Performance Management
Paper F5
Course Notes
(ANF513)
The online classroom – supporting your ACCA studies and helping you to pass!

Q - What’s included in the taught phase?

Online lectures of all the chapters – audio and visual walkthroughs of all the key concepts, techniques and lecture examples. Select debriefs of exam standard questions from the Q&A Bank.

Q - I’ve seen a chapter once – how should I use the online lecture?

If you’re comfortable with a chapter, then there’s no need to revisit it online. However, if there are some elements where another guided walk through would help, then use the online lecture to specifically address the aspects you need to see again.

All the lectures have easy-to-use indexes that allow you to jump straight to the section or lecture example you’d like to see again.

Q - What about assumed knowledge from previous papers?

If your paper has highly examinable topics that were covered in detail in a previous paper, there will be online lectures to help you cover these. Specific details will be provided at the appropriate place in the checkpoint/stage guidance as you progress through the course.

Q - I haven’t received my log-on details, or have encountered problems accessing the online classroom – what should I do?

Contact our support team who will be happy to help.

✉️ Custservdl@bpp.com
📞 0845 0751 100

Thanks for the course - this Online Classroom really seems to work

---

Improving study material and removing errors

There is a constant need to update and enhance our study materials in line with both regulatory changes and new insights into the exams. BPP appoints, from one of our experienced tutor team, a subject expert to update and improve these course notes regularly. These updates are technically checked by another tutor and frequently proof read.

We always aim to leave no numerical errors and narrative typos. However, given the volume of detailed information being changed in a short space of time, it is regrettable that an error may slip through our net despite our best intentions. We apologise sincerely for any inconvenience that this might cause.

If you find a specific error or typo please let us know at ACCAcoursesfeedback@bpp.com so we can correct it immediately. In addition we would welcome any suggestions you may have to further improve these study materials.
# F5 Performance Management Study Programme

## Step 1 – Taught Phase Study Programme

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Introduction to Paper F5 Performance Management

**Overall aim of the syllabus**
To develop knowledge and skills in the application of management accounting techniques to quantitative and qualitative information for planning, decision-making, performance evaluation, and control.

**The syllabus**
The broad syllabus headings are:

<table>
<thead>
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<th>A</th>
<th>Specialist cost and management accounting techniques</th>
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<td>B</td>
<td>Decision making techniques</td>
</tr>
<tr>
<td>C</td>
<td>Budgeting</td>
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<tr>
<td>D</td>
<td>Standard costing and variance analysis</td>
</tr>
<tr>
<td>E</td>
<td>Performance management systems, measurement and control</td>
</tr>
</tbody>
</table>

**Main capabilities**
On successful completion of this paper, candidates should be able to:

- Explain and apply cost accounting techniques
- Select and appropriately apply decision-making techniques to facilitate business decisions and promote efficient and effective use of scarce business resources, appreciating the risks and uncertainty inherent in business and controlling those risks
- Identify and apply appropriate budgeting techniques and methods for planning and control
- Identify and discuss performance management information systems and assess the performance of a business from both a financial and non-financial viewpoint, appreciating the problems of controlling divisionalised businesses and the importance of allowing for external aspects.
- Use standard costing systems to measure and control business performance and to identify remedial action
F5 is the middle paper in the management accounting section of the qualification structure. It builds upon the knowledge acquired in F2 and prepares those candidates who choose to study P5 at the Professional level.

F5 requires you to be able to apply techniques and think about their impact on the organisation. It seeks to examine candidates' understanding of how to manage the performance of a business.
# Taught Phase Aims

## Achieving ACCA's Study Guide Outcomes

Amended to reflect presentation in main body

### A  Specialist cost and management accounting techniques

<table>
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<th>Activity based costing</th>
<th>Chapter 2a</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2</td>
<td>Target costing</td>
<td>Chapter 2b</td>
</tr>
<tr>
<td>A3</td>
<td>Life cycle costing</td>
<td>Chapter 2c</td>
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<td>A4</td>
<td>Throughput accounting</td>
<td>Chapter 2d</td>
</tr>
<tr>
<td>A5</td>
<td>Environmental accounting</td>
<td>Chapter 2e</td>
</tr>
</tbody>
</table>

### B  Decision-making techniques

<table>
<thead>
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<th>B1</th>
<th>Relevant cost analysis</th>
<th>Chapter 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>B2</td>
<td>Cost volume analysis</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>B3</td>
<td>Limiting factors</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>B4</td>
<td>Pricing decisions</td>
<td>Chapter 5</td>
</tr>
<tr>
<td>B5</td>
<td>Make-or-buy and other short-term decisions</td>
<td>Chapter 6</td>
</tr>
<tr>
<td>B6</td>
<td>Dealing with risk and uncertainty in decision-making</td>
<td>Chapter 7</td>
</tr>
</tbody>
</table>

### C  Budgeting

<table>
<thead>
<tr>
<th>C1</th>
<th>Budgetary systems</th>
<th>Chapters 8 &amp; 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2</td>
<td>Types of budget</td>
<td>Chapter 9</td>
</tr>
<tr>
<td>C3</td>
<td>Quantitative analysis in budgeting</td>
<td>Chapters 10a &amp; 10b</td>
</tr>
<tr>
<td>C4</td>
<td>Behavioural aspects of budgeting</td>
<td>Chapter 8</td>
</tr>
</tbody>
</table>

### D  Standard costing and variance analysis

<table>
<thead>
<tr>
<th>D1</th>
<th>Budgeting and standard costing</th>
<th>Chapter 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2</td>
<td>Mix and yield variances</td>
<td>Chapter 12b</td>
</tr>
<tr>
<td>D3</td>
<td>Planning and operational variances</td>
<td>Chapter 12b</td>
</tr>
<tr>
<td>D4</td>
<td>Behavioural aspects of standard costing</td>
<td>Chapter 13</td>
</tr>
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</table>
Performance measurement and control

| E1 | Performance management information systems | Chapter 14 |
| E2 | Sources of management information | Chapter 15 |
| E3 | Management reports | Chapter 15 |
| E4 | The scope of performance measurement | Chapter 16 |
| E5 | Divisional performance and transfer pricing | Chapter 17 |
| E6 | Performance analysis in not-for-profit organisations and the public sector | Chapter 18 |
| E7 | External considerations and behavioural aspects | Chapter 18 |

The Examination Paper

Examiner: Ann Irons

The examination is a three hour paper with 15 minutes reading and planning time.

Format of the Exam

5 compulsory 20 mark questions

Questions on each paper will be drawn from each of the five syllabus areas. It is likely that they will be based on simple, realistic scenarios. The paper will be approximately 50% calculation, 50% discussion. Wherever possible students will first be asked to analyse / interpret given numbers and then prepare calculations of their own.

Time pressure warning
Key to icons

The following icons appear in this set of study notes

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![Question](image) | **Question practice**  
This is a question we recommend you attempt to reinforce your learning on a key topic |
| ![Real-life examples](image) | **Real-life examples**  
For further details see your Checkpoint Guidance |
| ![Section reference in the Study Text](image) | **Section reference in the Study Text**  
You could further consolidate your knowledge in this area with additional reading from the Study Text. |
| ![Formula to learn](image) | **Formula to learn** |
| ![Formula given in exam](image) | **Formula given in exam** |
Our analysis of the examiner’s comments on past exams, together with our experience of preparing students for this type of exam, suggests that to pass Paper F5 you will need to develop a number of key skills.

1. Effective use of the 15 minutes reading time at the start of the exam.
2. Knowledge of the syllabus is essential.
3. Exam approach to ensure that you play to your strengths and thereby maximise your marks.
4. Professional presentation of numbers and narrative answers.
5. Answering the question set. Ensuring your answer is specifically addressing the requirements and is applied to the scenario where necessary.
Skill 1 – Effective use of reading time

You are allowed 15 minutes reading time before the examination begins during which you should read the question paper and highlight or make notes on the question paper itself. You will not be allowed to open the answer book or start writing your answer during the reading time.

Do not under estimate the importance of this 15 minutes. Students who use this time wisely generally produce much better exam answers than those who don’t! This time allows you to get to grips with the questions asked and stops you from rushing into answering the questions.

Skill 2 – Knowledge of the syllabus

You need to have a good, broad knowledge of all of the F5 syllabus.

An effective memory technique is to create your own mind maps as the human brain is better at remembering patterns than lists. Pictures are another excellent memory tool. Often a simple picture can act as aid in recalling information. Another effective memory technique is to create mnemonics. The human mind is much better at memorising sounds and rhymes than simple lists.

Skill 3 – Exam approach

In order to maximise your marks available and to avoid panicking in the exam it is important that you play to your strengths. You should therefore be tackling those questions/requirements that you can do best, first. You should be aware of which these questions are likely to be, based upon your work in the reading time.

Skill 4 – Professional presentation

This is an area that students often don’t do well. It is vital that you do not throw marks away purely because the examiner cannot follow what you have done.

Numbers should be presented neatly and in discussion questions you need to avoid waffle. It is important that you make and explain your point fully without going overboard.

Skill 5 – Answer the question set

Sticking to the requirements you have been given may sound obvious but many candidates appear to get side tracked in the exam and therefore waste precious time on answers that don’t score any marks.

Candidates are required to not just make a point but need to apply it to the scenario given. Whenever you think you have finished your answer always go back and re-read that requirement before moving on.
How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
</table>
| Gain a broader background knowledge of areas covered in paper F2. These topics will be built upon throughout F5. | These topics will not be examined in their own right. However, calculation of OARs may be required within an ABC question and calculation of contribution may also be required in various aspects of the exam. Exam questions could also include a discursive comparison of modern costing techniques and traditional costing techniques. | Jola Publishing Co  
– June 2008, part (c), 5 marks  
Higgins Co  
– June 2008, part (a), 2 marks  
Brick by Brick  
– June 2010, part (a), 5 marks  
Gadget Co  
– Dec 2010, part (a), 5 marks |
Overview

- Absorption Costing
  - OAR
    - Under / Over Absorption
  - Reconciliation of profit
- Marginal Costing
  - Contribution

Costing
1 Principles of absorption costing

1.1 A method whereby all production costs are included in the costing of a cost unit, ie. direct materials, direct labour, variable production overheads and fixed production overheads. IAS2 requires an element of fixed production overhead to be ‘absorbed’ into product cost for inventory valuation purposes. All production costs are charged to units of production.

Example of a standard cost card for a cost unit

1.2

\[
\begin{array}{l}
\text{Direct costs:} \\
\quad \text{Direct materials} & (5\text{kg} @ $3/\text{kg}) & 15.00 \\
\quad \text{Direct labour} & (3\text{ hrs} @ $6/\text{hr}) & 18.00 \\
\quad \text{Indirect costs:} & & 33.00 \\
\quad \text{Variable overheads} & & 2.00 \\
\quad \text{Fixed overheads} & & 3.00 \\
\quad \text{Full product cost} & & 38.00
\end{array}
\]

2 Calculating the cost per unit

2.1
Revision Example: CD Factory

Cost Card

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct materials: Blank CD</td>
<td>$0.50</td>
</tr>
<tr>
<td></td>
<td>Box</td>
</tr>
<tr>
<td>Direct labour</td>
<td>$3.00</td>
</tr>
<tr>
<td>Direct expense: Royalties</td>
<td>$1.00</td>
</tr>
<tr>
<td>PRIME (direct) COST</td>
<td>$5.00</td>
</tr>
<tr>
<td>Indirect production costs</td>
<td>?</td>
</tr>
<tr>
<td>TOTAL PRODUCTION COST</td>
<td>?</td>
</tr>
</tbody>
</table>

Indirect Production costs/ overheads

Costs such as rent, supervisor’s salary, electricity etc are also incurred during production but they cannot be directly related to each CD.

How should these costs be allocated to a CD?

Three Step Process:

1. Allocate/apportion overheads to cost centres
2. Re-apportion service centre costs to production cost centres
3. Absorb into production

For example:

Total overheads are $20,000

Allocate: Pressing & packing

<table>
<thead>
<tr>
<th></th>
<th>Pressing</th>
<th>Packing</th>
<th>Canteen</th>
</tr>
</thead>
<tbody>
<tr>
<td>supervisors and a chef</td>
<td>$5,000</td>
<td>$3,000</td>
<td>$2,000</td>
</tr>
</tbody>
</table>

Apportion:

Rent based on floor space

<table>
<thead>
<tr>
<th></th>
<th>$500m²</th>
<th>$300m²</th>
<th>$200m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>$10,000</td>
<td>$5,000</td>
<td>$3,000</td>
<td>$2,000</td>
</tr>
</tbody>
</table>

Re-apportion:

Direct method : no inter-service cost centre work
Step Method : recognise significant inter-service cost centre work
Reciprocal : recognise all inter-service cost centre work

Eg. Direct method

<table>
<thead>
<tr>
<th></th>
<th>Pressing</th>
<th>Packing</th>
<th>Canteen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>$20,000</td>
<td>$10,000</td>
<td>$6,000</td>
</tr>
<tr>
<td>Split canteen based on no. employees (80% pressing, 20% packing)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20,000</td>
<td>13,200</td>
<td>800</td>
<td>(4,000)</td>
</tr>
</tbody>
</table>

(3) Absorb into production
3  Overhead absorption rates

3.1 O.A.R = \[\frac{\text{Estimated overhead costs}}{\text{Expected (normal) activity level}}\]

Example CD Factory continued.

(Step 3) **Absorb into production** –

- Produce 20,000 CDs
- Pressing = \(\frac{13,200}{20,000}\) CDs = $0.66
- Packing = \(\frac{6,800}{20,000}\) CDs = $0.34

$1.00 \rightarrow \text{add to cost card}

**Absorption Costing Summary**

3.2

**PRODUCTION COSTS**

**DIRECT COSTS**

- $5.00 per unit

**INDIRECT COST**

1. Allocate + apportion:

- Pressing: $10,000
- Packing: $6,000
- Canteen: $4,000

2. Re-allocate service CCs:

- Pressing: $13,200
- Packing: $6,800

2. Absorb into production

- Pressing: $0.66
- Packing: $0.34

**COST CARD**

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct materials</td>
<td>$1.00</td>
</tr>
<tr>
<td>Direct labour</td>
<td>$3.00</td>
</tr>
<tr>
<td>Direct expenses</td>
<td>$1.00</td>
</tr>
<tr>
<td>PRIME COST</td>
<td>$5.00</td>
</tr>
<tr>
<td>Fixed overheads absorbed</td>
<td>$1.00</td>
</tr>
<tr>
<td>TOTAL PRODUCTION COST</td>
<td>$6.00</td>
</tr>
</tbody>
</table>
Absorption into units of production

Bases

3.3  (a) Per unit
     (b) Per direct labour hour \[ \{ \text{Most frequently used in exams} \] 
     (c) Per machine hour
     (d) Percentage of direct materials cost
     (e) Percentage of direct labour cost
     (f) Percentage of prime cost

3.4 The basis level is always determined by the normal level of activity (IAS2) and the basis chosen should bear some reasonable relationship to the product.

Example CD Factory continued.
If the factory produces CDs and DVDs, it cannot absorb $1 per unit across both.

Labour hours are as follows:

<table>
<thead>
<tr>
<th></th>
<th>Pressing</th>
<th>Packing</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVD</td>
<td>1 hr</td>
<td>¼ hr</td>
</tr>
<tr>
<td>CD</td>
<td>½ hr</td>
<td>¼ hr</td>
</tr>
</tbody>
</table>

Produce 10,000 DVDs

Pressing: 10,000 labour hours
Packing: 2,500 labour hours

OAR

Pressing = $13,200 / 15,000 labour hours = $0.88/hr
Packing = $6,800 / 5,000 labour hours = $1.36/hr

\[ \begin{align*}
\text{DVD OAR:} & \\
\text{Pressing} & = 1\text{ hr} \times 0.88 = 0.88 \\
\text{Packing} & = 0.25 \text{ hr} \times 1.36 = 0.34 \\
\text{Total} & = 1.22 \\
\text{CD OAR:} & \\
\text{Pressing} & = 0.5 \text{ hr} \times 0.88 = 0.44 \\
\text{Packing} & = 0.25 \text{ hr} \times 1.36 = 0.34 \\
\text{Total} & = 0.78
\end{align*} \]
Under / Over Absorption

3.5

<table>
<thead>
<tr>
<th>Actual overhead expenditure</th>
<th>$X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of overhead absorbed</td>
<td>(X)</td>
</tr>
<tr>
<td>Under/(over) absorption</td>
<td>X/(X)</td>
</tr>
</tbody>
</table>

3.6 Reasons for under/over absorption:

- Expenditure variance – Actual overhead differed from budgeted overhead expenditure.
- Volume variance – Actual production activity differed from expected (normal) activity level.

Lecture example 1

Preparation question

<table>
<thead>
<tr>
<th>Selling price per unit</th>
<th>$10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable costs per unit</td>
<td></td>
</tr>
<tr>
<td>direct materials</td>
<td>$2</td>
</tr>
<tr>
<td>direct labour</td>
<td>$3</td>
</tr>
<tr>
<td>production overhead</td>
<td>$1</td>
</tr>
<tr>
<td>selling and distribution</td>
<td>$1</td>
</tr>
</tbody>
</table>

Fixed costs:

- Production: budgeted $8,000, actual $8,500 (each year)
- Selling and distribution: budgeted $2,000, actual $2,000

Activity levels:

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units</td>
<td>Units</td>
</tr>
<tr>
<td>Budgeted production</td>
<td>4,000</td>
</tr>
<tr>
<td>Actual sales</td>
<td>4,200</td>
</tr>
<tr>
<td>Actual production</td>
<td>4,400</td>
</tr>
</tbody>
</table>

There is no opening inventory in Year 1.

Required

Prepare an income statement under absorption costing for years 1 & 2.
<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sales</strong></td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td><strong>Cost of sales:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>opening inventory</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Production:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>variable costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>fixed costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>closing inventory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Over)/under absorption</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gross profit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Variable selling &amp; distribution</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fixed selling &amp; distribution</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Net profit</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4 Advantages and disadvantages of absorption costing

4.1 Advantages of absorption costing.
(a) It recognises that selling prices must cover all costs.
(b) It complies with IAS 2 on accounting for inventory, whereby the value of inventory must include an appropriate amount of fixed production overhead.

4.2 Disadvantages of absorption costing.
(a) Profits can be manipulated by simply changing production levels. This is because overheads will be carried forward in closing inventory.
(b) It is based on the assumption that overheads are volume related. In the next chapter we will see that ABC assumes that many overheads are complexity and diversity related, not merely volume related.

5 Principles of marginal costing (variable costing)

5.1 (a) A principle whereby variable production costs only are charged to cost units and the fixed costs attributable to the relevant period are written off in full against the contribution for the period.
(b) Inventory is valued at variable cost of production.

6 Contribution

6.1 Contribution towards fixed costs is represented by:
(a) Selling price per unit less all variable costs per unit (whether production admin. or selling etc).
(b) Fixed costs + profit.
Lecture example 2

Preparation question

There is no opening inventory in Year 1.

Selling price per unit $10
Variable costs per unit
  direct materials $2
  direct labour $3
  production overhead $1
  selling and distribution $1
Fixed costs:
Production: budgeted $8,000
  actual $8,500
Selling and distribution:
  (budgeted and actual) $2,000

Activity levels:

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units</td>
<td>Units</td>
</tr>
<tr>
<td>Budgeted production</td>
<td>4,000</td>
</tr>
<tr>
<td>Actual sales</td>
<td>4,200</td>
</tr>
<tr>
<td>Actual production</td>
<td>4,400</td>
</tr>
</tbody>
</table>

Required

Complete the income statement under marginal costing principles for both years.
Solution

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Cost of sales:</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>opening inventory</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Variable production costs</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>closing inventory</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Variable selling &amp; distribution</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>CONTRIBUTION</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Fixed costs:</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>production</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>selling &amp; distribution</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>PROFIT</td>
<td>$</td>
<td>$</td>
</tr>
</tbody>
</table>

Workings:
7 Advantages and disadvantages of marginal costing

Advantages

7.1 (a) Most appropriate for decision making as it highlights contribution. (It is useful for short-term pricing decisions or decisions on one-off or ad-hoc contracts.)
(b) Fixed costs are treated in accordance with their nature, ie as period costs.
(c) Profit depends on sales and efficiency not on production levels.
(d) Slightly simpler variance analysis.

Disadvantages

7.2 (a) There is a danger that products will be sold on an ongoing basis at a marginal contribution which fails to cover fixed costs.
(b) Does not comply with IAS 2, thus necessitating year end adjustments for the preparation of published accounts.
(c) Necessitates analysis of mixed costs between fixed and variable.
(d) Seasonal variations in a year can cause unnecessary profit variances.

8 Effect of inventory valuation on profit

8.1 (a) Production = sales (so inventory is constant)
\[ \text{AC profit} = \text{MC profit} \]
(b) Production < sales (so inventory is falling)
\[ \text{AC profit} < \text{MC profit} \]
(c) Production > sales (so inventory is climbing)
\[ \text{AC profit} > \text{MC profit} \]

8.2 If there is a difference between the two profit figures the difference between the figures will effectively be the OAR/unit x movement in inventory.

8.3 You can remember which profit will be highest using SIAM

- S – Stock (Inventories)
- I – Increase
- A – Absorption profit
- M – More
Lecture example 3

Preparation question

Reconcile the profit figures calculated in lecture examples 1 and 2.

Solution
<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Principles of Absorption Costing</td>
<td>Absorption costing <strong>includes</strong> the absorption of <strong>overheads</strong> when calculating a cost per unit</td>
</tr>
<tr>
<td>2</td>
<td>Calculating the cost per unit</td>
<td>The absorption happens over a three-step process</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Allocate &amp; apportion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 Reapportion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 Absorb</td>
</tr>
<tr>
<td>3</td>
<td>Overhead Absorption rate</td>
<td>Estimated overhead costs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Expected (normal) activity level</td>
</tr>
<tr>
<td>4</td>
<td>Advantages and disadvantages of absorption costing</td>
<td>Absorption costing complies with IAS 2 and ensures all production costs are included in the cost of a unit</td>
</tr>
<tr>
<td>5</td>
<td>Principles of Marginal Costing</td>
<td>Marginal costing doesn’t include overheads in unit costs instead charging them to the income statement in full</td>
</tr>
<tr>
<td>6</td>
<td>Contribution</td>
<td>Contribution (<strong>selling price less variable costs</strong>) is a key tool for decision making</td>
</tr>
<tr>
<td>7</td>
<td>Advantages and disadvantages of marginal costing</td>
<td>Marginal costing is most appropriate for decision making.</td>
</tr>
<tr>
<td>8</td>
<td>Differences between marginal and costing profit</td>
<td>The valuation of inventory drives the difference between the two profits. The difference will be the change in inventory x OAR.</td>
</tr>
</tbody>
</table>
## How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
</table>
|                            | Interpretation of variances and discussion as to a manager’s performance using variances has been regularly examined. Calculation of all basic variances has been required. | Simply Soup - Pilot Paper, part (a), 16 marks  
Spike Ltd – December 2007, part (c), 4 marks  
Chaff Co - June 2008, 25 marks  
Crumbly Cakes – June 2009, part (a), 7 marks  
SN – December 2009, part (a), 4 marks  
Sticky Wicket - June 2010, part (b), 13 marks  
Carad – December 2010, part (a), 7 marks |
|                            | Discussion requirement either in the context of labour variances or a learning curve question. | Chaff Co – June 2008, part (b), 16 marks (marks were available for format & reconciliation of actual profit) |
|                            | This would form the majority of a question on variances. | Chaff Co – June 2008, part (b), 4 marks |
|                            | This variance calculation is most likely to be one element of a larger variance question. | Chaff Co – December 2011, parts (b) and (c) 8 marks |
|                            | This discussion element would probably feature in a question alongside the idle time / waste variances. | Choc Co – December 2011, parts (b) and (c) 8 marks |
|                            | Variable overhead variances would be required. | |
|                            | This would be a discussion requirement. | |
Overview

Basic variances

Variance analysis

Interpretation
1 Calculation of basic variances

1.1 Variance analysis reconciles actual to budgeted costs, revenue or profit. It is a way of explaining the difference between actual and budgeted results. They can either be favourable (F), ie better than expected or adverse (A), worse than expected.

1.2 These variances have been examined at F2. They could also be examined in F5 along with a discussion as to what the variances are showing or preparation of an operating statement. Basic variances are assumed knowledge and not specifically mentioned in the F5 syllabus. It is vital that you are happy with them before day three of the course.

2 Operating statement proforma

<table>
<thead>
<tr>
<th>Operating Statement</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(under marginal costing)</td>
<td></td>
</tr>
<tr>
<td>Budgeted contribution</td>
<td></td>
</tr>
<tr>
<td>Sales volume contribution variance</td>
<td></td>
</tr>
<tr>
<td>Sales price variance</td>
<td></td>
</tr>
</tbody>
</table>

Cost variances:

<table>
<thead>
<tr>
<th></th>
<th>$(F)</th>
<th>$(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials</td>
<td>Price</td>
<td>Usage</td>
</tr>
<tr>
<td>Labour</td>
<td>Rate</td>
<td>Efficiency</td>
</tr>
<tr>
<td>Variable o/h</td>
<td>Expenditure</td>
<td>Efficiency</td>
</tr>
<tr>
<td>Actual contribution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed overheads</td>
<td>Budgeted</td>
<td>Expenditure variance</td>
</tr>
<tr>
<td>Actual profit</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


## 3 Variance proformas

### 3.1 Material variances

<table>
<thead>
<tr>
<th></th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Price</strong></td>
<td></td>
</tr>
<tr>
<td>‘Should’</td>
<td>Actual purchases should cost $X</td>
</tr>
<tr>
<td>‘Did’</td>
<td>Actual purchases did cost $(X)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Usage</strong></th>
<th>Kgs</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Should’</td>
<td>Actual production should use $X</td>
</tr>
<tr>
<td>‘Did’</td>
<td>Actual production did use $(X)</td>
</tr>
<tr>
<td></td>
<td>Difference valued at standard cost $X</td>
</tr>
</tbody>
</table>

### 3.2 Labour variances

<table>
<thead>
<tr>
<th></th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rate</strong></td>
<td></td>
</tr>
<tr>
<td>‘Should’</td>
<td>Actual hours paid should cost $X</td>
</tr>
<tr>
<td>‘Did’</td>
<td>Actual hours paid did cost $(X)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Efficiency</strong></th>
<th>Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Should’</td>
<td>Actual production should take $X</td>
</tr>
<tr>
<td>‘Did’</td>
<td>Actual production did take $(X)</td>
</tr>
<tr>
<td></td>
<td>Difference valued at standard rate per hour $X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Idle time</strong></th>
<th>Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Should’</td>
<td>Hours worked $X</td>
</tr>
<tr>
<td>‘Did’</td>
<td>Hours paid $(X)</td>
</tr>
<tr>
<td></td>
<td>Difference valued at standard rate per hour $X</td>
</tr>
</tbody>
</table>

### 3.3 Variable overhead variances

<table>
<thead>
<tr>
<th></th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Expenditure</strong></td>
<td></td>
</tr>
<tr>
<td>‘Should’</td>
<td>Actual hours worked should cost $X</td>
</tr>
<tr>
<td>‘Did’</td>
<td>Actual hours worked did cost $(X)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Efficiency</strong></th>
<th>Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Should’</td>
<td>Actual production should take $X</td>
</tr>
<tr>
<td>‘Did’</td>
<td>Actual production did take $(X)</td>
</tr>
<tr>
<td></td>
<td>Difference valued at standard rate per hour $X</td>
</tr>
</tbody>
</table>

NB: This assumes variable overheads are incurred per labour hour.
3.4 **Fixed overhead variances**

Under **marginal costing**, the fixed overhead variance is just the difference between budgeted and actual fixed overhead costs, i.e., fixed overhead expenditure variance.

Under **absorption costing**, the fixed overhead variance can be further subdivided as follows:

<table>
<thead>
<tr>
<th>Total variance (over/under absorption)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expenditure variance</td>
</tr>
<tr>
<td>$\text{'Should'}$ Budget expenditure $X$</td>
</tr>
<tr>
<td>‘Did’ Actual expenditure $(X)$</td>
</tr>
<tr>
<td>Volume variance</td>
</tr>
<tr>
<td>‘Should’ Budgeted units $X$</td>
</tr>
<tr>
<td>‘Did’ Actual units $(X)$</td>
</tr>
<tr>
<td>Difference value at OAR per unit $$X$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Should’ Actual production should take $X$</td>
</tr>
<tr>
<td>‘Did’ Actual production did take $(X)$</td>
</tr>
<tr>
<td>Difference valued at OAR per hr $$X$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Should’ Budgeted hours worked $X$</td>
</tr>
<tr>
<td>‘Did’ Actual hours worked $(X)$</td>
</tr>
<tr>
<td>Difference valued at OAR per hour $$X$</td>
</tr>
</tbody>
</table>

3.5 **Sales variances**

<table>
<thead>
<tr>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Should’ Actual units sold should sell for $X$</td>
</tr>
<tr>
<td>‘Did’ Actual units sold did sell for $(X)$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Should’ Budgeted sales units $X$</td>
</tr>
<tr>
<td>‘Did’ Actual sales units $(X)$</td>
</tr>
<tr>
<td>Difference valued at standard <strong>contribution/unit</strong> $$X$</td>
</tr>
</tbody>
</table>

Under absorption costing this variance will be valued at standard **profit/unit**.
Brenda and Eddie run The Italian Restaurant selling a variety of pasta dishes each using similar ingredients and taking the same amount of time to prepare.

To try to control costs they instigate a standard costing system, deriving the following standard cost per meal.

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Rate</th>
<th>Cost per meal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingredients (average value)</td>
<td>400g</td>
<td>$1.50/kg</td>
<td>0.60</td>
</tr>
<tr>
<td>Labour</td>
<td>30 mins</td>
<td>$4/hour</td>
<td>2.00</td>
</tr>
<tr>
<td>Variable overheads</td>
<td>30 mins</td>
<td>$1/hour</td>
<td>0.50</td>
</tr>
<tr>
<td>Fixed overheads</td>
<td>30 mins</td>
<td>$2.50/hour</td>
<td>1.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4.35</td>
</tr>
<tr>
<td>Standard profit</td>
<td></td>
<td></td>
<td>2.60</td>
</tr>
<tr>
<td>Selling price</td>
<td></td>
<td></td>
<td>6.95</td>
</tr>
</tbody>
</table>

The overheads are absorbed on the assumption that Brenda and Eddie normally sell 100 pasta meals per day over the year during which they are open for 300 days.

During one six day week, the following results are obtained:

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meals sold</td>
<td>630</td>
<td></td>
</tr>
<tr>
<td>Ingredients bought:</td>
<td>260 kg</td>
<td>$380</td>
</tr>
<tr>
<td>Ingredients used:</td>
<td>240 kg</td>
<td></td>
</tr>
<tr>
<td>Hours paid</td>
<td>300 hrs</td>
<td>$1,350</td>
</tr>
<tr>
<td>Time lost due to late delivery of ingredients</td>
<td>10 hours</td>
<td></td>
</tr>
<tr>
<td>Variable overheads</td>
<td></td>
<td>$325</td>
</tr>
<tr>
<td>Fixed overheads</td>
<td></td>
<td>$750</td>
</tr>
</tbody>
</table>

Required

(a) Reconcile the budgeted contribution to the actual profit (for one week) using marginal costing

(b) Prove the actual profit

(c) Suggest possible causes for the variances identified.
### Solution

**Operating Statement**
(under marginal costing)

<table>
<thead>
<tr>
<th>Budgeted contribution</th>
<th>Sales volume contribution variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales price variance</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost variances:</th>
<th>$(F)$</th>
<th>$(A)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials</td>
<td>Price</td>
<td>Usage</td>
</tr>
<tr>
<td>Labour</td>
<td>Rate</td>
<td>Efficiency</td>
</tr>
<tr>
<td>Variable o/h</td>
<td>Expenditure</td>
<td>Efficiency</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actual contribution</th>
<th>Fixed overheads</th>
<th>Actual profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budgeted</td>
<td>Expenditure variance</td>
<td></td>
</tr>
<tr>
<td>Actual</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Workings:
Differences between absorption costing and marginal costing

3.6 Variances calculated using absorption costing are the same as under marginal costing except:

(a) Fixed overheads – see Section 1.6
(b) Sales volume profit variance:
    variance in units valued at standard profit/unit, not contribution/unit
(c) Operating statement will usually reconcile budgeted profit to actual profit.

Lecture example 2

Required

Using the information in lecture example 1, analyse the fixed overhead variances in detail and prepare an operating statement using absorption costing principles.
Solution

Operating Statement
(under absorption costing)  

Budgeted profit
Sales volume profit variance
Sales price variance

Cost variances:  $(F) $(A)
Materials
- Price
- Usage
Labour
- Rate
- Efficiency
- Idle
Variable o/h
- Expenditure
- Efficiency
Fixed o/h
- Expenditure
- Efficiency
- Capacity

Actual profit

Workings:
4 Interpretation of variances

Causes of variances

4.1 Obviously the cause of the variance must be determined before appropriate action can be taken. An employee should only be judged on what they have control over.

(a) Different controllable expenditure
(b) Different uncontrollable expenditure
(c) Inaccurate standard due to
   • Poor planning
   • Use of unrealistic standard

(d) Inaccurate measurement

Interdependence of variances

4.2 In order to interpret variances effectively any interdependence between variances must be identified, i.e. it is not always possible to look at individual variances in isolation.

4.3 For example, a decision to purchase better quality, higher price materials may result in an adverse price variance but a favourable usage variance.

4.4 The following table may help you to think about some of the operational causes of variances.
### VARIANCE ANALYSIS

<table>
<thead>
<tr>
<th>Variance</th>
<th>Favourable</th>
<th>Adverse</th>
</tr>
</thead>
</table>
| **Material price** | Unforeseen discounts received  
Greater care in purchasing  
Change in material standard | Price increase  
Careless purchasing  
Change in material standard |
| **Material usage** | Material used of higher quality than standard  
More efficient use of material  
Errors in allocating material to jobs | Defective material  
Excessive waste or theft  
Stricter quality control  
Errors in allocating material to jobs |
| **Labour rate**   | Use of workers at a rate of pay lower than standard | Wage rate increase |
| **Idle time**     | The idle time variance is always adverse | Machine breakdown  
Illness or injury to worker |
| **Labour efficiency** | Output produced more quickly than expected because of worker motivation, better quality materials etc  
Errors in allocating time to jobs | Lost time in excess of standard  
Output lower than standard set because of lack of training, sub-standard materials etc  
Errors in allocating time to jobs |
| **Fixed overhead expenditure** | Savings in costs incurred  
More economical use of services | Increase in cost of services used  
Excessive use of services  
Change in type of service used |

*Overhead expenditure variances ought to be traced to the individual cost centres where the variances occurred.*

<table>
<thead>
<tr>
<th>Fixed overhead volume</th>
<th>Production or level of activity greater than budgeted</th>
<th>Production or level of activity less than budgeted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td>Reasons for this tie in exactly to labour efficiency</td>
<td>Reasons for this tie in exactly to labour efficiency</td>
</tr>
<tr>
<td>Capacity</td>
<td>Labour worked for more hours than budgeted. Maybe due to more production than expected</td>
<td>Maybe a result of lower production volumes or higher absenteeism eg holidays / sickness</td>
</tr>
</tbody>
</table>
| Sales price           | Unplanned price increase  
Fewer discounts given than expected | Anticipated increase in selling price did not happen  
More discounts allowed than expected |
| Sales volume          | Additional demand experienced | Fall in demand  
Lower output |
Lecture example 3

Required
Discuss instances when a favourable variance may not be good news and when adverse variances may be good for a business.

Solution
# Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Calculation of basic variances</td>
<td>Variance analysis is a performance evaluation tool that is often used especially as a part of cost control</td>
</tr>
<tr>
<td>4</td>
<td>Interpretation of variances</td>
<td>Interpretation of variances is as important as the calculations themselves</td>
</tr>
<tr>
<td>6</td>
<td>Investigating variances</td>
<td>Before deciding to investigate a variance factors such as size, trend and controllability should be considered</td>
</tr>
<tr>
<td></td>
<td></td>
<td>There are three variance investigation models: Rule of thumb, statistical control charts and the statistical significance model</td>
</tr>
</tbody>
</table>
## How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
</table>
| Identify appropriate cost drivers under ABC | Questions will require you to identify an appropriate driver to use when calculating costs per unit using ABC. To date these have been straightforward to identify. | Triple  
– Pilot Paper, part (b)  
Jola Publishing Co  
– June 2008, part (d)  
Brick by Brick  
– June 2010, part (b)  
Gadget Co  
– Dec 2010, part (b) |
| Calculate costs per driver and per unit using ABC | Calculation of OARs and then cost per unit using ABC will be required. | Triple  
– Pilot Paper, part (b), 12 marks  
Jola Publishing Co  
– June 2008, part (d), 8 marks  
Brick by Brick  
– June 2010, part (b), 5 marks  
Gadget Co  
– Dec 2010, part (b), 9 marks  
Wash Co  
– Dec 2012, 20 marks |
### Overview

**Activity based costing**

- **Calculation of cost/unit**
  - Cost pools
  - Cost drivers

- **Comparison with Absorption Costing**

- **Implications of ABC**
  - Benefits
  - Criticisms
  - Implications

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
</table>
| Compare ABC and traditional methods of overhead absorption based on production units, labour hours or machine hours | A discussion element explaining the differences in the resulting cost per units under absorption and ABC would generally be required. | **Triple**  
  - Pilot Paper, part (c), 4 marks  
  - Jola Publishing Co  
  - June 2008, part (d), 8 marks |
1 Activity based costing (ABC)

Introduction

1.1 In this chapter we will be looking at an alternative method of cost accumulation, ABC. ABC is a modern alternative to absorption costing which attempts to overcome the problems of costing in a modern manufacturing environment.

Traditional absorption costing

1.2 Traditional absorption costing uses a single basis for absorbing all overheads into cost units for a particular production department cost centre.

A business will choose the basis that best reflects the way in which overheads are being incurred, e.g. in an automated business much of the overhead cost will be related to maintenance and repair of the machinery. It is likely that this will vary to some extent with machine hours worked so we would have used a machine hour absorption rate.

Activity based costing

1.3 Production overheads are by no means all volume-related and hence a single basis for absorption, e.g. labour hours, would not adequately reflect the complexity of producing certain products/cost units as opposed to others.

1.4 ABC is an extension of absorption costing specifically considering what causes each type of overhead category to occur, i.e. what the cost drivers are. Each type of overhead is absorbed using a different basis depending on the cost driver.
Steps in ABC

1.5  (1) Group overheads into activities, according to how they are driven. These are known as cost pools.

(2) Identify the cost drivers for each activity, i.e., what causes the activity cost to be incurred.

(3) Calculate a cost per unit of cost driver.

(4) Absorb activity costs into production based on usage of cost drivers.

Absorption costing vs Activity based costing

2.1 Overhead absorption rates using ABC should be more closely linked to the causes of overhead costs.

The modern business environment has much wider product ranges than seen before, complex production process and decreasing product lifecycles. ABC recognises these factors by using multiple cost drivers when absorbing overheads.

Lecture example 1

Technique Demonstration

Dodo Ltd manufactures three products, A, B and C. Data for the period just ended is as follows:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output (units)</td>
<td>20,000</td>
<td>25,000</td>
<td>2,000</td>
</tr>
<tr>
<td>Sales price $</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Direct material cost $</td>
<td>5</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Labour hours/unit</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Wages paid at $5/hr</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total production overheads for Dodo Ltd amount to $190,000.

Required

(a) Calculate the profit per unit obtained on each product if production overheads are absorbed on the basis of labour hours (Traditional Absorption Costing).
The following data is now also available:

\[
\begin{align*}
\text{Machining} & \quad 55,000 \\
\text{Quality control and set-up costs} & \quad 90,000 \\
\text{Receiving} & \quad 30,000 \\
\text{Packing} & \quad 15,000 \\
\hline
\text{Total} & \quad 190,000
\end{align*}
\]

These are known as cost pools.

<table>
<thead>
<tr>
<th>Output (units)</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>20,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost driver data</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour hours/unit</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Machine hours/unit</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>No. of production runs</td>
<td>10</td>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>No. of component receipts</td>
<td>10</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>No. of customer orders</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>
Required

(b) Using ABC, show the cost and gross profit per unit for each product during the period and contrast this with the profit calculated using absorption costing.

(c) What factors should be considered when comparing the results?

Solution

Cost driver analysis

2.2 Today’s complex business environment means that costs are incurred because cost drivers occur at different levels.

2.3 There are four key categories for activities and their related costs.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Type of cost</th>
<th>Cost driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>Direct</td>
<td>Units produced</td>
</tr>
<tr>
<td>Batch</td>
<td>Set ups</td>
<td>Batches produced</td>
</tr>
<tr>
<td></td>
<td>Inspection</td>
<td></td>
</tr>
<tr>
<td>Product</td>
<td>R&amp;D</td>
<td>Products produced</td>
</tr>
<tr>
<td></td>
<td>Marketing</td>
<td></td>
</tr>
<tr>
<td>Facility sustaining</td>
<td>Depreciation</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Rent</td>
<td></td>
</tr>
</tbody>
</table>
The difference between unit costs under absorption costing and ABC depends upon the proportion of overhead in each category.

If most overheads are unit level or facility sustaining the costs will be similar.

If overheads are batch or product sustaining costs, the resulting unit costs will be very different.

3 Implications of ABC

When ABC should be used

3.1  (a) When production overheads are high relative to prime costs (eg service sector)
      (b) When there is a whole diversity of product range
      (c) When there are considerable differences in the use of resources by products
      (d) Where consumption of resources is not driven by volume

Benefits of ABC

3.2 The use of ABC provides opportunities for

      (a) Cost control and reduction by the efficient management of cost drivers
      (b) Better costing information used to assist pricing decisions
      (c) Re-analysis of production and output/product mix decisions
      (d) Profitability analysis (by customer, product line etc)
      (e) A more realistic estimate of costs and profits which can be used in performance appraisal

Criticisms of ABC

3.3 (a) It is time consuming and expensive
      (b) Will be of limited benefit if overhead costs are primarily volume related
      (c) Reduced benefit if the company is producing only one product or a range of products with similar costs
      (d) Complex situations may have multiple cost drivers
      (e) Some arbitrary apportionment may still exist
## 4 Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
</table>
| 1       | Activity Based Costing     | - Activity Based Costing groups overheads into activities. These are referred to as **cost pools**  
          |                             | - The item that causes the costs to be incurred is the **cost driver**  
          |                             | - Overheads are absorbed into products using the cost drivers                                                                 |
| 2       | Absorption costing vs ABC  | Overhead absorption rates under ABC should be more closely linked to the **causes of overhead** costs.                                        |
| 3       | Implications of ABC        | ABC results in a more **meaningful product cost** when overheads are high and there is a wide diversity of product range                   |
### How have the syllabus learning outcomes been examined?

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<th>Syllabus learning outcomes</th>
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</tr>
</thead>
</table>
| Derive a target cost in manufacturing and service industries | To date a description of the target costing process has been required along with calculations of an expected cost and the resulting cost gap. Discussion of the process has also been required. | Edward Ltd  
– December 2007, part d, 13 marks  
BCC  
– December 2009, part a, 2 marks  
Universal Health Systems  
– June 2012, part a, 6 marks |
| Explain the difficulties of using target costing in service industries | Discussion requiring application. | Universal Health Systems  
– June 2012, parts b,c & d, 14 marks |
| Suggest how a target cost gap might be closed | A discussion element requiring knowledge of possible actions | Edward Ltd  
– December 2007, part c, 5 marks  
BCC  
– December 2009, part b, 6 marks |
Overview

- Target costing
  - Deriving a target cost
  - Closing a target cost gap
  - Implications
  - Target costing in service industries
1 Target costing

Introduction

1.1 In a modern environment with shortening product lifecycles, organisations have to continually redesign their products. It is essential that they try to achieve a target cost during the product’s development.

Cost plus pricing

1.2 Under traditional approaches to pricing, businesses calculate the cost of manufacturing and selling a product, and then add mark up, to give the profit element. These methods are known as “cost plus pricing”.

1.3 A major criticism of cost plus pricing techniques is that they do not consider any external factors (e.g. demand for product; no. of competitors, etc). They are therefore unlikely to maximise the profits that a business will generate.

Target costing

1.4 As product life cycles have become much shorter, the planning, development and design stage of a product is critical to an organisation’s cost management process. Cost reduction must be considered at this stage of a product’s life cycle, rather than during the production process.

1.5 Target costing involves setting a selling price for your product by reference to the market. From this your desired profit margin is deducted leaving you with a target cost.
2 Deriving a target cost

Traditionally:

\[
\text{mark-up (2nd)} \quad \begin{cases} 
\text{Cost (1st)} \quad \text{selling price (3rd)} \\
\end{cases}
\]

Target Costing:

\[
\text{Target cost (3rd)} \quad \begin{cases} 
\text{mark-up (2nd)} \quad \text{selling price (1st)} \\
\end{cases}
\]

Implementing target costing

2.1 (a) Define product specification and estimate anticipated sales volume.
(b) Set a target selling price at which the company will be able to achieve the desired market share.
(c) Required profit is estimated based on profit margins or return on investment.
(d) Target cost is calculated as:

\[
\text{Target selling price} \times (X) \quad \text{Less: target profit} \quad \frac{\text{Target cost}}{X} = \frac{\text{Target selling price} \times (X) - \text{Target cost}}{X}
\]

(e) The estimated cost of the product is calculated based on the product specification and current cost levels.
(f) Estimated Product Cost – Target Cost = Cost Gap
(g) Efforts are made to close the cost gap. Aim to “design out” costs before production starts.
Lecture example 1

Preparation question

Sam produces rabbit hutches. He is about to launch a new top of the range hutch which he believes he can sell for $125. He demands a margin of 25% on sales.

Cost information for the new hutch is as follows:

Timber – Good quality timber is essential – the hutch needs 10m of good quality planed timber. Sam can acquire this at a cost of $48.

Felt roofing material – 2m² are required. Roofing material costs $17.50 / m²

Wire – 1m of wire is needed at a cost of $1.50 per metre

Labour – The hutch will take 2 hours to construct – labour is paid at a rate of $7 / hour

Variable overhead – These will be incurred at a rate of $1.50 per labour hour

Required

Calculate the target cost of the new hutch and identify any cost gap that may exist

Solution
3 Closing a target cost gap

Lecture example 2

Idea Generation

Suggest possible ways to close a target cost gap.

Note: Altering the selling price is not a valid way of reducing the gap.

Solution

4 Implications

4.1 Target costing turns the traditional cost plus approach to pricing on its head, meaning pricing is the first consideration. Cost control is considered right up front as part of the development of the product not merely as an activity which happens alongside production.

4.2 Performance management will therefore focus on ensuring sales targets are met and ways of improving processes / development to drive down costs to at least the level of the target cost.
5 Implications of target costing in service industries

5.1 The target costing approach is a sensible basis for estimating / driving down costs regardless of the type of business. However, due to the nature of service industries this process is more difficult in these businesses.

5.2 Unlike manufacturing, service industries have the following characteristics which make cost and performance measurement more difficult:

- **Simultaneity** – created at time consumed
- **Heterogeneity** – quality / consistency varies
- **Intangibility** – of what is provided
- **Perishability** – cannot make in advance and store up.

5.3 In addition to these problems, service organisations will require more qualitative information to arrive at a price and evaluate performance eg

- Quality of service
- Repeat customers etc

6 Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Target Costing</td>
<td>Target costing is an approach that sets the selling price of a product or service with reference to the market place</td>
</tr>
<tr>
<td>2</td>
<td>Deriving a target cost</td>
<td>Selling price less desired margin = target cost</td>
</tr>
<tr>
<td>3</td>
<td>Closing a target cost gap</td>
<td>Any cost gap should be closed via the design and development of the product</td>
</tr>
<tr>
<td>4</td>
<td>Implications</td>
<td>Cost control is considered up front during development stage</td>
</tr>
<tr>
<td>5</td>
<td>Implications of target costing in service industries</td>
<td>Target costing can be applied to service industries but the measurement of cost is more difficult</td>
</tr>
</tbody>
</table>
2b: TARGET COSTING

END OF CHAPTER

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ANF513
# Life cycle costing

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</table>
| Identify the costs involved at different stages of the life cycle. | This could most likely be examined via a discussion or by calculations of costs at different stages of the product lifecycle and a product’s overall profitability. | Wargrin  
– December 2008, parts (a) & (b), 10 marks. |
| Derive a life cycle cost in manufacturing and service industries | Calculation of costs at each stage of the life cycle may be required. | Fit Co  
– Dec 2011, part (a), 6 marks. |
| Identify the benefits of lifecycle costing. | This would form a discussion. Dec 08 linked with standard costing, links with the pricing area of the syllabus could also be made. | Wargrin  
– December 2008, part (a), 3 marks.  
Fit Co  
– Dec 2011, part (c), 4 marks. |
Overview

- Life cycle costing
  - Costs at the different stages of the life cycle
  - Deriving a life cycle cost
  - Benefits of life cycle costing
1 Life cycle costing

Introduction

1.1 Life cycle costing aims to cost a product, service, customer or project over its entire lifecycle with the aim of maximising the return over the total life while minimising costs.

1.2 Traditionally the costs and revenues of a product are assessed on a financial year or period by period basis.

1.3 Product life cycle costing considers all the costs that will be incurred from design to abandonment of a new product and compares these to the revenues that can be generated from selling this product at different target prices throughout the product's life.

2 Product life cycle

2.1 The product life cycle (PLC) can be divided into five stages.
2c: LIFE CYCLE COSTING

2.2 Characteristics of the PLC

<table>
<thead>
<tr>
<th>Stage</th>
<th>Sales Volume</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development</td>
<td>None</td>
<td>Research &amp; development</td>
</tr>
<tr>
<td>Introduction</td>
<td>Very low levels</td>
<td>Very high fixed costs (eg Fixed (non-current) assets, advertising)</td>
</tr>
<tr>
<td>Growth</td>
<td>Rapid increase</td>
<td>Increase in variable costs Some fixed costs increase (eg. Increase number of fixed (non-current) assets)</td>
</tr>
<tr>
<td>Maturity</td>
<td>Stable High volume</td>
<td>Primarily variable costs</td>
</tr>
<tr>
<td>Decline</td>
<td>Falling demand</td>
<td>Primarily variable costs (now decreasing) Some fixed costs (eg decommissioning costs)</td>
</tr>
</tbody>
</table>

Impact of PLC in the modern environment

2.3 (a) Shorter product life cycles.
(b) Clearer strategic planning required.
(c) 90% of costs to be incurred throughout its life cycle will have been determined before a product reaches the market.

Maximising return over the product lifecycle

2.4 There are a number of ways that return can be increased over the life cycle.
(a) Design costs out of products
Approximately 70% – 90% of a product's lifecycle costs are determined by decisions made early in the lifecycle at the design and development stage. Thus design and production teams must work together to ensure costs are minimised.
(b) Minimise the time to market
This is the time from the conception of the product to its launch. If a company can get a product to the market place very quickly, it will give the product as long a span as possible without competitors' rival products in the market place. This should mean that market share is increased in the long run.
(c) Minimise breakeven time
Pricing strategies will affect both contribution and volumes generated. A short breakeven time is very important for liquidity purposes.
(d) Extend the length of the life cycle itself
For example, product development, finding other uses for a product or staggering the launch of the product in different markets.
2.5 Collected data are compared with budgeted costs to check whether expected savings have been realised.

3 Implications

3.1 Given that there will be different levels of demand for a product over its expected life, it would **not be** appropriate to set one price for the product’s entire life.

3.2 An understanding of the stages a product goes through enables you to price accordingly to either manipulate demand (low price, demand will rise and the intro stage is shortened) or to maximise profit.

3.3 All costs relating to a product including R&D are associated with the product. This enables true assessment of a product’s profitability.

3.4 Having looked at a product’s PLC it is clear that initially the product will make a loss. Viewing profitability on a periodic basis can put unnecessary pressure on management due to the visibility of the loss and could lead to wrong decisions being taken.

Advantages

3.5 (a) Considers external factors throughout a product’s expected life.

(b) Considers **all** costs incurred on a product, and therefore leads to cost reduction.

(c) Very useful in the **modern competitive environment**, in which products often have a short life cycle and when a large portion of costs will be committed prior to production commencing.
Co X are in a high tech industry and are often first to market with new technological advances. They have recently spent $500,000 designing and developing a new product. The new product is expected to have an eighteen month lifecycle.

The anticipated performance of this product is as follows:

<table>
<thead>
<tr>
<th></th>
<th>Introduction</th>
<th>Growth</th>
<th>Maturity</th>
<th>Decline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales volume (units)</td>
<td>4,000</td>
<td>9,000</td>
<td>30,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Per unit ($)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selling price</td>
<td>599</td>
<td>549</td>
<td>449</td>
<td>349</td>
</tr>
<tr>
<td>Variable Cost</td>
<td>249</td>
<td>249</td>
<td>199</td>
<td>149</td>
</tr>
<tr>
<td>Overhead</td>
<td>100</td>
<td>100</td>
<td>60</td>
<td>75</td>
</tr>
</tbody>
</table>

**Required**

Calculate the profitability of the new product.

**Solution**
## 4 Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Life cycle Costing</td>
<td>Life cycle costing considers <strong>all</strong> costs and revenues of a product <strong>throughout its life</strong> rather than on a periodic basis.</td>
</tr>
</tbody>
</table>
| 2       | Product life cycle     | The product life cycle is divided into 5 stages:  
- Development  
- Introduction  
- Growth  
- Maturity  
- Decline |
| 3       | Implications           | Understanding the product life cycle enables you to price accordingly to either manipulate demand or maximise profit. |
## How have the syllabus learning outcomes been examined?

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<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculate and interpret a throughput accounting ratio (TPAR)</td>
<td>Calculations of ratios themselves, discussion as to the meaning of the ratios may also be required.</td>
<td>Yam Co – June 09, part (b), 8 marks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thin Co – June 2011, part (a), 6 marks.</td>
</tr>
<tr>
<td>Suggest how a TPAR could be improved</td>
<td>Suggestions will be required, possibly along with recommendation as to what to do if a TPAR is below 1.</td>
<td>Yam Co – June 09, part (c), 9 marks</td>
</tr>
<tr>
<td>Apply throughput accounting to a multi-product decision-making problem</td>
<td>Calculation of the optimum mix of products in a scarce resource situation</td>
<td>Thin Co – June 2011, part (b), 7 marks.</td>
</tr>
</tbody>
</table>
Overview

Theory of constraints  Throughput accounting ratios  Return/hour  Cost/hour  TPAR

Goldratt’s 5 steps

Throughput accounting and decision making  Products  Divisions  Limiting factor scenarios

Throughput accounting

Limiting factor scenarios
1 Throughput accounting (TA) and Theory of constraints (TOC)

Theory of constraints (TOC)
1.1 The theory of constraints is a production system where the key financial concept is the maximisation of throughput while keeping conversion and investment costs to a minimum.

1.2 **Throughput = Sales revenue – Material cost**

1.3 TOC focuses on bottlenecks in the production process which act as a barrier to throughput maximisation.

Bottlenecks

One process will inevitably act as a bottleneck, known as a binding constraint.

1.4 Goldratt's five steps for dealing with a bottleneck activity were:

   Step 1 – **Identify** the binding constraint
   
   Step 2 – **Exploit.** The highest possible output must be achieved from the binding constraint. This output must never be delayed and as such a buffer inventory should be held immediately before the constraint
   
   Step 3 – **Subordinate.** Operations prior to the binding constraint should operate at the same speed as it so that WIP does not build up
   
   Step 4 – **Elevate** the systems bottleneck. Steps should be taken to increase resources or improve its efficiency
   
   Step 5 – **Return to step 1.** The removal of one bottleneck will create another elsewhere in the system

Throughput accounting (TA)
1.5 TA is an accounting system based on the theory of constraints. It is very similar to marginal costing but can be used for longer-term decision making about production capacity. It is an alternative system of cost and management accounting in a just-in-time (JIT) environment (see Chapter 13).
1.6 TA emphasises throughput, inventory minimisation and cost control.

Three concepts:

(a) All factory costs are **fixed in the short run**, with the exception of material cost.

(b) In a JIT environment, producing for inventory is bad. Ideally inventory would be zero. Products should not be made unless there is a customer for them. This means **accepting some idle time** in non-bottleneck operations. **WIP should be valued at material cost only**, so that no value is added to profit until a sale is made.

(c) Profit is determined by the rate at which throughput can be generated, ie how quickly raw materials can be turned into sales to generate cash. Producing just to increase inventory creates no profit and so should not be encouraged.

<table>
<thead>
<tr>
<th>Traditional Costing</th>
<th>Throughput accounting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour costs and variable overheads are treated as variable costs.</td>
<td>All costs other than materials are seen as fixed in the short term.</td>
</tr>
<tr>
<td>Inventory is valued at total production cost.</td>
<td>Inventory is valued at material cost only.</td>
</tr>
<tr>
<td>Value is added when an item is produced.</td>
<td>Value is added when an item is sold.</td>
</tr>
<tr>
<td>Product profitability can be determined by deducting a product cost from selling price.</td>
<td>Profitability is determined by the rate at which money is earned.</td>
</tr>
</tbody>
</table>

2 **Ratios**

2.1 (a) **Total Factory Costs (TFC)** = Fixed production costs, including labour

(b) **Return per factory hour** = Sales revenue – material purchases

(c) **Cost per factory hour** = Total factory costs

(d) **TPA ratio** = Return per factory hour

Cost per factory hour
MN Co manufactures automated industrial trolleys. Each trolley sells for $2,000 and the material cost per unit is $600. Labour and variable overhead are $5,500 and $8,000 per week respectively. Fixed production costs are $450,000 per annum and marketing and administrative costs are $265,000 per annum.

The trolleys are made on three different machines. Machine X makes the four frame panels required for each trolley. Its maximum output is 180 frame panels per week. Machine X is old and unreliable and it breaks down from time to time. It is estimated that, 20 hours of production are lost per month. Machine Y can manufacture parts for 52 trolleys per week and machine Z, which is old but reasonably reliable, can process and assemble 30 trolleys per week.

The company has recently introduced a just-in-time (JIT) system and it is company policy to hold little work-in-progress and no finished goods inventory from week to week. The company operates a 40-hour week, 48 weeks a year.

Required

(a) Identify the bottleneck machine
(b) Calculate the throughput accounting ratio.

Solution
Lecture example 2

What actions could you take to improve a throughput accounting ratio?

Solution

3 Throughput accounting and decision making

Ranking production

3.1 Products/divisions are ranked by TPA ratio.

3.2 If two or more products are made in the same factory, they can be ranked on return per factory hour, not TPA ratio, since their costs will be identical.

Target for decision making

3.3 The TPA ratio should be greater than one if a product is to be viable. Return/hour enables businesses to make short-term decisions when there is a scarce resource.

Priority must be given to products generating the best ratios.

Use in performance management

3.4 A division of a company is not discouraged from inventory building if reported profit is used as a principal performance measure.

3.5 This is at odds with the JIT philosophy where purchase and production costs should only be incurred if there is to be an immediate return generated.

Use of TPAR instead of (or in addition to) profit should resolve this problem.
Will and Grace operate separate divisions making and selling products with identical cost structures.

- Sales price per unit $50
- Direct materials per unit $12
- Direct labour per unit $8

Fixed production overheads of $200,000 per month are absorbed across the normal production level of 10,000 units per month. In each division assume a bottleneck capacity of 20,000 hours.

In April, Will makes and sells exactly 10,000 units whilst Grace makes 12,000 units and sells only 9,500.

Neither Will nor Grace has any opening inventory of raw materials or components.

**Required**

Show which manager would benefit if bonuses were given on

(a) Profit
(b) Throughput accounting ratios

**Solution**
### 4 Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Throughput Accounting and the theory of constraints</td>
<td>Throughput accounting focuses on maximising throughput. Throughput = sales – materials. All labour and variable overheads are seen as fixed in the short term.</td>
</tr>
</tbody>
</table>
| 2       | Ratios                                                     | **Return per factory hour** = 
\[
\frac{\text{Sales revenue} - \text{material purchases}}{\text{Time on key resource}}
\]
**Cost per factory hour** = 
\[
\frac{\text{Total factory costs}}{\text{Time on key resource}}
\]
**TPA ratio** = 
\[
\frac{\text{Return per factory hour}}{\text{Cost per factory hour}}
\] |
| 3       | Throughput accounting and decision making                  | Decisions are made with reference to the TPAR.                                                   |
### How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discuss the issues business face in the management of environmental costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Describe the different methods a business may use to account for its environmental costs</td>
<td>Questions will focus on information for internal decision making only.</td>
<td></td>
</tr>
</tbody>
</table>

Environmental management accounting
Overview

Environmental management accounting

Principles

Managing environmental costs

Defining environmental costs

Methods to account for environmental costs
1 Principles of environmental costing

1.1 Increasingly, management accountants need to be aware of the environmental costs associated with business activities.

1.2 In the past, environmental costs such as energy costs were treated as production overheads and effectively hidden from management scrutiny.

1.3 Society has become more environmentally aware with ‘carbon footprint’ becoming a recognised term. A carbon footprint measures the total greenhouse gas emissions caused directly and indirectly by a person, organisation, event or product.

Managing environmental costs

1.4 Many benefits accrue from a clear understanding and effective management of the environment-related costs of business activities.

(a) Environmental costs are becoming huge for some companies. Once identified, environmental costs can be controlled and reduced.

(b) There is increasing worldwide regulation and a need for regulatory reporting of environmental costs.

(c) Ethical issues – businesses should be aware of how their production methods will affect the environment (e.g. carbon emissions)

(d) Improved brand image – ‘green’ ways of doing business can be a selling point.

(e) Associating environmental costs with individual products will lead to more accurate pricing and improved profitability.

Lecture example 1

Raxo plc is a multinational organisation, manufacturing chemicals for use in the agricultural industry.

List some of the environmental costs Raxo plc may need to consider.
2 Defining environmental costs

2.1 Definitions of environmental costs vary widely. This can make it difficult to identify the costs involved and therefore control them. They may be hidden inside ‘general overheads’.

2.2 Hansen and Mendoza (1999) suggested that environmental costs could be classified as:
   
   (a) **Environmental prevention costs**: the costs of activities undertaken to prevent the production of waste eg environmental training.

   (b) **Environmental detection costs**: costs incurred to ensure that the organisation complies with regulations and voluntary standards eg record keeping and recording.

   (c) **Environmental internal failure costs**: costs incurred from performing activities that have produced contaminants and waste that have not been discharged into the environment eg waste disposal costs.

   (d) **Environmental external failure costs**: costs incurred on activities performed after discharging waste into the environment.

2.3 Much business activity takes place at the cost of the environment, and some of these costs are felt by society as a whole. **Externalised costs** are those for which wider society has to ‘pay’ at least an element – e.g. global warming.
3 Accounting for environmental costs

3.1 The F5 syllabus is concerned with information for internal decision making only. It is not concerned with how environmental information is reported externally.

3.2 There are a range of management accounting techniques for the identification and allocation of environmental costs. The United Nations Division for Sustainable Development (UNDSD) identified four techniques.

Input/output flow analysis

3.3 The idea of this analysis is that what comes in, must go out. Material inflows are recorded and balanced with outflows. This forces the business to account for the difference and therefore focus on environmental costs.

Flow cost accounting

3.4 Material flows through an organisation are divided into three categories.

- Material
- System and delivery
- Disposal

The value and cost of each material flow is then calculated. The aim is to reduce the quantity of materials which should reduce business' total costs in the long-term and have a positive effect on the environment.

Activity-based costing

3.5 In order to fully integrate environmental costs into their management accounting, organisations can apply activity-based costing principles to environmental costs.

3.6 Environmental costs would be grouped together into environmental cost pools, and each pool would be associate with an environmental cost driver.

3.7 Individual products that passed through the most polluting processes would therefore absorb more environmental costs than cleaner or more ‘green’ products.

3.8 As for ABC in general, this will lead to:

(a) Increased awareness of how environmental costs behave.
(b) Better product pricing
(c) Better production decisions

Life-cycle costing

3.9 Environmental costs are considered from the design stage of a new product right up to the end-of-life costs such as decommissioning and removal.

The consideration of future disposal or remediation costs at the design stage may influence the design of the product itself, saving on future costs.
## 4 Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Principles of environmental costing</em></td>
<td>Environmental costs need to be clearly understood by management, and not ‘hidden’ in with production overheads</td>
</tr>
<tr>
<td>2</td>
<td><em>Defining environmental costs</em></td>
<td>Costs can be classified as ‘internalised’ in that the impacts are contained within the organisation. Externalised costs are those which affect society as a whole.</td>
</tr>
<tr>
<td>3</td>
<td><em>Accounting for environmental costs</em></td>
<td>There are four management accounting techniques for the identification and allocation of environmental costs: input/output analysis, flow cost accounting, activity based costing and lifecycle costing.</td>
</tr>
</tbody>
</table>
Cost volume profit analysis

How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain the nature of CVP analysis.</td>
<td>Most of these techniques will be examined via calculations but you may have to interpret graphs and discuss the limitations of the analysis.</td>
<td></td>
</tr>
<tr>
<td>Calculate and interpret break even point and margin of safety.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calculate the contribution to sales ratio, in single and multi-product situations, and demonstrate an understanding of its use.</td>
<td></td>
<td>Hair Co – Dec 12, parts (a) &amp; (b) 8 marks</td>
</tr>
<tr>
<td>Calculate target profit or revenue in single and multi-product situations, and demonstrate an understanding of its use.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepare break even charts and profit volume charts and interpret the information contained within each, including multi-product situations.</td>
<td></td>
<td>Hair Co – Dec 12, part (c) 9 marks</td>
</tr>
<tr>
<td>Discuss the limitations of CVP analysis for planning and decision making.</td>
<td></td>
<td>Hair Co – Dec 12, part (d) 3 marks</td>
</tr>
</tbody>
</table>
Overview

CVP analysis

Single product

Multi-product

Break even point
Margin of safety
C/S ratio
Target profit
Break even chart
Profit volume chart
Limitations
1 Cost volume profit analysis (CVP analysis)

Introduction

1.1 CVP analysis looks at the effects of differing levels of activity on the financial results of a business by examining the relationship between sales volume and profit.

1.2 Most businesses need to at least break even when setting prices and output levels. The break even point for a company is the sales volume which will give the company a profit of $nil. If sales exceed the break-even point the company will make a profit.

Assumptions

1.3 Constant.....
(a) Selling price per unit
(b) Variable cost per unit
(c) Total fixed costs

1.4 These lead to linear relationships for volume and sales revenue.

2 Single product break even analysis

2.1 Break even point = \( \frac{\text{Fixed costs}}{\text{Unit contribution}} \)

2.2 The ratio of contribution to sales is an alternative method of finding the break-even point. It gives the amount of contribution earned per dollar of sales. It can be measured as a fraction or a percentage. It is also known as the profit-volume (P/V) ratio and can be used to determine break-even revenue.

Contribution/Sales ratio = \( \frac{\text{Contribution / unit}}{\text{Selling price / unit}} \)

Break even revenue = \( \frac{\text{Fixed costs}}{\text{C/S ratio}} \) or Break even point x selling price / unit

2.3 The margin of safety is a measure of the amount by which sales must fall before we start making a loss. A loss is made if sales volume is less than the BEP.

Margin of safety = Budgeted sales – Break even sales

Margin of safety (%) = \( \frac{\text{Budgeted sales - Break even sales}}{\text{Budgeted sales}} \)

2.4 The approach used to find an expression for the break-even sales volumes can be extended to find the volume needed to attain a required profit level.

The required profit is like an additional fixed cost which must be covered before the company 'breaks even'.
Output required for target profit = \( \frac{\text{Fixed costs} + \text{target profit}}{\text{Unit contribution}} \)

### Lecture example 1

A company has fixed costs of $5,700 and variable costs per unit of $6.50.

**Required**

(a) If the selling price is $8/unit at all levels, what is the break even point (in units)?

(b) What is the break even revenue?

(c) What is the C/S ratio?

(d) If budgeted sales are 5,000 units, what is the margin of safety in units?
   
   What is the margin of safety as a %? What does this mean?

(e) What is the sales volume (in units) required to make a profit of $10,000?

### Solution
Break-even chart

2.5 The break-even point can also be determined graphically using a break-even chart. This diagrammatically shows the relationship between revenue, costs and sales volume.

Lecture example 2

Sketch the break-even chart for Lecture example 1.

Profit volume chart

2.6 The profit volume chart is a variation of the break-even chart which illustrates the relationship of costs and profit to sales and the margin of safety. It emphasises the impact of volume changes on profit.
Sketch the profit-volume chart for Lecture example 1.
Lecture example 4

Preparation question

(a) Indicate the following points on the chart in Lecture Example 3:

(i) Break-even point
(ii) Fixed costs
(iii) Margin of safety
(iv) Contribution from budget sales of 5,000 units

(b) How would the line differ if the fixed costs increased to $6,500?

(c) Describe the impact on the break-even point if the selling point increased to $10.

Solution

Limitations of breakeven analysis

2.7 Break-even analysis is a useful technique for managers as it can provide simple and quick estimates.

It does, however, have a number of limitations as it assumes that:

(a) All costs can be split into fixed and variable elements.
(b) Fixed costs are constant.
(c) Variable cost per unit is constant.
(d) Selling price is constant.
(e) Inventory levels are constant (Sales = Production)
3: COST VOLUME PROFIT ANALYSIS

3 Multi-product breakeven analysis

Introduction

3.1 Breakeven analysis can be expanded for a 'single' mix of products using a weighted average contribution figure. A constant product sales mix must be assumed.

Formulae

3.2 Break even point = \( \frac{\text{Fixed costs}}{\text{Weighted average unit contribution}} \)

\[
\text{Break even revenue} = \frac{\text{Fixed costs}}{\text{Weighted average C/S ratio}}
\]

Lecture example 5

Preparation question

United Trading sells three products as follows.

<table>
<thead>
<tr>
<th>Product</th>
<th>Footballs</th>
<th>Baseballs</th>
<th>Rugby balls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selling price</td>
<td>$7</td>
<td>$6</td>
<td>$9</td>
</tr>
<tr>
<td>Variable costs</td>
<td>3</td>
<td>4.50</td>
<td>5</td>
</tr>
<tr>
<td>Budgeted sales (units)</td>
<td>2,000</td>
<td>4,000</td>
<td>3,000</td>
</tr>
</tbody>
</table>

Assume that the sales mix is 'fixed' in these proportions.

Fixed costs are $20,000.

Required

(a) What is the breakeven sales volume?
(b) What is the breakeven sales revenue?
Solution
3. COST VOLUME PROFIT ANALYSIS

**Graphs**

3.3 Graphs can also be used in multi-product situations to indicate the relationships between cost, revenue and volume.

### Lecture example 6

**Preparation question**

**Required**

Sketch a breakeven chart for Lecture example 5, indicating the profit at budgeted sales.

**Solution**

**Workings**

<table>
<thead>
<tr>
<th>Budget</th>
<th>Units</th>
<th>SP</th>
<th>Revenue</th>
<th>VC</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football</td>
<td>2,000</td>
<td>7</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Baseball</td>
<td>4,000</td>
<td>6</td>
<td></td>
<td>4.50</td>
<td></td>
</tr>
<tr>
<td>Rugby ball</td>
<td>3,000</td>
<td>9</td>
<td></td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Fixed costs
3.4 Multi-product P/V charts can also be produced which plot each of the products individually, so allowing their profitability to be compared.

3.5 Products are plotted in the order of their contribution / sales ratio.

Lecture example 7

Preparation question

Required

Sketch a multi-product P/V chart for Lecture example 5.
### 3: COST VOLUME PROFIT ANALYSIS

#### Solution

**Workings**

<table>
<thead>
<tr>
<th></th>
<th>Revenue $</th>
<th>VC $</th>
<th>Contribution</th>
<th>C/S ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football</td>
<td>14,000</td>
<td>6,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseball</td>
<td>24,000</td>
<td>18,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rugby ball</td>
<td>27,000</td>
<td>15,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>65,000</td>
<td>39,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Cumulative revenue**

<table>
<thead>
<tr>
<th></th>
<th>Cumulative profit $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football</td>
<td></td>
</tr>
<tr>
<td>Rugby ball</td>
<td></td>
</tr>
<tr>
<td>Baseball</td>
<td></td>
</tr>
</tbody>
</table>
Multi-product P/V chart

$ 20,000

Revenue $
3.6 It can be observed from the graph that when the company sells its most profitable product first, it breaks even earlier than when it sells products in a constant mix.

### Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
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<tbody>
<tr>
<td>1</td>
<td>CVP analysis assumptions</td>
<td>Constant selling price, variable costs and fixed costs.</td>
</tr>
<tr>
<td>2</td>
<td>Single product breakeven analysis</td>
<td>Breakeven point = ( \frac{\text{Fixed costs}}{\text{contribution/unit}} )</td>
</tr>
<tr>
<td>3</td>
<td>Multi product breakeven analysis</td>
<td>Multi-product breakeven analysis can only be performed if a constant product sales mix is assumed. Breakeven point = ( \frac{\text{Fixed costs}}{\text{Weighted average contribution/unit}} ) On a PV chart, products should be plotted individually in order of the size of their c/s ratio.</td>
</tr>
</tbody>
</table>
Checkpoint 1 – Progress Review

To reinforce your learning to date you should now follow the study guidance in the following pages. On completion, your progress towards full exam preparation will be:

![Target knowledge meter]

55%

![Exam skills meter]

5%

![Question practice meter]

5%

You have now completed Stage 1 of the course. Before you attempt the work outlined within the Study Support section on the subsequent pages, take some time to reflect on the knowledge and skills you covered during Stage 1. If you feel you need further clarification on any of the key areas listed below you can use the on-line lecture for the relevant chapter.

**Key messages from Stage 1**

The F5 syllabus is pretty large so it is important not to leave all of your studying until too close to the exam. Consolidating your knowledge at each stage will help you remember the techniques and be able to build upon them as the course progresses.

It is essential that you review the online lectures for chapter 1b Variance Analysis before attending the classroom course for Chapter 12 Further Variance Analysis. As although this is assumed knowledge from F2 it underpins all of the new material.

**Key knowledge**

The specific areas of key knowledge covered in Stage 1 were: -

- **Costing** – whilst this won’t be examined in its own right, there are some fundamental principles which you do need in F5. The key items are how to calculate overhead absorption rates and contribution.
- **Variances** – as mentioned above this assumed knowledge is fundamental to understanding the new variances introduced in F5. It is included in stage 1 to give you sufficient time to cover it before studying chapter 12.
- **Activity based costing** – it is important to recognise that this is an extension of absorption costing and has evolved to provide more meaningful information in the modern manufacturing environment where production overheads are relatively high and companies make and sell a diverse range of products. You will need to be able to calculate the cost or profit of a unit under ABC but you will also be expected to discuss ABC. Such elements could focus on benefits, problems and reasons for costs being different under ABC and absorption costing.
- **Target costing** – calculations to derive a target cost or cost gap are likely along with discussion as to the process, ways to close a cost gap and the benefits of target costing.
- **Lifecycle costing** – equally if not more likely to be examined via words than numbers. The costs at each stage of the lifecycle along with its implications are key.
- **Throughput accounting** – the key here is remembering that the only variable cost in the immediate term is materials.
- **Environmental management accounting** – likely to be examined as a discussion part of a question.
- **Cost volume profit analysis** – you need to be able to do the calculations of break even point, margin of safety, C/S ratio, target profit as well as draw breakeven and profit volume graphs to illustrate the numbers for both single product and multi product situations. Its very important that you can demonstrate an understanding of all of this via explanations/discussion.
Key skills
You should realise that you have already begun to learn some of the key skills required to do well in the F5 exam.

Clearly knowledge of the syllabus is a fundamental area for the exam, additionally thinking about your presentation is essential so that the examiner can follow and understand your answer.

Use the example in the ABC chapter as a guide. There is a lot of information to deal with, so it needs to be laid out clearly and all workings cross referenced to the appropriate place in your answer.

Checkpoint 1 – Study Support

<table>
<thead>
<tr>
<th>Chapter 1a - Costing</th>
<th>80 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Absorption Costing</td>
</tr>
<tr>
<td></td>
<td>• Marginal Costing</td>
</tr>
<tr>
<td>Course Notes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• This chapter recaps the costing areas covered at F2.</td>
</tr>
<tr>
<td></td>
<td>• Topics may not be examined in their own right but will be built upon, so it is essential that you can remember these techniques and principles.</td>
</tr>
<tr>
<td>Question Practice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Work through Question 1 (Solo) from the Study Text question bank which acts as good practice for these costing techniques. Ensure you attempt part (b) as you will be required to discuss your calculations in the exam.</td>
</tr>
<tr>
<td>Additional Resources</td>
<td></td>
</tr>
<tr>
<td>Study Text resources</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• If you are not completely comfortable with these topics work through Section 3, a revision of absorption costing, to ensure you can remember the knowledge areas from F2 that this paper builds on.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 1b – Variance analysis</th>
<th>120 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Basic Variances</td>
</tr>
<tr>
<td></td>
<td>• Interpretation of variances</td>
</tr>
<tr>
<td>Course Notes – ensure that you listen to the online lecture.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• This chapter recaps variances covered at F2.</td>
</tr>
<tr>
<td></td>
<td>• Basic variances may not be examined as a question in their own right but will be built upon, so it is essential that you can calculate and interpret them.</td>
</tr>
<tr>
<td></td>
<td>• Carefully review the variance calculations. The examiner will expect you to perform these easily as they were examined at F2.</td>
</tr>
<tr>
<td></td>
<td>• Ensure you can suggest sensible potential causes of variances.</td>
</tr>
<tr>
<td>Additional Resources</td>
<td></td>
</tr>
<tr>
<td>Study Text resources</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• If you are not completely comfortable with basic variances work through Chapter 12 Section 1, and section 2 for the reasons for variances.</td>
</tr>
<tr>
<td>Chapter 2a – Activity based costing</td>
<td>70 mins</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td><strong>Key areas</strong></td>
<td></td>
</tr>
<tr>
<td>• Calculate a cost per unit using ABC</td>
<td></td>
</tr>
<tr>
<td>• Ensure you can comment on the merits, criticisms and implications</td>
<td></td>
</tr>
<tr>
<td><strong>Course Notes</strong></td>
<td></td>
</tr>
<tr>
<td>• This is a key chapter of the notes and appeared on the pilot paper. Review the approach and ensure you can identify cost drivers, calculate a unit cost using ABC and be able to contrast with absorption cost per unit.</td>
<td>10 mins</td>
</tr>
<tr>
<td>• Discussion elements in the exam will focus on your comparison with absorption as well as talking about merits, criticisms and implications of a switch to ABC.</td>
<td>10 mins</td>
</tr>
<tr>
<td><strong>Question Practice</strong></td>
<td></td>
</tr>
<tr>
<td>• Question 3 (Abkaber) from the Study Text question bank – work through this question as it is good practice of not only the ABC calculations but also the assessment of the various directors comments – this type of thing is very typical in the exam.</td>
<td>40 mins</td>
</tr>
<tr>
<td><strong>Additional Resources</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Study Text Resources</strong></td>
<td></td>
</tr>
<tr>
<td>• Read section 1.1 of the Study Text, reasons for the development of ABC. This will provide you with the necessary background information.</td>
<td>5 mins</td>
</tr>
<tr>
<td>• Review section 3 which covers the merits and criticisms of ABC.</td>
<td>5 mins</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 2b – Target costing</th>
<th>25 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key areas</strong></td>
<td></td>
</tr>
<tr>
<td>• Deriving a target cost</td>
<td></td>
</tr>
<tr>
<td><strong>Course Notes</strong></td>
<td></td>
</tr>
<tr>
<td>• Skim over the chapter and make sure you can calculate a target cost gap.</td>
<td>10 mins</td>
</tr>
<tr>
<td><strong>Additional Resources</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Real-life example</strong></td>
<td></td>
</tr>
<tr>
<td>• In the Real-life examples section you will find an article from the Financial Times illustrating how changes in the car market have resulted in Mercedes-Benz moving towards target costing. It is strongly recommended that you read this to help you understand how target costing is used in a very practical situation.</td>
<td>15 mins</td>
</tr>
</tbody>
</table>
### Chapter 2c – Life cycle costing

<table>
<thead>
<tr>
<th>Key areas</th>
<th>40 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Stages and costs of the product life cycle</td>
<td></td>
</tr>
<tr>
<td>• Implications for decision making</td>
<td></td>
</tr>
</tbody>
</table>

**Course Notes**

- Review the chapter ensuring you can identify the costs involved at each of the stages of the life cycle.
- Consider how this will affect pricing decisions.

**Question Practice**

- Attempt Question 4 from the Study Text question bank (Life cycle costing) this will help you consolidate your learning in this area. Prepare a plan for part (a) which covers all the points you would wish to include in your answer. Review the answer to see those points you have missed.

**Additional Resources**

**Study Text Resources**

- Read sections 3.3 and 3.4 to understand other life cycles.

### Chapter 2d – Throughput accounting

<table>
<thead>
<tr>
<th>Key areas</th>
<th>85 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Throughput accounting ratio</td>
<td></td>
</tr>
<tr>
<td>• Throughput accounting and decision making</td>
<td></td>
</tr>
</tbody>
</table>

**Course Notes**

- Review the chapter ensuring you can calculate all ratios.
- Ensure you can use throughput accounting in limiting factor scenarios.
- Suggest ways to improve a throughput accounting ratio.

**Question Practice**

- Attempt Question 5 (Bottlenecks) from the Study Text question bank – this is a good question testing your ability to perform these calculations.

**Additional Resources**

**Study Text Resources**

- Read section 2.3 – is it good or bad. This area will help you with discussion elements within throughput accounting questions.

**Examiner’s Articles**

- Throughput Accounting and the theory of constraints part 1 – October 2011
- Throughput Accounting and the theory of constraints part 2 – November 2011
### Chapter 2e – Environmental management accounting  (30 mins)

**Key areas**
- The issues business face in the management of environmental costs
- The different methods a business may use to account for its environmental costs

**Course Notes**
- Review the chapter ensuring you fully understand all of the concepts. Make sure you have enough knowledge to discuss this topical area.  (15 mins)

**Additional Resources**
**Study Text Resources**
- Read through this chapter to enhance your knowledge  (15 mins)

### Chapter 3 – Cost volume profit analysis  (70 mins)

**Key areas**
- Calculation of single product and multi product break even point and preparation of graphs.

**Course Notes**
- Rework all of the lecture examples to ensure you are happy with this technique.  (25 mins)

**Question Practice**
- Attempt Question 1 BD from the course notes question bank.  (30 mins)

**Additional Resources**
**Study Text**
- There are several examples in here which are useful to work through should you have the time.  (15 mins)
Checkpoint 1 - Progress Test

Having completed the Study Support guidance contained on the previous pages, you are now ready to attempt the Progress Test. You should aim to complete the test in 1 hour. If you find it takes you significantly longer to do so then please contact your course tutor for guidance.

The multiple choice questions contained within the Progress Test will thoroughly test your understanding of the material and your ability to perform the required calculations. Note that the F5 exam does not contain multiple choice questions. The three short written questions that follow will test your ability to apply your knowledge. These skills will prove important when answering discursive exam standard questions.

It is important that you continually review your progress and revise further any areas where you feel your understanding is weak.

A Multiple choice questions (10 questions – approximate time 40 minutes)

1 Using activity based costing, what is the overhead cost per unit of product Y?

<table>
<thead>
<tr>
<th></th>
<th>Product X</th>
<th>Product Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production (units)</td>
<td>500</td>
<td>2,000</td>
</tr>
<tr>
<td>Machine hours per unit</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Production runs</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Inspections during production</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Production set-up costs</td>
<td>$168,000</td>
<td>$96,000</td>
</tr>
<tr>
<td>Quality control costs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A $48.00  
B $37.71  
C $66.00  
D $105.60  

(2 marks)
Data for questions 2 and 3

The following data relate to costs, output volume and cost drivers of Heighway Rubbery Ltd for June 20X1.

<table>
<thead>
<tr>
<th>Product P</th>
<th>Product Q</th>
<th>Product R</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production and sales</td>
<td>3,000 units</td>
<td>2,000 units</td>
<td>1,500 units</td>
</tr>
<tr>
<td>2 Direct production costs</td>
<td>$ per unit</td>
<td>$ per unit</td>
<td>$ per unit</td>
</tr>
<tr>
<td>Direct materials</td>
<td>12</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Direct labour</td>
<td>3</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Labour hours per unit</td>
<td>1½</td>
<td>1</td>
<td>1½</td>
</tr>
<tr>
<td>4 Machine hours per unit</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5 Number of production runs</td>
<td>8</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>6 Number of deliveries to customers</td>
<td>3</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>7 Number of production orders</td>
<td>30</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>8 Number of deliveries of materials into store</td>
<td>17</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>9 Production overhead costs</td>
<td>$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machining</td>
<td>71,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set-up costs</td>
<td>10,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Materials handling (receiving)</td>
<td>35,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packing costs (despatch)</td>
<td>22,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineering</td>
<td>25,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>165,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Indirect production overheads that are not driven by production volume are:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set-up costs</td>
<td>Production runs</td>
</tr>
<tr>
<td>Materials handling</td>
<td>Deliveries of materials</td>
</tr>
<tr>
<td>Packing</td>
<td>Deliveries to customers</td>
</tr>
<tr>
<td>Engineering</td>
<td>Production orders</td>
</tr>
</tbody>
</table>

2 What would be the full production cost per unit of product R if overheads are absorbed on the basis of direct labour hours?

A $13.75  
B $23.75  
C $30.00  
D $51.25  

(2 marks)

3 What would be the full production cost per unit of product R using activity based costing?

A $43.27  
B $45.28  
C $62.27  
D $53.27  

(4 marks)

4 Orchard manufactures three products and operates a system of throughput accounting.

<table>
<thead>
<tr>
<th>$ per hour</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales price</td>
<td>40</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>Material</td>
<td>10</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Labour</td>
<td>5</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Overhead</td>
<td>15</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Profit</td>
<td>10</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>

If there is unlimited demand for the product which should be produced?

(2 marks)
5. A company makes product X which passes through three production operations A, B and C. Product X sells for $8 per unit and has a direct materials cost of $3 per unit. Total labour cost for the period is $10,000 and overheads for the same period amount to $14,000. Processing times per unit and maximum processing times available for the three operations are given below:

<table>
<thead>
<tr>
<th>Operations</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time per unit</td>
<td>3 mins</td>
<td>11 mins</td>
<td>6 mins</td>
</tr>
<tr>
<td>Total capacity (mins)</td>
<td>30,000</td>
<td>50,000</td>
<td>80,000</td>
</tr>
</tbody>
</table>

Calculate the throughput ratio for product X.

A 0.32
B 0.45
C 0.48
D 0.94
(3 marks)

6. In activity based costing what is a cost driver?

A An overhead cost that is incurred as a direct consequence of an activity
B Any factor which causes a change in the cost of an activity
C An activity or product item for which costs are incurred
D A basis for apportioning overheads to cost centres
(2 marks)

7. Indicate which of the following methods can be used to move a currently-attainable cost closer to target cost.

A Using standard components wherever possible
B Acquiring new, more efficient technology
C Making staff redundant
D Reducing the quality of the product in question
(2 marks)

8. A mobile phone manufacturer, C Ltd, is planning to produce a new model. The potential market over the next year is 1,000,000 units. C Ltd has the capacity to produce 400,000 units and could sell 100,000 units at a price of $50. Demand would double for each $5 fall in the selling price. The company has an 80% cost experience curve for similar products. The cost of the first batch of 1,000 phones was $103,000. A minimum margin of 25% is required. Calculate C Ltd's target cost per unit, to the nearest $.

A $40
B $30
C $50
D $45
(2 marks)

9. When are the bulk of a product's life cycle costs normally determined?

A At the design/development stage
B When the product is introduced to the market
C When the product is in its growth stage
D On disposal
(2 marks)
J Co produces and sells two products. The O sells for $12 per unit and has a total variable cost of $7.90, while H sells for $17 per unit and has a total variable cost of $11.20. For every four units of O sold, three of H are sold. J Ltd’s fixed costs are $131,820 per period. Budgeted sales revenue for the next period is $398,500.

What is the margin of safety (in $)?

A  $131,820  
B  $12,511  
C  $385,989  
D  $27,292  

(3 marks)

B  Short written questions (3 questions – approximate time 20 minutes)

1 What is meant by the theory of constraints?  

(2 marks)

2 What are Goldratt’s five steps for dealing with a bottleneck?  

(5 marks)

3 What are the limitations of CVP analysis for planning and decision making?  

(3 marks)
Section A

1. A  
   Set up cost per production run = \( \frac{16,000}{5 + 2} \) = $24,000
   
   Cost per inspection = \( \frac{96,000}{6 + 6} \) = $8,000
   
   Overheads to product Y:  
   Set up costs 48,000
   ($24,000 \times 2)
   Quality control costs 48,000
   ($8,000 \times 6)

   = $96,000

   = $48

2. B  
   Direct labour hours  
   P = 3,000 \times \frac{1}{2} = 1,500
   Q = 2,000 \times 1 = 2,000
   R = 1,500 \times \frac{1}{3} = 500

   = 4,000

   Absorption rate for overhead = $165,000 \div 4,000 = $41.25 per direct labour hour.

   Unit cost of R = $ (8 + 2 + 1/3 of 41.25) = $23.75

3. D  
   Overhead rates  
   Machining $71,500 \div 11,000 machine hours = $6.50 per machine hour
   Set-up costs $10,500 \div 20 production runs = $525.00 per run
   Materials handling $35,000 \div 40 materials deliveries = $875.00 per delivery
   Packing costs $22,500 \div 15 deliveries to customers = $1,500.00 per delivery
   Engineering $25,500 \div 50 production orders = $510.00 per order

   Product R overhead costs  
   Machining 3,000 machine hours \times $6.50 = 19,500
   Set-up costs 10 production runs \times $525.00 = 5,250
   Materials handling 20 deliveries \times $875.00 = 17,500
   Packing costs 10 customer deliveries \times $1,500.00 = 15,000
   Engineering 15 production orders \times $510.00 = 7,650

   = 64,900

   Cost per unit of R  
   Direct materials 8.00
   Direct labour 2.00
   Overhead ($64,900 \div 1,500 units of R) 43.27

   = 53.27
4 C

TA ratios: A B C
Return/hr 30 35 30
Cost/hr 20 25 15
TA ratio 1.5 1.4 2.0

5 D

Operation B is the bottleneck.

\[
\text{Return per factory minute} = \frac{8 - 3}{11} = 0.45/\text{minute}
\]

\[
\text{Cost per factory minute} = \frac{24,000}{50,000} = 0.48/\text{minute}
\]

\[
\text{Throughput ratio} = \frac{0.45}{0.48} = 0.94
\]

6 B A cost driver determines the size of the costs of an activity. It could be any type of factor, eg number of set ups or value of materials.

7 A Using standard components wherever possible – can
B Acquiring new, more efficient technology – can
C Making staff redundant – can't
D Reducing the quality of the product in question – can't

To make improvements towards the target cost, technologies and processes must be improved (B). The use of standard components is a way of improving the production process (A). Making staff redundant will not improve technologies and processes (C). Reducing the quality of the product in question does not do this either (D).

8 B Target cost = selling price at capacity – 25% profit margin

<table>
<thead>
<tr>
<th>Price</th>
<th>Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>$50</td>
<td>100,000</td>
</tr>
<tr>
<td>$45</td>
<td>200,000</td>
</tr>
<tr>
<td>$40</td>
<td>400,000</td>
</tr>
</tbody>
</table>

:\ Target cost = $40 – (25% × $40) = $30

9 A The bulk of a product's life cycle costs will be determined at the design/development stage (being designed in at the outset during product and process design, plant installation and setting up of the distribution network).
Section B

1 The theory of constraints (TOC) is an approach to production management which aims to maximise throughput while keeping conversion costs to a minimum.

Throughput is defined as sales revenue less material purchases.

The theory of constraints (TOC) focuses on bottlenecks in the production process which act as a barrier to throughput.

2 Goldratt's five steps are:

Step 1 – Identify the binding constraint.

Step 2 – Exploit. The highest possible output must be achieved from the binding constraint. This output must never be delayed and as such a buffer inventory should be held immediately before the constraint.

Step 3 – Subordinate. Operations prior to the binding constraint should operate at the same speed as it so that WIP does not build up.

Step 4 – Elevate the systems bottleneck. Steps should be taken to increase resources or improve its efficiency.

Step 5 – Return to step 1. The removal of one bottleneck will create another elsewhere in the system.

3 The limitations of CVP analysis concern the assumptions it is based on:

- Either a single product is being sold or, if there are multiple products, they are sold in a constant mix

- All other variables, apart from volume, remain constant but in reality economies of scale may be achieved as volumes increase, sales price may have to fall if volume is to be increased

- Total cost and total revenue functions are linear but this may only be true in the short-term
**Checkpoint 1 – Real-life examples**

**Case 1 – Mercedes Benz and target costing**

*Financial Times*

'Mercedes-Benz, one of the world's most prestigious and tradition-laden carmakers, has taken its time to wake up to the daunting dimensions of the challenges it faces in the rapidly-changing world car market of the 1990s.

The company has accepted that radical changes in the world car market mean that Mercedes-Benz will no longer be able to demand premium prices for its products based on an image of effortless superiority and a content of the ultimate in automotive engineering.

Instead of developing the ultimate car and then charging a correspondingly sky-high price as in the past, Mercedes-Benz is taking the dramatic and radical step of moving to 'target pricing'. It will decide what the customer is willing to pay in a particular product category – priced against its competitors – it will add its profit margin and then the real work will begin to cost every part and component to bring in the vehicle at the target price.

The following extracts are from an article which appeared three months later.

'The marketing motto for the Mercedes-Benz compact C-class is that it offers customers more car for their money.

It is the first practical example of the group's new pricing policy. The range embodies a principle new to Mercedes which states that before any work starts a new product will be priced according to what the market will bear and what the company considers an acceptable profit. Then each component and manufacturing process will be costed to ensure the final product is delivered at the target price.

Under the old system of building the car, adding up the costs and then fixing a price, the C-class would have been between 15 per cent and 20 per cent dearer than the 10-year-old outgoing 190 series, Mr Vöhringer said.

Explaining the practical workings of the new system, he explained that project groups for each component and construction process were instructed without exception to increase productivity by between 15 and 25 per cent. And they had to reach their targets in record time.

One result was that development time on the new models was cut to 40 months, about a third less than usual. But the most important effect, according to Mr Vöhringer, has been to reduce the company's cost disadvantages vis-à-vis Japanese competitors in this class from 35 per cent to only 15 per cent.'
How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify limiting factors in a scarce resource situation and select an appropriate technique.</td>
<td>This requires application of knowledge to a scenario. A question may require you to establish how many constraints there are and therefore which technique to use.</td>
<td></td>
</tr>
</tbody>
</table>
| Determine the optimal production plan where an organisation is restricted by a single limiting factor, including within the context of “make” or “buy” decisions. | Rank products based on their contribution per unit of limiting factor and devise the optimal production plan. | Robber  
– June 2012, part (b), 7 marks |
| Formulate and solve a multiple scarce resource problem both graphically and using simultaneous equations as appropriate. | Graphical linear programming will be required. Questions could require you to sketch a graph. | Higgins Co  
– June 2008, part (b), 12 marks  
Cut & Stitch  
– June 2010, parts (a & (d), 8 marks  
Cosmetic Co  
– Dec 2010, part (a), 14 marks |
| Explain and calculate shadow prices (dual prices) and discuss their implications on decision-making and performance management. | Calculation of shadow prices is likely along with a decision over whether to purchase additional items of a limiting factor at a given price. | Higgins Co  
– June 2008, parts (c) & (d), 11 marks  
Cut & Stitch  
– June 2010, parts (b) & (c), 12 marks  
Cosmetic Co  
– Dec 2010, part (b), 3 marks |
<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculate slack and explain the implications of the existence of slack for decision-making and performance management.</td>
<td>Calculation may be followed by discussion.</td>
<td>Cosmetic Co</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Dec 2010, part (b), 3 marks</td>
</tr>
</tbody>
</table>
Overview

Limiting factor analysis

Shadow prices

Single limiting factors

Multiple limiting factors

Slack / Surplus

Linear programming
- Graphical
- Simultaneous equations
1 Introduction

1.1 The production and sales plans of a business may be limited by a limiting factor/scarcе resource (the ‘principal budget factor’).

This could be:
- Demand
- Materials
- Labour
- Machine hours
- Money

The plans of the business must be built around this factor.

2 Single constraint

2.1 If the business makes more than one product, it will want to find the product mix which will maximise profit given the limiting factor by ranking products in terms of greatest contribution per unit of limiting factor.

3 Shadow prices

3.1 A shadow price or (dual price) is
- The additional contribution generated from one additional unit of limiting factor.
- The opportunity cost of not having the use of one extra unit.
- The maximum extra amount that should be paid for one additional unit of scarce resource.

Lecture example 1

Jam & Sponge has just changed its cake mix and is struggling to cope with increased demand for its cakes. Machine time available is 300 hours per week.

<table>
<thead>
<tr>
<th></th>
<th>Fairy</th>
<th>Butterfly</th>
<th>Pixie</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales price</td>
<td>$150</td>
<td>$120</td>
<td>$100</td>
</tr>
<tr>
<td>Variable cost</td>
<td>$100</td>
<td>$80</td>
<td>$70</td>
</tr>
<tr>
<td>Fixed cost</td>
<td>$20</td>
<td>$20</td>
<td>$20</td>
</tr>
<tr>
<td>Profit</td>
<td>$30</td>
<td>$20</td>
<td>$10</td>
</tr>
<tr>
<td>Machine time per batch</td>
<td>5hrs</td>
<td>2hrs</td>
<td>1hr</td>
</tr>
<tr>
<td>Demand per week</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

**Required**

(a) What is the optimal production plan?

(b) What would happen if five extra machine hours were made available?

(c) What is the shadow price of one machine hour?
4 Limiting factors and throughput accounting

4.1 In a throughput environment the approach when a single limiting factor exists is the same as under marginal costing except that we maximise return / unit of limiting factor.

Lecture example 2

PH plc produces three different products and has adopted throughput accounting for its short-term decisions.

The employees are guaranteed a weekly salary that is equivalent to their normal working hours paid at their normal hourly rate of $7 per hour.

Costs and selling prices per batch are as follows:

<table>
<thead>
<tr>
<th>Product</th>
<th>Adam $/batch</th>
<th>James $/batch</th>
<th>Luke $/batch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selling price</td>
<td>340</td>
<td>450</td>
<td>270</td>
</tr>
<tr>
<td>Material K ($5/kg)</td>
<td>150</td>
<td>120</td>
<td>90</td>
</tr>
<tr>
<td>Material L ($10/kg)</td>
<td>70</td>
<td>90</td>
<td>40</td>
</tr>
<tr>
<td>Material M ($15/kg)</td>
<td>30</td>
<td>75</td>
<td>45</td>
</tr>
<tr>
<td>Labour ($7/hour)</td>
<td>21</td>
<td>28</td>
<td>42</td>
</tr>
<tr>
<td>Factory costs absorbed</td>
<td>20</td>
<td>80</td>
<td>40</td>
</tr>
</tbody>
</table>

PH plc is preparing its production plans and has estimated the maximum demand from its customers to be as follows:

<table>
<thead>
<tr>
<th>Batches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adam</td>
</tr>
<tr>
<td>James</td>
</tr>
<tr>
<td>Luke</td>
</tr>
</tbody>
</table>

However, these demand maximums do not include a contract for the delivery of 50 batches of each product to an important customer. If this minimum contract is not satisfied then PH plc will have to pay a substantial financial penalty for non-delivery.

Material L is in short supply and the maximum amount available is 7,000 kg.

Required

Prepare calculations to determine the production mix that will maximise the profit of PH plc.
5 More than one constraint – graphical linear programming

5.1 When there is more than one limiting factor, the above method cannot be used. Instead linear programming using graphical analysis and simultaneous equations needs to be used.

Steps

5.2 Formulating the model
(a) Define variables
(b) Establish constraints – generally in the form: amount of resource used ≤ amount available
(c) Formulate objective function

Solving the problem using graphs (only if two variables):
(d) Plot constraints on a graph
(e) Identify the feasible region ie. those combinations of variables which are possible within the resource constraints
(f) Plot the slope of the objective function (iso-contribution / profit line) and slide to optimal point (away from the origin for a maximum, towards the origin for a minimum)
(g) Calculate the value of the objective function at the optimal point.

Lecture example 3

KG Ltd makes two products, the Purse and the Handbag. Each purse earns $5 contribution and each handbag earns $6. Inputs are as follows:

<table>
<thead>
<tr>
<th></th>
<th>Purse</th>
<th>Handbag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leather</td>
<td>1½ m²</td>
<td>2 m²</td>
</tr>
<tr>
<td>Skilled labour</td>
<td>45 min</td>
<td>30 min</td>
</tr>
</tbody>
</table>

There are six skilled labourers each working a 35 hour week and delivery contracts limit the amount of leather available to 600 m² each week.

KG Ltd has an EU quota ruling whereby it has to produce at least as many handbags as it does purses.

Leather costs $8 per m², wages are paid at $4.20 per hour.

Required
Determine the optimal production plan for KG Ltd and calculation the contribution that can be achieved.
Solution

(a) Identify variables

(b) State constraints as linear relationships

(c) Formulate objective function
(d) Plot a graph

Workings:

(e) Determine optimal point

(f) Calculate value of objective function at optimal point
6 Using simultaneous equations

Instead of sliding out the iso-contribution line, simultaneous equations can be used to solve the problem.

Lecture example 4

Solve the problem in lecture example 3 using simultaneous equations

Solution

Note: You may find using simultaneous equations quicker but it is not recommended until you have graphically shown the constraints. If the question requires the graphical method, you must draw a graph

Slack / Surplus

6.1 Slack occurs when the maximum availability of a resource is not used

6.2 Surplus occurs when more output has been made than the minimum requirement

Lecture example 5

(a) Calculate the value of any slack and surplus that exists in example 3.
(b) Determine the shadow price for materials and labour and explain the meaning of this for KG.
7 Using linear programming

7.1 Assumptions made in linear programming techniques include:

(a) Fixed costs are unchanged by decision
(b) Unit variable cost is constant
(c) Estimates of demand and resource requirements are known with certainty
(d) Units of output are divisible
(e) Total amount of each scarce resource is known with certainty
(f) No interdependence between demand for products
7.2 Linear programming can be useful in the following situations:
(a) Budgeting
(b) Calculation of relevant costs
(c) Production decisions
(d) Payment for scarce resources
(e) Control
(f) Capital budgeting

8 Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>Plans of the business are built around the limiting factor.</td>
</tr>
<tr>
<td>2</td>
<td>Single constraint</td>
<td>Single limiting factor problems can be solved by <strong>maximising contribution / limiting factor</strong> or <strong>return per limiting factor</strong> if with throughput accounting.</td>
</tr>
<tr>
<td>3</td>
<td>Shadow prices</td>
<td>A <strong>shadow price</strong> is the additional contribution generated from one more unit of limiting factor.</td>
</tr>
<tr>
<td>4</td>
<td>Multiple constraints</td>
<td>Multiple limiting factor problems are solved via linear programming. First formulate the model. Secondly solve the problem using graphs or simultaneous equations.</td>
</tr>
<tr>
<td>5</td>
<td>Using simultaneous equations</td>
<td>If a graph does not have to be drawn, simultaneous equations can be used. Equations need to be prepared for each possible optimal point.</td>
</tr>
<tr>
<td>6</td>
<td>Slack / surplus</td>
<td>Slack occurs when <strong>not all of a resource has been used</strong>. Surplus occurs when <strong>additional output</strong> has been made.</td>
</tr>
</tbody>
</table>
### How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain the factors that influence the pricing of a product or service.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explain the price elasticity of demand.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Derive and manipulate a straight line demand equation. Derive an equation for the total cost function (including volume-based discounts).</td>
<td>The total cost function is covered in Chapter 10a</td>
<td>Heat Co – June 2011, part (a), 3 marks</td>
</tr>
<tr>
<td>Calculate the optimum selling price and quantity for an organisation equating marginal cost and marginal revenue</td>
<td>Calculation could be followed by discussion here</td>
<td>Heat Co – June 2011, part (a), 3 marks</td>
</tr>
<tr>
<td>Evaluate a decision to increase production and sales levels, considering incremental costs, incremental revenues and other factors.</td>
<td>This links to short-term decisions in Chapter 6</td>
<td></td>
</tr>
<tr>
<td>Determine prices and output levels for profit maximisation using the demand based approach to pricing (both tabular and algebraic methods).</td>
<td>Calculation followed by discussion is likely here</td>
<td></td>
</tr>
<tr>
<td>Explain different pricing strategies.</td>
<td>This has been examined via a discussion of whether discounting and promotions are a good idea for a particular business. Explanation of the various pricing policies may also be required.</td>
<td>Bits and Pieces – June 09, part (c), 4 marks, Stay Clean – December 09, part (b), 4 marks, Brick by Brick – June 2010, part (c), 6 marks, Heat Co – June 2011, part (b), 8 marks</td>
</tr>
<tr>
<td>Calculate a price from a given strategy using cost-plus and relevant costing.</td>
<td>This calculation requirement links with chapter 6.</td>
<td>Hammer – June 2010, parts (a) &amp; (b), 10 marks</td>
</tr>
</tbody>
</table>
Overview

5. PRICING DECISIONS

Overview

Pricing decisions

Demand

Total cost function
\[ Y = a + bx \]

Demand function
\[ P = a - bQ \]

Price elasticity
\[ \frac{\Delta Q}{\Delta P} \]

Optimal pricing
\[ MR = MC \]

Pricing strategies
- Cost plus
  - Full cost
  - Marginal cost
  - Relevant cost
  - Standard cost
- Market penetration
- Market skimming
- Premium pricing
- Price discrimination
- Product bundling
- Psychological pricing
- Product line pricing
- Complementary products
- Loss leaders
- Controlled pricing
- Volume discounting
1 Introduction

1.1 Historically the cost of a product would have had a large influence on the selling price set for that product. Today there are many factors that will influence that price. These factors include:

(a) Demand
(b) Quality
(c) Competitors
(d) Substitutes
(e) Inflation
(f) Age of product
(g) Disposable incomes

2 Demand

2.1 Economic theory is that the higher the price charged the less demand there will be for normal goods.

Price elasticity

2.2 Price elasticity of demand (PED) is a measure of the responsiveness of demand to changes in price. Some products are more responsive than others.

2.3 PED is calculated

\[ \frac{\% \Delta Q}{\% \Delta P} = \frac{\text{% change in } Q}{\text{% change in } P} \]

When \( PED > 1 \):
The product is described as having elastic demand. This means that a small change in price will cause a proportionately greater change in quantity demanded.

When \( PED < 1 \):
The opposite applies. The product has inelastic demand and prices can be changed greatly without creating large changes in demand.

2.4 An awareness of the PED of a product will assist companies when setting price.

2.5 Where demand is inelastic prices can be raised.

2.6 If demand is elastic a decrease in price will result in an increase in volume.
A football club charges $12 per ticket for home games. Average attendance at these regular games is 16,000. When prices were increased by $1 per ticket, attendance fell by 2,500.

Required
Determine the PED if ticket price increases from $12 to $13.

Solution

Demand function

Price will affect the quantity demanded for a product. Output considerations will alter the price to be charged. If the demand function is known, and the desired output has been calculated, the appropriate price can be determined for the product.
2.8 Demand functions are usually downward sloping – demand falls when price rises and vice versa.

($) \quad P \quad Q \quad (\text{units})

2.9 If a downward sloping demand curve becomes steeper demand is becoming more inelastic. If it becomes shallower it is more elastic.

2.10 The demand function will be in the form \( P = a - bQ \).

- \( P \) = Selling price
- \( Q \) = Quantity demanded at that price
- \( a \) = Theoretical maximum price. If price is set at 'a' or above, demand will be zero
- \( b \) = \( \frac{\text{change in price}}{\text{change in quantity}} \) Gradient of line. Represents the change in price required to change demand by 1 unit

Lecture example 2

A football club charges $12 per ticket for home games. Average attendance at these regular games is 16,000.

When prices were increased by $1 per ticket, attendance fell by 2,500.

Required

Assuming attendance to be purely price dependent, what should be the ticket price to ensure a full house with capacity being 25,000?
3 Optimal pricing

3.1 The desired level of output can be determined graphically by plotting total cost and total revenue lines. This is another breakeven chart, as used by economists.
3.2 The gradient of the total revenue line is known as the marginal revenue (MR). It is the increase in total revenue from selling one more unit.

3.3 The marginal revenue will be MR = a – 2bQ

3.4 The gradient of the total cost line is known as the marginal cost (MC). It is the increase in total cost from producing one more unit.

3.5 This analysis can be used to ensure the company reaches its objective.

3.6 Profit is maximised where the gradients are equal, ie where marginal revenue = marginal cost.

Optimal pricing approach

Step 1 – Determine the demand function.
Step 2 – Make the MR equation given equal to the value of MC
Step 3 – Substitute the values found for a and b in step 1 into the MR formulae and solve.
Step 4 – Take the quantity found in step 3 and put this into the demand function to find the price that should be charged.

Lecture example 3

A firm charges $12 per unit for its product. At this price it sells 16,000 units. Research has shown that when prices were changed by $1 per unit sales changed by 2,500 units. The product has a constant variable cost per unit of $5. The demand function is given by P = a – bQ. The marginal revenue will be MR = a – 2bQ

Required

(a) Determine the demand function
(b) Determine the output level to maximise profit
(c) Determine the price to be charged to maximise profit
Tabular approach

3.7 One approach to determining the profit maximising production plan is to calculate the extra (marginal) costs and revenues at different combinations of output and selling price.

### Lecture example 4

<table>
<thead>
<tr>
<th>Output (Units)</th>
<th>Total Cost $</th>
<th>MC $</th>
<th>Selling Price $</th>
<th>Total Revenue $</th>
<th>MR $</th>
<th>Profit $</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
<td></td>
<td>5.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>25</td>
<td></td>
<td>4.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>45</td>
<td></td>
<td>4.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>70</td>
<td></td>
<td>3.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>100</td>
<td></td>
<td>3.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>135</td>
<td></td>
<td>2.50</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Required**

Determine the output level and selling price that will maximise profit.
3.8 A tabular approach assumes that only discrete variables exist, i.e., that either 30 or 40 units can be sold, not, say, 35. The use of equations can solve this problem.

4 Pricing strategies

Cost plus

4.1 The price of the product is calculated by adding an appropriate profit mark up to the product's cost. This cost could be:

- Absorption/full cost (including ABC)
- Marginal cost
- Relevant cost – (Chapter 6)
- Standard cost

Advantages

4.2 (a) Readily understood/easy to apply.
(b) Readily determined.
(c) Doesn't require/assume a linear and stable price/quantity relationship.

Disadvantages

4.3 (a) Because it ignores the impact that the price will have on quantity demanded, it will not maximise profit.
(b) If the basis of absorbing overheads changes, the price of the product will change. Thus absorption costing methods require accurate overhead and activity levels.
(c) Price may need to be adjusted to reflect market conditions.
5: PRICING DECISIONS

Market penetration
4.4 A policy of low prices when the product is first launched to obtain sales volume and market share.

4.5 Useful if:
   (a) The firm wants to discourage new entrants into the market
   (b) The firm wishes to shorten the initial period of the product's life cycle
   (c) There are significant economies of scale to be achieved.

Market skimming
4.6 Involves charging high prices when a product is first launched and spending heavily on advertising and sales promotion to obtain sales. As the product moves into the later stages of its life cycle (growth, maturity and decline) progressively lower prices will be charged. The aim of market skimming is to gain high unit profits early in the product's life.

4.7 Useful if:
   (a) The product is new and different, so that customers are prepared to pay high prices to be 'one up' on people who do not own it,
   (b) The product has a short life cycle and needs to recover development costs and make a profit quickly.

Premium pricing
4.8 Making a product appear 'different' so as to justify a premium price. The product may be different in terms of quality, reliability, durability, after-sales service or extended warranties. Heavy advertising can establish brand loyalty which can help to sustain a premium.

Price discrimination
4.9 When a company can sell into two or more separate markets, it might be able to charge a different price in each market. To be successful the company must prevent the transfer of goods from the cheap market to the more expensive one.

Product bundling
4.10 Selling a number of products or services as a package at a price lower than the aggregate of their individual prices.

Psychological pricing
4.11 Psychological pricing strategies include pricing a product at £19.99 instead of £20.

4.12 Another example would be withdrawing an unsuccessful product from the market and then relaunching it at a higher price, the customer having equated the lower price with lower quality (which was not the seller's intention).
Product–line pricing

4.13 Most organisations sell not just one product but a range of products. Focus is placed on the profit from the whole range rather than the profit on each single product.

Complementary product pricing

4.14 These products are sold separately but are used together. One product would tend to be priced competitively which attracts demand for the complementary product.

Loss leaders

4.15 Particularly useful in retailing, a very low price is charged for one product, which is intended to make consumers buy additional products in the range that carry higher profit margins.

Controlled pricing

4.16 Monopolies have the potential power to charge very high prices for their goods/services as demand is inelastic. Frequently monopolies are regulated to ensure customers receive value for money.

Volume discounts

4.17 These are given in order to increase sales volume without reducing prices permanently. They also allow differentiation between customers i.e. wholesale vs retail.

5 Other considerations

5.1 Bear in mind decisions should not just be based on financial factors. Non financial considerations should also be made.

These might include:

- Company objectives – profit, sales, revenue, market share, long term or short term
- Competition and markets – competing products and reaction of competitors
- Production capacity – demand may exceed supply
- Product lifecycle – introduction, growth, maturity, decline
- Superior innovation, technology or quality – may set higher prices
- Customer’s buying power
- Other products in range – displacing or supplementary
- Availability of resources
- Impact on staff
- Impact on customers
- Competitors’ reactions
- Opportunity costs
- Impact on other products
Recently company X has developed a new portable DVD recorder and wonders what price it should charge for a product which is at the leading edge of technology.

Required

Explain the relevance of the product life cycle when considering which pricing policies could be adopted.

Solution
## 6 Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Demand</td>
<td>PED measures the responsiveness of demand to a change in price. PED &gt;1 = elastic demand. PED &lt;1 = inelastic demand. Price can be determined using the demand function: P = a – bQ.</td>
</tr>
<tr>
<td>3</td>
<td>Optimal pricing</td>
<td>The output level to maximise profit is found when MR = MC. The output level to maximise revenue is where MR = 0. Prices at these output levels can then be determined from the demand function.</td>
</tr>
<tr>
<td>4</td>
<td>Pricing strategies</td>
<td>There are several strategies that can be applied to a product. These strategies may be changed depending upon the stage in the product life cycle.</td>
</tr>
<tr>
<td>5</td>
<td>Other considerations</td>
<td>The pricing strategy should be chosen bearing in mind both financial and non-financial factors.</td>
</tr>
</tbody>
</table>
# Short-term decisions

## How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain the concept of relevant costing.</td>
<td>The key considerations before deciding to outsource were required.</td>
<td>Sniff Ltd – December 2007, Part (d), 4 marks</td>
</tr>
<tr>
<td>Identify and calculate relevant costs for a specific decision from given data.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explain and apply the concept of opportunity costs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explain the issues surrounding make vs. buy and outsourcing decisions.</td>
<td>The key considerations before deciding to outsource have been examined. This could also be examined as mentioned above for make vs buy in costs.</td>
<td>Sniff Ltd – December 2007, part (d), 4 marks, Stay Clean – December 2009, part (c), 3 marks, Robber – June 2012, Parts (a), (b) &amp; (c) 20 marks</td>
</tr>
<tr>
<td>Calculate and compare “make” costs with “buy-in” costs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compare in-house costs and outsource costs of completing tasks and consider other issues surrounding this decision.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apply relevant costing principles in situations involving shut down, one-off contracts and the further processing of joint products.</td>
<td>Relevant costing calculations will be required in a variety of contexts. To date further processing and whether to extend opening hours have been examined.</td>
<td>Sniff Ltd – December 2007, parts (a) &amp; (b), 19 marks, Bits and Pieces – June 09, part (a), 12 marks, Stay Clean – December 2009, part (a), 13 marks</td>
</tr>
<tr>
<td>Syllabus learning outcomes</td>
<td>How syllabus outcomes are examined</td>
<td>Example past paper questions</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------------------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>Telephone Co</td>
<td>December 2011, part a, 14 marks, part b 6 marks</td>
<td></td>
</tr>
</tbody>
</table>
Overview

Short-term decisions

Relevant costs
- Future
- Cash flow
- Specific to decision
- Opportunity costs

Decisions
- Accept or reject
- Make or buy
- Outsourcing
- Shut down
- Minimum price
- Further processing
1 Decision making scenarios

1.1 (a) Accept or reject
   (b) Make or buy
   (c) Outsource
   (d) Shutdown
   (e) Minimum price of an order/job/contract
   (f) Further processing decisions

2 Relevant costs

The relevant cost concept is fundamental in decision-making.

2.1 In order for a cost to be a relevant cost it must be
   (i) Future
   (ii) Cash flow
   (iii) Incremental (specific to the decision)

2.2 Relevant costs may also be:
   (a) Opportunity costs – the value of a benefit sacrificed when one course of action is chosen in preference to an alternative. The opportunity cost is represented by the potential benefit forgone.
   (b) Avoidable costs – the specific costs of an activity or sector of a business which would be avoided if that activity or sector did not exist.
      Avoidable costs are usually associated with shutdown decisions. Fixed costs may be avoided if they are specific to a department or product. Allocated fixed costs are unlikely to change.

2.3 The following are not relevant costs.
   Sunk costs – costs that have already been incurred.
   Committed costs – these might include the cost of materials under a long term-contract.
   Notional costs – non cash items such as depreciation or the apportionment of general overheads.
Relevant cost of materials

2.4

Lecture example 1

A contract requires 400 kg of X and 200 kg of Y.

The following data is available

<table>
<thead>
<tr>
<th></th>
<th>In inventory</th>
<th>Historic cost</th>
<th>Current purchase price</th>
<th>Scrap value</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>300 kg</td>
<td>$2/kg</td>
<td>$3/kg</td>
<td>$2.20/kg</td>
</tr>
<tr>
<td>Y</td>
<td>300 kg</td>
<td>$0.50/kg</td>
<td>$2/kg</td>
<td>$1.50/kg</td>
</tr>
</tbody>
</table>

X is no longer used by the company; Y is regularly used for other products/purposes within the business.

Required

What is the relevant cost of X and Y to be included in the contract cost?
Relevant cost of labour

2.5

A plc is deciding whether to undertake a new contract. 15 hours of labour are required for the contract. Labour is currently at full capacity producing X.

Cost card for X
- Direct materials: 10 kg @ $2
- Direct labour: 5 hrs @ $6
- Selling price: 75
- Contribution: 25

Required
What is the cost of using 15 hours of labour for the contract?

Lecture example 2

Technique Demonstration
Solution
3 Accept or reject decisions

Proposal received: To manufacture 12,000 units of T over 12 months at a selling price of $3 per unit.

The following statement has been prepared:

<table>
<thead>
<tr>
<th></th>
<th>$</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales revenue</td>
<td>36,000</td>
<td></td>
</tr>
<tr>
<td>Costs:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material X at historical cost</td>
<td>5,000</td>
<td></td>
</tr>
<tr>
<td>Material Z at contract price</td>
<td>9,000</td>
<td></td>
</tr>
<tr>
<td>Manufacturing labour</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>Depreciation of machine</td>
<td>4,000</td>
<td></td>
</tr>
<tr>
<td>Variable overheads @ 30c per unit</td>
<td>3,600</td>
<td></td>
</tr>
<tr>
<td>Fixed overheads</td>
<td>8,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(39,600)</td>
<td>(3,600)</td>
</tr>
</tbody>
</table>

Further information

1. Material X cannot be used or sold for any other product. It would cost $200 to dispose of the existing inventories.

2. Each unit of new production uses two kilos of material Z. The company has entered into a long-term contract to buy 24,000 kilos at an average price of 37.5c per kilo. The current price is 17.5c per kilo. This material is regularly used in the manufacture of the company’s other products.

3. The machine which would be used to manufacture T was bought new three years ago for $22,000. It had an estimated life of five years with a scrap value of $2,000.

   If the new product is not manufactured the machine could be sold immediately for $7,000. If it is used for one year it is estimated that it could then be sold for $4,000.

4. The new product requires the use of skilled labour, which is scarce. If product T were not made this labour could be used on other activities, which would yield a contribution of $1,000.

Required

Prepare a statement of relevant costs and revenues and determine whether or not the proposal should be accepted.
## 4 Make or buy decisions

### Lecture example 4

Mars Co makes units Pluto & Jupiter, for which costs in the forthcoming year are expected to be as follows.

<table>
<thead>
<tr>
<th></th>
<th>P</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production (units)</td>
<td>1,000</td>
<td>1,500</td>
</tr>
<tr>
<td>Direct materials</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Direct labour</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Variable production overheads</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>17</td>
</tr>
</tbody>
</table>

Directly attributable fixed costs per annum and committed fixed costs:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Incurred as a direct consequence of making P</td>
<td>1,500</td>
</tr>
<tr>
<td>Incurred as a direct consequence of making J</td>
<td>3,000</td>
</tr>
<tr>
<td>Other fixed costs (committed)</td>
<td>10,000</td>
</tr>
<tr>
<td></td>
<td>14,500</td>
</tr>
</tbody>
</table>

A sub-contractor has offered to supply units of P for $12 and J for $21. Should Mars make or buy the components? What other factors should be considered before making a decision?

### Solution
6: SHORT-TERM DECISIONS

4.1 Remember decisions should not be purely based on financial factors.

4.2 Making the product gives the company more control whereas buying the product gives them access to an organisation with specific expertise.

4.3 They will also need to consider what the impact will be on:
   (i) The workforce
   (ii) Customers
   (iii) Competitors.

5 Outsourcing decisions

5.1 Outsourcing scenarios are very similar to make or buy decisions and therefore you should approach these in exactly the same way.

5.2 Consideration of non financial factors is particularly important here.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost savings</td>
<td>Loss of control</td>
</tr>
<tr>
<td>Access to expertise</td>
<td>Impact on quality</td>
</tr>
<tr>
<td>Releases capital</td>
<td>How flexible, reliable is supplier</td>
</tr>
<tr>
<td>Frees up capacity</td>
<td>Potential loss of confidential information</td>
</tr>
<tr>
<td></td>
<td>Loss of in house skill</td>
</tr>
<tr>
<td></td>
<td>Impact on employees morale</td>
</tr>
</tbody>
</table>

6 Shutdown decisions

6.1 These decisions may involve the closure of
   (a) A division
   (b) A product
   (c) A department
   of a business that appears to be loss making.

6.2 Shutdown decisions should not be made on the basis of profitability under absorption costing as this fails to consider the relevance of fixed overheads.

6.3 Shutdown decisions should focus on
   (a) Variable costs
   (b) Avoidable costs (what constitutes an avoidable cost may be different depending upon the timing of the decision)
   (c) Directly attributable costs (and revenues) if the closure is made
   (d) Timing
Lecture example 5

Lewis Ltd manufactures three products, the Keir, the Lucy and the Gareth. Forecasted income statements for next year are as follows:

<table>
<thead>
<tr>
<th></th>
<th>K</th>
<th>L</th>
<th>G</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$'000</td>
<td>$'000</td>
<td>$'000</td>
<td>$'000</td>
</tr>
<tr>
<td>Sales</td>
<td>600</td>
<td>300</td>
<td>200</td>
<td>1,100</td>
</tr>
<tr>
<td>Cost of production</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td>200</td>
<td>60</td>
<td>30</td>
<td>290</td>
</tr>
<tr>
<td>Labour</td>
<td>95</td>
<td>20</td>
<td>10</td>
<td>125</td>
</tr>
<tr>
<td>Variable overhead</td>
<td>75</td>
<td>10</td>
<td>5</td>
<td>90</td>
</tr>
<tr>
<td>Fixed overhead</td>
<td>200</td>
<td>50</td>
<td>80</td>
<td>330</td>
</tr>
<tr>
<td>Gross margin</td>
<td>30</td>
<td>160</td>
<td>75</td>
<td>265</td>
</tr>
<tr>
<td>Selling costs</td>
<td>40</td>
<td>20</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>Net margin</td>
<td>(10)</td>
<td>140</td>
<td>60</td>
<td>190</td>
</tr>
</tbody>
</table>

The directors are considering the closure of the Keir product line, due to the losses incurred. You obtain the following information:

(1) Fixed production overheads consist of an apportionment of general factory overheads, based on 80% of direct materials cost. The remaining overheads are specific to the product concerned.

(2) Selling costs are based on commission paid to sales staff.

Required

(a) Determine if the Keir product line should be closed down.
(b) Suggest other factors that should be considered prior to a final decision.

Solution
7 Minimum price

7.1 Minimum price scenarios are dealt with in exactly the same way as the other examples we have seen so far.

7.2 The minimum price quoted must be the relevant cost. Never be tempted to add on an amount for general overheads that the question may tell you is allocated to each job or a profit mark up. These items are not relevant.

8 The further processing decision

Processes

8.1 In certain circumstances more than one product may be produced from a single process. These products may sell in their current state or may need further, separate processing before they can be sold. The decision whether or not to process further is based on relevant costs and benefits.

Joint costs

8.2 The costs of the process will need to be apportioned between the products created by the process in order to

(a) Value inventory
(b) Prepare financial accounts

8.3 These costs are not relevant when deciding whether to process any product further because they are

(a) Sunk
(b) Arbitrarily apportioned

8.4 The total joint cost may be relevant for decisions regarding the viability of the process as a whole.

<table>
<thead>
<tr>
<th>Product</th>
<th>Output</th>
<th>Selling price at separation</th>
<th>Selling price after separation</th>
<th>Post separation costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>2,500</td>
<td>3</td>
<td>5</td>
<td>10,000</td>
</tr>
<tr>
<td>Y</td>
<td>1,500</td>
<td>5</td>
<td>10</td>
<td>8,000</td>
</tr>
<tr>
<td>Z</td>
<td>2,000</td>
<td>8</td>
<td>15</td>
<td>12,000</td>
</tr>
</tbody>
</table>

Joint processing costs are $20,000

Required

Which products should be processed further?
9 Qualitative factors

Assumptions in relevant costing

9.1 (a) Cost behaviour patterns are known with certainty
   (b) Costs, prices and volumes are known with certainty
   (c) Objective is to maximise profit/contribution
   (d) Information is complete and reliable

9.2 Note: state all assumptions made in relevant costing questions.

Other factors to consider

9.3 Exam questions may require a discussion of other factors, aside from the financial calculation, that should be taken into account in making any decision.

9.4 Timescale can also be relevant. Many fixed costs can be varied, but only in the long-term.

10 Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 8</td>
<td>Relevant costs</td>
<td>Decisions should be made on the basis of relevant costs. Relevant costs must be future, cash flows and specific to the decision. They may also be opportunity costs.</td>
</tr>
<tr>
<td>9</td>
<td>Qualitative factors</td>
<td>Non financial considerations should also be taken into account before making a final decision.</td>
</tr>
</tbody>
</table>
## Risk and uncertainty

### How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggest research techniques to reduce uncertainty e.g. Focus groups, market research.</td>
<td>Questions are most likely to ask you to suggest and explain techniques.</td>
<td>SH – December 2008, part (c), 6 marks.</td>
</tr>
<tr>
<td>Explain the use of simulation, expected values and sensitivity.</td>
<td>This will be examined via discussion elements.</td>
<td>SH – December 2008, part (c), 6 marks.</td>
</tr>
<tr>
<td>Apply expected values and sensitivity to decision-making problems.</td>
<td>Calculation of expected values in order to advise on a course of action is likely.</td>
<td>SH – December 2008, parts (a) &amp; (b), 14 marks. Cement Co – June 2011, part (a) 8marks</td>
</tr>
<tr>
<td>Apply the techniques of maximax, maximin, and minimax regret to decision-making problems including the production of profit tables.</td>
<td>Preparation of data tables often followed by comment as to the decision taken depending on the decision makers attitude to risk.</td>
<td>SH – December 2008, parts (a) &amp; (b), 14 marks. Heat Co – June 2011, parts (b) &amp; (c), 12 marks</td>
</tr>
<tr>
<td>Draw a decision tree and use it to solve a multi-stage decision problem</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calculate the value of perfect and imperfect information.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Overview

Risk vs uncertainty

Risk preference
- Risk seeker
- Risk averse
- Risk neutral

Risk and uncertainty in decision-making

Expected values
- $\Sigma px$

Decision methods
- Maximax
- Maximin
- Minimax regret

Techniques
- Data tables
- Joint probabilities
- Decision trees
- Sensitivity analysis
- Simulation
Part 1

Risk and uncertainty in decision-making

Risk vs uncertainty

Risk preference
- Risk seeker
- Risk averse
- Risk neutral

Expected values
- $\Sigma px$

Decision methods
- Maximax
- Maximin
- Minimax regret

Value of perfect information
1 Introduction

1.1 Decision making involves making decisions now which will affect future outcomes and it is unlikely that future cash flows will be known with certainty.

Risk

1.2 Risk exists where a decision maker has knowledge that several possible future outcomes are possible, usually due to past experience. This past experience enables a decision maker to estimate the probability of the likely occurrence of each potential future outcome. Risk can be quantified.

Uncertainty

1.3 Uncertainty exists when the future is unknown and the decision maker has no past experience on which to base predictions. Uncertainty cannot be quantified but techniques can be adopted to reduce uncertainty. These might include:

- Market research
- Focus groups

2 Risk preference

2.1 (a) Risk seeker – An optimist. A decision maker who is interested in the best outcomes no matter how small a chance that they may occur.

(b) Risk neutral – A decision maker who is concerned with the most likely outcome.

(c) Risk averse – A pessimist. A decision maker who acts on the assumption that the worst outcome might occur.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected outcome</td>
<td>$10,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>Highest possible</td>
<td>$25,000</td>
<td>$11,000</td>
</tr>
<tr>
<td>Lowest possible</td>
<td>$(10,000)</td>
<td>$9,000</td>
</tr>
</tbody>
</table>

Required

Which investment would be chosen by a decision maker who is:

(a) Risk seeking?
(b) Risk neutral?
(c) Risk averse?
3 Data tables

3.1 If there is one decision and one uncertain variable it is often easiest to display all options on a data table, which may be generated easily by a spreadsheet.

**Lecture example 2**

John must decide how best to use a monthly factory capacity of 1,200 units. His demand from regular customers is risky and as follows.

<table>
<thead>
<tr>
<th>Monthly demand (units)</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>0.2</td>
</tr>
<tr>
<td>500</td>
<td>0.6</td>
</tr>
<tr>
<td>700</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Regular customers generate contribution of $5 per unit. John has the opportunity to enter a special contract which will generate contribution of only $3 per unit. For the special contract John must enter a binding agreement now at a level of 900, 700 or 500 units.

**Required**

Display all possible contributions in a data table.
Solution

Workings:

<table>
<thead>
<tr>
<th>Special contract (units)</th>
<th>900</th>
<th>700</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand (units)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>300</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>700</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4 Expected values

Definition

4.1 When the final outcome is unknown and a range of possible future outcomes has been quantified (for example, best, worst and most likely) probabilities can be assigned to these outcomes and a weighted average (expected value) of those outcomes calculated.

\[ EV = \sum px \]

where p is the probability of the outcome occurring and x is the value of the outcome (profit or cost).

4.2 When faced with a number of alternative decisions, the one with the highest EV should be chosen.

Lecture example 3

Required

Suppose we assume that in lecture example 2 John wants to maximise profits over the long term. Find the optimal level of special contract to commit to every month, using expected values.
## Solution

<table>
<thead>
<tr>
<th>Demand (units)</th>
<th>P</th>
<th>Special contract (units)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>900</td>
<td>700</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>0.2</td>
<td>4,200</td>
<td>3,600</td>
<td>3,000</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>0.6</td>
<td>4,200</td>
<td>4,600</td>
<td>4,000</td>
<td></td>
</tr>
<tr>
<td>700</td>
<td>0.2</td>
<td>4,200</td>
<td>4,600</td>
<td>5,000</td>
<td></td>
</tr>
<tr>
<td>EV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Workings:

### Limitations of expected values

4.3  

(a) **EV is a long-term average**, so that the EV will not be reached in the short term and is therefore not suitable for one-off decisions.

(b) The results are dependent on the accuracy of the probability distribution. In particular, it uses discrete variables rather than continuous variables (i.e. variables are point estimates rather than a continuous range). This may not accurately model the real situation.

(c) **EV takes no account of the risk** associated with a decision.

(d) The EV itself may **not represent a single possible outcome**.
5 Decision methods

Maximin decisions

5.1 Maximise the minimum return of each decision.
Risk averse decision-maker.

Lecture example 4

<table>
<thead>
<tr>
<th>Demand (units)</th>
<th>900</th>
<th>700</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>4,200</td>
<td>3,600</td>
<td>3,000</td>
</tr>
<tr>
<td>500</td>
<td>4,200</td>
<td>4,600</td>
<td>4,000</td>
</tr>
<tr>
<td>700</td>
<td>4,200</td>
<td>4,600</td>
<td>5,000</td>
</tr>
</tbody>
</table>

Required
Assuming a totally risk averse attitude, what would be taken using the data table in lecture example 2?

Solution

5.2 Criticisms of maximin
- Ignores the probability of each outcome occurring
- Is conservative (doesn’t try to maximise profit)

Maximax decisions

5.3 Aim for the best possible return.
Risk seeking decision maker.
Lecture example 5

Preparation question

Risk seeking

Required

Assuming a risk seeking attitude, what decision would be taken using the data table in lecture example 2?

Solution

<table>
<thead>
<tr>
<th>Demand (units)</th>
<th>900</th>
<th>700</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>4,200</td>
<td>3,600</td>
<td>3,000</td>
</tr>
<tr>
<td>500</td>
<td>4,200</td>
<td>4,600</td>
<td>4,000</td>
</tr>
<tr>
<td>700</td>
<td>4,200</td>
<td>4,600</td>
<td>5,000</td>
</tr>
</tbody>
</table>
5.4 Criticisms of maximax
- Ignores the probability of each outcome occurring
- Is overly optimistic

Minimax regret decision rule
5.5 'Regret' means opportunity cost from making the wrong decision.

The decision rule chooses the option which minimises the maximum opportunity cost from making the wrong decision.

Lecture example 6

Preparation question

Required
Using the minimax regret rule, what decision would be taken using the data table in lecture example 2?
## Solution

<table>
<thead>
<tr>
<th>Demand (units)</th>
<th>900</th>
<th>700</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>4,200</td>
<td>3,600</td>
<td>3,000</td>
</tr>
<tr>
<td>500</td>
<td>4,200</td>
<td>4,600</td>
<td>4,000</td>
</tr>
<tr>
<td>700</td>
<td>4,200</td>
<td>4,600</td>
<td>5,000</td>
</tr>
</tbody>
</table>

### Opportunity Cost Table

<table>
<thead>
<tr>
<th>Demand (units)</th>
<th>900</th>
<th>700</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>700</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum regret</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6 **Perfect information**

6.1 Information may be available about uncertain variables eg. market research.

6.2 If this information is guaranteed to predict the future with certainty it is defined as perfect information.

6.3 Perfect information removes risk. It is therefore valuable.

6.4 Value of perfect information (VOPI)

\[
\begin{align*}
\text{EV (with perfect information)} & \quad X \\
\text{EV (no perfect information)} & \quad (X) \\
\text{VOPI} & \quad X
\end{align*}
\]

**Lecture example 7**

John has been contacted by a market research company, which guarantees that the results of its survey will be 100% correct.

These results will enable John to ascertain the demand from his regular customers every month, in advance of accepting the special order.

**Required**

What is the maximum amount that John should pay for the survey?

<table>
<thead>
<tr>
<th>Demand (units)</th>
<th>P</th>
<th>Special contract (units)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>900 700 500</td>
</tr>
<tr>
<td>300</td>
<td>0.2</td>
<td>4,200 3,600 3,000</td>
</tr>
<tr>
<td>500</td>
<td>0.6</td>
<td>4,200 4,600 4,000</td>
</tr>
<tr>
<td>700</td>
<td>0.2</td>
<td>4,200 4,600 5,000</td>
</tr>
</tbody>
</table>

**Solution**

END OF CHAPTER
Checkpoint 2 – Progress Review

To reinforce your learning to date you should now follow the study guidance in the following pages. On completion, your progress towards full exam preparation will be:

You have now completed Stage 2 of the course. Before you attempt the work outlined within the Study Support section on the subsequent pages, take some time to reflect on the knowledge and skills you covered during Stage 2. If you feel you need further clarification on any of the key areas listed below you can use the on-line lecture for the relevant chapter.

Key messages from Stage 2

Don’t worry if you found some of the topics covered in this stage a bit over-whelming, go back through your notes reworking the various examples.

Key knowledge

Limiting factor analysis – Linear programming is likely to require preparation of a graph. Many students often discover that whilst they felt confident with this technique whilst going through the notes, the reality of attempting this on their own is more difficult than they had envisaged so it is important to practise this technique now.

Try to memorise the steps involved in a linear programming problem and remember that the simultaneous equations prepared to discover the optimal point are for the two lines on the graph that intersect at the optimal point. (This will not necessarily be for labour and materials!)

Pricing decisions – Don’t forget this exam has as many marks available for numbers as it does words. Make sure you understand the various pricing policies and, particularly for cost plus, can discuss the various advantages and disadvantages.

Short term decisions – Relevant costing is a hugely important area that impacts many decisions. Questions in the exam will assume you know that you need to apply relevant costing principles and won’t necessarily even mention the term relevant cost.

Risk & uncertainty – This area can seem very involved on a first look at the notes. It is therefore important to practise the steps involved.

Remember a risk neutral person or someone who wishes to maximise their profit will use expected values to make their decision.

- Firstly a data table will be drawn up detailing the various possible contributions
- Secondly these contributions are multiplied by the appropriate probability
- Lastly the values are totalled to arrive at an expected value

Don’t forget the exam also includes discussion and so you should be prepared to interpret data not just calculate it.
**Key skills**

With your introduction to some quite complex techniques during Stage 2, it is important that you give sufficient attention to the key skills you need in order to score well in the exam. You must aim to:

- Learn the proformas and the steps/approaches to each of the various topics.
- Ensure your layout and presentation is clear and easy to follow.
- Use workings and cross reference all your workings to the appropriate place within your answer.

After working through the Study Support guidance, Course Exam 1 can be attempted.
# Checkpoint 2 – Study Support

## Chapter 4 – Limiting factor analysis

### Key areas
- Linear programming – graphical and simultaneous equations
- Shadow prices
- Slack

### Course Notes
- Rework the examples in the Course Notes ensuring you are happy with the steps involved.
- Ensure you can explain a shadow price and slack.

### Question Practice
- Attempt Question 8 (RAB Consulting) from the Study Text question bank for further practice of this technique.
- If you feel you need more practice in this area have another look at Q3 (Ferny Chewer) from the course notes question bank.

### Additional Resources
- **Study Text Resources**
  - Work through the examples in section 4 to ensure you are comfortable with linear programming.

## Chapter 5 – Pricing decisions

### Key areas
- Price elasticity of demand
- Demand function
- Pricing strategies

### Course Notes
- Learn and ensure you can use the demand function.
- Learn and ensure you do the optimal pricing calculations.
- Ensure you can explain all of the pricing strategies and can recommend when they might be appropriate.

### Question Practice
- Question 9 (Plastic tools) from the Study Text question bank – work through this question in full. Think about the discussion elements carefully and try to come up with one point for each mark.

### Additional Resources
- **Real-life examples**
  - In the Real-life examples section you will find case 2, an article from the BBC that discusses Apple’s market position and pricing strategy.
- **Study Text Resources**
  - Read section 2.3 on demand and the individual firm.
  - Work through the examples on cost plus pricing in section 5.
### Chapter 6 – Short-term decisions

**Key areas**
- Relevant costs
- Decision making using relevant costs and other factors

**Course Notes**
- Review the relevant cost diagrams carefully and ensure you understand the logic involved.
- Run through the examples once more.
- Ensure you can come up with the non-financial factors which should also be taken into account.

**Question Practice**
- If you have not yet done Q3, attempt this from the course notes before attempting Study Text Question 10 (AB). Work through this question in full. Think about the discussion elements carefully and try to come up with one point for each mark. This will enable you to practice these techniques in a variety of decision making situations.

**Additional Resources**
**Study Text Resources**
- Read through section 3 on outsourcing.
- Section 4 has more detail on joint products. If your memory is hazy in this area work through this section.

### Chapter 7 – Risk and uncertainty Part 1

**Key areas**
- Expected values
- Techniques
- Decision methods

**Course Notes**
- Review the notes and ensure you can perform the appropriate calculations.

**Additional Resources**
**Study Text Resources**
- Read through section 4 on decision rules to make sure you are completely happy with these techniques.

---

**On completion of Stages 1 & 2 (including Progress Tests)**

**you are ready to attempt Course Exam 1**
Checkpoint 2 – Progress Test

Having completed the Study Support guidance contained on the previous pages, you are now ready to attempt the Progress Test. You should aim to complete the test in 1 hour.

The multiple choice questions contained within the Progress Test will thoroughly test your understanding of the material and your ability to perform the required calculations. Note that the F5 exam does not contain multiple choice questions. The five short written questions that follow will test your ability to apply your knowledge and will help to prepare you for the discursive element of the exam.

It is important that you continually review your progress and revise further any areas where you feel your understanding is weak.

A  Multiple choice questions (10 questions – approximate time 40 minutes)

1 Price discrimination involves:
   A  Selling at a high price when initially launching a product in a market with major barriers to entry then slowly lowering the price to generate further demand
   B  Selling two distinct products at different prices in two separate markets with limited opportunities for arbitrage
   C  Selling at a low price when initially launching a product in a market with few barriers to entry in order to gain a large share of the market and obtain customer loyalty
   D  Selling essentially the same product at different prices in two separate markets with limited opportunities for arbitrage

2 Which of the following statements regarding external pricing strategies is incorrect?
   A  Loss leader pricing is where a low price is charged for one product in a range, hoping to encourage purchase of other products
   B  Market skimming is appropriate where the product life cycle is short
   C  Market penetration is useful to shorten the introduction phase of a product’s life cycle
   D  Price discrimination is where a company sells a different quality product in different markets at a different price

Data for questions 3 and 4

A firm has established that maximum demand for its product is 80,000 units per annum. When it reduced its prices by $20, demand rose by 1,600 units.

3 What is the demand function?
   A  \( P = 1,000 - 0.025Q \)
   B  \( P = 1,000 - 0.0125Q \)
   C  \( P = 50 - 0.025Q \)
   D  \( P = 500 - 0.0125Q \)

4 What price should be set in order to sell 50,000 units?
   A  $125
   B  $225
   C  $375
   D  $500
5 Top has limited factory capacity measured in labour hours and a decision must be made whether to make or buy product X. Supplies of X can be purchased for $12 per unit. If X is made each unit costs $5 in raw materials and requires three labour hours. Labour is paid at $1.50 per hour. Labour is currently working to capacity making product Y which earns a contribution of $2 per unit, each unit needing five labour hours.

Which one of the following statements is true?

A Top should be indifferent between making or buying X since the labour will be fully utilised in any case
B Top should make X because it is $3.50 per unit cheaper than purchasing
C Top should buy X because it is $5.80 per unit cheaper than making
D Top should make X because it is $1.30 per unit cheaper than buying X

(2 marks)

6 Roger is considering undertaking a contract which will yield income of $15,000 over a 15-month period. To carry out the contract he will have to use 1,000 kg of material. 800 kg is already held in inventory and cost $15 per kg. The current replacement cost is $20 per kg. If not used for the contract the material would be sold to Moore Co for $2,000 in total.

Roger could utilise his old machine for the contract if conversion costs of $5,000 are undertaken. Alternatively he could scrap his old machine and receive $3,000 and hire another one at a cost of $500 per month.

Labour currently has spare capacity and variable overheads are estimated to be $1 per hour. 2,000 hours are believed to be required for the period of the contract.

What is the net relevant cash flow for the contract? (Ignore the time value of money)

A $2,000
B $2,500
C $4,000
D $4,500

(3 marks)

7 The following data relate to material held in inventory and needed immediately for a contract.

<table>
<thead>
<tr>
<th>Description</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacement cost</td>
<td>4,000</td>
</tr>
<tr>
<td>Realisable value</td>
<td>3,900</td>
</tr>
<tr>
<td>Storage costs for this quantity for one month</td>
<td>200</td>
</tr>
</tbody>
</table>

There will be no alternative use for this material until one month later when the replacement cost will be $4,300.

What cost should be included for the material when assessing the viability of the contract?

A $3,900
B $4,000
C $4,200
D $4,300

(2 marks)
Three sales representatives – J, K and L – rate their (independent) chances of achieving certain levels of sales as follows.

<table>
<thead>
<tr>
<th>Possible sales</th>
<th>$10,000</th>
<th>$20,000</th>
<th>$30,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>J Probability</td>
<td>0.3</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>K Probability</td>
<td>0.3</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>L Probability</td>
<td>0.2</td>
<td>0.6</td>
<td>0.2</td>
</tr>
</tbody>
</table>

(For example, J rates her chances of selling $20,000 worth of business as '50-50' and K has a 30% chance of selling $30,000)

On this evidence, the highest expected sales will be from

A. J alone
B. K alone
C. L alone
D. K and L  (2 marks)

Brain Co is considering launching a new product. Expected sales volumes (at a selling price of $5 per unit) and expected unit variable costs are as follows

<table>
<thead>
<tr>
<th>Sales</th>
<th>Units</th>
<th>Probability</th>
<th>Variable costs per unit</th>
<th>$1,000</th>
<th>0.9</th>
<th>1.30</th>
<th>0.55</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,000</td>
<td></td>
<td></td>
<td>2,000</td>
<td></td>
<td>1.50</td>
<td>0.45</td>
</tr>
</tbody>
</table>

Fixed costs are expected to be $3,000. The company produces to order. What is the expected profit?

A. $2,400
B. $30
C. $3,971
D. $971  (3 marks)

Pobble plc is in the process of preparing a quotation for a special order. The job will require 255 units of material M. 210 units, which originally cost $50 per unit, are in stock. Net realisable value per unit is $30 and replacement cost is $72 per unit. The only other use for the material is to use as a substitute for 375 units of material N which currently costs $25 per unit.

What is the relevant cost of material M for the special order?  (3 marks)

B. Short written questions (5 questions – approximate time 20 minutes)

1. What is meant by the term scarce resource?  (2 marks)
2. List some qualitative factors that may also be considered when taking a decision  (2 marks)
3. What is meant by the term 'price elasticity'?  (2 marks)
4. What is the maximin decision rule?  (2 marks)
5. What is meant by the term expected value?  (2 marks)
Checkpoint 2 – Progress Test solutions

Section A

1  D  To be able to operate price discrimination you need to have two separate markets with no cross-selling opportunities so that you can charge two different prices.

2  D  The product or service must be the same for true price discrimination.

3  B  \[ P = a - bQ \]

Assuming a straight line demand function

\[
\frac{80,000}{1,600} = 50 \text{ steps}
\]

\[
50 \times 20 = 1,000
\]

\[ P = $1,000 - $0.0125Q \]

4  C  \[ P = $1,000 - $0.0125Q \]

\[ P = $1,000 - ($0.0125 \times 50,000) \]

\[ P = $375 \]

5  D  Relevant cost of making:

\[
\begin{align*}
\text{Cash flow making X} & \quad \$ \\
\text{Raw materials} & \quad (5) \\
\text{Labour (basic cost: 3 hrs at $1.50/hr)} & \quad (4.50) \\
\text{Cash flows next best alternative} & \quad \text{(1.20)} \\
\text{lost contribution ($2 \times 3/5)} & \quad 12.00 \\
\text{Saved cost of buying} & \quad +1.30
\end{align*}
\]

ie making $1.30 cheaper than buying.
### 6 B

<table>
<thead>
<tr>
<th>Material</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 kg × $20</td>
<td>(4,000)</td>
</tr>
<tr>
<td>Scrap proceeds forgone</td>
<td>(2,000)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Machine</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use old + convert:</td>
<td>(5,000)</td>
</tr>
<tr>
<td>Scrap old + hire</td>
<td>(4,500)</td>
</tr>
<tr>
<td>$3,000 – (15 × $500)</td>
<td>(4,500)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Labour</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable overheads</td>
<td>(2,000)</td>
</tr>
<tr>
<td>2,000 × $1</td>
<td>2,500</td>
</tr>
</tbody>
</table>

### 7 B

Since we need the material in one month then:

If we do the contract:

<table>
<thead>
<tr>
<th>Option</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Replace now</td>
<td>4,000</td>
</tr>
<tr>
<td>One month storage</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>4,200</td>
</tr>
</tbody>
</table>

Or (b) Buy in one month

<table>
<thead>
<tr>
<th>Option</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Realise value</td>
<td>3,900</td>
</tr>
<tr>
<td>Purchase in one month</td>
<td>(4,300)</td>
</tr>
<tr>
<td></td>
<td>(400)</td>
</tr>
</tbody>
</table>

The better option is (a)

If we do not do the contract:

<table>
<thead>
<tr>
<th>Option</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Realise value</td>
<td>3,900</td>
</tr>
<tr>
<td>Purchase in one month</td>
<td>(4,300)</td>
</tr>
<tr>
<td></td>
<td>(400)</td>
</tr>
</tbody>
</table>

Or (b) Store

<table>
<thead>
<tr>
<th>Option</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b) Store</td>
<td>(200)</td>
</tr>
</tbody>
</table>

The better option is (b)

Therefore the storage costs will be incurred whether we do the contract or not and so the relevant cost becomes $4,000, not $4,200.

### 8 D

The expected sales are given by

J: $10,000 × 0.3 + 20,000 × 0.5 + 30,000 × 0.2 = $19,000

K: $10,000 × 0.3 + 20,000 × 0.4 + 30,000 × 0.3 = $20,000

L: $10,000 × 0.2 + 20,000 × 0.6 + 30,000 × 0.2 = $20,000

### 9 D

Expected sales quantity = (1,000 × 0.9) + (2,000 × 0.1) = 1,100

Expected sales revenue = 1,100 × $5 = $5,500

Expected unit cost = (1.30 × 0.55) + (1.50 × 0.45) = $1.39

Expected total variable costs = $1.39 × 1,100 = $1,529

### Profit calculation

<table>
<thead>
<tr>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales revenue</td>
</tr>
<tr>
<td>Less: variable costs</td>
</tr>
<tr>
<td>fixed costs</td>
</tr>
<tr>
<td>971</td>
</tr>
</tbody>
</table>
CHECKPOINT 2

10 Units
    255 required
    210 in inventory
    45 to purchase $3,240

In inventory: opportunity cost (W1) 9,375

(W1) Higher of NRV $30 \times 210 $6,300
    Material N $25 \times 375 $9,375

12,615

Section B

1 A scarce resource may be defined as a resource which is in short supply, so that the total opportunities that exist for making profitable use of the resource exceed the amount of the resource available.

2 At least three of:
   Effects on: Customers, suppliers, employees, local community, competition

3 Price elasticity of demand measures the responsiveness of demand to a change in price.

4 The maximin decision rule suggests that a decision maker should select the alternative that offers the least attractive or worst outcome. This would mean choosing the alternative that maximises the minimum profits.

5 The expected value is the long-term weighted average outcome expected. It is measured by multiplying the possible outcomes by their respective probabilities.
Case 2 - Premium Pricing Strategy

BBC – OCTOBER 2012

iPad Mini unveiled by Apple as it enters small tablet market

Apple has unveiled its widely-anticipated 7.9in (20.1cm) tablet, the iPad Mini. The device, which is 7.2mm (0.3in) thick and weighs 0.68lbs (0.3kg), was announced at an event in California. The entry wi-fi-only model, with 16GB storage, will cost £269 in the UK and be available on 2 November.

The iPad Mini will compete directly with cheaper similar-sized tablets recently launched by Google, Amazon, Samsung and others.

Apple's vice-president of marketing Phil Schiller told attendees that the device was 23% thinner and 53% lighter than the third-generation iPad, which was released in March this year.

Change of heart

The iPad Mini launch ends years of speculation that Apple was considering launching a new, smaller version of its bestselling iPad range.

In 2010, late founder Steve Jobs described 7in tablets as being "too small". However, the company's apparent change of heart comes in the face of mounting pressure from its closest competitors, who already offer smaller - and crucially, cheaper - products.

In the UK, both Amazon's new 7in Kindle Fire HD and Google's Nexus 7 cost £159.

During the presentation, Mr Schiller stressed the importance of being able to hold the device in one hand - a nod to the more travel-friendly appeal of the smaller devices. However, Adam Leach, principal analyst at Ovum, said he had expected the iPad Mini to be more competitively priced. "We got a mix of a bit of new Apple and bit of old Apple in the same announcement," he told the BBC.

Tablets, big and small, are crowding out the PC, with sales of personal computers down 8% on a year ago.

In 2010 when the iPad was launched many mocked it as a plaything - but Apple, Google and even Microsoft believe the future of their industry is tablet-shaped. "This is new for Apple to be responding to competitors instead of pioneering their own way."

"It's old Apple as they've gone into this market with a premium pricing strategy." At the moment this doesn't place a lot of pressure on the Kindle Fire or the Nexus 7."He added that the iPad Mini was an indicator that Apple might be nervous about losing its control over a market which it has dominated in recent years.

During the nineties, Apple found itself outpaced in the home computer market by Microsoft and Windows-powered computers - a period of the company's history it will be conscious to avoid repeating.

"The popularity of the Kindle e-reader and the Android smartphones made consumers aware of Amazon content and Google services," said Francisco Jeronimo, research manager at consultants IDC.

"The low price points of the Google Nexus 7 and the Amazon Kindle Fire have been attracting consumers looking for more affordable devices that also come with the content and services they already use or want."But he added: "This new product from Apple will disrupt the market again. The iPad Mini is now the new category killer."

The other iPad Mini wi-fi-only models will have a recommended retail price of £349 for 32GB and £429 for 64GB. The iPad Mini is expected to boost Apple's dominance of the tablet market.

The devices supporting 3G and 4G data connections would be released "a couple of weeks" later, the company said. They will be priced at £369 for 16GB, £449 for 32GB and £529 for 64GB.
'Kick in the face'

Apple also announced a lower-key upgrade for the full-sized iPad. Calling it the "fourth generation" iPad, Mr Schiller said its new A6X chip meant it had twice the CPU (central processing unit) power of the third-generation model.

Paddy Smith, online editor for Stuff.tv, said some Apple users might see the iPad upgrade as a "kick in the face" as the previous model was just seven months old."I think a lot of people will be upset to see a new full size iPad so soon," he told the BBC."For many people that represents a pretty major purchase, something you wouldn't want to do more than once a year."Stuff.tv's Mr Smith agreed that Christmas shoppers could be hesitant.

"I think if they look at the competition and they see that the Google Nexus 7 is £100 cheaper it's going to be hard to ignore that - unless you're buying for a hardcore Apple fan."However, IDC predicted that the new device would boost Apple's already dominant position in the tablet market.

It forecast that Apple would hold a 68% share of the market in 2012, compared to 29% for Android tablets.
Part 2

Risk and uncertainty in decision-making

Expected values
- $\Sigma px$

Techniques
- Data tables
- Joint probabilities
- Decision trees
- Sensitivity analysis
- Simulation
7 Joint probability tables

7.1 If there are two variables that are uncertain or risky it may be helpful to record the range of possible outcomes in a joint probability table.

7.2 Analysis could take the form of expected values or the data table could be used to give management an overview of the decision it is facing.

Lecture example 8

Brown Co has developed a new product.

The company is confident that demand for the product will be 30,000 units at a selling price of $25, but both the variable cost per unit and the specific fixed costs associated with this product are uncertain.

Brown Co believes that the following circumstances could occur.

<table>
<thead>
<tr>
<th>VC</th>
<th>Prob</th>
<th>FC</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>$</td>
<td></td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>0.2</td>
<td>100,000</td>
<td>0.4</td>
</tr>
<tr>
<td>13</td>
<td>0.35</td>
<td>110,000</td>
<td>0.5</td>
</tr>
<tr>
<td>14</td>
<td>0.45</td>
<td>120,000</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Required

(a) Construct a two-way data table for profit generated.

<table>
<thead>
<tr>
<th>VC</th>
<th>Fixed Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$100,000</td>
</tr>
<tr>
<td>$12</td>
<td></td>
</tr>
<tr>
<td>$13</td>
<td></td>
</tr>
<tr>
<td>$14</td>
<td></td>
</tr>
</tbody>
</table>
(b) Using the joint probabilities for each combination of fixed cost and variable cost, calculate the expected value of Brown Co's profit.

Joint probability table

<table>
<thead>
<tr>
<th>Variable Costs</th>
<th>$100,000</th>
<th>$110,000</th>
<th>$120,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prob</td>
<td>0.4</td>
<td>0.5</td>
<td>0.1</td>
</tr>
<tr>
<td>VC $12</td>
<td>0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VC $13</td>
<td>0.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VC $14</td>
<td>0.45</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Expected value of profit

<table>
<thead>
<tr>
<th>Fixed Costs</th>
<th>$100,000</th>
<th>$110,000</th>
<th>$120,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>$12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VC $13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$14</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Solution
8 Decision trees

8.1 A decision tree is a pictorial method of showing a sequence of interrelated decisions and their expected outcomes. Decision trees can incorporate both the probabilities of, and value of, expected outcomes, and are used in decision-making.

8.2 Decision trees are most useful when there are several decisions and ranges of outcome.

Constructing a decision tree

8.3 Constructing a tree requires all the choices and outcomes to be drawn and the numbers (probabilities, outcomes and EVs) to be entered.

The steps involved are:

(a) Plan the tree diagram and tick off all information given in the question as you use it in the plan.

(b) Draw the tree from left to right, using a ruler, giving yourself as much space as possible.

(c) Show a key in the answer detailing the different symbols for decisions and outcomes.

Evaluating a decision tree

8.4 Once drawn the optimal decision can be calculated using rollback analysis.

(a) Evaluate the tree from right to left.

- Calculate expected values at outcome points
- Take highest benefit at decision points

(b) Keep your workings on a different page.

(c) State clearly the initial decision to be made.

Lecture example 9

Captain Co runs its business through a number of centres. One of its centres is suffering from declining sales and management has a range of options:

(a) To shut down the site and sell it for $5 million
(b) To undertake a major refurbishment
(c) To undertake a cheaper refurbishment

In the past 2/3 of such refurbishments have achieved good results, the other 1/3 being less successful, achieving poor results.

The major refurbishment will cost $4,000,000 now. Estimates of the outcomes are as follows.

(1) Good results PV = $13,500,000
(2) Poor results PV = $6,500,000

The cheaper refurbishment, costing $2,000,000 now would have the following outcomes:

(1) Good results PV = $8,500,000
(2) Poor results PV = $4,000,000
Required
(a) Construct a decision tree for Captain Co to show all possible decisions and outcomes.
(b) Evaluate the decision tree and recommend what action should be taken.

Solution

Workings:
Captain Co now has the opportunity to commission a market research survey prior to deciding what action to take regarding its centre.

There is a 69% chance of receiving positive feedback and a 31% chance of receiving negative feedback. However, the survey is not 100% reliable. The probability of a good outcome after positive feedback is 91%. Where as the probability of a poor outcome after negative feedback is 87%.

If feedback from the survey is positive, Captain Co would consider either the major or cheaper refurbishment. If the feedback is negative they would only consider the cheaper refurbishment or closure.

Required:

(a) Construct a decision tree to show the outcomes and decisions that can now occur

(b) Calculate the value of the perfect information

Solution

Workings:
9 Sensitivity analysis

9.1 Assessing probabilities of a range of variables may be difficult with certainty. Sensitivity analysis permits an alternative way of assessing risk.

Decisions are assessed for their response to a change in a variable.

9.2 Approaches to sensitivity analysis are:

(a) Calculating the maximum percentage change in a variable before the decision would change.

(b) Assessing if the decision would change if a variable changed by x% of estimate.

(c) Estimating by how much costs / revenues would need to change before the decision maker would be indifferent between two options.

9.3 Limitations of sensitivity analysis

- Only one variable can be tested at a time
- There is no decision rule
- It does not quantify the probability of the variable changing

Lecture example 11

Company P is considering the launch of a new product.

Details are as follows:

\[
\begin{array}{lcl}
\text{Sales} & \text{10,000 units} @ \$10 & 100,000 \\
\text{Material costs} & \$2 \text{ per unit} & 20,000 \\
\text{Labour cost} & \$3 \text{ per unit} & 30,000 \\
\text{Fixed Overheads} & & (50,000) \\
\text{Profit} & & (30,000) \\
\end{array}
\]

Required

Assess the sensitivity of the product to a change in

(a) Material cost
(b) Units sold
10 Simulation

10.1 Simulation models can be used to deal with decisions where there are a number of uncertain variables.

10.2 Simulation models can be created using computers and random numbers. These numbers are linked to probability distributions so that the number chosen occurs with the same probability that the real life event would occur.

10.3 Simulation can be used for estimating queues in shops as this depends on two uncertainties; arrival of customers at the shop and service time. Two sets of probabilities and random numbers will be required.
# 7: RISK AND UNCERTAINTY

## 11 Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Risk &amp; Uncertainty</td>
<td>Risk is where a decision-maker has past experience. With uncertainty there is no past experience.</td>
</tr>
</tbody>
</table>
| 2       | Risk preference | There are three types of risk preference  
- Risk seeker – optimist  
- Risk averse – pessimist  
- Risk neutral – uses expected values |
| 3       | Data tables | Data tables are used to display all the possible outcomes when there is one decision and one uncertain variable |
| 4       | Expected values | Expected values are calculated as $\sum px$ |
| 5       | Decision methods | Maximin – maximise the minimum return  
Maximax – maximise the maximum return  
Minimax regret – minimise the opportunity cost from making the wrong decision |
| 6       | Perfect information | Perfect information is guaranteed to predict the future with 100% accuracy. Imperfect information is valuable even though it may incorrectly predict future events.  
The value of perfect information is calculated as:  
\[
\text{EV with perfect information} \times (X)  
\text{EV without perfect information} \times (X)  
\text{Value of information} \times (X)
\] |
| 7       | Joint probability tables | A joint probability table can be prepared if there are two unknown variables. |
| 8       | Decision trees | Decision trees can be used to illustrate the choices and possible outcomes of a decision.  
The value of imperfect information may be needed too. |
| 9       | Sensitivity analysis | An alternative way of assessing risk. Variables are assessed in isolation. |
| 10      | Simulation | A method of assessing risk where there are several uncertain variables. |
## How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain how budgetary systems fit within the performance hierarchy.</td>
<td>All of this chapter would be examined via discussion. Questions are likely to outline a scenario and will require discussion of various elements of these syllabus outcomes.</td>
<td></td>
</tr>
<tr>
<td>Identify the factors which influence behaviour.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss the issues surrounding setting the difficulty level for a budget</td>
<td></td>
<td>Sauce Co – June 2012, part (b) 10 marks</td>
</tr>
<tr>
<td>Explain the benefits and difficulties of the participation of employees in the negotiation of targets.</td>
<td></td>
<td>PC Co – December 2011, part (b) 11 marks</td>
</tr>
<tr>
<td>Select and explain appropriate budgetary systems for an organisation, including top-down, bottom-up and feed-forward control.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Overview

- Planning and control cycle
- Budgetary control
- Behavioural aspects
  - Controllable vs uncontrollable expt
  - Feedback & feedforward control
  - General
  - Motivation
  - Participation
1 Introduction

1.1 Long-term strategic plans are broken down into short-term plans and targets. This is generally done in the form of a budget or forecast. A budget is a financial and/or quantitative plan of operations for a forthcoming period.

2 Planning and control

2.1 Budgeting is part of the overall process of planning and control. A budget is a plan which will assist in achieving objectives.

2.2 Purpose of budgetary control:

P – Planning
R – Responsibility
I – Integration and co-ordination
M – Motivation
E – Evaluation and control

3 Budgetary control

3.1 A system must be controlled to keep it steady or enable it to change safely. Control is required because unpredictable disturbances arise and enter the system, so that actual results/(outputs) deviate from expected results.

Examples of disturbances from the environment which would impact on a business system would be as follows:

- Rise in the cost of raw materials
- Changes in demand levels
- Price war

A control system must ensure that the business is capable of surviving the disturbances.

3.2 The components of a controlled system are:

- a meaningful target or standard
- a method of gathering information form a system (sensor)
- a method of comparing information to a standard (comparator)
- the means to initiate control action (effector)

3.3 This flow of information through a system is known as the ‘feedback loop’

A ‘single feedback’ loop is confined to information coming from within the organisation and refers to a fixed budget. For example, if sales targets are not reached, control action will be taken to ensure that targets will be reached soon.

This can be compared to a ‘double feedback’ loop, in which the external environment is monitored and action maybe taken to modify the control system itself (for example, the budget may be amended to reflect an expected downturn in sales).
Controllable vs uncontrollable costs

3.4 A controllable cost is a cost which can be influenced by the budget holder.

There may well be costs which cannot be changed by the budget holder or by management within a given time period. These are uncontrollable costs.

Responsibility accounting associates costs and revenues with the managers that can control them. It therefore distinguishes between controllable and uncontrollable costs.

Feedback control

3.5 A feedback system operates by comparing actual (historical) results against a standard or plan, and taking control action where differences between actual and plan have occurred. Events in the past are used to take corrective action for the future.

Positive feedback indicates that results were better than planned. Control action may be taken to encourage the deviation from what was originally expected.

Negative feedback indicates worse results than planned. Control action aims to get back to the original plan.

Feedforward control

3.6 A feedforward system operates by comparing planned results against a current (revised) forecast of what results will be (unless corrective measures are taken). Control action is triggered by differences between anticipated and planned results.
4 Behavioural aspects of budgeting

General considerations

4.1 Accountants must consider the impact of their budgeting systems on human behaviour.
   
   (a) Budget pressure unites employees against management
   (b) Pressure may lead to negative results
   (c) Workers form into protective groups
   (d) Accounting personnel equate success with finding fault in workers
   (e) Workers feel victimised – loss of confidence and motivation results
   (f) Supervisors use budgets as an expression of their position of superiority

A good system of control must influence employees in the direction of the company’s best interests.

Motivation and budget setting

4.2 Best performance is usually achieved when a budget is perceived as challenging but achievable.

Hofstede’s analysis suggested targets should be set at ‘almost achievable’ levels for maximum motivation and performance.

4.3 It is vital that the goals of management are in line with the goals of the organisation as a whole. This is known as goal congruence.

Management accountants should therefore try to ensure that management and employees have positive attitudes towards setting and implementing budgets, and feedback of results.

Participation in budgeting

4.4 In a top-down system, budgets are imposed on individuals by their managers.

In a bottom-up system, the budget holder is invited to have input at the budget setting stage.

In between these two extremes is negotiated budgeting. Regardless of the initial approach taken the final budget is likely to be arrived at after much negotiation between senior and junior management and so in reality budgeting is actually a bargaining process.

4.5 Advantages of top-down (imposed) budgeting systems include:
   
   (a) Likely to be quicker
   (b) Avoid budgetary slack and budget bias
   (c) Utilise senior management awareness of total resource availability

4.6 Advantages of bottom-up budgeting systems include:
   
   (a) More detailed information used in budget setting processes
   (b) Morale and motivation is improved
   (c) Increased likelihood of achievement
## 5 Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>Budgeting is part of the planning and control process.</td>
</tr>
<tr>
<td>2</td>
<td>Planning and control</td>
<td>Purpose of budgetary control is:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P – Planning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R – Responsibility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I – Integration and co-ordination</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M – Motivation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E – Evaluation</td>
</tr>
<tr>
<td>3</td>
<td>Budgetary control</td>
<td>Managers should only be assessed on those items within their control.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control can be feedback or feedforward – comparison of past results or forecast results to plan.</td>
</tr>
<tr>
<td>4</td>
<td>Behavioural aspects of budgeting</td>
<td>The budget set and the participation in the process can have a large impact on motivation.</td>
</tr>
</tbody>
</table>
# Budgetary systems

## How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select and explain appropriate budgetary systems for an organisation, including rolling, zero-base, activity- base and incremental.</td>
<td>This could be a discussion question, likely to involve a comparison of two or three of these approaches to budgeting.</td>
<td>Northland – June 09, part (d), 3 marks</td>
</tr>
<tr>
<td>Describe the information used in budget systems and the sources of the information needed.</td>
<td>Discussion including definition and application to a specific scenario.</td>
<td>Designit – December 2012, parts (a) &amp; (b) 10 marks</td>
</tr>
<tr>
<td>Explain the difficulties of changing a budgetary system.</td>
<td>This would be part of a discussion requirement.</td>
<td></td>
</tr>
<tr>
<td>Explain how budget systems can deal with uncertainty in the environment.</td>
<td>This would be a discussion element and may link to a risk and uncertainty question not just a budgeting one.</td>
<td></td>
</tr>
<tr>
<td>Indicate the usefulness and problems with different budget types (zero-base, activity– based, incremental, master, functional and flexible).</td>
<td>This would be a discussion question.</td>
<td>Wargrin – December 2008, part (c), 6 marks Western – December 2009, part (c), 6 marks Commentators – December 2010, 20 marks ZBB – December 2010, parts (b), (c) &amp; (d) 15 marks</td>
</tr>
<tr>
<td>Explain the difficulties of changing the type of budget used.</td>
<td>A discussion element would be required.</td>
<td></td>
</tr>
<tr>
<td>Prepare rolling budgets and activity based budgets.</td>
<td>Calculations requiring knowledge of cost behaviours.</td>
<td></td>
</tr>
<tr>
<td>Explain and illustrate the importance of flexing budgets in performance management.</td>
<td>Discussion would be likely to focus on issues of comparability and meaningful performance evaluation, calculations and knowledge of cost behaviour could also be required.</td>
<td>Noble – June 2011, parts (a) 11 marks</td>
</tr>
<tr>
<td>Syllabus learning outcomes</td>
<td>How syllabus outcomes are examined</td>
<td>Example past paper questions</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Apply expected values and explain the problems and benefits.</td>
<td>Calculation of expected values (links with chapter 7) may be required or a description of the limitations of the technique.</td>
<td>Northland – June 09, parts (b) and (c), 14 marks</td>
</tr>
<tr>
<td>Explain the benefits and dangers inherent in using spreadsheets in budgeting.</td>
<td>Discussion</td>
<td>Designit – December 2012, part (d) 4 marks</td>
</tr>
</tbody>
</table>
Overview

- Fixed, Flexible, Flexed
- Changing Budgetary System
  - Incremental
  - Zero based
  - Activity based
  - Rolling
  - Budgeting and uncertainty
  - Spreadsheets
1 Budget systems

Fixed budgets

1.1 A fixed budget is one that is not adjusted regardless of the level of activity attained in a period. The fixed budget is the master budget prepared before the beginning of the budget period.

It is based on budgeted volumes and costs/revenues and as such are often unrealistic as the actual level of activity will be almost certainly different from the level of activity originally planned.

Flexible budgets

1.2 The flexible budget is a budget which is designed to change as volume of activity changes. This can be done by recognising the behaviour of different costs (fixed, variable, semi-variable etc).

Useful at the planning stage to show different results from various possible activity levels (what-if analysis) allowing better planning for uncertainty in the future.

Flexed budgets

1.3 Used at the control stage budgets need to be flexed to reflect the actual activity level achieved in a given period before the budget can meaningfully be compared with actual results and variance analysis performed.

Purpose of flexible / flexed budgets

1.4 (a) Designed to cope with different activity levels to keep the budget meaningful and hence preserve the relevance of variances for effective control.

(b) Useful at planning stage to show different results from possible activity levels.

(c) Necessary as control device because we can meaningfully compare actual results with relevant flexible budget, ie budgetary control.
Lecture example 1

Preparation question

Chateau Larnaque has a bottling plant for its wine and has prepared flexible budgets:

Flexible Budgets

<table>
<thead>
<tr>
<th>Bottles:</th>
<th>10,000</th>
<th>12,000</th>
<th>14,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production costs:</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Materials</td>
<td>30,000</td>
<td>36,000</td>
<td>42,000</td>
</tr>
<tr>
<td>Labour</td>
<td>27,000</td>
<td>31,000</td>
<td>35,000</td>
</tr>
<tr>
<td>Overhead</td>
<td>20,000</td>
<td>20,000</td>
<td>20,000</td>
</tr>
</tbody>
</table>

Required

If actual production was 12,350 bottles and the production costs incurred totalled $90,000, what is the meaningful total variance for performance evaluation purposes?

Solution

Q5 McDreamy
Incremental budgeting

1.5 Incremental budgeting is where the budget is based on the current year's budget (or results) plus an extra amount for estimated growth or inflation.

1.6 Incremental budgeting may be appropriate for certain costs. For example in a stable environment it may be sufficient to budget salary costs by taking current year plus wage inflation. However, if the headcount was larger than necessary this approach would keep building in unnecessary cost which would never get stripped out.

1.7 Traditionally this type of budgeting would have been very evident in the public sector. This would often result in departments becoming locked in to public expenditure.

Advantage
(a) Easy

Disadvantages
(a) Unnecessary spending
(b) Budgeting slack
(c) No business scrutiny

Zero base budgeting (ZBB)

1.8 ZBB is a technique used to allocate resources more efficiently thus reducing waste and increasing efficiency.

1.9 The process of ZBB starts from the basic premise that next year’s budget is zero; every process or item of expenditure, or intended activity (referred to as a ‘decision package’), must be justified in its entirety before it can be included in the budget.

1.10 The three-step approach to ZBB is as follows:
(a) Define decision packages
(b) Evaluate and rank packages
(c) Allocate resources

1.11 ZBB is not particularly suitable for direct manufacturing costs but lends itself very well to support expenses or discretionary costs.

1.12 ZBB is particularly useful in public sector organisations where funding (income) is set and the best possible service for the available budget needs to be achieved.

Advantages of ZBB

1.13 (a) Can identify and remove inefficient or obsolete operations
(b) Necessitates close examination of organisation’s operations
(c) Results in a more efficient allocation of resources
Disadvantages of ZBB

1.14 (a) May emphasise short-term benefits to detriment of longer-term goals  
(b) May need skills not available in organisation  
(c) Resistance from employees  
(d) Time and effort required  
(e) Ranking activities is very difficult

Rolling budgets

1.15 Rolling budgets are also called continuous budgets. They are particularly useful when an organisation is facing a period of uncertainty making it difficult to prepare accurate forecasts. For example, it may be difficult to estimate the level of inflation for the forthcoming period.

1.16 Rolling budgets are an attempt to prepare targets and plans which are more realistic and certain, particularly with a regard to price levels, by shortening the period between preparing budgets.

1.17 Instead of preparing a periodic budget annually for the full budget period, budgets would be prepared, say, every one, two or three months (four, six, or even twelve budgets each year). Each of these budgets would plan for the next twelve months so that the current budget is extended by an extra period as the current period ends: hence the name rolling budgets. Cash budgets are usually prepared on a rolling basis.

1.18 Advantages of rolling budgets  
(a) They reduce the element of uncertainty  
(b) Managers have to regularly reassess the budget  
(c) Planning and control will be based on a more recent plan  
(d) The budget always extends for some time into the future

1.19 Disadvantages of rolling budgets  
(a) Effort and expense required to continuously update the budget  
(b) May demotivate managers
Bay Ltd uses a system of rolling budgets. The sales budget for the year to 31 Dec 2X13 is as follows:

<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>$122,000</td>
<td>$131,760</td>
<td>$142,301</td>
<td>$153,685</td>
<td>$549,746</td>
</tr>
</tbody>
</table>

Actual sales for Q1 were $117,879. The adverse variance is explained by growth being lower than anticipated and the market being more competitive than predicted.

Senior management has proposed that the revised assumption for sales growth should be 5% per quarter.

**Required**

Update the budget from Q2 based on the above information.

**Solution**
Activity-based budgeting (ABB)

1.20 Activity-based budgeting involves defining the activities that underlie the financial figures in each function and using the level of activity to decide how much resource should be allocated, how well it is being managed and to explain variances from budget.

1.21 ABB recognises that:
(a) activities drive costs
(b) the causes (drivers) of cost should be controlled rather than the cost themselves
(c) not all activities are value-adding
(d) demand and decisions beyond the control of a department's manager drive many departmental activities
(e) traditional financial measures of performance are unable to fulfil the objective of continuous improvement

1.22 Advantages of ABB
(a) Focuses on whole of activity therefore more likely to be right
(b) Critical success factors are identified – allows performance measurement
(c) Takes company strategy into account

2 Changing budgetary systems

2.1 Whilst the business environment may dictate that a change in budgetary system is necessary, the change is not without its problems. The following need to be borne in mind.
- Employee resistance
- Cost of change
- Learning curve
- Loss of control
- Training
- Lack of accounting systems

3 Budgeting and uncertainty

3.1 Preparing a budget involves forecasting which is open to risk and uncertainty. Some of the tools we have seen will help to deal with this. Examples include.
- Flexible budgeting
- Rolling budgets
- Probabilistic budgeting (Section 3.2)
- Sensitivity analysis

Probabilistic budgeting

3.2 You have already come across expected values when dealing with risk and uncertainty. Budgets are subject to risk and uncertainty and as such expected values may be incorporated into the budget.
Orchard has made the following predictions for the profitability of its product the Russet for the upcoming financial year.

<table>
<thead>
<tr>
<th>Profit / (loss)</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>$'000</td>
<td></td>
</tr>
<tr>
<td>Best</td>
<td>400</td>
</tr>
<tr>
<td>Most likely</td>
<td>200</td>
</tr>
<tr>
<td>Worst</td>
<td>(150)</td>
</tr>
</tbody>
</table>

Required
Calculate the expected value that would be included in the budget.

Solution

Obviously the problems discussed earlier about expected values still hold ie

(a) The results are dependent on the accuracy of the probability distribution.
(b) EV takes no account of the risk associated with a decision.
(c) The EV itself may not represent a single possible outcome.

4 Spreadsheets in budgeting

4.1 Spreadsheet packages can be used to build business models and to assist the forecasting and planning process. They are particularly useful for “what if?” analysis.
5 Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Budget Systems</em></td>
<td>• <strong>Flexible</strong> budgets are ideal for <strong>planning</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• <strong>Flexed</strong> budgets are the best budget for <strong>control</strong> as they allow you to compare like for like</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• <strong>Incremental</strong> budgets tend to build in <strong>slack and inefficiency</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• <strong>ZBB</strong> results in efficient resource allocation and is suitable for <strong>discretionary spend</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• <strong>Rolling budgets</strong> are useful in times of <strong>uncertainty</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• <strong>ABB</strong> ensures the <strong>causes of cost</strong> are managed</td>
</tr>
<tr>
<td>2</td>
<td><em>Changing Budgetary Systems</em></td>
<td>Changes to the budgetary system will meet with resistance due to the learning curve, loss of control, cost and training required.</td>
</tr>
<tr>
<td>3</td>
<td><em>Budgeting and uncertainty</em></td>
<td>Probabilistic budgeting incorporates expected values. Flexible and rolling budgets can also be used.</td>
</tr>
<tr>
<td>4</td>
<td><em>Spreadsheets in budgeting</em></td>
<td>Useful for “what if?” analysis.</td>
</tr>
</tbody>
</table>
How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
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</tr>
</thead>
</table>
| Analyse fixed and variable cost elements from total cost date using high/low method. | This technique is likely to be examined as part of other questions not just on questions from this area of the syllabus. | Edward Ltd  
– December 2007, part (d), 2 marks  
HC  
– December 2008, part (b), 3 marks.  
Wargrin  
– December 2008, part (b), 2 marks.  
Western  
– December 2009, part (b), 10 marks |
| Estimate the learning effect and apply the learning curve to a budgetary problem, including calculations on the steady state. | Calculations of costs per unit or costs for a period where a learning curve exists are typical. Expect to have to use the formula to calculate hours / costs. Calculations of cost during learning and after learning period are also likely. | BFG  
– Pilot Paper, parts (a) & (b), 17 marks  
BCC (a & c)  
– December 2009, parts (a) & (c), 9 marks  
Heat Co  
– June 2011, part (a) 6 marks  
Fit Co  
– December 2011, part (b), 10 marks |
<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discuss the reservations with the learning curve.</td>
<td>Yet to be examined, but knowledge of conditions for learning curve and the problems with it are likely to be tested.</td>
<td></td>
</tr>
</tbody>
</table>
Overview

Quantitative analysis in budgeting

Theory
As cumulative output doubles the average time to produce a unit falls by a given rate

Learning curves
Formula
\[ Y = ax^b \]

Conditions and Problems

Total cost function
\[ Y = a + bx \]

Steady state

Experience effect
1 **Introduction**

1.1 In order to prepare budgets, forecasts of costs and revenues will need to be undertaken. You will have seen in your earlier studies the use of the high-low method and linear regression to analyse total costs into their fixed and variable elements.

2 **High-low method**

**Example**

<table>
<thead>
<tr>
<th>Units</th>
<th>10,000</th>
<th>12,000</th>
<th>14,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour ($)</td>
<td>27,000</td>
<td>31,000</td>
<td>35,000</td>
</tr>
</tbody>
</table>

**Required**

Calculate the variable cost per unit and the fixed labour cost.

**Solution**

**Step 1** – Take the highest and lowest output levels

<table>
<thead>
<tr>
<th>Output</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest</td>
<td>14,000</td>
</tr>
<tr>
<td>Lowest</td>
<td>10,000</td>
</tr>
</tbody>
</table>

**Step 2** – Find the difference

<table>
<thead>
<tr>
<th>4,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>8,000</td>
</tr>
</tbody>
</table>

**Step 3** – Calculate the variable cost / unit

\[ VC/\text{unit} = \frac{$8,000}{4,000} = $2 \]

**Step 4** – Calculate the fixed cost

By substitution into high output:

\[ \begin{align*}
\text{Total Costs} & = 35,000 \\
\text{Variable cost} & = (28,000) \\
\therefore \text{fixed cost} & = 7,000
\end{align*} \]

3 **Total cost function**

3.1 When determining price and output levels we need to bear in mind the cost and revenue behaviours. These can be expressed as equations and graphed (as you will have seen in your earlier studies on cost behaviours).

3.2 Most simply the costs of producing an item are expressed as \( y = a + bx \)

\[
\begin{align*}
y & = \text{total cost} \\
a & = \text{fixed cost (the intercept on the y axis)} \\
b & = \text{variable cost per unit (the gradient of the line)} \\
x & = \text{output}
\end{align*}
\]
3.3 This assumes fixed costs remain unchanged and variable costs per unit are constant. However, this will not always be the case.

3.4 In the short term we may be able to assume that fixed costs stay the same but variable costs could change due to bulk buying or learning curves.

4 Learning curve theory

Introduction

4.1 When new working practices or products are introduced, the theory is that as a workforce gains experience in a task, it will come to perform that task quicker.

This means that labour costs and variable overheads (if labour hour driven) will be lower in later periods of production than when the new product or production technique is introduced.

Theory

4.2 The theory of learning curves will only hold if the following conditions apply:

(a) There is a significant manual element in the task being considered.
(b) The task must be repetitive.
(c) Production must be at an early stage so that there is room for improvement.
(d) There must be consistency in the workforce.
(e) There must not be extensive breaks in production, or workers will 'forget' the skill.
(f) Workforce is motivated.

Rule

4.3 As cumulative output doubles, the cumulative average time per unit falls to a given percentage of the previous cumulative average time per unit.

Cumulative average time is the average time for all units produced so far.
A firm's workforce experiences a 75% learning rate.

**Required**

If the budgeted time for the first batch is 100 hours, calculate the time to produce eight batches in total.

**Solution**

<table>
<thead>
<tr>
<th>Output (batches)</th>
<th>Total time (hours)</th>
<th>Cumulative average time (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Formula

4.4 \[ Y = aX^b \]

where

- \( Y \) is the cumulative average time per unit taken to produce \( X \) units
- \( a \) is the time taken to produce the first unit
- \( X \) is the cumulative number of units
- \( b \) is the index of learning (\( \log LR / \log 2 \))
- \( LR = \) the learning rate as a decimal

Lecture example 2

(With the formula)

A firm’s workforce experiences a 75% learning rate.

The budgeted time for the first batch is 100 hours.

Required

Using the formula \( Y = aX^b \), calculate the time to produce:

(a) the first 10 batches in total
(b) the 10th batch only.

Solution
Steady state

4.5 Eventually, the time per unit will reach a steady state where no further improvement can be made.

Cessation of learning effect

4.6 Practical reasons for the learning effect to cease are:

(a) When machine efficiency restricts any further improvement.
(b) The workforce reach their physical limits.
(c) There is a ‘go-slow’ agreement among the workforce.

Lecture example 3

Flogel Co has just produced the first full batch of a new product taking 200 hours.
Flogel has a learning curve effect of 85%.

Required

(a) How long will it take to produce the next 15 batches?
(b) Flogel expects that after the 30th batch has been produced, the learning effect will cease. From the 31st batch onwards, each batch will take the same time as the 30th batch. What time per batch should be budgeted?

Solution
Uses of learning curve theory

4.7 The learning curve theory can be used in the business for:
- Forecasting labour hours required
- Cash forecasting
- Standard setting
- Cost calculation
- Price setting

Problems with learning curve theory

4.8 Although it seems a useful and easy to apply technique learning curve theory is not without problems:
- How do we calculate the rate?
- How do we know when the production will reach steady state?
- Is the rate really constant?

5 Experience effect

5.1 The ‘learning curve’ is a term usually applied to the time taken by the skilled labour element in production.

5.2 The ‘experience curve’ covers all costs that may reduce due to technological and managerial learning effects, following an increase in production volumes:
- Material costs may decrease with quantity discounts
- Variable overheads follow the pattern of direct labour
- Fixed overheads per unit will decrease as production volumes rise.

5.3 The experience curve is exploited through
- Growth
- Market share
- Mass production
### Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>High Low Method</td>
<td>This can be used to determine the amount of fixed and variable cost which can then be used to forecast for different levels of output.</td>
</tr>
<tr>
<td>3</td>
<td>Total cost function</td>
<td>Total costs can be represented as a straight line equation $y = a + bx$.</td>
</tr>
<tr>
<td>4</td>
<td>Learning curve theory</td>
<td>The amount of time needed for production may reduce when the product is new, repetitive and has a significant manual element. Learning curve theory states that as cumulative output doubles, the cumulative average time per unit falls to a given percentage of the previous cumulative average time per unit. The time / cost for production of units can be calculated if the rate of learning is known using the formula $Y = aX^b$. Eventually a consistent time to produce a unit will be reached from which it is not possible to improve any further. This is known as steady state.</td>
</tr>
<tr>
<td>5</td>
<td>Experience effect</td>
<td>This refers to the other costs (besides labour) that may reduce as production volumes increase.</td>
</tr>
</tbody>
</table>
Budgeting and standard costing

How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain the use of standard costs.</td>
<td>This would be examined via a discussion</td>
<td></td>
</tr>
<tr>
<td>Outline the methods used to derive standard costs and discuss the different types of cost possible.</td>
<td>Discussion requirement</td>
<td></td>
</tr>
<tr>
<td>Explain and apply the principle of controllability in the performance management system.</td>
<td>This would be a discussion based on a scenario eg the extent to which the targets set are controllable</td>
<td>Jump – June 2010, part (b), 9 marks</td>
</tr>
</tbody>
</table>
Overview

- Purpose of standards
- Calculation of standards
- Bases of standard

Budgeting and standard costing

- Controllability
- Standards and budgets
- Waste and idle time
1 Standards

1.1 A standard is prepared by management in advance, and details their expectations of the future.

1.2 Standards are not just for items of production in manufacturing businesses. They exist in many different spheres. Standard times for repairing cars, standard punctualities for train companies and standard response times for ambulances are just some of the many examples encountered.

1.3 A standard cost is an estimated unit cost.

1.4 You will have come across standard costs before as part of costing. When trying to establish a cost of a unit be it under absorption or marginal costing the cost card was derived using standard costs

As a reminder:

Example of a standard cost card for a cost unit

1.5

<table>
<thead>
<tr>
<th>Direct costs:</th>
<th>$/unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct materials (5kg @ $3/kg)</td>
<td>15.00</td>
</tr>
<tr>
<td>Direct labour (3 hrs @ $6/hr)</td>
<td>18.00</td>
</tr>
<tr>
<td></td>
<td>33.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indirect costs:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable overheads</td>
<td>2.00</td>
</tr>
<tr>
<td>Fixed overheads</td>
<td>3.00</td>
</tr>
<tr>
<td>Full product cost</td>
<td>38.00</td>
</tr>
</tbody>
</table>

The costs in the cost card are built up using for example, the expected amount of material at the expected price of the material.

2 Purposes of standards

2.1 The uses of standard costing are as follows:

(a) Prediction of costs and times for decision making, eg for allocating resources.

(b) Standard costing is used in setting budgets – an accurate standard will increase the accuracy of the budget.

(c) Variance analysis is a control technique which compares actual with standard costs and revenues.

(d) Performance evaluation systems make use of standards as motivators and also as a basis for assessment.

(e) Inventory valuation – this is often less time consuming than alternative valuations methods such as FIFO or weighted average.
3 Bases

3.1 (a) **Ideal** standard – assumes an optimum level of efficiency.
(b) **Attainable** standard – makes an allowance for normal inefficiencies but also includes hoped-for improvements.
(c) **Current** standard – based on current efficiency levels and achievements.
(d) **Basic** standard/historic standard – not updated regularly, used to show changes over the long term.

**Lecture example 1**

*Idea Generation*

How do you think each of the bases of standard would impact an employee's motivation?

**Solution**

---

4 Deriving standards

4.1 The standard cost of materials will be estimated by the purchasing department

**Lecture example 2**

*Idea Generation*

What considerations will

(a) The purchasing department take into account when trying to establish the standard cost of material?

(b) The production department take into account when trying to establish the quantity of material needed per unit?
Lecture example 3

If inflation is significant, would a standard be relevant?

Solution
4.2 Setting standards for other elements on the cost card will undergo a similar process.

5 Standards and budgets

5.1 Similarities:
- Are very similar in terms of their motivation impacts on employees
- Standards generally form the basis for the budget
- Both used for control

5.2 Differences:

<table>
<thead>
<tr>
<th>Standards</th>
<th>Budgets</th>
</tr>
</thead>
<tbody>
<tr>
<td>By Unit</td>
<td>In total</td>
</tr>
<tr>
<td>For areas of repetition</td>
<td>All areas</td>
</tr>
<tr>
<td>Financial &amp; non-financial targets</td>
<td>Financial targets</td>
</tr>
</tbody>
</table>
## 6 Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Standards</td>
<td>A standard is prepared in advance based upon expectations of the future.</td>
</tr>
<tr>
<td>2</td>
<td>Purposes of standards</td>
<td>Standard costs have many uses in performance management. These include:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Performance evaluation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Decision making</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Budgeting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Inventory valuation</td>
</tr>
<tr>
<td>3</td>
<td>Bases</td>
<td>The four bases are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ideal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Attainable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Current</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Basic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Standards should be set at an attainable level to drive the best performance.</td>
</tr>
<tr>
<td>4</td>
<td>Deriving standards</td>
<td>Standards are prepared taking into account future price rise, efficiencies etc.</td>
</tr>
<tr>
<td>5</td>
<td>Standards and budgets</td>
<td>Standards are set for a unit, whereas budgets encompass the whole business.</td>
</tr>
</tbody>
</table>
## Further variance analysis

### How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculate, identify the cause of and explain material mix and yield variances.</td>
<td>Calculation of mix and yield variances has been required along with an explanation of the meaning of the variances.</td>
<td>Simply Soup</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Pilot Paper, part (b), 9 marks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crumbly Cakes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– June 09, part (b), 6 marks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Choc Co</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– December 2011, part (a), 12 marks</td>
</tr>
<tr>
<td>Explain the wider issues involved in changing mix e.g. cost, quality and performance measurement issues.</td>
<td>This is likely to be examined via a discussion of measuring performance using variances such as in the pilot paper</td>
<td>Simply Soup</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Pilot Paper, part (a), 12 marks</td>
</tr>
<tr>
<td>Identify and explain the relationship of the material usage variance with the material mix and yield variances.</td>
<td>Again this has been examined via a consideration of performance using these variances</td>
<td>Simply Soup</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Pilot Paper, part (a),12 marks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crumbly Cakes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– June 09, part (a), 7 marks</td>
</tr>
<tr>
<td>Suggest and justify alternative methods of controlling production processes.</td>
<td>Suggestions of better methods to measure performance have been examined.</td>
<td>Simply Soup</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Pilot Paper, part (a), 4 marks</td>
</tr>
<tr>
<td>Calculate, identify the cause of, and explain sales mix and quantity variances.</td>
<td>Calculation of variances could be required along with an explanation of their meaning.</td>
<td>Carad</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– December 2010, part (a), 6 marks</td>
</tr>
<tr>
<td>Identify and explain the relationship of the sales volume variances with the sales mix and quantity variances.</td>
<td>This could be examined via a consideration of performance using these variances</td>
<td>Noble</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– June 2011, part (b), 4 marks</td>
</tr>
<tr>
<td>Calculate a revised budget.</td>
<td>Revised forecasts to include new proposals has been examined.</td>
<td>Bridgewater</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– June 2008, part (b), 7marks</td>
</tr>
<tr>
<td>Identify and explain those factors that could and could not be allowed to revise an original budget.</td>
<td>An explanation of circumstances when budget revisions should and should not be allowed has been examined, along with comment on a hypothetical scenario</td>
<td>Spike Ltd</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– December 2007, parts (a) &amp; (b), 13 marks</td>
</tr>
</tbody>
</table>

*Further variance analysis*
<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculate, identify and explain planning and operational variances for sales, including market size and share, materials and labour, including the effect of the learning curve.</td>
<td>Planning &amp; operating variances for sales (ie market size and share) has been examined</td>
<td>Spike Ltd – December 2007, part (d), 4 marks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SN – December 2009, part (b), 8 marks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Carad – December 2010, parts (a) &amp; (b) 7 marks</td>
</tr>
<tr>
<td>Explain and discuss the manipulation issues involved in revising budgets.</td>
<td>These were examined as part of the reasons a revision should not be allowed.</td>
<td>Spike Ltd – December 2007, part (a), 5 marks</td>
</tr>
</tbody>
</table>
Overview

Variance analysis

- Mix and yield variances
- Planning and operational variances
  - Budget revisions
1 Mix and yield variances

Materials and labour inputs

1.1 Where inputs can be substituted for one another, the efficiency/usage variance can be subdivided.

The materials and labour variances can both be split into mix and yield (or output) components.

- **Mix variance** represents the financial impact of using a different proportion of raw materials.
- **Yield variance** represents the financial impact of the input yielding a different level of output to the standard.
- The same principle can be applied to labour if different grades of labour are needed for one product.

Lecture example 1

Exam standard for 6 marks

Brenda and Eddie are analysing the main ingredients to their basic pasta sauce.

The standard ingredients for one batch of tomato pasta sauce are:

- **Onions** 5kg @ $2/kg
  - $10
- **Tomatoes** 5kg @ $4/kg
  - $20

Over the last month, 100 batches of sauce were prepared, using the following ingredients:

- **Onions** 600 kg
- **Tomatoes** 900 kg

Required

Calculate the materials mix and yield variances and comment on their meaning.
Lecture example 2

What are the implications of a change in mix?

Solution

1.5 Mix and yield with losses
A company manufactures a fruit flavoured drink by mixing 2 liquids (A & J). The standard cost for ten litres of the drink is shown below:

$5 Litres of liquid A at $16 per litre 80
$6 Litres of liquid J at $25 per litre 150

The company does not hold any inventory. During June the company produced 4,800 litres of the drink. This was 200 litres below budgeted production. The company purchased 2,200 litres of A for $18 per litre and 2,750 litres of J for $21 per litre.

**Required**

Calculate the materials mix and yield variance for June.

**Solution**
12: FURTHER VARIANCE ANALYSIS

Sales mix and quantity variances

1.6 The sales volume profit variance can be analysed further into a sales mix variance and a sales quantity variance.

1.7 The sales mix variance occurs when the proportions of the various products sold are different from those in the budget.

1.8 The sales quantity variance shows the difference in contribution/profit because of a change in sales volume from the budgeted volume of sales.

Lecture example 4

Puddingsrus makes and sells two products, Sticky Toffee and Chocolate Goo. The budgeted sales and profit are as follows.

<table>
<thead>
<tr>
<th>Sales</th>
<th>Revenue</th>
<th>Costs</th>
<th>Profit</th>
<th>Profit per unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units</td>
<td>$</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Sticky Toffee</td>
<td>800</td>
<td>5,600</td>
<td>2,400</td>
<td>3,200</td>
</tr>
<tr>
<td>Chocolate Goo</td>
<td>900</td>
<td>4,500</td>
<td>2,700</td>
<td>1,800</td>
</tr>
</tbody>
</table>

Actual sales were 600 units of Sticky Toffee and 1,200 units of Chocolate Goo. The company management is able to control the relative sales of each product through the allocation of sales effort, advertising and sales promotion expenses.

Required

Calculate the sales volume profit variance, the sales mix variance and the sales quantity variance.

Solution
2 Planning and operational variances

2.1 The variance analysis you have studied so far has compared actual results with a budget which was set at the beginning of the year.

Is this sensible?

Approach to planning and operational variances

2.2

<table>
<thead>
<tr>
<th>Original standard cost card</th>
<th>Revised cost card</th>
<th>Actual performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original flexed budget</td>
<td>Revised flexed budget</td>
<td>Actual results</td>
</tr>
</tbody>
</table>

- Should
- Should now
- Did

Planning variances
Operational variances

Traditional variances

2.3 The traditional variances we have seen so far can be investigated further to look at the elements driven by a wrong standard (Planning variances) and the elements that were within the manager’s control (Operational variances).

Lecture example 5

Exam standard for 8 marks

The following data relate to product AJ and its material content for the month of June.

<table>
<thead>
<tr>
<th>Budget</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output – 15,000 units of AJ</td>
<td>Output – 14,000 units of AJ</td>
</tr>
<tr>
<td>Materials – 4kg per unit @ $9 per kg</td>
<td>Materials – 54,000 kg @ $9.50</td>
</tr>
</tbody>
</table>

It has now been agreed that the standard price for the raw material purchased in June should have been $9.30 per kg and the standard kg / unit should have been 3.8 kg.

Required

Calculate the planning and operational material variances and the total materials variance.
Chianti Limited manufactures and sells a single product. The company uses a standard costing system, and the standard cost per unit is as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials: 1 litre at $1 per litre</td>
<td>1.00</td>
</tr>
<tr>
<td>Direct labour – 2 hours at $2.50 per hour</td>
<td>5.00</td>
</tr>
<tr>
<td>Variable overhead</td>
<td>1.40</td>
</tr>
<tr>
<td>Standard cost</td>
<td>7.40</td>
</tr>
<tr>
<td>Standard contribution</td>
<td>8.60</td>
</tr>
<tr>
<td>Budgeted sales price</td>
<td>16.00</td>
</tr>
</tbody>
</table>

Budgeted production and sales for 20X8 were 5,000 units. The budgeted fixed overhead was $20,000.

Actual production in 20X8 was 5,200 units, and 5,100 units were sold for $81,000.

Production costs were:

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials: purchased and used: 5,150 litres costing</td>
<td>5,120</td>
</tr>
<tr>
<td>Labour: 10,200 hours were paid for and cost</td>
<td>27,400</td>
</tr>
<tr>
<td>Variable overheads</td>
<td>7,000</td>
</tr>
<tr>
<td>Fixed overheads</td>
<td>19,500</td>
</tr>
</tbody>
</table>

You have also found the following:

(a) Material usage should have been 1.2 litres per unit, at a price of $0.95 per litre.
(b) Labour rate should have been $2.60 per hour.
(c) Industry sales of Chiantis were 10% lower than forecast

**Required**

Calculate planning and operating variances for materials, labour and sales volumes.

NB. The fall in industry sales here ie the market size is uncontrollable and therefore results in a sales volume planning variance. Any fall in market share is controllable and so forms the operating variance.
Advantages of revising the budget

2.4  (a) Highlights those variances which are controllable and those which aren’t
     (b) Ensures that operational performance is appraised by reference to realistic targets.
     (c) Should ensure that future budgets are more realistic.

Disadvantages of revising the budget

2.5  (a) Determination of revised budget
     • May be biased
     • May need external information
     (b) Use of revised budget may undermine original budget as a target and as a motivator.
     (c) Employees may use this system to their advantage by excusing operating problems
         as poor planning if this method is used.

2.6  A budget should only be revised for items that are beyond the control of the organisation.
     Such changes would render the original budget inappropriate as a performance
     management tool.

2.7  Budgets should not be revised for operational issues.

3  Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mix and yield variances</td>
<td>A mix variance is the result of a different mix of materials to the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>standard being used.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A yield variance occurs when a different quantity from standard is</td>
</tr>
<tr>
<td></td>
<td></td>
<td>input in order to achieve the desired output.</td>
</tr>
<tr>
<td>2</td>
<td>Planning and operational</td>
<td>Planning variances represent the difference between the original and</td>
</tr>
<tr>
<td></td>
<td>variances</td>
<td>revised budget.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operational variances are those items which were within a manager’s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>control. They are the difference between the revised budget and the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>actual.</td>
</tr>
</tbody>
</table>
Checkpoint 3 – Progress Review

To reinforce your learning to date you should now follow the study guidance in the following pages. On completion, your progress towards full exam preparation will be:

You have now completed Stage 3 of the course. Before you attempt the work outlined within the Study Support section on the subsequent pages, take some time to reflect on the knowledge and skills you covered during Stage 3. If you feel you need further clarification on any of the key areas listed below you can use the on-line lecture for the relevant chapter.

Key messages from Stage 3

Stage 3 finishes off the risk and uncertainty material and then moves on to cover the budgeting area of the syllabus as well as variance analysis. Some of this material you may have seen before at F2. It is important to remember though that the F5 exam is very different to F2 and requires different skills. Don’t neglect the topics you have seen before assuming you know them.

Key knowledge

- Risk and uncertainty – make sure you can do the techniques and can also describe their usefulness to a decision maker.
- Budgeting – ensure you can describe each type of budget, its advantages and disadvantages and what situations it is suitable for.
- Quantitative analysis in budgeting – you will find the high low technique used throughout the syllabus. Learning curves – it is important that you can use the formula to calculate the total time for production and the time taken to produce the nth unit. Make sure you practice these calculations and can list the conditions for the learning curve to exist as these may form part of a discussion piece in this area.
- Variance analysis – this is a highly examinable topic, both in terms of the calculations and the written analysis. It is essential you have mastered the assumed knowledge of basic variances (Chapter 1b) as well as the new techniques in Chapter 12. You should be prepared to undertake calculation and discussion style questions.
- Mix and yield variances – these take variance analysis to a further level of detail that you are unlikely to have seen before. It is important to remember that we are still comparing what ‘should’ have happened with what ‘did’ happen. If you can learn the proformas and the method to calculating these variances then you will be surprised how quickly you start getting them all correct.
- Planning and operational variances – another example of more advanced variance analysis, and one that is particularly relevant for performance evaluation because it provides useful management information about responsibility (e.g. the budgeting team being responsible for planning variances and the day-to-day operating team being responsible for operating variances). Learn these proformas by using the ‘Should’, ‘Should Now’ and ‘Did’ framework.
Key skills

- Learn the variance pro formas so that you can reproduce them quickly and accurately in the exam.
- As with all numerical questions, continue to lay out your answers clearly and cross-reference all your workings.
- Much of these topics focused on written areas - presentation of these is equally as important as presentation of numbers. Drawing up a quick plan before starting to write will help to give your answers structure. Make sure whenever you make a point, you explain it succinctly and don’t waffle! You should aim to produce concise answers that directly answer the question you are being asked.

After working through the Study Support guidance for Stage 3 you could attempt course exam 2 questions 3 & 4 if you wished. Questions 1 & 2 could also be attempted as these are based on material covered in the first half of the course.
## Checkpoint 3 – Study Support

### Chapter 7 – Risk and uncertainty

<table>
<thead>
<tr>
<th>Key areas</th>
<th>100 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Value of perfect information</td>
<td></td>
</tr>
<tr>
<td>• Decision trees</td>
<td></td>
</tr>
<tr>
<td>• Sensitivity analysis</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Notes</th>
<th>30 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Review the course notes and ensure you can use all of the techniques and understand what the results tell you.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question Practice</th>
<th>30 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Question 5 Henry Lenny from the course notes question bank – If sections of this question proved difficult when first attempted, revisit them once you’ve been back through your notes.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional Resources</th>
<th>40 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Text Resources</td>
<td></td>
</tr>
<tr>
<td>• Work through the examples in sections 5 and 6 to help your understanding of this quite tricky area.</td>
<td></td>
</tr>
</tbody>
</table>

### Chapter 8 – Budgetary control

<table>
<thead>
<tr>
<th>Key areas</th>
<th>60 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Budgetary control &amp; planning and control cycle</td>
<td>10 mins</td>
</tr>
<tr>
<td>• Behavioural aspects of budgeting</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Notes</th>
<th>20 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Review your notes so you are comfortable with discussing the concepts.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question Practice</th>
<th>15 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Attempt Question 12 (Budgets and people) from the Study Text question bank as a detailed plan to ensure you have grasped all these key elements.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional Resources</th>
<th>15 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Text Resources</td>
<td></td>
</tr>
<tr>
<td>• Read section 1 as the objectives of budgetary control is assumed knowledge</td>
<td></td>
</tr>
<tr>
<td>• Section 2 contains more detail on the planning and control cycle which you may wish to use to add to your existing knowledge.</td>
<td></td>
</tr>
<tr>
<td>• Read section 3 which details the planning and control at various levels in the performance hierarchy.</td>
<td></td>
</tr>
<tr>
<td>• Section 5.2 discusses poor attitudes when setting budgets. This element would be very likely in a discussion question focussing on behavioural impacts of budgeting.</td>
<td></td>
</tr>
</tbody>
</table>
## Chapter 9 - Budgetary systems

### Key areas
- All the varying budget systems

### Course Notes
- This will be another key area for discussion questions, but could also require calculations (Q3 Noble June 2011)
- Ensure you know the various types of budget and their advantages and/or disadvantages.
- Also consider the problems with switching from one type of budget to another.
- Read through the additional notes to refresh your memory as to content of a budget. You will not need to prepare a budget but you may be asked to talk about information required when completing them.

### Question Practice
- Try and attempt Question 13 from the Study Text question bank (Zero-based budgeting) in full to determine whether you can come up with enough points in this area. Don’t forget you should still do a brief key word plan before writing your answer.
- Question 15 McDreamy from the Study Text question bank is useful for practicing flexed budget.

### Additional Resources
#### Real-life examples
- In the Real-life examples you will find an article from the Sunday Times discusses Zero based budgeting techniques used in the public sector.

#### Study Text Resources
- Read section 1.1 which details the key points of budget preparation.
- Read section 3.1 and annotate your notes with the additional detail on how to implement zero based budgeting.
# Chapter 10 – Quantitative analysis in budgeting

<table>
<thead>
<tr>
<th>Key areas</th>
<th>60 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>• High Low Method</td>
<td></td>
</tr>
<tr>
<td>• Learning curve</td>
<td></td>
</tr>
<tr>
<td>Course Notes</td>
<td></td>
</tr>
<tr>
<td>• Review the learning curve calculations.</td>
<td>10 mins</td>
</tr>
<tr>
<td>• Note the limitations with the learning curve.</td>
<td>5 mins</td>
</tr>
</tbody>
</table>

### Question Practice

- Attempt Question 14 (Dench) from the Study Text question bank. Ensure you are happy that the variable overheads are split across the skilled and unskilled labour hours. | 25 mins |

### Additional Resources

#### Study Text Resources

- Review sections 2.9 – 2.11 which discuss applications and limitations of the learning curve. | 20 mins |
- Review section 3 applying expected values (probabilistic budgets) |
- Review section 4 using spreadsheets in budgeting, including the advantages and disadvantages. |

---

# Chapter 11 – Budgeting and standard costing

<table>
<thead>
<tr>
<th>Key areas</th>
<th>70 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Deriving standard costs</td>
<td></td>
</tr>
<tr>
<td>• Purposes of standard costs</td>
<td></td>
</tr>
<tr>
<td>• Controllability</td>
<td></td>
</tr>
</tbody>
</table>

### Course Notes

- Ensure you work carefully through this chapter in full and can answer the syllabus detailed outcomes on the first page of the chapter. | 15 mins |

### Question Practice

- Question 15 from the Study Text question bank (McDreamy) requires preparation of flexible budgets and also requires a detailed discussion on the controllability principle. | 40 mins |

### Additional Resources

#### Study Text Resources

- Review section 2.4 and 2.5 which detail setting standards for overhead costs and sales. | 10 mins |
- Read section 3 which compares budgets with standards. | 5 mins |
<table>
<thead>
<tr>
<th>Chapter 12 Further variance analysis</th>
<th>60 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key areas</td>
<td></td>
</tr>
<tr>
<td>• Mix &amp; yield variances</td>
<td></td>
</tr>
<tr>
<td>• Planning &amp; operational variances</td>
<td></td>
</tr>
<tr>
<td>Course Notes</td>
<td></td>
</tr>
<tr>
<td>• Review the detailed calculations in your notes.</td>
<td>10 mins</td>
</tr>
<tr>
<td>• Ensure you are able to interpret and understand the relationship between price, mix and yield.</td>
<td>5 mins</td>
</tr>
<tr>
<td>• Ensure you can identify which factors would result in a budget being revised.</td>
<td>5 mins</td>
</tr>
<tr>
<td>Question Practice</td>
<td></td>
</tr>
<tr>
<td>• Question 16 (ACCA-Chem Co) tests your knowledge of mix and yield variances, and includes interpretation. Attempt this using good exam technique, ie proforma then easy numbers cross referenced workings and a quick plan for the written elements before writing it up in full.</td>
<td>30 mins</td>
</tr>
<tr>
<td>Additional Resources</td>
<td></td>
</tr>
<tr>
<td>Study Text Resources</td>
<td></td>
</tr>
<tr>
<td>• Work through section 5 the principle of controllability.</td>
<td>10 mins</td>
</tr>
</tbody>
</table>
Checkpoint 3 - Progress Test

Having completed the Study Support guidance for stage 3, you are now ready to attempt the Progress Test. You should aim to complete the test in 1 hour.

The multiple choice questions contained within this Progress Test will thoroughly test your understanding of the material and your ability to perform the required calculations. Note that the F5 exam does not contain multiple choice questions. The five short written questions that follow will test your ability to apply your knowledge. These skills will prove important when answering discursive exam standard questions.

It is important that you continually review your progress (solutions follow the questions) and revise further any areas where you feel your understanding is weak.

A  Multiple choice questions (8 questions – approximate time 30 minutes)

1  Which of the following is/are purposes of flexible budgeting?
   (i) To cope with different activity levels
   (ii) To reward sales rather than production
   (iii) To more meaningfully compare actual and budgeted costs
   (iv) To show different results which may occur between different activity levels
   A  (i) only
   B  (i), (ii), and (iii)
   C  (i), (iii) and (iv)
   D  (i) and (iv)  

2  A product has a constant (flat) trend in its sales, and is subject to quarterly seasonal variations as follows.

<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seasonality</td>
<td>+50%</td>
<td>+50%</td>
<td>-50%</td>
<td>-50%</td>
</tr>
</tbody>
</table>

Sales last quarter, Q2, were 240 units.

Assuming a multiplicative model for the time series, predicted unit sales for the next quarter, Q3 will be closest to

A  60
B  80
C  120
D  160  

3  A company has produced the first batch of a new product which took 40 hours to manufacture. With an 80% learning curve, how long would it take to make the next nine batches?

A  151 hours
B  171 hours
C  191 hours
D  211 hours  

4  KJ has recently developed a new product. It is usual for the workforce to experience an 80% learning effect as the work is repetitive. It takes 3 kg of material at $4/kg to produce each unit and variable overheads are expected to cost $2.50/hr. Labour is paid $8/hr.

If the first unit took 40 minutes to produce, what will be the expected cost of the fifth unit?  

(4 marks)
5 In order to indicate to managers the trend and materiality of variances, B plc expresses them as percentages as in the following examples.

<table>
<thead>
<tr>
<th></th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material usage variance as a percentage of standard total production cost</td>
<td>3% (F)</td>
<td>2% (A)</td>
<td>6% (A)</td>
<td>10%(A)</td>
<td>12%(A)</td>
</tr>
<tr>
<td>Material price variance as a percentage of standard cost of material used</td>
<td>1%(A)</td>
<td>2%(A)</td>
<td>7% (F)</td>
<td>8% (F)</td>
<td>9%(F)</td>
</tr>
</tbody>
</table>

(A) denotes an adverse variance; (F) denotes a favourable variance

The following statements relate to recent operational events.

Statement

1 In September the buyer located a new supplier who charged a lower price than the previous supplier. The material was found to be of low quality, however, leading to a high level of waste.

2 The general trend is that all direct material variances are becoming more significant and are likely to be worthy of management attention.

3 A change in the bonus payment scheme has improved the productivity of labour, who are now processing material more effectively.

Which of the statements is/are consistent with the results shown?

A Statements 1 and 2
B Statements 1 and 3
C Statements 2 and 3
D Statement 2 only

6 A firm that uses zero-base budgeting has

A zero as the starting point for budgeting the coming year’s overheads
B a zero variance between budgeted and actual overhead
C an assumed sales level of zero as the starting point for budgeting the coming year’s overheads
D an overhead budget of zero

Data for questions 7 and 8

The following data is available with regard to a product

<table>
<thead>
<tr>
<th></th>
<th>Actual</th>
<th>Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales (units)</td>
<td>10,100</td>
<td>10,000</td>
</tr>
<tr>
<td>Sales value</td>
<td>$52,520</td>
<td>$51,000</td>
</tr>
<tr>
<td>Manufacturing costs at standard</td>
<td>43,430</td>
<td>43,000</td>
</tr>
<tr>
<td>Manufacturing profit</td>
<td>9,090</td>
<td>8,000</td>
</tr>
</tbody>
</table>

7 What is the sales price variance?

A $1,010 adverse
B $510 favourable
C $520 favourable
D $1,010 favourable

(2 marks)
8 What is the sales volume variance?
A $80 favourable  
B $90 favourable  
C $510 favourable  
D $520 favourable  

(2 marks)

B Short written questions (5 questions – approximate time 30 minutes)

1 What is the learning curve theory?  

(2 marks)

2 List the main objectives of a budgetary planning and control system.  

(3 marks)

3 Define budgetary slack and describe TWO negative consequences of budgetary slack for an organisation.  

(5 marks)

4 Ruthie plc’s operating statement for the month just ended shows the following variances against the direct labour cost.

- Labour rate variance $26,000 Adverse
- Labour idle time variance $1,050 Adverse
- Labour efficiency variance $12,500 Adverse

Required

Explain how these variances have been calculated and discuss how an adverse labour rate variance, or an adverse labour efficiency variance, may be consistent with an overall increase in profit.  

(5 marks)

5 Performance standards are used to set efficiency targets. There are four of them. Explain the performance standards with particular reference to working conditions and motivation.  

(5 marks)
**Section A**

1. C  

2. B  
   \[ Q2 \left(\frac{TS}{SV}\right) = \text{Trend } \frac{240}{1.5} = 160 \]  
   Q3 160 \times 50\% = 80

3. A  
   \[ y = ax^b \]  
   \[ b = \frac{\log 0.8}{\log 2} = -0.3219 \]  
   \[ y = 40 \times 10^{-0.3219} \]  
   y = 19.062 hours

   Time for all 10 batches \[ 10 \times 19.062 \]  
   Less: time for first batch \[ (40) \]  
   Time for 9 batches \[ \frac{191}{9} \]  

4. \[ y = ax^b \]  
   \[ = 40 \times 5 \]  
   \[ = 23.825 \text{ mins} \times 5 \text{ units} \]  
   119.13

   \[ y = ax^b \]  
   \[ = 40 \times 4 \]  
   \[ = 25.6 \text{ mins} \times 4 \text{ units} \]  
   102.40

   Time for 5th unit \[ 16.73 \]  

   Cost  
   Materials \[ 3 \text{ kg} \times \$4/\text{kg} \]  
   $8 \times 3 = 24 \]  
   Labour \[ 16.73 \text{ mins} \times \frac{\$}{60} \]  
   $2.50 \times 16.73 = 22.29 \]  
   Variable overheads \[ 16.73 \text{ mins} \times \frac{\$}{60} \]  
   $0.70 \times 16.73 = 11.71 \]  
   Total cost of 5th unit \[ 14.93 \]  

5. A  
   **Statement 1** is consistent with the variances because a fairly large favourable price variance arose at the same time as an adverse usage variance, which could have been caused by the higher wastage.

   **Statement 2** is consistent with the variances because the trend is towards higher percentage variances. Even if these variances are still within any control limits set by management, the persistent trend is probably worthy of investigation.

   **Statement 3** is not consistent with the variances, because more effective use of material should produce a favourable usage variance.

6. A
245

Section B

1. As cumulative output doubles, the cumulative average time per unit falls to a given percentage of the previous average time per unit.

2. The objectives of a budgetary planning and control system are as follows.
   - To ensure the achievement of the organisation's objectives
   - To compel planning
   - To communicate ideas and plans
   - To coordinate activities
   - To provide a framework for responsibility accounting
   - To establish a system of control
   - To motivate employees to improve their performance

3. Budgetary slack refers to the practice of overstating budgeted costs and/or understating budgeted revenues.
   This has negative consequences for performance in that 'good' performance is difficult to measure without a credible standard to benchmark against. For example, if budgets are set for sales at 10,000 units when the sales manager truly believes that sales can be as high as 12,000 units, then actual sales of 11,000 units would actually be disappointing, despite the fact that this level of sales is above budget. Also, budgetary slack can lead to the misallocation of resources. For example, if an activity which is deemed essential has a budgeted cost of $1.2 million for the year, yet the manager believes it can be done for $1.0 million then $200,000 which could have been allocated to other worthwhile activities, e.g. training and preventative maintenance have been misallocated.

4. Direct labour rate variance
   This variance quantifies the impact on profit of paying direct labour an hourly rate which is different to the standard. It is the difference between the number of direct labour hours paid multiplied by the standard rate per hour and the actual direct labour cost for the period.

   Direct labour idle time variance
   This is calculated as the difference between the hours worked (as productive time) and the hours paid for. The difference in hours are valued at the standard labour rate per hour.

   Direct labour efficiency variance
   This is calculated as the difference between the number of hours it should take to produce the actual production (ie standard hours) and the actual number of hours it took to produce the units. The difference in hours is valued at the standard rate per hour.

   An adverse efficiency variance would be caused by actual production taking more hours than estimated in the standard. This could be because a more complex, higher value, customised version of the product has been produced which may sell at a higher margin.

   An adverse labour rate variance may signify a higher skilled workforce which would improve the quality of work performed which, in turn, would increase profit overall.
Ideal standard

These are based on perfect operating conditions: no wastage, no spoilage, no inefficiencies, no idle time, no breakdowns. Variances from ideal standards are useful for pinpointing areas where a close examination may result in large savings in order to maximise efficiency and minimise waste. However ideal standards are likely to have an unfavourable motivational impact because reported variances will always be adverse. Employees will often feel that the goals are unattainable and not work so hard.

Attainable

These are based on the hope that a standard amount of work will be carried out efficiently, machines properly operated or materials properly used. Some allowance is made for wastage and inefficiencies. If well-set they provide a useful psychological incentive by giving employees a realistic, but challenging target of efficiency. The consent and co-operation of employees involved in improving the standard are required.

Current

These are based on current working conditions (current wastage, current inefficiencies). The disadvantage of current standards is that they do not attempt to improve on current levels of efficiency.

Basic

These are kept unaltered over a long period of time, and may be out of date. They are used to show changes in efficiency or performance over a long period of time. Basic standards are perhaps the least useful and least common type of standard in use.
Zero budgeting is vital to control public sector waste. Every new minister, let alone government, creates new bodies and new spending programmes to do something about some need, scandal or priority of the day. The Gershon report urged ministers to keep asking whether they would start spending programmes if they did not already have them. Zero budgeting can also be cruel.

Something like the DTI’s Small Business Service (SBS) seems to have existed since the 1960s but this version was created only in 2000. Since then, its activities have been reviewed and changed several times. For much of this time, one of the agency’s main purposes has been to simplify the hundreds of aid schemes that exist but overlap each other, are unknown or difficult to use. Last year, the running of Business Link, the main money user, was transferred to the Regional Development Agencies. A few years down the road, these RDAs will doubtless be abolished after a zero budgeting exercise. But today Mr Leigh (chairman of the Public Accounts Committee) says that SBS has to justify the value obtained from the $213 million a year spent by or on the service if it is to be worthwhile continuing.
### Behavioural aspects of standard costing

How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe the dysfunctional nature of some variances in the modern environments of JIT and TQM.</td>
<td></td>
<td>Lock Co June 2012, part (b) 8 marks</td>
</tr>
<tr>
<td>Discuss the behavioural problems resulting from using standard costs in rapidly changing environments.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss the effect that variances have on staff motivation and action.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Overview

Behavioural aspects of Standard Costing

Modern business environment
- WCM
- TQM
- JIT

Standard costing in service industries

Behavioural impacts of standard costing in the modern environment

Criticisms of standard costing
1 The modern business environment and world class manufacturing

1.1 Traditional production methods have centred around high volume, low unit cost outputs. However, in recent years many changes have taken place in the nature of the world economy, technology, market demand and manufacturing practices.

Lecture example 1

Idea Generation

Required
What are some features of the environment that businesses now have to operate in?

Solution

World class manufacturing

1.2 Features of WCM
(a) Quality improvement
(b) JIT based production
(c) Managing people
(d) Flexible approach to customer requirements

1.3 Main benefits
(a) Improved quality and a reduced cost to the customer
(b) Dramatic improvements in production efficiency
(c) Improved motivation and greater loyalty from key employees
(d) Improvements in customer satisfaction and the development of genuine goodwill
(e) The achievement of competitive advantage
(f) Increase in medium to long-term profitability
2 Total quality management

TQM is a business philosophy aimed at improving quality.

Get it right, first time

2.1 The cost of preventing mistakes is less than the cost of correcting them if they occur.

Continuous improvement

2.2 Never be satisfied with current achievement. It is always possible to improve performance.

Goals of TQM

2.3 (a) To gain competitive advantage via continuously improved quality
      (b) To continuously reduce the cost of providing enhanced quality
      (c) Innovation
      (d) Provide first class customer service
      (e) To involve all employees

Design for quality

2.4 Design quality into an organisation's products and operations from the outset.
      (a) Reduce the number of parts in a product
      (b) Use components common to other products in the organisation
      (c) Improve physical characteristics to meet customers' needs

Performance measurement

2.5 Traditional variance analysis is not appropriate in a TQM environment, due to the focus on
      • Continuous improvement
      • Quality as opposed to cost

2.6 Alternative measures of performance, therefore, include:
      (a) Measuring incoming supplies
      (b) Monitoring work as it proceeds
      (c) Measuring customer satisfaction

3 Just-in-time

3.1 JIT is a system whose objective is to produce or buy units as they are required rather than
      for inventory. It is a demand 'pull' system.
      
3.2 Aims to restructure the manufacturing process to bring about more flexible, rapid and cost
      effective production. This will include the elimination of non-value adding activities.

3.3 There are two aspects of JIT:
      • JIT production: production is customer demand driven
      • JIT purchasing: purchase components/materials to meet production requirements
**JIT purchasing**

3.4 Objective:

(a) Buy in raw materials as you need them  
(b) Zero inventory of raw materials  
(c) Usage of raw materials matched with delivery from supplier

3.5 Elements:

(a) Frequent deliveries  
(b) Control over delivery timing  
(c) Close working relations with fewer suppliers  
(d) Long-term contracts  
(e) Quality assurance

**Lecture example 2**

Preparation question

*Required*

What are the advantages and disadvantages of JIT purchasing?

**Solution**

---

**JIT production**

3.6 Objective:

(a) Obtain low cost, high quality, on-time production to order  
(b) By minimising inventory levels between successive processes and therefore  
(c) Minimising idle equipment, facilities and workers
3.7 Elements:
(a) WIP and finished goods reductions
(b) Decreased lead and set-up times
(c) Zero defects and continuous improvement (see TQM)
(d) Flexible workforce
(e) Quality control as part of the production process
(f) Producing to order
(g) Detection of production problems as they occur

Performance measurement
3.8 Traditional variance analysis is not appropriate in a JIT environment as supplier quality and reliability is more important than cost.

3.9 For example, minimising cost (i.e. price variances) is a key focus within a traditional environment, however with JIT having reliable suppliers that are prepared to make more frequent, smaller deliveries of an assured quality is more important. Cost will therefore rise with this approach.

3.10 Similarly, in order to avoid adverse efficiency variances and idle time, managers may try to maintain production which could result in goods being produced which are not needed and so are held in stock.

4 Criticisms of standard costing
4.1 Standard costing has some disadvantages and, arguably, is less relevant in the modern environment than previously.
   (a) Standard costing works best in a stable environment; the modern business environment is very fast changing
   (b) Regular revisions to the standard are required. This process is expensive and time consuming
   (c) Meeting the standard should not necessarily be accepted as satisfactory if further improvements could be made
   (d) Techniques associated with standard costing (such as variance analysis) are less useful in a modern environment of customised products

Revision of standards
4.2 Standards should be reviewed regularly, and revised when there is a change in the basis upon which they were set. This ensures that they remain useful as a performance measure.
5 Setting standards in service industries

5.1 The application of standard costing in service industries does have its problems.
(a) Difficult to establish a measurable cost unit for some services.
(b) In some service organisations every cost unit will be different or heterogeneous.
(c) Since the human influence is so great in many services it can be difficult to predict and control the quality of the output and the resources used in its production.

5.2 To overcome these problems and enable the application of standard costing for planning and control in service industries it is therefore necessary to do the following.
(a) Establish a measurable cost unit. For example, cost per passenger-mile or a tonne-mile, or for hotels, such as a guest-night.
(b) Attempt to reduce the heterogeneity of services. If every service provided to the customer is the same as the last, then it will be possible to set a standard cost for the service and use this to maximise efficiency and reduce waste.
(c) Reduce the element of human influence. By swapping machines for humans wherever possible.

6 Behavioural impacts of standard costing in the modern environment

6.1 As seen in Chapter 11 standard costing is often perceived as being at odds with the modern business environment.

<table>
<thead>
<tr>
<th>Traditional manufacturing</th>
<th>Modern environment</th>
<th>Impacts of standard costing</th>
</tr>
</thead>
<tbody>
<tr>
<td>High labour cost, low overhead</td>
<td>Low labour cost, high overhead</td>
<td>Overhead variances do not have enough detail to aid performance measurement</td>
</tr>
<tr>
<td>Stable environment / products</td>
<td>Rapidly changing environment / products</td>
<td>Regular revision of standards can be demotivating for employees as the goal post keep moving</td>
</tr>
<tr>
<td>Standard product</td>
<td>Customised product</td>
<td>Differences between products make developing a standard difficult. Resulting variances may not be meaningful and certain employees may be unfairly penalised</td>
</tr>
<tr>
<td>Focus on cost</td>
<td>Focus on quality</td>
<td>Variance analysis encourages cost control. Desired quality may drive adverse price variances</td>
</tr>
</tbody>
</table>
6.2 Despite the criticisms and impacts, many businesses still operate with standard costing as it does aid planning and control. Other non-financial measures should be used alongside it such as on time deliveries, customer satisfaction measures and so on.

7 Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
</table>
| 1       | The modern business environment and world class manufacturing | The modern business environment is no longer purely concerned with cost instead it focuses on:  
- Quality  
- Reliability  
- Flexibility |
| 2       | Total quality management                   | Business philosophy aimed at improving quality. Two key aims are:  
- Get it right first time  
- Continuous improvement  
Traditional variance analysis is not appropriate as focus is on quality and continuous improvement rather than cost. |
| 3       | Just in time                               | Two aspects Just in time production and just in time purchasing. This is a demand pull system where items are only purchased and produced when there is demand for them.  
Traditional variance analysis is not appropriate as focus is on supplier quality and reliability rather than cost. |
| 4       | Criticisms of standard costing            | The changes occurring in today’s business environment result in standard costing being criticised.  
- Requires a stable environment  
- Regularly updating the standard is time consuming and costly  
- Meeting a standard is the goal rather than improving upon it.  
- Less appropriate with customised products |
<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Setting standards in service industries</td>
<td>This is much harder to do than in a manufacturing environment due to three things:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Difficult to establish a measurable cost unit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Every cost unit will be different</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Human influence is great</td>
</tr>
<tr>
<td>6</td>
<td>Behavioural impacts of standard costing in the modern environment</td>
<td>Standard costing is often still used as it still aids planning, control and decision making. Care must be taken when using it for control as modern business philosophies such as TQM and JIT will often drive adverse price or efficiency variances. Other mechanisms reflecting today’s key indicators must be used in performance management.</td>
</tr>
</tbody>
</table>
Performance management information systems

How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Exam past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify the accounting information requirements and describe the different types of information systems used for strategic planning, management control and operational control and decision making</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Define and identify the main characteristics of transaction processing systems; management information systems; executive information systems; and enterprise resource planning systems,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Define and discuss the merits of, and potential problems with, open and closed systems with regard to the needs of performance management</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Not yet examined, this would be examined via discussion
Overview

Performance management information systems

Information Levels
- Strategic
- Operational
- Tactical

Systems
- Open
- Closed

Management Information systems
- TPS
- MIS
- EIS
- ERP
### 1 Information levels

1.1 Performance management information systems provide the information which enables performance measurement to take place.

1.2 **Tactical information** is also important to facilitate management planning & control for shorter time periods (e.g. 1 year ahead); and those responsible for **day to day management** will also need **operational information** to facilitate day to day decision-making.
Lecture example 1

Hydra is a bicycle retailer which has a significant presence in the South of England. Each location has a manager who is responsible for day-to-day operations and is supported by an administrative assistant. All other staff at each location are involved in retailing operations.

The directors of Hydra are currently preparing a financial evaluation of an investment of $2m in a new IT system for submission to its bank. They are concerned that sub-optimal decisions are being made because the current system doesn’t provide appropriate information throughout the firm.

Required

Discuss the THREE levels of information required to assist in decision making within Hydra, providing TWO examples of information that would be appropriate at each level.

Solution

<table>
<thead>
<tr>
<th>Preparation question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic information</td>
</tr>
<tr>
<td>Operational information</td>
</tr>
<tr>
<td>Tactical information</td>
</tr>
</tbody>
</table>
2 **Strategic Management Accounting**

2.1 Definition: A form of management accounting in which emphasis is placed on information about factors which are external to the organisation, as well as non-financial and internally generated information.

2.2 It differs from traditional management accounting because it has an external and future orientation

2.3 Examples of information provided:
- Product profitability
- Customer profitability
- Value of market share
- Capacity expansion
- Brand values
- Shareholder wealth
- Cashflow
- Competitors’ costs
- Financial effect of competitor response
- Effect of acquisitions and mergers

3 **Management information systems**

You should be aware of the main characteristics of the following four systems

3.1 Transaction processing system (TPS)

TPS collect, store, modify and retrieve the transactions of an organisation. There are two main types: Batch transaction processing which collects data as a group and processes it later and real time transaction processing, which involves immediate processing of data.

Characteristics of TPS:
- Controlled processing
- Inflexibility
- Rapid response
- Reliability

3.2 Management Information Systems (MIS)

MIS generate information for monitoring performance (e.g. productivity) and maintaining co-ordination (e.g. between purchasing and accounts payable). Information is extracted from TPS and summarised to provide periodic reports for management.
Characteristics of MIS:
- Support structured decisions
- Report on existing operations
- Analytical capability
- Internal focus

3.3 Executive information systems (EIS)
EIS draw data from MIS and allow communication with external sources of information, providing a generalised computing and communication environment to senior managers to support strategic decisions.

EIS typically involves lots of data analysis and modelling tools such as what-if analysis to help strategic decision making.

3.4 Enterprise resource planning systems (ERP systems)
ERP systems are modular software packages which aim to integrate the key process in an organisation so that a single systems can serve the information needs of all functional areas.

The real-time operation of ERP systems ensures that the exact status of everything is always available.

3.5 There is a different need for volume of data at each level of the organisation. For example, the CEO is not going to be concerned about the detail of every sale (which would be represented in the TPS) but is going to require strategic information including external data (represented in the EIS) so that he can set strategy for the business. The volume of data decreases the higher you go in the organisation.
Lecture example 2

Fix It is a chain of garages with eight branches in the South West of England and one warehouse which supplies spare part to the garages. Mechanics are assigned to a particular garage but can work in different locations. As well as repairs the company also carries out MOTs for which specialist testing equipment is required.

Fix It has decided to implement an ERP system.

Required

What benefits could management hope to see following the implementation of the system?

Solution

4 Open & closed systems

4.1 An open system is connected to and interacts with the environment and is influenced by it.

4.2 All social systems, including business organisations are open systems. For example it is influenced by and has an influence on suppliers, customers, employees, competitors and society as a whole.

4.3 Advantages of an open system:

- Strong communication
- Adapts to changing environment
- Highlights inter-dependencies of operations and processes
- Focus on external factors.
4.4 **Closed** systems are isolated and shut off from the environment. Information is not received from or provided to the environment, this makes them less useful for Strategic Management Accounting.

4.5 Reasons for a closed system include:

- Business critical information
- Confidential information

5 **Chapter summary**

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Information levels</td>
<td>Management accounting information can be used at strategic, tactical and operating levels. Managers need information according to their responsibilities.</td>
</tr>
<tr>
<td></td>
<td>accounting</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Strategic Management</td>
<td>Information aimed at long-term decisions, which will often be external to the organisation and with a future orientation.</td>
</tr>
<tr>
<td></td>
<td>accounting</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Management information</td>
<td>Provide information at different levels and for different purposes:</td>
</tr>
<tr>
<td></td>
<td>systems</td>
<td>• TPS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• MIS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• EIS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ERP</td>
</tr>
<tr>
<td>4</td>
<td>Open and closed systems</td>
<td>Systems can be open or closed. Open systems are capable of responding to changes in the environment. Most business systems need to be open systems.</td>
</tr>
</tbody>
</table>
## How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Exam past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify the principal internal and external sources of management accounting information.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demonstrate how these principal sources of management information might be used for control purposes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identify and discuss the direct data capture and process costs of management accounting information.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identify and discuss the indirect costs of producing information.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss the limitations of using externally generated information.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss the principal controls required in generating and distributing internal information.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss the procedures that may be necessary to ensure security of highly confidential information that is not for external consumption.</td>
<td></td>
<td>Not yet examined, would be tested via discussion</td>
</tr>
</tbody>
</table>
Overview

Sources of management information and management reports

- Internal/external
  - Costs
  - Uses
  - Sources
- Control
1 Internal sources of information

1.1 Internal information includes:

<table>
<thead>
<tr>
<th>Formal</th>
<th>Informal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting records</td>
<td>Meeting minutes</td>
</tr>
<tr>
<td>Payroll records</td>
<td>Questionnaires</td>
</tr>
<tr>
<td>Capacity</td>
<td></td>
</tr>
<tr>
<td>Timesheets</td>
<td></td>
</tr>
</tbody>
</table>

1.2 Internal information is usually operational in nature, but can include information on customers and suppliers.

2 External sources of information

2.1 External information is more relevant than internal information to strategic decisions.

2.2 Capturing external information is potentially expensive as it has so many sources. Information technology is helping to reduce the cost of data collection.

2.3 Sources of external information include:

(a) Directories
(b) Associations
(c) Government agencies
(d) Customers
(e) Suppliers
(f) Internet
(g) Databases/data warehouses

2.4 External information can be out of date by the time it has been collated.

3 Primary and secondary data

3.1 Data can be either primary or secondary. Primary data is collected by the organisation. Secondary data is not collected by, or for, the user.

3.2 Primary data can be expensive to obtain. It can be achieved by:

(a) Desk research
(b) Interviews and questionnaires
(c) Market research.

3.3 Secondary data is cheaper than primary data. This is because it is less relevant.
4 Controls over information

Reports

4.1 Before any report is created the following controls should be adopted:
   (a) Cost/benefit analysis
   (b) Prototype
   (c) Check that report is not duplicated.

Distribution

4.2 To ensure efficiency and security of data the following controls should be created:
   (a) Procedures manual
   (b) Format
   (c) Distribution list
   (d) Disposal (especially if confidential)

Security and confidential information

4.3 IT systems are particularly vulnerable to unauthorised access, or use, from both internal and external parties unless they are protected.

Lecture example 1

Required

Suggest appropriate controls over the following risks of an IT system.

Access
   – computer (hardware)
   – information (software)

Hacking
   – alteration of information
   – reading transmitted data

Solution
## Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
</table>
| 1-2     | Internal and external sources of information | Information can be internal to organisations or available in the external environment. Data can be:  
• Out of date  
• Expensive  
• Biased. |
| 3       | Primary and secondary data                  | Data can be collected by an organisation or bought from third parties. This is the difference between primary and secondary data.       |
| 4       | Controls over information                   | Controls are required over access to, and use of, information hardware and software. This is important both when information is available to external parties and when it is only available internally. |
# How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
</table>
| Describe, calculate and interpret financial performance indicators for profitability, liquidity and risk in both manufacturing and service businesses. Suggest methods to improve these measures. | Various financial ratios to be calculated, followed by a discussion as to the financial performance of a business. Alternative performance indicators can be given with a requirement to determine if a bonus based on targets would be paid. | Ties Only Limited – December 2007, part (a), 12 marks  
Preston Financial Services – Pilot Paper, part (a), 8 marks  
PC – December 2008, parts (a) & (c), 16 marks  
Oliver’s Salon – June 2009, part (b), 11 marks  
TIP – December 2009, part (a), 14 marks  
Jump – June 2010, part (a), 6 marks  
Accountancy Co – December 2010  
Web Co – December 2012 |
| Describe, calculate and interpret non-financial performance indicators (NFPs) and suggest methods to improve the performance indicated. | Various non financial data will be given. Ratios will need to be calculated along with comment as to performance of the business. Discussion as to the conflict between financial and non financial data is also likely. | Ties Only Limited – December 2007, part (c), 9 marks  
Preston Financial Services – Pilot Paper, part (c), 12 marks  
Oliver’s Salon – June 2009, part (c), 6 marks  
TIP – December 2009, part (b), 6 marks  
Accountancy Co – December 2010  
Web Co – December 2012 |
<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
</table>
| Explain the causes and problems created by short-termism and financial manipulation of results and suggest methods to encourage a long-term view. | This could be assessed as a discussion exploring whether short termism exists and alternative performance measures which avoid it. A description of how results can be manipulated. | Bridgewater Co  
– June 2008, 25 marks  
PC  
– December 2008, part (b), 4 marks  
Jump  
– June 2010, part (c), 5 marks  
Designit  
– December 2012, part (c), 6 marks |
| Explain and interpret the Balanced Scorecard, and the Building Block model proposed by Fitzgerald and Moon. | To date, the building block model has been examined via calculation of suitable ratios for two of the standards. Other discussion requirements would probably require some application to a scenario. | Oliver's Salon  
– June 2009, part (c), 6 marks  
Brace Co  
– June 2011, part (a), 10 marks |
| Discuss the difficulties of target setting in qualitative areas.                            | This would be examined via a discussion.                                                    |                                                                                                |
Overview

Financial performance indicators
- Profitability
- Liquidity
- Gearing

Non financial performance indicators

Performance management

Short termism

Balanced scorecard

Performance measurement in service businesses

Building block model
1 Performance measurement

Financial performance indicators

1.1 Analysis and interpretation of a company’s accounts will give an indication of the company's performance.

The aims would be to:

- assess the company’s performance and financial position (in comparison with other companies in the same industry)
- try to assess the potential future performance or identify weakness

Company performance assessment

1.2 This would usually involve:

(a) Ratio analysis
(b) Review of the A/c’s to highlight issues not disclosed by ratio analysis (e.g.: contingent liabilities)
(c) Review of the benefits / wealth from the point of view of the other stakeholders
(d) Analysis of other financial and non-financial information from external sources

Areas for analysis

1.3 (a) Profitability – how well a company performs, given its asset base
(b) Liquidity – short-term financial position
(c) Gearing – measure of risk

These areas can all be assessed using ratios but when presented with a set of accounts, you should start by looking at obvious trends or changes in figures (you will normally be given figures with some sort of comparative data).

Details of these ratios is provided in the additional notes section of this chapter. You must ensure that you learn these, however the focus for F5 is application.

Basis for comparison

1.4 (a) Over time
(b) With other companies
(c) With industry averages
(d) With other performance measures

2 Limitations and strengths of ratios

2.1 Limitations:

(a) Not useful on their own – need to be compared to yardstick.
(b) Must be carefully defined.
(c) Inflation needs to be adjusted for – often forgotten.
(d) Different basis of calculating between companies.
(e) Based on historical costs – accurate reflection of future?

2.2 Strengths:
(a) Easier to understand than absolute measures.
(b) Easier to look at changes over time.
(c) Puts performance into context.
(d) Can be used as targets.
(e) Summarise results.

Other problems with financial performance indicators

2.3 (a) Focus only on variables which can be expressed in monetary terms ignoring other important variables which cannot be expressed in monetary terms
(b) Focus on past
(c) Do not convey the full picture of a company’s performance in a modern business environment eg. quality, customer satisfaction
(d) Focus on the short term

3 Short-termism

3.1 Short-termism – is when managers focus on their performance in the short term often at the expense of long-term performance.

3.2 If manager’s performance is measured on a short-term basis or a company is under pressure to report positive growth short-termism may occur.

Lecture example 1

List some of the short-term decisions managers may take and the potential consequences of them.

Solution
Lecture example 2

Idea Generation

What could be done to encourage managers to take decisions in the long-term interests of the company?

Solution

### 4 Non-financial performance indicators (NFPIs)

#### Definition

4.1 NFPI's are measures of performance based on non-financial information which operating departments use to monitor and control their activities.

#### Examples

4.2 Examples of non-financial performance indicators are summarised in the table below.

<table>
<thead>
<tr>
<th>Area assessed</th>
<th>Performance measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service quality</td>
<td>Number of complaints</td>
</tr>
<tr>
<td></td>
<td>Proportion of repeat bookings</td>
</tr>
<tr>
<td></td>
<td>On-time deliveries</td>
</tr>
<tr>
<td></td>
<td>Customer waiting time</td>
</tr>
<tr>
<td>Personnel</td>
<td>Staff turnover</td>
</tr>
<tr>
<td></td>
<td>Days lost through absenteeism</td>
</tr>
<tr>
<td></td>
<td>Days lost through accidents/sickness</td>
</tr>
<tr>
<td></td>
<td>Training time per employee</td>
</tr>
</tbody>
</table>

Different industries will place a different weighting on each area depending on those most critical to their success.
Value of NFPIs

4.3 (a) Information can be provided quickly for managers (eg. per shift, daily or hourly) unlike traditional financial performance reports.
(b) Anything can be measured/compared if it is meaningful to do so.
(c) Easy to calculate and easier for non-financial managers to understand and use effectively.
(d) Less likely to be manipulated than traditional profit related measures.
(e) Can be quantitative or qualitative.
(f) Provide information about key areas such as quality, customer satisfaction etc.
(g) Better indicator of future prospects than financial indicators which focus on the short term

Problems with NFPI’s

4.4 (a) Too many measures can lead to information overload for managers, providing information which is not truly useful.
(b) May lead managers to pursue detailed operational goals at the expense of overall corporate strategy.
(c) Need to be linked with financial measures.
(d) Need to be developed and refined over time to ensure remain relevant.

5 The balanced scorecard

5.1 A popular approach in current management thinking to performance measurement (for service and non-service organisations) is the use of what is called a "balanced scorecard", consisting of a variety of indicators both financial and non-financial.

5.2 The balanced scorecard focuses on four different perspectives and aims to establish goals for each together with measures which can be used to evaluate whether these goals have been achieved.
How do we create value for our shareholders?

Financial perspective

Goals

Measures

---

Customer perspective

Goals

Measures

---

Internal business perspective

Goals

Measures

---

Innovation and learning perspective

Goals

Measures

Can we continue to improve and create value?

Features

5.3 (a) Traditional measures are mainly inward looking and narrow in focus with over emphasis on financial measures and short term goals.

(b) The Balanced Scorecard focuses on both internal and external factors and links performance measures to key elements of a company's strategy.

(c) It requires a balanced consideration of both financial and non-financial measures and goals to prevent improvements being made in one area at the expense of another.

(d) It attempts to identify the needs and concerns of customers to identify new products and markets and focuses on comparison with competitors to establish best practice.
Required

Recommend one performance measure for each of the four perspectives of the balanced scorecard for a restaurant. State the reason for your choice of measure.

Solution

6 Performance measurement in service businesses

6.1 In Chapter 2b the characteristics which make cost and performance measurement difficult in service industries were discussed.

6.2 Current thinking is that if something is difficult to measure it is because it has not been defined clearly enough.
Fitzgerald and Moon’s building blocks

6.3 Fitzgerald and Moon (1996) focused on performance measurement in service businesses. The diagram below shows their building blocks for dimensions, standards and rewards. This framework is also known as the results and determinants framework.

![Diagram showing Fitzgerald and Moon's building blocks for dimensions, standards, and rewards.]

6.4 Performance of the organisation is viewed over six dimensions, the first two listed on the diagram – Profit and Competitiveness being the results of the other four determinants:

(a) **Quality** – being reliability, courtesy, competence and availability
(b) **Flexibility** – the ability to deliver at the right time, response to customer requirements and changes in demand
(c) **Resource utilisation** – best use of inputs to create outputs. This is usually measured in terms of productivity
(d) **Innovation** – ability to develop new products or services, move into new markets and continuous improvement

6.5 Underlying the achievement of results via the determinants are the standards:

- **Ownership** – Employees need to participate in the creation of standards to take ownership of them but this can sometimes lead to the inclusion of some budgetary slack
- **Achievement** – The standards set must be challenging but achievable
- **Equity** – Each division or department must have appropriate standards set for it in order to ensure fairness in measurement
6.6 And the rewards:

- **Clarity** – The objectives of the organisation need to be clearly understood
- **Motivation** – Individuals need to be motivated to achieve the objectives
- **Controllability** – Managers should not be held responsible for costs over which they have no control

## Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Performance measurement</strong></td>
<td>Performance of a business can be evaluated by financial indicators. Financial indicators focus on the <em>past</em> and are short-term measures as such non-financial indicators also need to be used. A balance is needed between both.</td>
</tr>
<tr>
<td>2</td>
<td><strong>Limitations and strengths of ratios</strong></td>
<td>Whilst ratios are very helpful as a target and a means of assessing performance, they should not be used on their own. They only focus on the past and monetary measures and are very often short term.</td>
</tr>
<tr>
<td>3</td>
<td><strong>Short termism</strong></td>
<td>Performance indicators need to be devised to ensure that they do not encourage managers to focus on the short term.</td>
</tr>
<tr>
<td>4</td>
<td><strong>Non financial performance indicators</strong></td>
<td>These measures when used in conjunction with financial measures enable the whole picture to be seen. They can be quantitative or qualitative. Anything that is important to the business can be measured and these ratios are not easily manipulated.</td>
</tr>
</tbody>
</table>
| 5       | **The balanced scorecard**           | Tools such as the balanced scorecard help to evaluate a business by looking at all key areas using a variety of financial and non-financial indicators. The four key areas are:
  - Customer
  - Financial
  - Internal
  - Innovation and learning |
| 6       | **Performance measurement in service businesses** | Cost and performance measurement is more difficult in service industries. The building blocks model can be used which looks at dimensions, standards and rewards. |
Additional Notes
8 Profitability ratios

8.1 ROCE = \( \frac{\text{PBIT}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Capital Employed}} \)

\( \text{ROCE} = \frac{\text{PBIT}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Capital Employed}} \)

ROCE = Net Profit Margin / Asset Turnover

ROCE states profit as a percentage of capital employed and shows how well the business utilises the funds invested in it.

There are three comparisons that can be made:
(i) The change in ROCE from year to year
(ii) Comparison to other similar businesses
(iii) Comparison to the market borrowing rate

Note: ROCE should be increasing. If it is static or reducing it is important to determine whether this is due to a reduced profit margin or asset turnover. If both profit margin and asset turnover are deteriorating then the company has a profitability problem.

8.2 Net profit margin

\( \text{Net profit margin} = \frac{\text{Net profit}}{\text{Sales}} \times 100\% \)

A high profit margin indicates that either sales prices are high or total costs are being kept well under control.

8.3 Gross profit margin

\( \text{Gross profit margin} = \frac{(\text{Sales} - \text{COS})}{\text{Sales}} \times 100\% \)

A high gross profit margin indicates that either sales prices are high or production costs are being kept well under control.

8.4 Asset turnover

The ratio of sales turnover to the amount of capital employed

\( \frac{\text{Sales}}{(\text{Total assets - current liabilities})} \)

This shows the turnover that is generated from each $1 worth of assets employed.
9 Liquidity/working capital ratios

9.1 The current ratio can be calculated by dividing the most liquid assets in the business (receivables, inventories and cash) by the business' payables.

\[
\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}
\]

9.2 The current ratio can be amended by excluding the inventory from the current assets. This gives the quick ratio or acid test.

\[
\text{Quick ratio} = \frac{\text{Current assets} - \text{inventories}}{\text{Current liabilities}}
\]

1 Receivables period
Average receivables \times 365 = days
\frac{\text{Credit sales}}{\text{Credit purchases}}

2 Inventory period
Average finished goods \times 365 = days
\frac{\text{Cost of sales}}{\text{Credit purchases}}

3 Payables period
Average payables \times 365 = days
\frac{\text{Credit purchases}}{\text{Credit purchases}}

NB: If average data is not available year end values should be used.

9.3 Improving the ratios

Inventory
(a) Reducing the raw material inventory holding period
   • Introduce JIT (Just-in-Time) inventory management systems
   • Reducing the variety of parts and components used and, consequently, the variety of inventory to hold
(b) Reducing the production time
   • Redesign of the factory layout to facilitate a smoother flow through the production process
   • Introduction of TQM (Total Quality Management) philosophy. This should reduce or eliminate the level of rejects and costly rectification work
   • Provide relevant staff training and development focused on continuously seeking improvements in performance and efficient practices
   • Invest in the on going review of product and process design to ensure only value adding activities are undertaken in the manufacturing or service processes
   • Introduction of automated processes where appropriate.
(c) Reduce finished goods inventory holding periods

- If possible, operate a JIT philosophy of only manufacturing to order thus reducing finished goods inventory levels to zero
- Regular review of inventory turnover by finished inventory item with a view to eliminating slow or obsolete inventory line.

Lecture example 4
Idea Generation

What measures could be undertaken to improve the receivables ratio?

Solution

Lecture example 5
Idea Generation

What measures could be undertaken to improve the payables ratio? Discuss whether it is wise to take them.

Solution
10 Gearing ratios

10.1 Gearing ratio = \( \frac{\text{Long-term debt}}{\text{Long term debt + equity (shareholders' funds)}} \)

Gearing measures the financial risk of a company.

Business risk

10.2 Business risk refers to the variability in earnings which is due to the business activities of the organisation. This can result from the organisation's products, customers, suppliers or cost structure.

10.3 Operating gearing is a ratio which is calculated to quantify business risk. It looks specifically at the operating cost structure of the organisation.

\[
\frac{\text{Contribution}}{\text{Profit before interest and tax (PBIT)}}
\]

10.4 If operating gearing is high this indicates that a large proportion of the organisation's operating costs are fixed. Fixed costs make profit more volatile as PBIT becomes more vulnerable to downturns in business volume.

Lecture example 6

ARH has the following results for the last two years of trading.

ARH INCOME STATEMENT FOR THE YEAR ENDED

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>14,400</td>
<td>17,000</td>
</tr>
<tr>
<td>Less cost of sales</td>
<td>11,800</td>
<td>12,600</td>
</tr>
<tr>
<td>Gross profit</td>
<td>2,600</td>
<td>4,400</td>
</tr>
<tr>
<td>Less expenses</td>
<td>1,200</td>
<td>2,000</td>
</tr>
<tr>
<td>Net profit for the year</td>
<td>1,400</td>
<td>2,400</td>
</tr>
<tr>
<td>Dividends paid</td>
<td></td>
<td>520</td>
</tr>
</tbody>
</table>
ARH STATEMENT OF FINANCIAL POSITION

<table>
<thead>
<tr>
<th></th>
<th>31 December 20X4</th>
<th>31 December 20X5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-current assets</strong></td>
<td>$2,500</td>
<td>$4,000</td>
</tr>
<tr>
<td><strong>Current assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventories</td>
<td>$1,300</td>
<td>$2,000</td>
</tr>
<tr>
<td>Receivables</td>
<td>$2,000</td>
<td>$1,600</td>
</tr>
<tr>
<td>Bank balances</td>
<td>$2,400</td>
<td>$820</td>
</tr>
<tr>
<td></td>
<td><strong>5,700</strong></td>
<td><strong>4,420</strong></td>
</tr>
<tr>
<td><strong>Financed by:</strong></td>
<td><strong>8,200</strong></td>
<td><strong>8,420</strong></td>
</tr>
<tr>
<td>2.4 million ordinary shares of $1 each</td>
<td>$2,400</td>
<td>$2,400</td>
</tr>
<tr>
<td>Revaluation reserves</td>
<td>$500</td>
<td>$500</td>
</tr>
<tr>
<td>Retained profits</td>
<td>$1,200</td>
<td>$2,820</td>
</tr>
<tr>
<td></td>
<td>$4,100</td>
<td>$5,720</td>
</tr>
<tr>
<td><strong>Long term liabilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10% bonds</td>
<td>$2,600</td>
<td>–</td>
</tr>
<tr>
<td><strong>Current liabilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payables</td>
<td>$1,500</td>
<td>$2,700</td>
</tr>
<tr>
<td></td>
<td><strong>8,200</strong></td>
<td><strong>8,420</strong></td>
</tr>
</tbody>
</table>

**Required**

Calculate for both years

(a) The gross profit margin
(b) The net profit margin
(c) The return on capital employed
(d) The asset turnover
(e) The acid test ratio
(f) The inventory turnover period in days
(g) The gearing ratio

Discuss what each ratio is telling you.
Solution
## Divisional performance measures

### How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain and illustrate the basis for setting a transfer price using variable cost, full cost and the principles behind allowing for intermediate markets.</td>
<td>Discussion requirement with a calculation element, possibly calculating profit of each division</td>
<td>Hammer – June 2010, 20 marks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bath Co – December 2011 parts (a) &amp; (b) 14 marks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wash Co – December 2012 parts (b) &amp; (c) 11 marks</td>
</tr>
<tr>
<td>Explain how transfer prices can distort the performance assessment of divisions and decisions made.</td>
<td>This would be a discussion element probably linked to a given scenario. Calculations could be required in order to assess performance where differing transfer prices exist.</td>
<td>Bath Co – December 2011 parts (c) 6 marks</td>
</tr>
<tr>
<td>Explain the meaning of, and calculate, Return on Investment (ROI) and Residual Income (RI), and discuss their shortcomings.</td>
<td>Calculation of ratios &amp; interpretation of performance along with benefits and drawbacks would probably be required here</td>
<td>PC – December 2008, parts (a) &amp; (b), 4 marks specifically for ROI.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brace Co – June 2011, part (b), 10 marks.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biscuits &amp; Cake – June 2012, parts (a) (b), (c), (d) &amp; (e) 20 marks,</td>
</tr>
<tr>
<td>Syllabus learning outcomes</td>
<td>How syllabus outcomes are examined</td>
<td>Example past paper questions</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Compare divisional performance and recognise the problems of doing so.</td>
<td>This is likely to be a discussion element.</td>
<td></td>
</tr>
</tbody>
</table>
Overview

Divisional performance measures

- Responsibility accounting
- Investment centre performance appraisal methods
- Transfer pricing
  - ROI – Return On Investment
  - RI – Residual Income
  - Approaches
    - Market based
    - Cost based
    - Opportunity cost

Aims
1 Responsibility accounting

1.1 Generally a company with several divisions will be a decentralised organisation. In such organisations divisional managers tend be responsible for making their own decisions concerning the operation of the division.

1.2 Advantages of decentralisation include:
   (a) Decisions taken more quickly
   (b) Increased motivation of management
   (c) Increased quality of decisions due to local knowledge
   (d) Reduced head office bureaucracy
   (e) Provides better training for all levels of management

1.3 Disadvantages of decentralisation
   (a) Potential for dysfunctional decision-making ie not in the interests of the whole organisation
   (b) Duplication amongst divisions leading to greater cost
   (c) Senior management loss of control

   Appropriate performance evaluation methods are therefore needed.

Conditions for a good performance measure

1.4 A good performance measure should:
   (a) Provide incentive to the divisional manager to make decisions which are in the best interests of the overall company (goal congruence)
   (b) Only include factors for which the manager (division) can be held accountable
   (c) Recognise the long-term objectives as well as short-term objectives of the organisation.

Responsibility accounting

1.5 Responsibility accounting is the term used to measure performance of decentralised units.

1.6

<table>
<thead>
<tr>
<th>Responsibility structure</th>
<th>Manager's area of responsibility</th>
<th>Typical financial performance measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost centre</td>
<td>Decisions over costs</td>
<td>Standard costing variances</td>
</tr>
<tr>
<td>Revenue centre</td>
<td>Revenues only</td>
<td>Revenues</td>
</tr>
<tr>
<td>Profit centre</td>
<td>Decisions over costs and revenues</td>
<td>Controllable profit</td>
</tr>
<tr>
<td>Investment centre</td>
<td>Decisions over costs, revenues, and assets</td>
<td>Return on investment and residual income</td>
</tr>
</tbody>
</table>

So far we have seen many of the performance measures dealing with the first three of these responsibility centres.
2 Investment centres

2.1 Within an investment centre, managers also have responsibility over investments and assets. To measure their performance purely on say profit would be only focussing on part of the picture. To overcome this we use two methods which measure the assets and the profit they generate.

Return on investment (ROI)

2.2 ROI = \( \frac{\text{Divisional Profit}}{\text{Divisional Investment}} \times 100 \)

2.3 Profit should be before interest and tax (PBIT). It may also be helpful in measuring performance to calculate ROI based on controllable profit.

For the investment, use year end values of total assets less current liabilities. Alternatively an average book value may be used.

2.4 ROI enables performance in different divisions to be compared.

Similarly, new investments can also be appraised using ROI.

2.5 Decision rule

Only projects which increase the existing ROI should be undertaken.

2.6 Problems with ROI

- Dysfunctional behaviour – only projects which increase ROI will be accepted, this could be at the expense of growth in corporate profits.
- The ratio will be distorted by the age of the assets
- Profit can be manipulated

Lecture example 1

Brenda and Eddie have two franchises in different parts of town and want to monitor the performance of the two managers who have full control over investments.

Forecast results for the year are:

<table>
<thead>
<tr>
<th></th>
<th>Vittorio’s</th>
<th>Dugaldo’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profits</td>
<td>$90,000</td>
<td>$135,000</td>
</tr>
<tr>
<td>Investment</td>
<td>500,000</td>
<td>750,000</td>
</tr>
</tbody>
</table>

Vittorio is considering investing in a labour-saving piece of equipment which will cost $8,000. This will generate an increase in net profit of $1,200 each year for 10 years, after which time the equipment is expected to have no resale value. Vittorio uses straight-line depreciation.

Dugaldo has been offered a replacement oven for one of his existing ones. The existing one is written down in the books to an NBV of $2,000 and is very inefficient. Total costs are $25,000, including maintenance and depreciation.
The replacement will cost $75,000, will have no downtime and negligible maintenance costs in its early years. Depreciation will be 20% p.a. straight-line.

Each oven is estimated to generate $60,000 p.a. before these costs are considered.

**Required**

(a) Would profit or ROI be more equitable for comparing Vittorio’s and Dugaldo’s forecast performance?

(b) Show why, in each case, ROI (based on opening book values) will lead to dysfunctional decisions. Brenda and Eddie’s group ROCE is 12%.

**Solution**
Residual income

2.7 Traditionally the main alternative to ROI. It provides a hurdle figure for profit based on the company’s minimum required percentage return from a division.

\[ \text{PBIT (or controllable profit)} \times \text{Residual income} \]

less: "imputed interest" (= Divisional Investment \times \text{Cost of Capital})

The result is an absolute figure.

Lecture example 2

Required

Re-assess the decisions in lecture example 1 using residual income.

Solution

Advantages of residual income

2.8 • Avoids dysfunctional behaviour
• Different costs of capital can be used to reflect risk
ROI vs RI

2.9 In practice, however, ROI is used more frequently than RI, for the following reasons:

(a) Dysfunctional behaviour is not material
(b) ROI is consistent with corporate assessment (ROCE)
(c) Percentages are more easily understood
(d) RI requires a cost of capital

Lecture example 3

Exam standard for 6 marks

Required

Discuss the strengths and weaknesses of ROI and RI as methods of assessing the performance of divisions.

Solution
3 Transfer pricing

3.1 Within a decentralised organisation there may be a division which makes units that are then transferred to another division or provides services which are consumed by another division. For example IT support or legal services. It will usually be necessary to charge the receiving division for the goods or services that it has received in order for performance to be measured equitably.

A transfer price is the price at which goods are transferred internally. It has NO impact on the reported profit of the company.

3.2 It is vital that the transfer price is carefully selected to ensure all parties act in the best interest of the company. The overriding question should be:

"Whether the transfer is in the company's best interest"

If so, the price charged should ensure that the transfer satisfies the Company, the supplying division and the receiving division.

3.3 The goals of a transfer pricing system are:

(a) Goal congruence
(b) Equitable performance measurement
(c) Retain divisional autonomy
(d) Motivate divisional managers
(e) Optimum resource allocation
The Fruity Bakers specialise in making delicious cakes. Their trademark fruit cake is made in division A (the supplying division) and sold to external customers for them to decorate, or it can be enjoyed plain. It is also transferred to division B (the receiving division) where it is iced and decorated to be sold as a luxury wedding cake. Fruity Bakers are currently trying to decide what the optimum price to sell the cakes from Division A to B should be in order to motivate the managers of both divisions. The following data shows the costs incurred by Division A to make a fruit cake and by Division B to ice and decorate the wedding cake.

<table>
<thead>
<tr>
<th>Division</th>
<th>Variable costs</th>
<th>Fixed overhead</th>
<th>Total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Division A</td>
<td>20.00</td>
<td>8.00</td>
<td>28.00</td>
</tr>
<tr>
<td>Division B</td>
<td>40.00</td>
<td>5.00</td>
<td>45.00</td>
</tr>
</tbody>
</table>

Note 1: Plain fruit cakes can be sold and purchased externally for $30.  
Note 2: Wedding cakes can be sold for $100.

**Required**

(a) Should the company make the fruit cakes internally or buy them in?  
(b) What non-financial factors should also be taken into consideration?  
(c) What would be the implication of using the following transfer pricing policies?  
   (i) Full cost plus 10%  
   (ii) Variable cost plus 55%  
   (iii) Variable cost only  
   (iv) The external market price
Solution
It has now been identified that division A also makes excellent sponge cakes. These are sold externally only. The bakers can make either 100 fruit cakes per month or 800 sponge cakes or any combination of the two. The following information is available:

<table>
<thead>
<tr>
<th></th>
<th>Fruit cake</th>
<th>Sponge cake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selling price</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>Variable costs</td>
<td>(20)</td>
<td>(6)</td>
</tr>
<tr>
<td>Fixed overheads</td>
<td>(8)</td>
<td>(2)</td>
</tr>
<tr>
<td>Profit</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Labour hours per cake</td>
<td>2</td>
<td>0.25</td>
</tr>
</tbody>
</table>

**Required**

Using the above information, provide advice on the determination of an appropriate transfer price and provide a reasoned recommendation of a policy The Fruity Bakers should adopt for the transfer of fruit cakes from division A to division B in the following conditions:

(a) When division A has spare capacity and limited external demand for sponge cakes
(b) When division A is operating at full capacity with unsatisfied external demand for sponge cakes.

**Solution**
Bath Co is a company specialising in the manufacture and sale of baths. Each bath consists of a main unit plus a set of bath fittings. The company is split into two divisions, A and B. Division A manufactures the bath and Division B manufactures sets of bath fittings. Currently, all of Division A’s sales are made externally. Division B, however, sells to Division A as well as to external customers. Both of the divisions are profit centres.

The following data is available for both divisions:

**Division A**
- Current selling price for each bath: $450
- Costs per bath:
  - Fittings from Division B: $75
  - Other materials from external suppliers: $200
  - Labour costs: $45
- Annual fixed overheads: $7,440,000
- Annual production and sales of baths (units): 80,000
- Maximum annual market demand for baths (units): 80,000

**Division B**
- Current external selling price per set of fittings: $80
- Current price for sales to Division A: $75
- Costs per set of fittings:
  - Materials: $5
  - Labour costs: $15
- Annual fixed overheads: $4,400,000
- Maximum annual production and sales of sets of fittings (units): 200,000
  (including internal and external sales)
- Maximum annual external demand for sets of fittings (units): 180,000
- Maximum annual internal demand for sets of fittings (units): 80,000

The transfer price charged by Division B to Division A was negotiated some years ago between the previous divisional managers, who have now both been replaced by new managers. Head Office only allows Division A to purchase its fittings from Division B, although the new manager of Division A believes that he could obtain fittings of the same quality and appearance for $65 per set, if he was given the autonomy to purchase from outside the company. Division B makes no cost savings from supplying internally to Division A rather than selling externally.

**Required**

(a) Under the current transfer pricing system, prepare a profit statement showing the profit for each of the divisions and for Bath Co as a whole. Your sales and costs figures should be split into external sales and inter-divisional transfers, where appropriate.

Head Office is considering changing the transfer pricing policy to ensure maximisation of company profits without demotivating either of the divisional managers. Division A will be given autonomy to buy from external suppliers and Division B to supply external customers in priority to supplying to Division A.

(b) Calculate the maximum profit that could be earned by Bath Co if transfer pricing is optimised.
Solution

Checklist of things to look out for in exam questions:

- Impact on BOTH divisions and COMPANY as a whole
- Capacity issues
- Opportunity costs
- Remember the current situation does not always result in goal congruent behaviour!
## 4 Summary of all of the different approaches to Transfer Pricing:

<table>
<thead>
<tr>
<th>Method</th>
<th>Impact on Selling division</th>
<th>Impact on buying division</th>
<th>Impact on Company</th>
</tr>
</thead>
</table>
| Market based                  | • Earns same profit as external sales  
• Equitable performance management     | • Happy to accept transfer (can't buy cheaper elsewhere)  
• Equitable performance management | Goal congruent behaviour should arise |
| Full Cost                     | • No incentive to transfer unless spare capacity | • Happy to accept (if less than market price) | May lead to dysfunctional behaviour |
| Variable cost                 | • No incentive to transfer | • Happy to accept | May lead to dysfunctional behaviour |
| Full cost plus %              | • Covers all costs and makes a contribution to profit so happy to sell | • May not accept as price could be higher than market price | May lead to dysfunctional behaviour |
| Variable cost plus %          | • May not cover all fixed costs | • Will accept if lower than market price | May lead to dysfunctional behaviour |
| Head office intervention      | • Lack of autonomy so demotivating | • Lack of autonomy so demotivating | Goal congruent behaviour should arise |
Supplying division

Min Transfer Price = Marginal cost + opportunity cost

Receiving division

Max Transfer Price = lower of: External market price
and
Divisional net revenue

(i) If an external market exists for the intermediate product, opportunity cost is equal to contribution foregone

(ii) If no external market, the opportunity cost is likely to be nil. Opportunity cost is likely to exist however if the company is at full capacity on another task.

Opportunity/cost-based approaches should always result in goal congruent behaviour, with both buyer and seller happy to transfer when it is in the group’s best interest to do so.

An opportunity cost based approach is the optimum approach to setting transfer prices.

### Chapter summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Responsibility accounting</td>
<td>A good performance measure should be one that drives goal congruence, measures managers only on those items that they can control and recognises long-term as well as short-term objectives</td>
</tr>
<tr>
<td>2</td>
<td>Investment centres</td>
<td>Performance measures need to reflect not just profit but also the investment made to generate that profit. ROI is the most commonly used measure within a decentralised business but can result in dysfunctional behaviour. Using RI will ensure all decisions result in goal congruent behaviour</td>
</tr>
<tr>
<td>3</td>
<td>Transfer pricing</td>
<td>Within a decentralised business it may be necessary to set transfer prices when goods are transferred between divisions. Transfer prices can be set on the basis of cost, market price or opportunity cost. Cost based transfer prices are most likely to result in dysfunctional behaviour</td>
</tr>
<tr>
<td>4</td>
<td>Summary of different approaches</td>
<td>Transfer prices can be set on the basis of cost, market price or opportunity cost. Cost based transfer prices are most likely to result in dysfunctional behaviour</td>
</tr>
</tbody>
</table>
Additional Notes
6 Transfer pricing in practice

Market based approaches

6.1 If an external market exists for transferred goods (and there is unsatisfied demand externally), the transfer price can be set as the external market price.

6.2 |
<table>
<thead>
<tr>
<th>Seller</th>
<th>Buyer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earns the same level of profit on internal sales as external sales</td>
<td>Happy to accept transfer (cannot buy cheaper elsewhere)</td>
</tr>
<tr>
<td>Equitable performance measurement</td>
<td>Equitable performance measurement</td>
</tr>
</tbody>
</table>

The managers of both divisions will behave in a goal congruent way.

6.3 If savings are made by selling internally then this may be reflected in the transfer price, eg by offering a discount equivalent to saved transport costs.

Cost based approaches

6.4 The idea behind these approaches are similar to those involved in manufacturing accounts. The supplying division has its costs of manufacturing refunded and may also be given a mark up to encourage the transfer.

Actual cost v standard cost

6.5 Use of actual costs would result in

(a) All inefficiencies passed on to buying division
(b) No encouragement for cost control in selling division
(c) Buying division does not know in advance what price it will be paying
(d) Performance measurement is therefore difficult
(e) Seller will want to transfer, buying division will not want to transfer

Using standard costs overcomes all these problems.
**Full cost v variable cost**

6.6 Full Cost

<table>
<thead>
<tr>
<th>Seller</th>
<th>Buyer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doesn’t receive any profit on transfers</td>
<td>Happy to accept transfer (assuming full cost is below market price)</td>
</tr>
<tr>
<td>May not transfer unless it has spare capacity</td>
<td></td>
</tr>
</tbody>
</table>

This approach may lead to dysfunctional behaviour.

6.7 Variable Cost

<table>
<thead>
<tr>
<th>Seller</th>
<th>Buyer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doesn’t receive any contribution towards fixed costs or profit</td>
<td>Happy to accept transfer</td>
</tr>
<tr>
<td>Will not want to transfer unless it has spare capacity</td>
<td></td>
</tr>
</tbody>
</table>

This approach may lead to dysfunctional behaviour.

**Standard full cost plus percentage**

6.8

<table>
<thead>
<tr>
<th>Seller</th>
<th>Buyer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covers all costs and makes a contribution towards profit</td>
<td>Price may be higher than market price</td>
</tr>
<tr>
<td>Will want to transfer</td>
<td>May not wish to accept transfer</td>
</tr>
</tbody>
</table>

This approach may often lead to dysfunctional behaviour.

**Standard variable cost plus percentage**

6.9

<table>
<thead>
<tr>
<th>Seller</th>
<th>Buyer</th>
</tr>
</thead>
<tbody>
<tr>
<td>May not cover all fixed costs</td>
<td>Likely to be happy to accept transfer (assuming percentage is not so large that final price exceeds market price)</td>
</tr>
<tr>
<td>May not wish to transfer if percentage does not provide enough contribution towards fixed costs</td>
<td></td>
</tr>
</tbody>
</table>

This approach could potentially lead to dysfunctional behaviour.
# Further performance management

## How have the syllabus learning outcomes been examined?

<table>
<thead>
<tr>
<th>Syllabus learning outcomes</th>
<th>How syllabus outcomes are examined</th>
<th>Example past paper questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comment on the problems of having non-quantifiable objectives in performance management.</td>
<td>Discussion requirements would test all of this chapter.</td>
<td></td>
</tr>
<tr>
<td>Explain how performance could be measured in this sector (NFPOs and the public sector).</td>
<td></td>
<td>Commentators December 2010 parts (a) and (d)</td>
</tr>
<tr>
<td>Comment on the problems of having multiple objectives in this sector.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outline Value for Money (VFM) as a public sector objective.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explain the need to allow for external considerations in performance management, including stakeholders, market conditions and allowance for competitors.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suggest ways in which external considerations could be allowed for in performance management.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interpret performance in the light of external considerations.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identify and explain the behaviour aspects of performance management.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Overview

Objectives

Evaluation of performance

Further performance management

External factors

Behavioural aspects
1 Objectives

1.1 Profit seeking organisations

Primary objective:
- Maximise the wealth of the owners of the business – (equity)

Secondary objectives might be:
- Ensure survival
- Provide a quality product/service (customer satisfaction)
- Be a good corporate citizen (health and safety/environment)
- Create wealth/benefits for management/employees
- Secure competitive advantage and grow market share

The objective of profit or wealth maximisation is thus modified to meet the needs of different interest groups (stakeholders).

1.2 Public sector organisations

Primary objective might be:
- Provision of a quality product/service within a value for money framework

Secondary objectives might be:
- Be a good corporate citizen (health and safety/environment)
- Adopt an ethical social stance in decision making
- Create wealth/benefit for management/employees
- Earn sufficient profits to provide for future capital investment and perhaps provide a surplus for the exchequer

1.3 Not for profit organisations (NFPOs)

Primary objective might be:
- Provision of a social or community service for the well being of society

Secondary objectives might be:
- Be a good corporate citizen (health and safety/environment)
- Adopt an ethical social stance in decision making
- Increase wealth/benefit for management/employees

2 Evaluation of performance

2.1 NFPOs and public sector organisations will not have wealth maximisation as a primary objective. However, they will still have strategic objectives (albeit non-financial) and stakeholders (clients, members etc), who will wish to measure their performance.
2.2 Problems of performance measurement in NFPOs

- Multiple objectives
- How to measure output
- Lack of financial / profit measure
- Difficult to define a unit

Lecture example 1

Required

(a) Suggest what items might be measured for a hospital.

(b) Highlight the problems that may occur in attempting to monitor performance of the hospital using league tables of this data over time and against other hospitals.

Solution
Possible performance measurement methods

2.3 • The 3 Es
  • Comparisons – eg comparison of results / benchmarking between different public sector organisations
  • Efficiency measurement – ie cost / patient / day
  • Judgement - some measurement will be subjective

2.4 The '3 Es' measures performance in value for money terms

Economy – Sourcing inputs at minimum cost while maintaining standards of quality
Efficiency – Achieving better productivity (output) from resources input/consumed
Effectiveness – Success in achieving objectives

Lecture example 2

Required

Using the 3 Es suggest a range of performance measures for a public sector higher education college.

Solution
3 Performance measurement and external factors

3.1 When devising performance measures for any organisation, consideration needs to be given to three key external factors:
   - Stakeholders
   - Economic environment
   - Competition

3.2 A stakeholder is anyone who has a legitimate interest in the organisation. Stakeholders can be broken down into three key groups.
   - Internal – such as employees
   - Connected – shareholders, customers, suppliers
   - External – community and the government

Lecture example 3

Suggest performance management measures that could be used in a large fashion retailer which would incorporate the needs of the three stakeholder groups and discuss the information which would be monitored for the remaining two key external factors.

Solution
3.3 There will often be a conflict between the stakeholder objectives. For example, shareholders want larger returns whereas employees want pay rises. Performance measures need to be considered carefully. A suitable measure in this case might be performance related pay.

4 **Performance management and behaviour aspects**

4.1 You have already come across some of the behavioural aspects of performance measurement when looking at setting standards and budgets.

These are some of the aspects to bear in mind...
- Targets should be set which support the company objectives
- Managers should only be assessed on those items that they can control
- Targets should incorporate long-term as well as short-term objectives
- Targets should be set that motivate
- Targets should encompass the big picture and may include financial and non-financial aspects

5 **Chapter summary**

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Objectives</td>
<td>Performance measurement in public sector or NFP organisations can be difficult as they often have multiple objectives and these are often hard to quantify and measure.</td>
</tr>
</tbody>
</table>
| 2       | Evaluation of performance                  | Performance is often evaluated using the 3 E’s  
- Economy  
- Effective  
- Efficiency |
| 3       | Performance measurement and external factors | Performance measures need to be developed bearing in mind three external factors:  
- Stakeholders (which can be internal, external or connected)  
- economic environment  
- competition |
| 4       | Performance measurement and behaviour aspects | Issues here are the same issues that occur with performance measurement in a profit making organisation. |
Checkpoint 4 – Progress Review

To reinforce your learning to date you should now follow the study guidance in the following pages. On completion, your progress towards full exam preparation will be:

You have now completed Stage 4 of the course. Before you attempt the work outlined within the Study Support section on the subsequent pages, take some time to reflect on the knowledge and skills you covered during Stage 4. If you feel you need further clarification on any of the key areas listed below you can use the on-line lecture for the relevant chapter.

Key messages from Stage 4

The majority of this stage covered the performance measurement section of the syllabus. All other areas feed into this and so this is a very important area for F5.

Key knowledge

- Performance management – a hugely important area. Assessment of performance is key whether via financial ratios or non financial performance indicators. Often these will contradict each other. Make sure you do more than the calculations – the bulk of the marks on these questions will come from your explanation or interpretation of the data. Whenever you make a comment make sure you have explained an item fully enough so that you can’t leave the examiner able to say ‘…and?’ or ‘so what?’
- Divisional Performance measures – there are two key elements to this chapter – one is the performance measures themselves i.e. ROI / RI. The other is transfer pricing. With transfer pricing ensure you can determine the behavioural impact for both the buyer and seller of each type of transfer price.
- Further performance management – an extension of performance management but dealing specifically with not for profit organisations. Being able to explain each of the 3 Es and suggest suitable measures for each is key.
- Management accounting information for strategic planning, control and decision making.

Key skills

You will have now covered the necessary knowledge for F5. Try also to remember the necessary key skills discussed so far and more importantly to start to practice these, particularly as you approach your course exam.

- Play to your strengths so answer those questions you find easiest first
- Draw up any relevant proformas
- Ensure that when answering calculation elements you tackle the easy numbers first
- Carefully present your answers so that they are clear, easy to follow and workings are cross referenced to your answer

After working through the Study Support guidance all of Course Exam 2 can be attempted.
## Checkpoint 4 – Study Support

<table>
<thead>
<tr>
<th>Chapter 13 – Behavioural aspects of standard costing</th>
<th>25 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key areas</strong></td>
<td></td>
</tr>
<tr>
<td>• Behavioural aspects of standard costing</td>
<td></td>
</tr>
<tr>
<td><strong>Course Notes</strong></td>
<td></td>
</tr>
<tr>
<td>• Ensure you work carefully through this chapter in full and can answer the syllabus detailed outcomes on the first page of the chapter.</td>
<td>20 mins</td>
</tr>
<tr>
<td><strong>Additional Resources</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Study Text Resources</strong></td>
<td></td>
</tr>
<tr>
<td>• Review section 2.3.1. Can standard costing and TQM co-exist?</td>
<td>5 mins</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 14 – Performance management information systems</th>
<th>45 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key areas</strong></td>
<td></td>
</tr>
<tr>
<td>• Management accounting information for strategic planning, control and decision making</td>
<td></td>
</tr>
<tr>
<td><strong>Course Notes</strong></td>
<td></td>
</tr>
<tr>
<td>• Ensure you are happy with the definitions of the different MIS in section 3 and the information requirements of different levels of management. Consulting section 5 of the Study Text if necessary.</td>
<td>10 mins</td>
</tr>
<tr>
<td><strong>Question Practice</strong></td>
<td></td>
</tr>
<tr>
<td>• Question 18 from the study text question bank (Handra) is a discussion question on this area. Attempt this in full and then review to see the additional examples you could have suggested. Remembering to plan your answer before starting to write.</td>
<td>35 mins</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 15 – Sources of management information and management reports</th>
<th>45 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key areas</strong></td>
<td></td>
</tr>
<tr>
<td>• Sources of management accounting information</td>
<td></td>
</tr>
<tr>
<td>• Controls over generating and distributing information</td>
<td></td>
</tr>
<tr>
<td><strong>Course Notes</strong></td>
<td></td>
</tr>
<tr>
<td>• Review the course notes and make sure you can suggest controls.</td>
<td>10 mins</td>
</tr>
<tr>
<td><strong>Question Practice</strong></td>
<td></td>
</tr>
<tr>
<td>• Question 19 from the study text question bank (JM Foods). Review the answer carefully, especially if you struggled to generate sufficient points.</td>
<td>35 mins</td>
</tr>
</tbody>
</table>
### Chapter 16 – Performance management

<table>
<thead>
<tr>
<th>Key areas</th>
<th>100 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Non-financial performance indicators</td>
<td></td>
</tr>
<tr>
<td>• Financial performance indicators</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Notes</th>
<th>5 mins 20 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Ensure you can suggest non-financial performance indicators.</td>
<td></td>
</tr>
<tr>
<td>• Review the ratios in the additional notes and make sure you can both calculate and explain them.</td>
<td></td>
</tr>
<tr>
<td>• Review the remaining sections of the notes.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question Practice</th>
<th>35 mins 35 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Attempt Question 4 from the pilot paper – this tests your analysis of financial performance of a company and is a very typical exam question. When you have completed this question you should refer to the on-line debrief which is available for this question.</td>
<td></td>
</tr>
<tr>
<td>• Question 20 from the study text question bank (Spring) is a discussion question on this area. Attempt this and then review to see the additional points you could raise.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional Resources</th>
<th>5 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Text Resources</td>
<td></td>
</tr>
<tr>
<td>• Work through the example in section 6.3.3. The ratio analysis you may have to perform in the exam will not necessarily be just the familiar financial ratios.</td>
<td></td>
</tr>
</tbody>
</table>

### Chapter 17 – Divisional performance measures

<table>
<thead>
<tr>
<th>75 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Notes</td>
</tr>
<tr>
<td>• Review ROI and RI to ensure you can calculate, contrast and criticise them.</td>
</tr>
<tr>
<td>• Review your notes to ensure you can explain how you would set a transfer price and how that price might distort performance measurement.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question Practice</th>
<th>40 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Attempt Question 21 (Divisional performance measures) from the Study Text question bank if you need some additional practice at ROI &amp; RI.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional Resources</th>
<th>10 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real-life examples</td>
<td></td>
</tr>
<tr>
<td>• In the Real-life examples section you will find a short article talking about the way well known companies use transfer pricing to avoid paying corporation tax and the pressure on the UK government to reduce these practices.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study Text Resources</th>
<th>5 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Read section 1 on divisionalisation. The concepts in this chapter apply to companies with this decentralised structure.</td>
<td></td>
</tr>
</tbody>
</table>

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321
ANF512

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**CHECKPOINT 4**
### Chapter 18 – Further performance management

<table>
<thead>
<tr>
<th>Course Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Review your notes to ensure you can explain the problems of performance measurement in this sector.</td>
</tr>
<tr>
<td>• Ensure you can discuss the three external factors – stakeholders, economic environment and competition.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Attempt Question 22 from the Study Text question bank (Non profit seeking organisations) in full. This will give you a good idea of the types of question you might get in this area as well as enabling you to practice written questions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Study Text Resources</strong></td>
</tr>
<tr>
<td>• Review the solutions to performance measurement problems in section 2.3 and ensure you could discuss these as ways of overcoming the measurement problems in NFPOs.</td>
</tr>
</tbody>
</table>

**On completion of this final stage (including Progress Tests) you are ready to attempt Course Exam 2**
Checkpoint 4 - Progress Test

Having completed the Study Support guidance contained on the previous pages, you are now ready to attempt the Progress Test. You should aim to complete the test in **1 hour and 10 minutes**.

The multiple choice questions contained within this Progress Test will thoroughly test your understanding of the material and your ability to perform the required calculations. Note that the F5 exam does not contain multiple choice questions. The seven short written questions that follow will test your ability to apply your knowledge. These skills will prove important when answering discursive exam standard questions.

It is important that you continually review your progress and revise further any areas where you feel your understanding is weak.

**A  Multiple choice questions (9 questions – approximate time 32 minutes)**

Data for questions 1 – 4

Fowell O’Durr plc manufactures an industrial insect repellent Wingblitz. Standard data for budgeted monthly production of 1,000 litres is as follows:

<table>
<thead>
<tr>
<th>Material</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical W – 700 litres</td>
<td>1,400</td>
</tr>
<tr>
<td>Chemical P – 400 litres</td>
<td>600</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,000</strong></td>
</tr>
</tbody>
</table>

Material inventories are valued at standard price, and inventories for the month of June were as follows:

<table>
<thead>
<tr>
<th>Chemical W</th>
<th>Chemical P</th>
</tr>
</thead>
<tbody>
<tr>
<td>litres</td>
<td>litres</td>
</tr>
<tr>
<td>1 June</td>
<td>650</td>
</tr>
<tr>
<td>30 June</td>
<td>680</td>
</tr>
</tbody>
</table>

During June, 670 litres of Chemical W were purchased for $1,474 and 320 litres of Chemical P at a price of $1.60 per litre. 900 litres of repellent were produced in June.

1. What is the total direct materials price variance for June?
   - A. $162 Adverse
   - B. $163 Adverse
   - C. $166 Adverse
   - D. $180 Adverse

2. What is the total direct materials usage variance for June?
   - A. $20 Adverse
   - B. $87.50 Adverse
   - C. $112.50 Favourable
   - D. $180 Favourable

3. What is the total direct materials mix variance for June?
   - A. $12.50 Favourable
   - B. $15 Favourable
   - C. $20 Adverse
   - D. $180 Favourable
4 What is the direct materials yield variance for June?

A $nil
B $90 Adverse
C $100 Adverse
D $200 Adverse

(2 marks)

Data for questions 5 to 6

Bacon and Higgs Limited set a monthly direct labour budget for their single product as follows:

Budgeted production 270 units
Direct labour hours 810
Wages cost $4,050

During the year it was realised that due to certain planning errors, the original standard cost was unrealistic and was not useful for cost control.

Accordingly, the standard was revised for variance analysis purposes to:

Four direct labour hours at $4.50 per hour = $18 per unit produced

Actual results for August were:

Production 300 units
Direct labour hours 1,140
Wages cost $5,586

5 What is the total planning variance for August?

A $228 Favourable
B $810 Adverse
C $930 Adverse
D $900 Adverse

(2 marks)

6 What is the total operational variance for August?

A $114 Favourable
B $186 Adverse
C $156 Adverse
D $1,086 Adverse

(2 marks)

7 Division X of Tina Pease Ltd produced the following results in the last financial year:

Net profit $360
Capital employed: non-current assets 1,500
net current assets 100

For evaluation purposes all divisional assets are valued at original cost. The division is considering a project which will increase annual net profit by $25,000 but will require average inventory levels to increase by $30,000 and non-current assets to increase by $100,000. Tina Pease Ltd imposes an 18% capital charge on its divisions.

Given these circumstances, will the evaluation criteria of Return on Investment (ROI) and Residual Income (RI) motivate Division X management to accept the project?

<table>
<thead>
<tr>
<th></th>
<th>ROI</th>
<th>RI</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>B</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>C</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>D</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

(2 marks)
8. Which of the following definitions best describes the responsibility of an investment centre in a decentralised organisation?

A. Responsibility for the level of sales, production costs, collection of debts and payment of suppliers
B. Responsibility for the level of sales, production costs and treasury functions
C. Responsibility for the level of sales, production costs and purchase of new fixed assets
D. Responsibility for the level of production costs, treasury functions and collection of debtors and payment of suppliers

(2 marks)

9. A division currently has an annual return of 20% with an investment base of $2,400,000 and annual profits of $480,000. The following additional projects are being considered:

<table>
<thead>
<tr>
<th>Investment</th>
<th>Annual Profit</th>
<th>Annual Return on Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outlay</td>
<td>$'000</td>
<td>$'000</td>
</tr>
<tr>
<td>R</td>
<td>600</td>
<td>200</td>
</tr>
<tr>
<td>S</td>
<td>1,400</td>
<td>420</td>
</tr>
<tr>
<td>T</td>
<td>1,000</td>
<td>260</td>
</tr>
<tr>
<td>U</td>
<td>400</td>
<td>88</td>
</tr>
</tbody>
</table>

Which combination of investments will cause the division's return on investment to be maximised?

A. R only
B. R and S
C. R, S and T
D. R, S, T and U

(2 marks)

B. **Short written questions (7 questions – approximate time 35 minutes)**

1. Explain the benefits of operating a transfer pricing system within a divisionalised company. (4 marks)

2. Explain the advantages and weaknesses of RI compared with ROI. (5 marks)

3. Describe the term non-financial performance measure. (2 marks)

4. What are the four perspectives considered as part the balanced scorecard? (1 mark)

5. What are the four characteristics of services that distinguish services from manufacturing? (1 mark)

6. What are the five costs of obtaining external data? (1 mark)

7. What are the limitations of planning and operational variances if they are to be applied in practice? (4 marks)
### Section A

1. **C** The standard data can be used to determine the standard price per litre for each material:

   \[ W = \frac{1,400}{700} = \$2 \text{ per litre} \]

   \[ P = \frac{600}{400} = \$1.5 \text{ per litre} \]

   The next problem is: should the calculation of the price variance be based on materials used or materials purchased? Since inventories are valued at standard price, all of the price variance is eliminated immediately the inventories are received, therefore the variance should be based on purchases.

<table>
<thead>
<tr>
<th>Should cost</th>
<th>Did cost</th>
<th>Price variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>670 litres of ( W ) (( \times 2 ))</td>
<td>1,340</td>
<td>1,474</td>
</tr>
<tr>
<td>320 litres of ( P ) (( \times 1.5 ))</td>
<td>480 (( \times 1.6 ))</td>
<td>512</td>
</tr>
<tr>
<td><strong>1,820</strong></td>
<td><strong>1,986</strong></td>
<td><strong>166 (A)</strong></td>
</tr>
</tbody>
</table>

2. **B** The actual usage of each material must be determined from the inventory and purchases data:

<table>
<thead>
<tr>
<th>W litres</th>
<th>P litres</th>
<th>Total litres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening inventory</td>
<td>650</td>
<td>380</td>
</tr>
<tr>
<td>Purchases</td>
<td>670</td>
<td>320</td>
</tr>
<tr>
<td></td>
<td>1,320</td>
<td>700</td>
</tr>
<tr>
<td>Less: closing inventory</td>
<td>680</td>
<td>295</td>
</tr>
<tr>
<td></td>
<td><strong>640</strong></td>
<td><strong>405</strong></td>
</tr>
</tbody>
</table>

   Usage variance:

<table>
<thead>
<tr>
<th>Usage</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>900 litres of output</td>
<td></td>
</tr>
<tr>
<td>should use (( \times 0.7 ))</td>
<td>630 litres (( \times 0.4 ))</td>
</tr>
<tr>
<td>did use</td>
<td>640 litres</td>
</tr>
<tr>
<td>10 litres</td>
<td>45 litres (A)</td>
</tr>
<tr>
<td>( \times $2 \text{ std cost} )</td>
<td>+</td>
</tr>
<tr>
<td>$20 (A)</td>
<td></td>
</tr>
<tr>
<td>= $87.50 (A)</td>
<td></td>
</tr>
</tbody>
</table>

3. **A** The total material used was 1,045 litres (see previous solution). The standard mix of this input must be compared with the actual mix.

<table>
<thead>
<tr>
<th>Material</th>
<th>Standard mix of actual input litres</th>
<th>Actual mix litres</th>
<th>Difference litres</th>
<th>At std price $</th>
<th>Variance $</th>
</tr>
</thead>
<tbody>
<tr>
<td>( W ) (( \times 700/1,100 ))</td>
<td>665</td>
<td>640</td>
<td>25 (F)</td>
<td>2.00</td>
<td>50.00 (F)</td>
</tr>
<tr>
<td>( P ) (( \times 400/1,100 ))</td>
<td>380</td>
<td>405</td>
<td>25 (A)</td>
<td>1.50</td>
<td>(37.50) (A)</td>
</tr>
<tr>
<td><strong>1,045</strong></td>
<td><strong>1,045</strong></td>
<td><strong>$12.50</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4 C From the standard data, 1,100 litres input should yield 1,000 litres output, at a cost of $2,000 or $2 per litre of output.

Therefore, 1,045 litres of material input should yield:

\[
\left( \times \frac{1,000}{1,100} \right) 950 \text{ litres output}
\]

but did yield 900 litres

a shortfall of 50 litres (A)

\times \text{ standard cost per litre produced} \quad \$ \ 2

= \text{ yield variance} \quad \$100 \ \text{Adverse}

5 D

Planning

300 units should cost \( \times \$5 \times 3 \text{ hours} \) 4,500

Revised cost \( \times \$4.50 \times 4 \text{ hours} \) 5,400

Planning variance \$900 \ (A)

6 B

Operating

300 units Revised cost \( \times \$4.50 \times 4 \text{ hours} \) 5,400

Did cost 5,586

Efficiency variance 186 \ (A)

7 C Current ROI = \( \frac{360}{1,600} \) = 22.5%

New ROI = \( \frac{(360 + 25)}{(1,600 + 130)} \) = \( \frac{385}{1,730} \) = 22.25%, which is lower

Current RI in $000 = 360 – (18% of 1,600) = 72

New RI in $000 = 385 – (18% of 1,730) = 73.6, which is higher.

8 C An investment centre has responsibility for sales, production and investment in new non-current assets.

9 C To maximise return, the existing division and the new projects must be evaluated and the largest return chosen.

A + R only \( \frac{480 + 200}{2400 + 600} \) = 22.67%

B + R&S \( \frac{480 + 200 + 420}{2,400 + 600 + 1400} \) = 25%

C + R,S&T \( \frac{480 + 200 + 420 + 260}{2400 + 600 + 1400 + 1000} \) = 25.18%

D + R,S,T&U \( \frac{480 + 200 + 420 + 260 + 88}{2400 + 600 + 1400 + 1000 + 400} \) = 24.96%
**Section B**

1 Potential benefits of operating a transfer pricing system within a divisionalised company include the following.
   (a) It can lead to **goal congruence** by motivating divisional managers to make decisions, which improve divisional profit and improve profit of the organisation as a whole.
   (b) It can prevent **dysfunctional decision making** so that decisions taken by a divisional manager are in the best interests of his own part of the business, other divisions and the organisation as a whole.
   (c) Transfer prices can be set at a level that enables divisional performance to be measured 'commercially'. A transfer pricing system should therefore report a level of divisional profit that is a **reasonable measure of the managerial performance** of the division.
   (d) It should ensure that **divisional autonomy** is not undermined. A well-run transfer pricing system helps to ensure that a balance is kept between divisional autonomy to provide incentives and motivation, and centralised authority to ensure that the divisions are all working towards the same target, the benefit of the organisation as a whole.

2 **The advantages of using RI**
   (a) Residual income will **increase** when investments earning above the cost of capital are undertaken and investments earning below the cost of capital are eliminated.
   (b) Residual income is **more flexible** since a different cost of capital can be applied to investments with **different risk** characteristics.

   The **weakness** of RI is that it **does not facilitate comparisons** between investment centres nor does it relate the size of a centre's income to the size of the investment.

   Residual income will increase if a new investment is undertaken which earns a profit in excess of the imputed interest charge on the value of the asset acquired. Residual income will go up even if the investment only just exceeds the imputed interest charge, and this means that 'marginally profitable' investments are likely to be undertaken by the investment centre manager.

   In contrast, when a manager is judged by ROI, a marginally profitable investment would be less likely to be undertaken because it would reduce the average ROI earned by the centre as a whole.

3 Non-financial performance measures are measures of performance based on non-financial information which may originate in and be used by operating departments to monitor and control their activities without any accounting input.

4 Customer, internal, innovative and learning, and financial.

5 Intangibility, inseparability, variability, perishability, no transfer of ownership.

6 Direct search costs, indirect search costs, management costs, infrastructure costs, time-theft costs.
It is difficult to decide in hindsight what the realistic standard should have been. It may become too easy to justify all the variances as being due to bad planning, so no operational variances will be highlighted.

Establishing realistic revised standards and analysing the total variance into planning and operational variances can be a time consuming task, even if a spreadsheet package is devised.

Even though the intention is to provide more meaningful information, managers may be resistant to the very idea of variances and refuse to see the virtues of the approach. Careful presentation and explanation will be required until managers are used to the concepts.
Case 4 – Transfer Pricing and tax avoidance

MULTINATIONAL COMPANIES SUCH AS STARBUCKS, AMAZON AND GOOGLE HAVE COMPLICATED TAX SYSTEMS - ALL SAY THEY OPERATE WITHIN THE LAW. GLOBAL FIRMS IN THE UK THAT PAY LITTLE OR NO TAX ARE AN "INSULT" TO BRITISH BUSINESSES, A COMMITTEE OF MPs SAYS. PUBLIC ACCOUNTS COMMITTEE CHAIRWOMAN MARGARET HODGE SAID HM REVENUE AND CUSTOMS (HMRC) NEEDED TO BE "MORE AGGRESSIVE AND ASSERTIVE IN CONFRONTING CORPORATE TAX AVOIDANCE".

MULTINATIONALS SUCH AS STARBUCKS AND AMAZON HAVE COME UNDER FIRE FOR PAYING LITTLE OR NO CORPORATION TAX.

HMRC SAID IT ALREADY ENSURED THAT INTERNATIONAL COMPANIES PAID THE TAX DUE "IN ACCORDANCE WITH UK TAX LAW".

THE TREASURY SAID IT WOULD PROVIDE HMRC WITH £77m IN NEW MONEY TO HELP IT TRACK DOWN WEALTHY INDIVIDUALS AND COMPANIES WHO TRIED TO AVOID PAYING TAX. THE TREASURY SAID IT EXPECTED TO RECoup £2bn A YEAR AS A RESULT OF THE MEASURES ANNOUNCED.
Let BPP Professional Education help you with your revision

You have now completed the very important Learning Phase of your studies. You have built core skills and have tested these using course exams and practice questions. You now need to focus on developing new skills to address the ultimate test – the exam itself.

**Phase 2 – Revision**

**Revision courses**

Our Revision Courses, available in the period running up to the exam, will focus on one objective – passing the exam. Success in the exam requires more than just understanding the syllabus; you also need to apply this knowledge to the context of the exam questions. Using real exam questions written by the examiner you’ll learn the unique exam skills for each paper. We will teach you how to:

- Pick up easy marks for that paper
- Write in the correct style for that particular exam
- Choose the best questions for you
- Apply simple and understandable methods to pass the most difficult technical questions
- Build exceptional time management skills

During a BPP Revision Course you will cover all of the issues above, maximising your chances of picking up marks. After all, those extra marks could mean the difference between a pass and a fail! We also suggest that if possible, the final step in your preparation should be a Question Day as an effective exam rehearsal that will test your technique under timed conditions.

Finally, don’t forget that if you wish to make use of our FREE Pass Assurance, then attending a revision course is one of the criteria you must fulfil.

**Phase 3 – Exam practice**

This phase allows you to perfect your exam technique, giving you the confidence you need to apply key skills in the exam and therefore critical to passing the exam. BPP offers the following:

**Question Days**

A Question Day provides one final day of practice (normally 1-2 weeks before the actual exam) giving you a chance to attempt a targeted mock exam under timed conditions. Your answers will be marked and you will receive feedback during the day allowing you to practise improvements to your question technique as the day progresses. During the day your tutor will provide debriefs of the questions and helpful tuition tips. Please note that places are very limited so book early to avoid disappointment.

**Final Mock with Online Debrief**

You will receive an exam standard mock to attempt in your own time, suggested solutions, marking guide, and access to an online debrief. Ideal if you can’t secure a place on a Question Day or would prefer to practice in your own time. These are a convenient and flexible alternative to the Question Day.

**Note.** Question Days or the Final Mock with Online debrief are not a substitute for a revision course and do not count as a ‘revision course’ under the Pass Assurance rules.
Answers to Lecture Examples
**Chapter 1a**

**Answer to Lecture Example 1**

Absorption costing

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sales</strong></td>
<td>$42,000</td>
<td>$40,000</td>
</tr>
<tr>
<td><strong>Cost of sales:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>opening inventory</td>
<td>–</td>
<td>1,600</td>
</tr>
<tr>
<td><strong>Production:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>variable costs</td>
<td>26,400</td>
<td>22,800</td>
</tr>
<tr>
<td>fixed costs (W1)</td>
<td>8,800</td>
<td>7,600</td>
</tr>
<tr>
<td></td>
<td>35,200</td>
<td>32,000</td>
</tr>
<tr>
<td>closing inventory (W3)</td>
<td>(1,600)</td>
<td>–</td>
</tr>
<tr>
<td>(Over)/under absorption (W2)</td>
<td>(300)</td>
<td>(33,300)</td>
</tr>
<tr>
<td><strong>Gross profit</strong></td>
<td>8,700</td>
<td>7,100</td>
</tr>
<tr>
<td><strong>Variable selling &amp; distribution</strong></td>
<td>(4,200)</td>
<td>(4,000)</td>
</tr>
<tr>
<td><strong>Fixed selling &amp; distribution</strong></td>
<td>(2,000)</td>
<td>(2,000)</td>
</tr>
<tr>
<td><strong>Net profit</strong></td>
<td>2,500</td>
<td>1,100</td>
</tr>
</tbody>
</table>

(W1) OAR = \(\frac{8,000}{4,000}\) = $2/unit

(W2)

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual overhead</td>
<td>8,500</td>
<td>8,500</td>
</tr>
<tr>
<td>Fixed overhead absorbed</td>
<td>8,800</td>
<td>7,600</td>
</tr>
<tr>
<td>(Over)/Under absorption</td>
<td>(300)</td>
<td>900</td>
</tr>
</tbody>
</table>

(W3)

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening inventory</td>
<td>-</td>
<td>200</td>
</tr>
<tr>
<td>add: production</td>
<td>4,400</td>
<td>4,000</td>
</tr>
<tr>
<td>less: sales</td>
<td>(4,200)</td>
<td>(3,800)</td>
</tr>
<tr>
<td>Closing inventory</td>
<td>200</td>
<td>-</td>
</tr>
</tbody>
</table>

Valued at full cost / unit $8

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$1,600</td>
<td>$0</td>
</tr>
</tbody>
</table>
**Answer to Lecture Example 2**

Marginal costing

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>$42,000</td>
<td>$40,000</td>
</tr>
<tr>
<td>Variable production costs:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>opening inventory</td>
<td>–</td>
<td>1,200</td>
</tr>
<tr>
<td>production</td>
<td>26,400</td>
<td>22,800</td>
</tr>
<tr>
<td>closing inventory (w1)</td>
<td>(1,200)</td>
<td>–</td>
</tr>
<tr>
<td>(25,200)</td>
<td>(24,000)</td>
<td></td>
</tr>
<tr>
<td>Variable selling &amp; distribution</td>
<td>(4,200)</td>
<td>(4,000)</td>
</tr>
<tr>
<td>Contribution</td>
<td>12,600</td>
<td>12,000</td>
</tr>
<tr>
<td>Fixed costs:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>production</td>
<td>(8,500)</td>
<td>(8,500)</td>
</tr>
<tr>
<td>selling &amp; distribution</td>
<td>(2,000)</td>
<td>(2,000)</td>
</tr>
<tr>
<td>Profit</td>
<td>2,100</td>
<td>1,500</td>
</tr>
</tbody>
</table>

(W1)

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening inventory</td>
<td>–</td>
<td>200</td>
</tr>
<tr>
<td>add: production</td>
<td>4,400</td>
<td>4,000</td>
</tr>
<tr>
<td>less: sales</td>
<td>(4,200)</td>
<td>(3,800)</td>
</tr>
<tr>
<td>Closing inventory</td>
<td>200</td>
<td>–</td>
</tr>
<tr>
<td>Valued at full cost / unit $6</td>
<td>$1,200</td>
<td>$0</td>
</tr>
</tbody>
</table>

**Answer to Lecture Example 3**

AC Profit

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>add: fixed overhead in opening inventory</td>
<td>–</td>
<td>400</td>
</tr>
<tr>
<td>less: fixed overhead in closing inventory*</td>
<td>400</td>
<td>–</td>
</tr>
<tr>
<td>MC profit</td>
<td>2,100</td>
<td>1,500</td>
</tr>
</tbody>
</table>

*200 × $2

**Chapter 1b**

**Answer to Lecture Example 1**

(a) Contribution per unit = 6.95 – (0.60 + 2.00 + 0.50) = 3.85

Operating Statement

<table>
<thead>
<tr>
<th></th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budgeted contribution (6 × 100 × $3.85)</td>
<td>2,310.0</td>
</tr>
<tr>
<td>Sales volume variance (W10)</td>
<td>115.5 (F)</td>
</tr>
<tr>
<td>Standard contribution for actual sales (630 × $3.85)</td>
<td>2,425.5</td>
</tr>
</tbody>
</table>
Sales price variance (W9) 121.5 (F)
Cost variances
\[\begin{array}{ccc}
\text{Materials} & \text{Price} & (W1) 10 \\
& \text{Usage} & (W2) 18 \\
\text{Labour} & \text{Rate} & (W3) 150 \\
& \text{Idle time} & (W4) 40 \\
& \text{Efficiency} & (W5) 100 \\
\text{Variable overheads} & \text{Expenditure} & (W6) 35 \\
& \text{Efficiency} & (W7) 25 \\
\end{array}\]
\[\begin{array}{c}
\text{Net cost variances} \\
\text{Actual contribution} \\
\text{Fixed overheads} \\
\text{Budgeted} (6 \times 100 \times 1.25) 750 \\
\text{Expenditure variance (W8)} (750.0) \\
\text{Actual profit} 1,725.0 \\
\end{array}\]
\[\text{Workings}\]
(1) Materials price
\[\begin{array}{c}
260 \text{ kg should cost } (\times 1.50) 390 \\
did cost 380 \\
10 \text{ (F)} \\
\end{array}\]
(2) Materials usage
\[\begin{array}{c}
630 \text{ meals should use } (\times 0.4) 252 \\
did use 240 \\
12 \text{ kg (F)} \\
@ $1.50/kg standard $18 \text{ (F)} \\
\end{array}\]
(3) Labour rate
\[\begin{array}{c}
300 \text{ hours should cost } (\times 4) $1,200 \\
did cost $1,350 \\
$ 150 \text{ (A)} \\
\end{array}\]
(4) Labour idle time
\[\begin{array}{c}
\text{Hours paid} 300 \text{ hours} \\
\text{Hours worked} 290 \text{ hours} \\
\times \text{ standard cost per hour ($4)} $40 \text{ (A)} \\
\end{array}\]
(5) Labour efficiency
\[\begin{array}{c}
630 \text{ meals should take } (\times 0.5) 315 \text{ hours} \\
did take 290 \text{ hours} \\
25 \text{ hours} \\
\times \text{ standard cost per hour ($4)} $100 \text{ (F)} \\
\end{array}\]
(6) Variable overhead expenditure
\[\begin{array}{c}
290 \text{ hours should incur ($1)} 290 \\
did incur 325 \\
35 \text{ (A)} \\
\end{array}\]
(7) Variable overhead efficiency
As labour $25 (F)  
× standard overhead per labour hour ($1) $25 (F)

(8) Fixed overhead expenditure $ 750  
Budget = 100 × 6 × 1.25 750  
Actual 750  
Nil

(9) Sales price $  
630 meals should sell for (× 6.95) 4,378.50  
did sell for 4,500.00  
121.50 (F)

(10) Sales volume meals  
Budget meals 600  
Actual meals 630  
30 meals  
× standard contribution per meal ($3.85) $115.50 (F)

(b)
Sales 4,500  
Less:  
Materials (380 – 30) 350  
Labour 1,350  
Variable overheads 325  
Fixed overheads 750  
Actual profit 1,725

(c) Favourable price variance could be due to:
  Negotiated better price
  • bulk buying → discount
  • cheaper quality goods
  • alternative supplier used
  • price inflation different to anticipated

Favourable usage variance
  • less wastage
  • more efficient may be due to better processes
  • better grade of staff
  • better quality of material (unlikely given favourable price variance)

Adverse labour rate
  • higher pay rises than anticipated
  • higher skilled workers than expected
  • overtime worked

Favourable efficiency variance
  • better processes
  • better materials .. less rework
  • higher skilled staff
  • learning effect
  • training
Idle time – given in question

Adverse variable overheads expenditure variance
- rate rise
- alternative suppliers
- standard too low
- excessive use

Favourable efficiency variance (as labour)

**Answer to Lecture Example 2**

**Total variance**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed overhead incurred</td>
<td>$750.00</td>
</tr>
<tr>
<td>Fixed overhead absorbed</td>
<td></td>
</tr>
<tr>
<td>(630 meals × $1.25 per meal)</td>
<td>$787.50</td>
</tr>
<tr>
<td>Over-absorption</td>
<td>$37.50 (F)</td>
</tr>
</tbody>
</table>

**Expenditure variance**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budgeted expenditure</td>
<td>$750</td>
</tr>
<tr>
<td>Actual expenditure</td>
<td>$750</td>
</tr>
<tr>
<td>Volume variance</td>
<td>$0</td>
</tr>
<tr>
<td>Budget meals</td>
<td>600</td>
</tr>
<tr>
<td>Actual meals</td>
<td>630</td>
</tr>
<tr>
<td>× std cost ($1.25)</td>
<td>$37.50 (F)</td>
</tr>
</tbody>
</table>

Fixed overhead efficiency variance

- As labour
  - 25 hours (F)
  - × standard overhead per labour hour ($2.50)
    - $62.50 (F)

Fixed overhead capacity variance

- Hours
  - Budget hours (100 × 6 × 30mins)
    - 300
  - Actual hours
    - 290
  - 10A
  - × standard overhead per labour hour ($2.50)
    - ($25.00) (A)

**Sales volume variance**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budget meals</td>
<td>600</td>
</tr>
<tr>
<td>Actual meals</td>
<td>630</td>
</tr>
<tr>
<td>× std profit ($2.60)</td>
<td>$78     (F)</td>
</tr>
</tbody>
</table>

**Operating Statement**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budgeted profit (6 × 100 × $2.60)</td>
<td>$1,560.0</td>
</tr>
<tr>
<td>Sales volume variance (30 × $2.60)</td>
<td>$78.0 (F)</td>
</tr>
<tr>
<td>Sales price variance</td>
<td>$121.50 (F)</td>
</tr>
</tbody>
</table>
Cost variances

<table>
<thead>
<tr>
<th></th>
<th>$(F)$</th>
<th>$(A)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Usage</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Labour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rate</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Idle time</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Efficiency</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Variable overheads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expenditure</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Efficiency</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Fixed overheads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expenditure</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Efficiency</td>
<td>62.50</td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>190.5</td>
<td>225</td>
</tr>
</tbody>
</table>

Actual profit

1.725.0

**Answer to Lecture Example 3**

Some examples would include:

**Price / rate variance**

Favourable – this may indicate buying a material / employing labour too cheaply which may have quality implications.

Adverse – a decision to purchase better quality materials may be the right thing to do and lead to better efficiency.

**Usage / efficiency variances**

Favourable – this may indicate that too little material or time is being used which may result in poor quality goods.

**Sales price variance**

Favourable – it may be that price has been raised too high so that volume and overall revenue is down.

Adverse – this may have been reduced in order to drive more sales.

**Chapter 2a**

**Answer to Lecture Example 1**

(a) Under traditional absorption costing

OAR = $190,000 ÷ 67,000 = $2.836/hr

<table>
<thead>
<tr>
<th></th>
<th>$/unit</th>
<th>$/unit</th>
<th>$/unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>20.67</td>
<td>17.84</td>
<td>17.84</td>
</tr>
<tr>
<td>B</td>
<td>20.00</td>
<td>20.00</td>
<td>20.00</td>
</tr>
<tr>
<td>C</td>
<td>(0.67)</td>
<td>2.16</td>
<td>2.16</td>
</tr>
</tbody>
</table>

Revised product cost
Sales price
Profit
(b) Under ABC

Workings: recovery rates

(1) Machine cost

\[
\frac{55,000}{40,000 + 50,000 + 4,000} = 0.585 \text{ per machine hour}
\]

(2) QC & set up

\[
\frac{90,000}{10 + 13 + 2} = 3,600 \text{ per production run}
\]

(3) Receiving

\[
\frac{30,000}{10 + 10 + 2} = 1,363.64 \text{ per component receipt}
\]

(4) Packing

\[
\frac{15,000}{20 + 20 + 20} = 250 \text{ per customer order}
\]

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machining costs</td>
<td>23,404</td>
<td>29,255</td>
<td>2,341</td>
<td>55,000</td>
</tr>
<tr>
<td>Quality control &amp; set-up</td>
<td>36,000</td>
<td>46,800</td>
<td>7,200</td>
<td>90,000</td>
</tr>
<tr>
<td>Receiving</td>
<td>13,636</td>
<td>13,636</td>
<td>2,728</td>
<td>30,000</td>
</tr>
<tr>
<td>Packing</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Total overhead costs</td>
<td>78,040</td>
<td>94,691</td>
<td>17,269</td>
<td>190,000</td>
</tr>
</tbody>
</table>

| Units produced | 20,000 | 25,000 | 2,000 |
| Overhead cost/unit | $3.90 | $3.79 | $8.63 |

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct materials cost</td>
<td>5.00</td>
<td>10.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Direct labour cost</td>
<td>10.00</td>
<td>5.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Production overhead cost</td>
<td>3.9</td>
<td>3.79</td>
<td>8.63</td>
</tr>
</tbody>
</table>

\[
\begin{align*}
\text{Sales price} & = 20.00 \quad 20.00 \quad 20.00 \\
\text{Gross profit/unit} & = 1.1 \quad 1.21 \quad (3.63)
\end{align*}
\]

(c) Items to consider are:

How much more cost have we been able to allocate on a meaningful basis?

Have we the right cost drivers?

Why have the costs changed?

Do we need to revisit selling prices?

Do we need to alter the product mix?

Should we cease production of C? – bear in mind decisions should be based upon contribution
Chapter 2b

Answer to Lecture Example 1

\[
\begin{align*}
\text{Selling price} & \quad 125.00 \\
\text{margin (25%)} & \quad 31.25 \\
\text{Target cost} & \quad 93.75 \\
\end{align*}
\]

\[
\begin{align*}
\text{Expected cost} & \quad \$ \\
\text{Timber} & \quad 48.00 \\
\text{Roofing material} & \quad 35.00 \\
\text{Wire} & \quad 1.50 \\
\text{Labour} & \quad 14.00 \\
\text{Variable overhead} & \quad 3.00 \\
\end{align*}
\]

\[
\begin{align*}
\text{Total} & \quad 101.50 \\
\end{align*}
\]

\[
\begin{align*}
\text{Cost gap} & \quad 7.75 \\
\end{align*}
\]

Answer to Lecture Example 2

- Cheaper materials
- Fewer parts
- Cheaper labour
- No non-value adding activities
- Training
- Automation

Chapter 2c

Answer to Lecture Example 1

<table>
<thead>
<tr>
<th>Development</th>
<th>Introduction</th>
<th>Growth</th>
<th>Maturity</th>
<th>Decline</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales volume (units)</td>
<td>4,000</td>
<td>9,000</td>
<td>30,000</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>$000s</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenue</td>
<td>2,396</td>
<td>4,941</td>
<td>13,470</td>
<td>3,490</td>
<td>24,297</td>
</tr>
<tr>
<td>Variable Cost</td>
<td>996</td>
<td>2,241</td>
<td>5,970</td>
<td>1,490</td>
<td>10,697</td>
</tr>
<tr>
<td>Overhead</td>
<td>400</td>
<td>900</td>
<td>1,800</td>
<td>750</td>
<td>3,850</td>
</tr>
<tr>
<td>Development cost</td>
<td>500</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>500</td>
</tr>
</tbody>
</table>

so not appropriate

Whether price variances are occurring
Chapter 2d

Answer to Lecture Example 1

(a) Machine X loses 20 hours / mth = 5 hours / week
    loss of 12.5%
    Max output therefore 180 – 12.5%
No of trolleys /4
    Machine Y
    Machine Z

Z is therefore the bottleneck

(b) TA ratio:
    Return / hr 2,000-600 hours * 30 trolleys
    Trolleys 42,000
    40
    1,050
    Cost / hr 5,500 + 8,000 + (450,000/48)
    22,875
    40
    572
    TA ratio
    Return / hour
    Cost / hour
    1.84

Answer to Lecture Example 2

Increase selling price
Buy cheaper materials
Decrease labour
Decrease overhead

Answer to Lecture Example 3

(a) Will Grace
Sales $ 500,000 $ 475,000
Variable production costs
  Materials 120,000 144,000
  Labour 80,000 96,000
Fixed production costs (W1) 200,000 240,000
Less: closing inventory (W3) – (100,000)
Adjustment for (over)/under absorption (W2) – (400,000) (40,000) (340,000)
Gross Profit 100,000 135,000

(W1) OAR = £200,000 / 10,000 = $20/unit
(W2)

<table>
<thead>
<tr>
<th></th>
<th>Will</th>
<th>Grace</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual overhead</td>
<td>200,000</td>
<td>200,000</td>
</tr>
<tr>
<td>Fixed overhead absorbed</td>
<td>200,000</td>
<td>240,000</td>
</tr>
<tr>
<td>(Over)/Under absorption</td>
<td>–</td>
<td>(40,000)</td>
</tr>
</tbody>
</table>

(W3)

<table>
<thead>
<tr>
<th></th>
<th>Will</th>
<th>Grace</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening inventory</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>add: production</td>
<td>10,000</td>
<td>12,000</td>
</tr>
<tr>
<td>less: sales</td>
<td>(10,000)</td>
<td>(9,500)</td>
</tr>
<tr>
<td>Closing inventory</td>
<td>–</td>
<td>2,500</td>
</tr>
</tbody>
</table>

Valued at full cost / unit $40 $0 $100,000

(b)

<table>
<thead>
<tr>
<th></th>
<th>Will</th>
<th>Grace</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return</td>
<td>$500,000</td>
<td>475,000</td>
</tr>
<tr>
<td>Sales</td>
<td>(120,000)</td>
<td>(144,000)</td>
</tr>
<tr>
<td>Less: materials</td>
<td>380,000</td>
<td>331,000</td>
</tr>
<tr>
<td>+ hrs</td>
<td>20,000</td>
<td>20,000</td>
</tr>
<tr>
<td>Return/hr</td>
<td>$19</td>
<td>$16.5556</td>
</tr>
<tr>
<td>Costs</td>
<td>280,000</td>
<td>296,000</td>
</tr>
<tr>
<td>+ hrs</td>
<td>20,000</td>
<td>20,000</td>
</tr>
<tr>
<td>Cost/hr</td>
<td>$14</td>
<td>$14.80</td>
</tr>
<tr>
<td>TA ratio</td>
<td>1.36</td>
<td>1.12</td>
</tr>
</tbody>
</table>
Chapter 2e

Answer to Lecture Example 1

Waste
- Cost of unused raw materials and disposal
- Fines for compliance procedures eg pollution
- Environmental taxes

Water consumption
- Buying it and disposing of it

Energy
- Identification of inefficiencies and wasteful practices

Transport and travel
- Invest in fuel efficient vehicles?

Consumables and raw materials
- Refilling consumables rather than replacing
- Consideration of the environment when sourcing raw materials eg mines

Chapter 3

Answer to Lecture Example 1

(a) \[ \text{BEP} = \frac{\text{Fixed costs}}{\text{Contribution/unit}} = \frac{5,700}{8 - 6.50} = 3,800 \text{ units} \]

Break-even revenue = \( 3,800 \times \$8 = \$30,400 \)

(b) \[ \text{C/S ratio} = \frac{\text{Contribution/unit}}{\text{Sales price}} = \frac{\$1.50}{\$8} = 0.1875 \]

Break-even revenue = \( \frac{5,700}{0.1875} = \$30,400 \)

(c) Margin of safety = \( 5,000 - 3,800 = 1,200 \text{ units} \)

or \[ \frac{1,200}{5,000} \times 100 = 24\% \]

The sales volume must fall by 24% from budgeted level before a loss is made.

(d) Sales volume = \( \frac{10,000 + 5,700}{\$1.50} = 10,467 \text{ units} \)
**Answer to Lecture Example 2**

Total costs at BEP  =  $5,700 + ($6.50 \times 3,800)  = $30,400

Total revenue at BEP  =  $3,800 \times $8  = $30,400

We can also draw a contribution graph which shows that the gap between the total revenue line and the variable cost line is the contribution:
Answer to Lecture Example 3

Gradient of line  = \frac{\text{Change in profit}}{\text{Change in volume}} = \text{contribution per unit} = \$1.50

[Diagram showing the calculation of the contribution per unit and the break-even point (BEP) with a margin of safety.]

Answer to Lecture Example 4

(a) (i)-(iv) Points identified on graph in the above graph from Lecture Example 3.

(b) The line would start at \(-6,500\) and cross the x axis at 4.333 units using \(\text{BEP} = \frac{\text{FC}}{\text{unit cost}}\) = \\
\[
\frac{6,500}{1.5} = 4,333 \text{ units}
\]

The gradient would not change.

(c) If selling price is \$10

The contribution will become

\$10 - 6.50 = \$3.50

So break-even point will be

\[
\frac{5,700}{3.50} = 1,629 \text{ units}
\]
### Answer to Lecture Example 5

<table>
<thead>
<tr>
<th>Footballs</th>
<th>Baseballs</th>
<th>Rugbyballs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selling price</td>
<td>$7</td>
<td>$6</td>
</tr>
<tr>
<td>Variable costs</td>
<td>$3</td>
<td>$4.50</td>
</tr>
<tr>
<td>Contribution</td>
<td>$4</td>
<td>$1.50</td>
</tr>
</tbody>
</table>

Breakeven point = \( \frac{\text{Fixed costs}}{\text{Average contribution}} \)

= \( \frac{\$20,000}{\$2.889} \)

= 6,923 units

(W1) Average contribution = \( \frac{(4 \times 2) + (1.50 \times 4) + (4 \times 3)}{2 + 4 + 3} \)

= \( \frac{\$2.889}{6,923} \)

The 6,923 units would be split as follows:

<table>
<thead>
<tr>
<th>Sales mix</th>
<th>Units</th>
<th>SP</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football</td>
<td>2</td>
<td>7</td>
<td>10,766</td>
</tr>
<tr>
<td>Baseball</td>
<td>4</td>
<td>6</td>
<td>18,462</td>
</tr>
<tr>
<td>Rugbyball</td>
<td>3</td>
<td>9</td>
<td>20,772</td>
</tr>
</tbody>
</table>

\[ \begin{array}{ccc}
\text{Total} & 6,923 & 50,000 \\
\end{array} \]

### Answer to Lecture Example 6

<table>
<thead>
<tr>
<th>Budgets</th>
<th>Costs</th>
<th>Revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Footballs</td>
<td>(2,000 \times $3)</td>
<td>6,000</td>
</tr>
<tr>
<td>Baseballs</td>
<td>(4,000 \times $4.50)</td>
<td>18,000</td>
</tr>
<tr>
<td>Rugbyballs</td>
<td>(3,000 \times $5)</td>
<td>15,000</td>
</tr>
</tbody>
</table>

| Fixed costs | 20,000 |
| Total costs | 59,000 |
**Answer to Lecture Example 7**

<table>
<thead>
<tr>
<th>Contribution</th>
<th>Sales</th>
<th>C/S ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>$</td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>Footballs</td>
<td>8,000</td>
<td>14,000</td>
</tr>
<tr>
<td>Baseballs</td>
<td>6,000</td>
<td>24,000</td>
</tr>
<tr>
<td>Rugby balls</td>
<td>12,000</td>
<td>27,000</td>
</tr>
</tbody>
</table>

Plot in order of C/S ratio

<table>
<thead>
<tr>
<th>Product</th>
<th>Cumulative sales</th>
<th>Cumulative profit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Footballs</td>
<td>14,000</td>
<td>(12,000)</td>
</tr>
<tr>
<td>Rugby balls</td>
<td>41,000</td>
<td>0,000</td>
</tr>
<tr>
<td>Baseballs</td>
<td>65,000</td>
<td>6,000</td>
</tr>
</tbody>
</table>

Multi-product P/V chart
Chapter 4

Answer to Lecture Example 1

(a)

<table>
<thead>
<tr>
<th>Production plan</th>
<th>Fairy</th>
<th>Butterfly</th>
<th>Pixie</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batches</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>400</td>
</tr>
<tr>
<td>Hours / batch</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Hours needed</td>
<td>250</td>
<td>100</td>
<td>50</td>
<td>400</td>
</tr>
<tr>
<td>Hours available</td>
<td></td>
<td></td>
<td></td>
<td>300</td>
</tr>
<tr>
<td>Shortfall</td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Sales price / batch | 150 | 120 | 100 |
Variable cost / batch | 100 | 80  | 70  |
Contribution/batch | $50 | $40 | $30 |

Hours / batch | 5 | 2 | 1 |
Contribution/machine hour | $10 | $20 | $30 |
Rank | 3rd | 2nd | 1st |

Production schedule | Hrs / unit | hrs available | $ contribution /hour |
Produce maximum P | 50 | 1 | (50) | 30 |
Produce maximum B | 50 | 2 | (100) | 20 |
Produce F with (150/5) | 30 | 5 | (150) | 10 |

(b) With five extra hours you would make one more batch of Fairy cakes

(c) The extra contribution from one batch is $50

Contribution per hour $\frac{50}{5} = $10 / hour

Shadow price of 1 hour is therefore $10
Answer to Lecture Example 2

**Step 1** Calculate return per unit of scarce resource and rank ingredients

<table>
<thead>
<tr>
<th>Product</th>
<th>Adam</th>
<th>James</th>
<th>Luke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return per batch ($)</td>
<td>90</td>
<td>165</td>
<td>95</td>
</tr>
<tr>
<td>Kgs per batch</td>
<td>7</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Return per kg ($)</td>
<td>12.86</td>
<td>18.33</td>
<td>23.75</td>
</tr>
<tr>
<td>Ranking</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

**Step 2** Determine the optimum product mix

<table>
<thead>
<tr>
<th>Product</th>
<th>Demand Batches</th>
<th>Ingredient L required</th>
<th>Material L available</th>
<th>Batches produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract – Adam</td>
<td>50 (x7)</td>
<td>350</td>
<td>7,000</td>
<td>50</td>
</tr>
<tr>
<td>– James</td>
<td>50 (x9)</td>
<td>450</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>– Luke</td>
<td>50 (x4)</td>
<td>200</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Luke</td>
<td>350 (×4)</td>
<td>1,400</td>
<td>1,000</td>
<td>350</td>
</tr>
<tr>
<td>James</td>
<td>400 (×9)</td>
<td>3,600</td>
<td>1,000</td>
<td>400</td>
</tr>
<tr>
<td>Adam</td>
<td>500 (×7)</td>
<td>3,500</td>
<td>1,000</td>
<td>142*</td>
</tr>
</tbody>
</table>

* 1000 ÷ 7 = 142.86

Answer to Lecture Example 3

(a) Let
p = weekly number of purses
h = weekly number of handbags

(b)

Leather 1.5p + 2h ≤ 600
Skilled labour 0.75p + 0.5h ≤ 210
Quota p – h ≤ 0
Non-negativity p, h ≥ 0

(c) Objective:
Maximise 5p + 6h
(d) \[352\]

Leather

EU quota

Objective

Labour

(e) Optimal production: 160 purses
180 handbags

(f) Contribution = 5p + 6h
= (5 \times 160) + (6 \times 180)
= $1,880 per week
Answer to Lecture Example 4

The steps up to determining the feasible region are exactly the same

Determine optimal solution
Clearly this will not be at 0
At A there is 167 handbags and 167 purses
At B there is 180 handbags and 160 purses
At C there is 300 handbags and no purses

Point B therefore will generate the most contribution. Simultaneous equations can be used to determine the exact values of purses and handbags and the total contribution.

Optimal point is Point B where labour and leather intersect

\[ 1.5p + 2h = 600 \quad (1) \]
\[ 0.75p + 0.5h = 210 \quad (2) \]
\[ 1.5p + 1h = 420 \quad (3) \text{ (multiply (2) by 2)} \]
\[ h = 180 \quad (1) – (3) \]
\[ 1.5p + 360 = 600 \quad \text{Substitute } h \text{ into (1)} \]
\[ 1.5p = 420 \]
\[ p = 160 \]

Optimal production: 160 purses
180 handbags

Contribution = 5p + 6h
= (5 × 160) + (6 × 180)
= $1,880 per week
Answer to Lecture Example 5

(a) Optimal production plan is for 160 purses and 180 handbags

Leather required is therefore \((160 \times 1.5) +(180 \times 2) = 600 \text{ m}^2\).

Available leather is 600 m². Therefore there is no slack leather.

Labour required is \((160 \times 0.75) +(180 \times 0.5) = 210 \text{ hours}\)

Available hours are \((6 \times 35) 210\). Therefore there is no slack labour.

The quota ruled that at least as many handbags as purses had to be produced. 20 additional handbags were made therefore the surplus is 20 handbags.

(b) If one more unit of leather available:

\[
\begin{align*}
1.5p + 2h &= 601 \quad \text{(leather)} \\
0.75p + 0.5h &= 210 \quad \text{(labour)}
\end{align*}
\]

So: 
\[
\begin{align*}
1.5p + 1h &= 420 \\
h &= 181 \\
1.5p + 362 &= 601 \\
1.5p &= 239 \\
p &= 159.33
\end{align*}
\]

Optimal production: 
159.33 purses
181 handbags

Contribution 
\[
= 5p + 6h \\
= (5 \times 159.33) + (6 \times 181) \\
= $1,882.65 \text{ per week}
\]

Original contribution 
\[
= $1,880.00
\]

Shadow price 
\[
$2.65
\]

Usual price 
8.00

Maximum price 
\[
10.65
\]

$2.65 is the maximum extra KG Ltd would be prepared to pay to obtain one further m² of leather. The maximum price it would pay is therefore $10.65 for 1 m²

If one more unit of labour available:

\[
\begin{align*}
1.5p + 2h &= 600 \quad \text{(leather)} \\
0.75p + 0.5h &= 211 \quad \text{(labour)}
\end{align*}
\]

So: 
\[
\begin{align*}
1.5p + 1h &= 422 \\
h &= 178 \\
1.5p + 356 &= 600 \\
1.5p &= 244 \\
p &= 162.67
\end{align*}
\]
Optimal production: 178 handbags
162.67 purses

Contribution = 5p + 6h
= (5  \times  162.67) + (6  \times  178)
= $1,881.35 per week

Original contribution = $1,880.00

Shadow price $1.35

Shadow price  1.35
Usual price  4.20
Maximum price  5.55

$1.35 is the maximum extra KG Ltd would be prepared to pay to obtain one further hour of labour. The maximum price it would pay is therefore $5.55.

Chapter 5

Answer to Lecture Example 1

\[
\frac{\% \Delta P}{\% \Delta Q} = \frac{\frac{1}{12}}{\frac{2,500}{16,000}} = 8.3\% \text{ increase}
\]

\[
\frac{\% \Delta Q}{\% \Delta P} = \frac{15.6\%}{8.3\%} = 1.9
\]

Demand is elastic

Answer to Lecture Example 2

\[P = a - bQ\]

\[b = \frac{\frac{1}{2,500}}{12} = 0.0004\]

\[12 = a - (0.0004 \times 16,000)\]

\[a = 18.4\]

\[P = 18.4 - 0.0004Q\]

Therefore to sell 25,000 tickets:

\[P = 18.4 - 25,000 \times 0.0004 = $8.40 \text{ per ticket.}\]
Answer to Lecture Example 3

(a) \[ P = a - bQ \]
\[ b = \frac{\$1}{2,500} = 0.0004 \]
\[ 12 = a - (0.0004 \times 16,000) \]
\[ a = 18.4 \]
\[ P = 18.4 - 0.0004Q \]

(b) \[ MC = MR \]
\[ 5 = 18.4 - 0.0008Q \]
Therefore, \( Q = 16,750 \) units

(c) \[ P = 18.4 - (0.0004 \times 16,750) \]
\[ = \$11.70 \text{ per unit} \]

(d) \[ MR = 18.4 - 0.0008Q \]
\[ MR = 0 \text{ at maximum revenue} \]
\[ 18.4 - 0.0008Q = 0 \]
\[ Q = 23,000 \text{ units} \]
\[ P = \$9.20 \text{ per unit} \]

Answer to Lecture Example 4

<table>
<thead>
<tr>
<th>Output (units)</th>
<th>Total Cost</th>
<th>MC</th>
<th>Selling Price</th>
<th>Total Revenue</th>
<th>MR</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>$10</td>
<td>10</td>
<td>$5.00</td>
<td>$50</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>20</td>
<td>$25</td>
<td>15</td>
<td>$4.50</td>
<td>$90</td>
<td>40</td>
<td>65</td>
</tr>
<tr>
<td>30</td>
<td>$45</td>
<td>20</td>
<td>$4.00</td>
<td>$120</td>
<td>30</td>
<td>75</td>
</tr>
<tr>
<td>40</td>
<td>$70</td>
<td>25</td>
<td>$3.50</td>
<td>$140</td>
<td>20</td>
<td>70</td>
</tr>
<tr>
<td>50</td>
<td>$100</td>
<td>30</td>
<td>$3.00</td>
<td>$150</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>60</td>
<td>$135</td>
<td>35</td>
<td>$2.50</td>
<td>$150</td>
<td>0</td>
<td>15</td>
</tr>
</tbody>
</table>

Output level of 30 units. Selling price of $4 per unit.
Answer to Lecture Example 5

The product life cycle comprises five stages:

- Development
- Introduction
- Growth
- Maturity
- Decline

During the first stage the product is being developed. No sales are made until introduction.

In the introduction stage the company needs to price the product to achieve its market strategy using either penetration or skimming pricing policies.

A penetration policy is used with the objective of achieving a high level of demand very quickly by using a low price that is affordable to a large number of potential customers. This has the effect of discouraging new suppliers to the market because the unit profitability is relatively low, but the high volume of sales enables the initial supplier to recover their development costs.

A skimming policy is particularly appropriate to a product that has a novelty value or that is technologically advanced. Such a policy uses a price that is high and this restricts the volume of sales since only high worth customers can afford the product, but the high unit profitability enables the initial supplier to recover their development costs. However, the high unit profitability attracts competitors to the market.

The X organisation is launching a technologically advanced product which will be demanded by high worth customers who are proud to be amongst the first to own such a state of the art product. This is exactly the type of product for which a price skimming policy is appropriate.

Competitors will be attracted to the product by its high price and will seek to compete with it by introducing their own version of the product at much lower development costs (by reverse engineering X’s product) so it is important for X to reduce the price during the growth stage of the product's life cycle. There may be many price reductions during this phase so that the product gradually becomes more affordable to lower social economic groups.

As the product enters the maturity stage the price will need to be lowered further, though a profitable contribution ratio would continue to be earned. The opportunity to make profit and cash surpluses should still exist. However, in this type of market the price will tend to be set by the market and X will have to accept that price. Thus X will need to focus on the control of its costs to ensure that the product will remain profitable.

When the product enters the decline phase a loyal group of customers may continue to be prepared to pay a reasonable price and at this price the product will continue to be profitable, especially as costs continue to reduce. Eventually the price will be lowered to marginal cost or even lower in order to sell off inventories of what is now an obsolete product as it has been replaced by a more technologically advanced item.
Chapter 6

Answer to Lecture Example 1

Historic cost can be ignored as it is a sunk cost.

X

Since X is no longer used by the company, the inventory of X will be used rather than buying in new supplies of X. (Note: the next best alternative to using the inventory is to scrap it for $2.20/kg)

So relevant cost X

\[
\begin{align*}
300 \text{kg inventory: lost scrap value} & \times (300 \times $2.20) \quad 660 \\
100 \text{kg buy in} & \times (100 \times $3) \quad 300 \\
960
\end{align*}
\]

Y

If the inventory of Y is used it will have to be replaced when it is needed elsewhere in the business.

So relevant cost Y

\[
\begin{align*}
200 \text{ kg at current replacement cost} & \times (200 \times $2) \quad 400
\end{align*}
\]

Answer to Lecture Example 2

Labour is currently working at full capacity ∴

if 15 hours are used in the contract \[
\frac{15 \text{ hrs}}{5 \text{ hrs}} = 3 \text{ units of X will not be made}
\]

Cash flows under each option

<table>
<thead>
<tr>
<th>Undertake contract</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct labour</td>
<td>90</td>
</tr>
<tr>
<td>(15 hrs @ $6)</td>
<td></td>
</tr>
<tr>
<td>Lost contribution 3X</td>
<td>75</td>
</tr>
<tr>
<td>(3 \times $25)</td>
<td></td>
</tr>
<tr>
<td>Relevant cost</td>
<td>165</td>
</tr>
</tbody>
</table>

Alternative approach

The cash flows which will change if the contract goes ahead are:

<table>
<thead>
<tr>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lost revenue from X</td>
</tr>
<tr>
<td>(3 \times $75)</td>
</tr>
<tr>
<td>Saved costs from X materials (3 \times 20)</td>
</tr>
<tr>
<td>Relevant cost of 15 hrs of labour</td>
</tr>
</tbody>
</table>
Answer to Lecture Example 3

Accept or reject decisions

Sales revenue (1) 36,000
Costs
Material X (2) (200)
Material Z (3) 4,200
Labour (4) 11,000
Variable overhead (5) 3,600
Depreciation (6) –
Fixed overheads (7) –
Lost scrap proceeds (8) 3,000

Net Relevant Contribution (21,600)

Conclusion: the proposal should be accepted as it makes a positive contribution of $14,400 based on relevant costs.

(1) Revenue earned as a result of producing and selling T.
(2) No other use for X in business, but $200 disposal costs are saved by using X to make Ts.
(3) Z is used in the business and will have to be replaced for $0.175 x 2 x 12,000 = $4,200.

Assuming inventories can be bought at this price.

(4) Opportunity cost of using labour = contribution foregone + cost of labour
    = $1,000 + $10,000
    = $11,000

(5) Variable overhead is only incurred when units are made.
    ∴ relevant cost = 12,000 x $0.30

(6) Depreciation is not a cash flow and ∴ not relevant

(7) These fixed overheads will be incurred regardless of whether or not Ts are made, therefore cost is not relevant.

(8) If machine is used, instead of scrapped the business loses $(7,000 – 4,000) of scrap proceeds.

However, the following non-financial factors also need to be considered:

(a) The likelihood of a more profitable proposal being received;
(b) Whether repeat orders would be expected at the same price in future years;
(c) Whether the company’s present customers can be differentiated from this special order price.
Answer to Lecture Example 4

<table>
<thead>
<tr>
<th></th>
<th>P</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production (units)</td>
<td>1,000</td>
<td>1,500</td>
</tr>
<tr>
<td>Variable cost of making</td>
<td>$11</td>
<td>$17</td>
</tr>
<tr>
<td>Variable cost of buying</td>
<td>$12</td>
<td>$21</td>
</tr>
<tr>
<td>Extra cost of buying / unit</td>
<td>$1 = 4</td>
<td></td>
</tr>
<tr>
<td>Extra variable cost of buying (per annum)</td>
<td>$1,000 = 6,000</td>
<td></td>
</tr>
<tr>
<td>Fixed costs saved by buying</td>
<td>(1,500) = (3,000)</td>
<td></td>
</tr>
<tr>
<td>Extra total cost of buying</td>
<td>(500) = 3,000</td>
<td></td>
</tr>
</tbody>
</table>

The company would save $500 pa by sub-contracting component P but should make units of J itself.

Further considerations

(i) If units of P are sub-contracted, the company will have spare capacity. How should that spare capacity be profitably used? Are there hidden benefits to be obtained from sub-contracting? Would the company’s workforce resent the loss of work to an outside sub-contractor, and might such a decision cause an industrial dispute?

(ii) Would the sub-contractor be reliable with delivery times, and would he supply components of the same quality as those manufactured internally?

(iii) Does the company wish to be flexible and maintain better control over operations by making everything itself?

(iv) Are the estimates of fixed cost savings reliable?

Answer to Lecture Example 5

(a) If Keir were shut down the incremental costs and revenues are:

<table>
<thead>
<tr>
<th></th>
<th>$'000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lost revenue</td>
<td>600</td>
</tr>
<tr>
<td>Saved</td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td>200</td>
</tr>
<tr>
<td>Labour</td>
<td>95</td>
</tr>
<tr>
<td>Variable overhead</td>
<td>75</td>
</tr>
<tr>
<td>Fixed overhead</td>
<td>40</td>
</tr>
<tr>
<td>20% x $200</td>
<td>40</td>
</tr>
<tr>
<td>Selling costs</td>
<td></td>
</tr>
<tr>
<td>Profit foregone</td>
<td>150</td>
</tr>
</tbody>
</table>

Alternatively:

<table>
<thead>
<tr>
<th></th>
<th>$'000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed costs still incurred</td>
<td></td>
</tr>
<tr>
<td>80% x $200</td>
<td>160</td>
</tr>
<tr>
<td>Loss forecast</td>
<td>(10)</td>
</tr>
</tbody>
</table>

(b) Other factors

- Losing over 54% of company’s revenue – other costs likely to change
- Product interdependencies
- Possibility of changing sales commission or reducing expenses in place of closure
- Capital costs of closure not considered such as asset sales/write-offs
- Redundancy costs
Answer to Lecture Example 6

<table>
<thead>
<tr>
<th>Product</th>
<th>Increased selling price</th>
<th>Incremental revenue</th>
<th>Further Costs</th>
<th>Inc benefit / (cost)</th>
<th>Process further?</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>2</td>
<td>5,000</td>
<td>10,000</td>
<td>(5,000)</td>
<td>No</td>
</tr>
<tr>
<td>Y</td>
<td>5</td>
<td>7,500</td>
<td>8,000</td>
<td>(500)</td>
<td>No</td>
</tr>
<tr>
<td>Z</td>
<td>7</td>
<td>14,000</td>
<td>12,000</td>
<td>2,000</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Chapter 7

Answer to Lecture Example 1

(a) Risk-seeker chooses A as it gives a chance of earning the best NPV of $25,000.
(b) Risk-neutral decision-maker is indifferent between A and B as they give the same expected NPV.
(c) Risk-averse decision-maker chooses B to avoid the chance of the worst NPV of $(10,000) with investment A.

Answer to Lecture Example 2

<table>
<thead>
<tr>
<th>Demand (units)</th>
<th>Special contract (units)</th>
<th>900</th>
<th>700</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td></td>
<td>4,200</td>
<td>3,600</td>
<td>3,000</td>
</tr>
<tr>
<td>500</td>
<td></td>
<td>4,200</td>
<td>4,600</td>
<td>4,000</td>
</tr>
<tr>
<td>700</td>
<td></td>
<td>4,200</td>
<td>4,600</td>
<td>5,000</td>
</tr>
</tbody>
</table>

Answer to Lecture Example 3

EV(900) = 4,200
EV(700) = (3,600 × 0.2) + (4,600 × 0.8) = 4,400
EV(500) = (3,000 × 0.2) + (4,000 × 0.6) + (5,000 × 0.2) = 4,000
∴ to maximise profits over the long term choose 700 for special contract.

Answer to Lecture Example 4

Maximin rule:
Maximise the possible minimum return that the decision-maker could get
ie. choose 900 units.
Answer to Lecture Example 5

Maximax rule:
Choose the option giving the highest possible return
ie. choose 500 units.

Answer to Lecture Example 6

Opportunity cost table

<table>
<thead>
<tr>
<th>Demand</th>
<th>900</th>
<th>700</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>0</td>
<td>600</td>
<td>1,200</td>
</tr>
<tr>
<td>500</td>
<td>400</td>
<td>0</td>
<td>600</td>
</tr>
<tr>
<td>700</td>
<td>800</td>
<td>400</td>
<td>0</td>
</tr>
</tbody>
</table>

Maximum regret: $800 $600 $1,200

Decision – set order level for special contract at 700 units.

Working example:
If demand is 300 units, the best special order level would have been 900 units. If an order level of 700 units has been chosen there would be an opportunity cost equal to the difference between the profits of $4,200 and $3,600 at the 900 units and 700 units order levels respectively.

Answer to Lecture Example 7

EV with perfect information

\[
\begin{array}{cccc}
\text{Demand} & \text{Contract} & \text{Contribution} & \rho & \text{EV} \\
\text{Units} & \text{Units} & \$ & & \$
\hline
300 & 900 & 4,200 & 0.2 & 840 \\
500 & 700 & 4,600 & 0.6 & 2,760 \\
700 & 500 & 5,000 & 0.2 & 1,000 \\
\end{array}
\]

\[ \therefore \text{VOPI} = \text{EV with PI} - \text{EV without PI} = 4,600 - 4,400 = 200 \]

This is the maximum John would be willing to pay each month for the survey.
## Answer to Lecture Example 8

(a) **Profit generated ($'000)**

<table>
<thead>
<tr>
<th>VC ($)</th>
<th>100,000</th>
<th>110,000</th>
<th>120,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>290</td>
<td>280</td>
<td>270</td>
</tr>
<tr>
<td>13</td>
<td>260</td>
<td>250</td>
<td>240</td>
</tr>
<tr>
<td>14</td>
<td>230</td>
<td>220</td>
<td>210</td>
</tr>
</tbody>
</table>

(b) **Joint probability**

<table>
<thead>
<tr>
<th>Fixed Costs</th>
<th>$100,000</th>
<th>$110,000</th>
<th>$120,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prob</td>
<td>0.4</td>
<td>0.5</td>
<td>0.1</td>
</tr>
<tr>
<td>$12</td>
<td>0.2</td>
<td>0.08</td>
<td>0.1</td>
</tr>
<tr>
<td>VC</td>
<td>0.35</td>
<td>0.14</td>
<td>0.175</td>
</tr>
<tr>
<td>$13</td>
<td>0.45</td>
<td>0.18</td>
<td>0.225</td>
</tr>
</tbody>
</table>

**Expected value of profit**

<table>
<thead>
<tr>
<th>Fixed Costs</th>
<th>100,000</th>
<th>110,000</th>
<th>120,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>23,200</td>
<td>28,000</td>
<td>5,400</td>
</tr>
<tr>
<td>VC</td>
<td>36,400</td>
<td>43,750</td>
<td>8,400</td>
</tr>
<tr>
<td>($)</td>
<td>41,400</td>
<td>49,500</td>
<td>9,450</td>
</tr>
</tbody>
</table>

\[
EV \text{ profit} = \sum px
\]

\[
= 245,500
\]
Answer to Lecture Example 9

(a) All values in $'000

<table>
<thead>
<tr>
<th>Option</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sell</td>
<td>5,000</td>
</tr>
<tr>
<td>A</td>
<td>11,167</td>
</tr>
<tr>
<td>B</td>
<td>13,500</td>
</tr>
<tr>
<td>C</td>
<td>7,000</td>
</tr>
<tr>
<td>Exp (4,000)</td>
<td>8,500</td>
</tr>
<tr>
<td>Good 2/3</td>
<td>6,500</td>
</tr>
<tr>
<td>Poor 1/3</td>
<td>4,000</td>
</tr>
<tr>
<td>Cheap (2,000)</td>
<td>5,000</td>
</tr>
<tr>
<td>Major refurb</td>
<td>7,167,000</td>
</tr>
<tr>
<td>Cheap refurb</td>
<td>5,000,000</td>
</tr>
</tbody>
</table>

Key
- □ = decision point
- ○ = outcome point
- EV @ B = (2/3 × $13,500) + (1/3 × $6,500) = $11,167
- EV @ C = (2/3 × $8,500) + (1/3 × $4,000) = $7,000

(b) Decision at A:
The expected values of the options are:
1. Sell $5,000,000
2. Major refurb $7,167,000 (11,167 – 4,000)
3. Cheap refurb $5,000,000 (7,000 – 2,000)

Captain should undertake the major refurbishment.
Answer to Lecture Example 10

(a) All values in $'000s

Key:  = decision point
      = outcome point

\[
\text{EV @ G} = (0.91 \times 13,500) + (0.09 \times 6,500) \\
= 12,870
\]

\[
\text{EV @ H} = (0.91 \times 8,500) + (0.09 \times 4,000) \\
= 8,095
\]

\[
\text{EV @ I} = (0.13 \times 8,500) + (0.87 \times 4,000) \\
= 4,585
\]

Decision at E:
Exp. refurb = 12,870 – 4,000 = 8,870
Cheap refurb = 8,095 – 2,000 = 6,095

∴ Choose exp. refurb
Decision at F:

- Sell = 5,000
- Cheap refurb = 4,585 – 2,000 = 2,585

∴ Choose sell.

\[ EV@D = (0.69 \times 8,870) + (0.31 \times 5,000) \]
\[ = 7,670 \]

(b) Value of perfect information:

Value with info 7,670
Value no info 7,167

\[ \text{Answer to Lecture Example 11} \]

(a) If material costs were more than double the original estimate the product would make a loss

(b) Sales would have to fall by over 4,000 units (40%) i.e. to under 6,000 for the product to make a loss

Chapter 8

No Lecture examples

Chapter 9

Answer to Lecture Example 1

Materials:
  Variable cost = $3/unit

Overhead:
  Fixed cost = $20,000

Labour:
  Output | Cost
  14,000 | 35,000
  10,000 | 27,000
  4,000  |  8,000

(High-low method)

\[ \text{.. VC/unit} = 2 \]

By substitution into high output:

Total VC = $28,000

\[ \text{.. Total FC} = 35,000 – 28,000 \]
\[ = 7,000 \]

\[ \text{.. Flexed budgeted cost:} \]

Materials (12,350 × 3) 37,050
Labour (7,000 + 2 × 12,350) 31,700
Overhead 20,000

\[ \text{Actual Costs – Flexed Budgeted cost} \]
\[ = 88,750 \]
\[ = 1,250 \text{ (A)} \]
Answer to Lecture Example 2

| Sales  | Q2 $123,773 | Q3 $129,962 | Q4 $136,460 | 2X14 Q1 $143,283 | Total $533,478 |

The revised budget should incorporate 5% growth, starting from Q1’s actual figure.

Q2: $117,879 \times 1.05 = $123,773
Q3: $123,773 \times 1.05 = $129,962
Q4: $129,962 \times 1.05 = $136,460
Q1: $136,460 \times 1.05 = $143,283

Answer to Lecture Example 3

Expected values are calculated as: \( \sum p \times \) Profit/(loss) \times Probability = Expected value

<table>
<thead>
<tr>
<th>Profit/(loss)</th>
<th>Probability</th>
<th>Expected value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best</td>
<td>400 $'000</td>
<td>120</td>
</tr>
<tr>
<td>Most likely</td>
<td>200 $'000</td>
<td>100</td>
</tr>
<tr>
<td>Worst</td>
<td>(150) $'000</td>
<td>(30)</td>
</tr>
</tbody>
</table>

Chapter 10

Answer to Lecture Example 1

<table>
<thead>
<tr>
<th>Output</th>
<th>Total time (hrs)</th>
<th>Cumulative average time (hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>150</td>
<td>75</td>
</tr>
<tr>
<td>4</td>
<td>225</td>
<td>56.25</td>
</tr>
<tr>
<td>8</td>
<td>337.5</td>
<td>42.1875</td>
</tr>
</tbody>
</table>
Answer to Lecture Example 2

(a) \[ Y = aX^b \]
\[ a = 100 \]
\[ X = 10 \]
\[ b = \log 0.75 / \log 2 = -0.125 / 0.301 = -0.415 \]
\[ Y = 100 \times 10^{0.415} = 38.459 \text{ hrs} \]
Total time taken to produce 10 batches: \( 10 \times 38.459 = 384.59 \text{ hrs} \)

(b) \[ Y = aX^b \]
\[ a = 100 \]
\[ X = 9 \]
\[ b = -0.415 \]
\[ Y = 100 \times 9^{0.415} = 40.1781 \text{ hrs} \]
Total time to produce 9 batches = \( 9 \times 40.1781 = 361.60 \text{ hrs} \)
∴ Time to produce 10th batch = \( 384.59 - 361.60 = 22.99 \text{ hrs} \)

Answer to Lecture Example 3

\[ b = \log 0.85 / \log 2 = -0.2345 \]

(a) To produce the next 15 batches:
find time to produce 16 and deduct time to make 1:
\[ y = 200x^{16 - 0.2345} = 104.4 \text{ hours} \] average time per batch, thus 16 batches will take
\[ 16 \times 104.4 = 1,670.4 \text{ hours} \]
less time for first batch \( 200.0 \text{ hours} \)
time for the next 15 batches \( 1,470.4 \text{ hours} \)

(b) Time for 30 batches:
\[ y = 200x^{30 - 0.2345} = 90.08 \times 30 = 2,702 \]
Time for 29 batches:
\[ y = 200x^{29 - 0.2345} = 90.80 \times 29 = 2,633 \]

Time for 30th batch = \( 2,702 - 2,633 = 69 \text{ hours} \), so this should be the budgeted hours once the steady state has been achieved.
Answer to Lecture Example 4

(a) \( Y = aX^b \)
\[
a = 200 \\
X = 10 \\
b = \log 0.75/\log 2 = -0.125/0.301 = -0.415
\]
\[
Y = 200 \times 10^{-0.415} = 76.92
\]
Total cost to produce 10 batches: \( 10 \times 76.92 = 769.20 \)

(b) \( Y = aX^b \)
\[
a = 200 \\
X = 9 \\
b = -0.415
\]
\[
Y = 200 \times 9^{-0.415} = 80.36
\]
Total cost to produce 9 batches = \( 9 \times 80.36 = 723.24 \)

\( \therefore \) Cost to produce 10th batch
\[
= 769.20 - 723.24 = 45.96
\]

Chapter 11

Answer to Lecture Example 1

Ideal – demotivates as impossible to achieve

Attainable – best level to set for motivation of employees – It is a target with stretch but it is do-able at a stretch

Current – no incentive to do any more than is currently being done

Basic – often too out-of-date to be relevant and therefore no positive impact – may even be adverse affects

Answer to Lecture Example 2

(a) Price discussions with suppliers
Anticipated inflation
Bulk discounts
Quality of material purchased
Quantity required

(b) Anticipated quantity per unit based on specs
Whether required quality of material is available
Amount of wastage from material
Amount of rework required – needs understanding of skills / training of labour force
Answer to Lecture Example 3

In times of inflation a decision needs to be made as to what level to set the standard at.

If it is at the inflated price, early in the year a favourable variance due to price may be experienced.

If mid point is chosen the variance may be favourable early in the year and adverse later in the year.

Setting a standard and evaluating performance against it is therefore more difficult. However, inflation is measurable and so its effects can be stripped out so that performance can be measured.

Chapter 12

Answer to Lecture Example 1

Total mix variance

<table>
<thead>
<tr>
<th></th>
<th>Std Mix</th>
<th>Actual Mix</th>
<th>Difference</th>
<th>x $std</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onions</td>
<td>750</td>
<td>600</td>
<td>150 (F)</td>
<td>$2</td>
<td>300 (F)</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>750</td>
<td>900</td>
<td>150 (A)</td>
<td>$4</td>
<td>600 (A)</td>
</tr>
<tr>
<td></td>
<td>1,500</td>
<td>1,500</td>
<td></td>
<td></td>
<td>300 (A)</td>
</tr>
</tbody>
</table>

Total yield variance

<table>
<thead>
<tr>
<th></th>
<th>Std in Std mix</th>
<th>Actual in Std mix</th>
<th>Difference</th>
<th>x $std</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onions</td>
<td>500</td>
<td>750</td>
<td>250 (A)</td>
<td>$2</td>
<td>500 (A)</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>500</td>
<td>750</td>
<td>250 (A)</td>
<td>$4</td>
<td>1,000 (A)</td>
</tr>
<tr>
<td></td>
<td>1,000</td>
<td>1,500</td>
<td></td>
<td></td>
<td>1,500 (A)</td>
</tr>
</tbody>
</table>

OR

1,500 kg of input should yield \( \frac{1,500 \text{ kg}}{5 + 5} \) batches

1,500 kg of input and yield \( \frac{100 \text{ batches}}{50 \text{ A}} \)

Value at std cost per batch ($30) \$1,500 A

The adverse material mix variance shows an increase in costs caused by the use of more of the more expensive ingredients.

The adverse yield variance is because we used more ingredients than expected to make 100 batches of sauce, ie. there is a reduction in output compared with standard, a reduction in productivity.

Answer to Lecture Example 2

Cheaper ingredients in the mix could lead to lower yields, poorer quality, loss of customers, wastage, idle time etc.

Looking at mix and yield variances in isolation may be insufficient if a business needs to focus on quality as well as cost and could be short-termist.

Look at other performance indicators eg quality control, customer satisfaction etc

Answer to Lecture Example 3

<table>
<thead>
<tr>
<th>Mix</th>
<th>Act Qty</th>
<th>Act Qty</th>
<th>Diff</th>
<th>Std cost $</th>
<th>Var $</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Std Mix</td>
<td>Act Mix</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>1,000</td>
<td>1,040</td>
<td>(40)</td>
<td>80</td>
<td>(3,200)</td>
</tr>
<tr>
<td>J</td>
<td>600</td>
<td>560</td>
<td>40</td>
<td>100</td>
<td>4,000</td>
</tr>
<tr>
<td>H</td>
<td>400</td>
<td>400</td>
<td>120</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2,000</td>
<td>2,000</td>
<td></td>
<td>800</td>
<td>F</td>
</tr>
</tbody>
</table>
Yield

<table>
<thead>
<tr>
<th></th>
<th>Std Qty</th>
<th>Act Qty</th>
<th>Diff</th>
<th>Std cost $</th>
<th>Var $</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Std Mix</td>
<td>Std Mix</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>1,056</td>
<td>1,000</td>
<td>56</td>
<td>80</td>
<td>4,480</td>
</tr>
<tr>
<td>J</td>
<td>633</td>
<td>600</td>
<td>33</td>
<td>100</td>
<td>3,300</td>
</tr>
<tr>
<td>H</td>
<td>422</td>
<td>400</td>
<td>22</td>
<td>120</td>
<td>2,640</td>
</tr>
<tr>
<td></td>
<td>2,111 (w1)</td>
<td>2,000</td>
<td>111</td>
<td>10,420 F</td>
<td></td>
</tr>
</tbody>
</table>

(W1) Standard quantity = 1,900/0.9 = 2,111
or
Actual input should yield (2,000 × 0.9) kg
Actual input did yield (1,900) kg
Value at std cost per kg (W2) $104.44 $10,440 F

(W2) Standard cost of 1 kg of output is $900/90 = 104.44

Answer to Lecture Example 4

Sales volume profit variance

<table>
<thead>
<tr>
<th></th>
<th>Sticky Toffee</th>
<th>Chocolate Goo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budgeted sales</td>
<td>800 units</td>
<td>900 units</td>
</tr>
<tr>
<td>Actual sales</td>
<td>600 units</td>
<td>1,200 units</td>
</tr>
<tr>
<td>Sales volume variance in units</td>
<td>200 units (A)</td>
<td>300 units (F)</td>
</tr>
<tr>
<td>× standard margin per unit</td>
<td>× $4</td>
<td>× $2</td>
</tr>
<tr>
<td>Sales volume variance in $</td>
<td>$800 (A)</td>
<td>$600 (F)</td>
</tr>
<tr>
<td>Total sales volume variance</td>
<td>$200 (A)</td>
<td></td>
</tr>
</tbody>
</table>

Profit is lower as a result of a lower sales volume compared with budget.

Sales mix variance

<table>
<thead>
<tr>
<th></th>
<th>Sticky Toffee</th>
<th>Chocolate Goo</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Should' mix Standard mix</td>
<td>Actual sales</td>
<td>Actual sales</td>
</tr>
<tr>
<td>'Did' mix Actual sales</td>
<td>Actual sales</td>
<td>Actual sales</td>
</tr>
<tr>
<td>Difference</td>
<td>× Standard margin</td>
<td>Variance</td>
</tr>
<tr>
<td>Sticky Toffee</td>
<td>847 units</td>
<td>600 units</td>
</tr>
<tr>
<td>Chocolate Goo</td>
<td>953 units</td>
<td>1,200 units</td>
</tr>
<tr>
<td>1,800 units</td>
<td>1,800 units</td>
<td>–</td>
</tr>
</tbody>
</table>

The profit would have been $494 higher if the 1,800 units had been sold in the budgeted mix of 8:9.

Sales quantity variance

<table>
<thead>
<tr>
<th></th>
<th>Standard sales</th>
<th>Actual sales</th>
<th>Difference in units</th>
<th>× Standard profit</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sticky Toffee</td>
<td>800 units</td>
<td>847 units</td>
<td>47 units (F)</td>
<td>× $4</td>
<td>$188 (F)</td>
</tr>
<tr>
<td>Chocolate Goo</td>
<td>900 units</td>
<td>953 units</td>
<td>53 units (F)</td>
<td>× $2</td>
<td>$106 (F)</td>
</tr>
<tr>
<td>1,700 units</td>
<td>1,800 units</td>
<td>100 units</td>
<td></td>
<td></td>
<td>$294 (F)</td>
</tr>
</tbody>
</table>
Summary

Sales mix variance 494 (A)
Sales quantity variance 294 (F)
Sales volume profit variance 200 (A)

Answer to Lecture Example 5

Total Variance
Actual production should use \((14,000 \times 9 \times 4\) kg\)
Actual production did use \((513,000)\)
Total variance \(-9,000\) (A)

Planning
'Should' 14,000 units should cost @ 4kg @ $9 $504,000
'Should now' 14,000 units @ revised cost @ 3.8kg @ $9.30 $(494,760)
Total Planning variance $9,240 (F)

Operational
'Should now' 14,000 units @ revised cost @ 3.8kg @ $9.30 $494,760
'Did' Did cost – 54,000 @ $9.50 $513,000
Total Operating variance $18,240 (A)

Total Planning variance $25,200 F - $15,960 A = $9,240 (F)

Operating
Price
'Should now' 54,000 kg should cost @ $9.30 $502,200
'Did' 54,000 kg did cost $(513,000)
Total Operating variance $10,800 A + $7,440 A = $18,240 (A)

Usage
'Should now' 14,000 units @ revised std kg 3.8kg $53,200
'Did' 14,000 units did use $(54,000)
Total Operating variance $10,800 A + $7,440 A = $18,240 (A)
Answer to Lecture Example 6

Materials variances

Planning

<table>
<thead>
<tr>
<th>'Should'</th>
<th>'Should now'</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,200 units should cost @ original standard (1 litre @ $1/litre)</td>
<td>5,200</td>
</tr>
<tr>
<td>And @revised standard (1.2 litres @ $0.95/litre)</td>
<td>5,928</td>
</tr>
</tbody>
</table>

(728) (A)

Operational

<table>
<thead>
<tr>
<th>'Should now'</th>
<th>'Did'</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,200 units @ revised standard (1.2 litres @ $0.95/litre)</td>
<td>5,928</td>
</tr>
<tr>
<td>And did cost (per question)</td>
<td>5,120</td>
</tr>
</tbody>
</table>

808 (F)

Materials sub variances

Planning

Price

<table>
<thead>
<tr>
<th>'Should'</th>
<th>'Should now'</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,200 units @ revised std litres should cost @ 1.2l @ $1</td>
<td>6,240</td>
</tr>
<tr>
<td>And @ revised std litres should now cost @ 1.2 l @ $0.95</td>
<td>5,928</td>
</tr>
</tbody>
</table>

312 (F)

Usage

<table>
<thead>
<tr>
<th>'Should'</th>
<th>'Should now'</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,200 units @ orig std litres 1l</td>
<td>5,200</td>
</tr>
<tr>
<td>And @ revised std litres 1.2l</td>
<td>6,240</td>
</tr>
</tbody>
</table>

1,040 (A)

@ original standard cost $1 $1,040 (A)

Total Planning variance $1,040 A - $312 F = $728 (A)

Operating

Price

<table>
<thead>
<tr>
<th>'Should now'</th>
<th>'Did'</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,150 litres should cost @ $0.95</td>
<td>4,892.50</td>
</tr>
<tr>
<td>5,150 litres did cost</td>
<td>(5,120.00)</td>
</tr>
</tbody>
</table>

227.50 (A)

Usage

<table>
<thead>
<tr>
<th>'Should now'</th>
<th>'Did'</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,200 units @ revised std litres 1.2l</td>
<td>6,240</td>
</tr>
<tr>
<td>5,200 units did use</td>
<td>(5,150)</td>
</tr>
</tbody>
</table>

1,090 (F)

@ revised standard cost $0.95 $1,035.5 (F)

Total Operating variance $227.5 A - $1,035.5 F = $808 (F)

Labour variances

Planning

<table>
<thead>
<tr>
<th>'Should'</th>
<th>'Should now'</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,200 units @ original standard (2 hours @ $2.50/hour)</td>
<td>26,000</td>
</tr>
<tr>
<td>And @revised standard (2 hours @ $2.60/hour)</td>
<td>27,040</td>
</tr>
</tbody>
</table>

(1,040) (A)

Operational

<table>
<thead>
<tr>
<th>'Should now'</th>
<th>'Did'</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,200 units @ revised standard (2 hours @ $2.60/hour)</td>
<td>27,040</td>
</tr>
<tr>
<td>And @ actual (per question)</td>
<td>27,400</td>
</tr>
</tbody>
</table>

(360) (A)

Sales volume variances

Planning

<table>
<thead>
<tr>
<th>'Should'</th>
<th>'Should now'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original budgeted sales</td>
<td>5,000</td>
</tr>
<tr>
<td>Revised budget sales</td>
<td>4,500</td>
</tr>
</tbody>
</table>

500 (A)

@ original contribution / unit $8.60 $4,300 (A)
Chapter 13

Answer to Lecture Example 1

- Globalisation (internationally dispersed businesses)
- Multinational companies
- Changing attitudes to employment
- More companies competing to sell same products and services
- More demanding customers
- Increased emphasis on quality and reliability of output
- Increased importance of customisation of products and services
- Introduction of new technologies
- Cost is not the only competitive weapon nowadays

Answer to Lecture Example 2

Advantages

- No capital tied up in inventory
- Storage space saved
- Fewer holding costs of inventory
- Less material wastage/obsolescence

Disadvantages

- Dependant on suppliers – needs close relationships to guarantee quality and timeliness
- May pay more to ensure reliability
- Reduce no. of suppliers, may reduce flexibility
- Need performance measures around quality not necessarily around cost

Chapter 14

Answer to Lecture Example 1

Strategic information is required by the management of an organisation in order to enable management to take a longer term view of the business and assess how the business may perform during that period. The length of this longer term view will vary from one organisation to another, being very much dependent upon the nature of the business and the ability of those responsible for strategic direction to be able to scan the planning horizon. Strategic information tends to be holistic and summary in nature and would be used by management when, for example, undertaking SWOT analysis. In Hydra strategic information might relate to the development of new services such as the provision of a car parts. Other examples would relate to the threats posed by Hydra’s competitors or assessing the potential acquisition of a bicycle manufacturer in order to enhance customer value via improved efficiency and lower costs.
Tactical information is required in order to facilitate management planning and control for shorter time periods than strategic information. Such information relates to the tactics that management adopt in order to achieve a specific course of action. In Hydra this might involve consideration of whether to open an additional outlet in another part of the country or whether to employ additional staff at each outlet in order to improve the quality of service provision to its customers.

Operational information relates to a very short time scale and is often used to determine immediate actions by those responsible for day-to-day management. In Hydra, the manager at each location would require information relating to the level of customer sales, the number of bicycles sold or serviced and the number of complaints received during a week. Operational information might be used within Hydra in order to determine whether staff are required to work overtime due to an unanticipated increase in demand, or whether operatives require further training due to excessive time being spent on servicing.

**Answer to Lecture Example 1**

Fix It could use an ERP system to assist with the following:

- Scheduling of repair jobs
- Scheduling of MOTs, ensuring that the testing equipment and trained MOT testing staff are available at the correct garage. Reducing the need to have some at every site all day
- Invoice customers
- Order parts from the central warehouse for individual garages
- Reorder stock from suppliers to replenish the warehouse
- Plan preventative maintenance for machinery
- Staff rota

**Chapter 15**

**Answer to Lecture Example 1**

<table>
<thead>
<tr>
<th>Access</th>
<th>Doors</th>
</tr>
</thead>
<tbody>
<tr>
<td>– computer (hardware)</td>
<td>Locks</td>
</tr>
<tr>
<td>– information (software)</td>
<td>Passwords</td>
</tr>
<tr>
<td></td>
<td>Supervision</td>
</tr>
<tr>
<td>Hacking</td>
<td>Logs</td>
</tr>
<tr>
<td>– alteration</td>
<td>CAAT</td>
</tr>
<tr>
<td></td>
<td>Job rotation</td>
</tr>
<tr>
<td></td>
<td>Anti-spyware software</td>
</tr>
<tr>
<td>– transmitted data</td>
<td>Firewalls</td>
</tr>
<tr>
<td></td>
<td>Encryption</td>
</tr>
<tr>
<td></td>
<td>Anti-spyware software</td>
</tr>
</tbody>
</table>
Chapter 16

Answer to Lecture Example 1
Postpone repair / maintenance expenditure until following year – machine break downs etc leading to more wastage / idle time & lower output
Cut training costs / don’t recruit – fewer skills may lead to more wastage / lower quality product
Reduce R&D – lowers chance of development and keeping up with marketplace

Answer to Lecture Example 2
Evaluate performance / reward performance over long term as well as short term.
Link bonuses to share price
Targets could be based on quality measures

Answer to Lecture Example 3
Customer
– no. of complaints
– no. of returning customers
– customer satisfaction scores
Internal
– staff turnover
– time taken to deliver meal to guest
Innovation and learning
– no. days staff training per yr
– no. new dishes on menu
Financial
– spend per guest
– food margin %
– drink margin %

Answer to Lecture Example 4
Improved credit control procedures
• Efficient internal controls to ensure that all despatches are invoiced without delay
• Attempt to move customers onto efficient payment methods to reduce the length of time from a customer initiating payment to the eventual receipt of cleared funds
• Prompt lodgement of payments received from customers to reduce total float time
• Factoring or invoice discounting to reduce the period from making a credit sale to the eventual receipt of payment

Answer to Lecture Example 5
Payables
Delay payment
But this should not be done beyond the terms of the credit agreement. The following also needs to be taken into consideration
• By delaying payment valuable discounts may be lost
• Suppliers may become unwilling to extend more credit
Suppliers may begin to insist on payment in advance
Prices may be increased for future orders
Reputation as a slow payer may damage the company’s image and credit rating.

**Answer to Lecture Example 6**

(a) The gross profit margin is

<table>
<thead>
<tr>
<th></th>
<th>20X4</th>
<th>20X5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2,600/14,400</td>
<td>18.1%</td>
</tr>
<tr>
<td></td>
<td>4,400/17,000</td>
<td>25.9%</td>
</tr>
</tbody>
</table>

(b) The net profit margin is

<table>
<thead>
<tr>
<th></th>
<th>20X4</th>
<th>20X5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,400/14,400</td>
<td>9.7%</td>
</tr>
<tr>
<td></td>
<td>2,400/17,000</td>
<td>14.1%</td>
</tr>
</tbody>
</table>

(c) The return on capital employed is

<table>
<thead>
<tr>
<th></th>
<th>20X4</th>
<th>20X5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,400/6,700</td>
<td>20.9%</td>
</tr>
<tr>
<td></td>
<td>2,400/5,720</td>
<td>42.0%</td>
</tr>
</tbody>
</table>

(d) The asset turnover is

<table>
<thead>
<tr>
<th></th>
<th>20X4</th>
<th>20X5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14,400/6,700</td>
<td>2.1 times</td>
</tr>
<tr>
<td></td>
<td>17,000/5,720</td>
<td>3.0 times</td>
</tr>
</tbody>
</table>

(e) The acid test ratio is

<table>
<thead>
<tr>
<th></th>
<th>20X4</th>
<th>20X5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(2,000 + 2,400)/1,500</td>
<td>2.9:1</td>
</tr>
<tr>
<td></td>
<td>(1,600 + 820)/2,700</td>
<td>0.9:1</td>
</tr>
</tbody>
</table>

(f) The inventory turnover period in days is

<table>
<thead>
<tr>
<th></th>
<th>20X4</th>
<th>20X5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,300/11,800 × 365</td>
<td>40 days</td>
</tr>
<tr>
<td></td>
<td>2,000/12,600 × 365</td>
<td>58 days</td>
</tr>
</tbody>
</table>

(g) The gearing ratio is

<table>
<thead>
<tr>
<th></th>
<th>20X4</th>
<th>20X5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2,600/6,700 × 100</td>
<td>38.9 %</td>
</tr>
</tbody>
</table>

**Chapter 17**

**Answer to Lecture Example 1**

(a) ROI as it is a relative measure, and takes into account size of investment.

(b) Vittorio:

\[ \text{Current ROI} = \frac{90,000}{500,000} = 18\% \]

\[ \text{ROI of equipment} = \frac{1,200}{8,000} = 15\% \]

ie less than current (18%) so would turn down.

However 15% is better than company requirement (12%) so should have been accepted.
Dugaldo: 

ROI of current = \( \frac{60,000 - 25,000}{2,000} \) = 1750% 

ROI of replacement = \( \frac{60,000 - 15,000}{75,000} \) = 60% 

Replacement is not as good as current so Dugaldo rejects. 
60% > 12% so company would accept replacement.

Answer to Lecture Example 2

Vittorio:

\[
\text{Cost saving (profit) of proposal} = 1,200 \\
\text{Imputed interest} = 12\% \times 8,000 = (960) \\
\text{Residual income} = 240 \quad \text{(Positive so accept)} 
\]

Dugaldo:

\[
\text{Profit from proposal} = (60,000 - 15,000) = 45,000 \\
\text{Existing profit} = (60,000 - 5,000 - 20,000) = 35,000 \\
\text{Incremental profit} = 10,000 \\
\text{Imputed interest} = 12\% \times 75,000 = (9,000) \\
\text{Incremental RI} = 1,000 \quad \text{(Positive so accept)} 
\]

Answer to Lecture Example 3

- ROI gives a % – comparisons easier
- ROI does not require specific cost of capital
- ROI may lead to wrong decision making – dysfunctional behaviour
- RI generally results in maximising company wealth
- RI gives an absolute figure
- Both distorted by age of assets
- Both use profit which can be manipulated

Answer to Lecture Example 4

“Whether the transfer is in the company’s best interest”

If so, the price charged should ensure that the transfer satisfies the Company, the supplying division and the receiving division.

(a) Cost to buy in $30. 

Variable cost to make internally $20. 

Therefore it is $10 cheaper for the company to make the fruit cakes internally.

(b) Non financial factors:
- Quality/taste/appearance of bought in cakes
- Unsatisfied customer demand due to capacity constraints
(c) | Transfer price | Division A (selling) | Division B (receiving) | Result |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>Full cost plus 10% - $30.80</td>
<td>Happy to supply as covers all costs and makes contribution to profit</td>
<td>Would prefer to buy externally</td>
</tr>
<tr>
<td>(ii)</td>
<td>Variable cost plus 55% - $31</td>
<td>Happy to supply as covers all costs and makes contribution to profit</td>
<td>Would prefer to buy externally</td>
</tr>
<tr>
<td>(iii)</td>
<td>Variable cost only - $20</td>
<td>No incentive to transfer</td>
<td>Happy to buy as cannot source cheaper</td>
</tr>
<tr>
<td>(iv)</td>
<td>External market price - $30</td>
<td>Happy to supply</td>
<td>Happy to buy</td>
</tr>
</tbody>
</table>

Conclusion

Division A requires a price in excess of $20 to cover its variable costs.
Division B requires a price less than $30 to ensure it purchases internally.

A price in the range $20 – $30 will ensure the transfer takes place. Within this range, negotiation will occur. For Division A to be incentivised the Transfer Price will need to cover fixed costs too, possibly between $28 and $30 will be acceptable to both divisions.

**Answer to Lecture Example 5**

(a) Spare capacity = no opportunity cost

Same situation as lecture example 4. I.e. the min transfer price is variable cost + lost contribution $20 + 0 and the maximum transfer price is $30.

(b) | Fruit cake | Sponge cake |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribution $</td>
<td>10</td>
</tr>
<tr>
<td>Hours</td>
<td>2</td>
</tr>
<tr>
<td>Contribution/hr $</td>
<td>5</td>
</tr>
<tr>
<td>Rank</td>
<td>2</td>
</tr>
</tbody>
</table>

Variable cost + lost contribution

$20 + (2 \times 16) = $52

It is better for the company to buy fruit cakes for $30 from external market and use the capacity in division A to make sponge cakes to sell externally. The company can buy in externally for $30 or internally at a cost of $52 thus the optimal policy is to buy the fruit cakes externally so that the company to buy fruit cakes for $30 from external market and use the capacity in division A to make sponge cakes to sell externally.
Answer to Lecture Example 6

Bath Co

(a) Profit statement

<table>
<thead>
<tr>
<th></th>
<th>Division A $'000</th>
<th>Division B $'000</th>
<th>Company $'000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sales Revenue:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External (1)</td>
<td>36,000</td>
<td>9,600</td>
<td>45,600</td>
</tr>
<tr>
<td>Inter-divisional transfers</td>
<td>6,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>36,000</td>
<td>15,600</td>
<td>45,600</td>
</tr>
<tr>
<td><strong>Variable Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External material costs (2)</td>
<td>(16,000)</td>
<td>(1,000)</td>
<td>17,000</td>
</tr>
<tr>
<td>Inter-divisional transfers (3)</td>
<td>(6,000)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Labour Costs (4)</td>
<td>(3,600)</td>
<td>(3,000)</td>
<td>(6,600)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(25,600)</td>
<td>(4,000)</td>
<td>(23,600)</td>
</tr>
<tr>
<td><strong>Fixed Costs</strong></td>
<td>(7,440)</td>
<td>(4,400)</td>
<td>(11,840)</td>
</tr>
<tr>
<td><strong>Profit</strong></td>
<td>2,960</td>
<td>7,200</td>
<td>10,160</td>
</tr>
</tbody>
</table>

**Note:** Provided that the transfer price is set between the minimum of $20 (Division B’s marginal cost) and $65 (the cost to Division A of buying from outside the group), the actual transfer price is irrelevant in this calculation. The overall profit of the company will be the same.

**Workings ($'000)**

(1) External Sales
- Div A: 80,000 × $450 = $36,000
- Div B: 120,000 × $80 = $9,600
- Div B: 80,000 × $75 = $6,000

(2) External material costs
- Div A: 80,000 × $200 = $16,000
- Div B: 200,000 × $5 = $1,000

(3) Inter-divisional transfers
- Div A: 80,000 × $75 = $6,000

(4) Labour costs
- Div A: 80,000 × $45 = $3,600
- Div B: 200,000 × $15 = $3,000

(b) Bath Co’s profit if transfer pricing is optimised

<table>
<thead>
<tr>
<th></th>
<th>Division A $'000</th>
<th>Division B $'000</th>
<th>Company $'000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sales Revenue:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External (1)</td>
<td>36,000</td>
<td>14,400</td>
<td>50,400</td>
</tr>
<tr>
<td>Internal sales (2)</td>
<td></td>
<td>850</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>36,000</td>
<td>15,250</td>
<td>50,400</td>
</tr>
<tr>
<td><strong>Variable costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External material costs (3)</td>
<td>(19,900)</td>
<td>(1,000)</td>
<td>(20,900)</td>
</tr>
<tr>
<td>Inter-divisional transfers (2)</td>
<td>(850)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labour costs</td>
<td>(3,600)</td>
<td>(3,000)</td>
<td>(6,600)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(24,350)</td>
<td>(4,000)</td>
<td>(27,500)</td>
</tr>
<tr>
<td><strong>Fixed costs</strong></td>
<td>(7,440)</td>
<td>(4,400)</td>
<td>(11,840)</td>
</tr>
<tr>
<td><strong>Profit</strong></td>
<td>4,210</td>
<td>7,200</td>
<td>10,160</td>
</tr>
</tbody>
</table>

**Note:** A transfer price of $42.50 has been used as the midpoint of the range of transfer prices $20 - $65.
Workings ($'000)
(1) External Sales
Div A 80,000 × $450 = $36,000
Div B 180,000 × $80 = $14,400
(2) Internal sales/inter-divisional transfers
20,000 × $42.50 = $850
(3) Material Costs
Div A 60,000 × $265 + (20,000 × $200) = $19,900
Div B 200,000 × $5 = $1,000

Chapter 18

Answer to Lecture Example 1
(a) Incidents of MRSA
   Waiting times
   Number of compensations/complaints
   Under/over spends against budget
   Deaths
   Overtime costs
   Re-admissions
   Costs per bed/night
   Number of bed blockers
   Length of stay

(b) Common problems are likely to include:
   • Concentration on one factor at detriment of others.
   • How can it be made directly comparable (poor areas of country v affluent areas).
   • Creative accounting/Fraud.
   • Self fulfilling prophecy (downward spiral).

Answer to Lecture Example 2
Effectiveness – Achieving target pass rates of grades (Objective)
   – Proportion of graduates employed within a year.
Efficiency – Cost of books per student (Input to output ratio)
   – Staff hours per student
   – Teaching cost per student
   – Total cost of producing a graduate.
Economy – Value for money in sourcing lecture staff of appropriate quality (Cost of inputs)
   – Competitive tendering for:
     – computers
     – security
     – cleaning
Answer to Lecture Example 3

Stakeholders
Internal
Employee turnover
Career progression paths
Satisfaction scores
Connected
P/E ratio
EPS growth
Interest cover
Customer service scores
Quality and reliability scores
Credit rating
Percentage of repeat customers
External
Number of staff
Taxation
Pollution rating

Economic environment
Economic growth
Interest rates
Inflation
Employment levels

Competition
Competitors’ pricing
Market share %
No. of new product lines
Question and Answer bank
# Index to Question and Answer bank

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<tr>
<td>402</td>
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<tr>
<td>404</td>
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<tr>
<td>404</td>
</tr>
</tbody>
</table>
Questions

1 BD Company (Study Text question 7)  

For some time the BD company has sold its entire output of canned goods to supermarket chains which sell them as 'own label' products. One advantage of this arrangement is that BD incurs no marketing costs, but there is continued pressure from the chains on prices, and margins are tight.

As a consequence, BD is considering selling some of its output under the BD brand. Margins will be better but there will be substantial marketing costs.

The following information is available.

<table>
<thead>
<tr>
<th>Current year’s results – 20X2 (adjusted to 20X3 cost levels)</th>
<th>Forecast for 20X3 (assuming all 'own label' sales)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales (millions of cans)</td>
<td>Sales</td>
</tr>
<tr>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>$ million</td>
<td>$ million</td>
</tr>
<tr>
<td>Sales</td>
<td>5.94</td>
</tr>
<tr>
<td>Manufacturing costs</td>
<td>4.30</td>
</tr>
<tr>
<td>Administration costs</td>
<td>1.20</td>
</tr>
<tr>
<td>Profit</td>
<td>0.44</td>
</tr>
</tbody>
</table>

For 20X3 the unit contribution on BD brand sales is expected to be 33\(\frac{1}{3}\)% greater than 'own label' sales, but variable marketing costs of 2c per can and fixed marketing costs of $400,000 will be incurred.

Required

(a) Prepare a contribution breakeven chart for 20X3 assuming that all sales will be 'own label'.  
(7 marks)

(b) Prepare a contribution breakeven chart for 20X3 assuming that 50% of sales are 'own label' and 50% are of the BD brand.  
(7 marks)

Note. The breakeven points and margins of safety must be shown clearly on the charts.

(c) Comment on the positions shown by the charts and your calculations and discuss what other factors management should consider before making a decision.  
(6 marks)

Ignore inflation.  
(Total = 20 marks)
HYC makes three products H, Y and C. All three products must be offered for sale each month in order to be able to provide a complete market service. The products are fragile and their quality deteriorates rapidly once they are manufactured.

The products are produced on two types of machine and worked on by a single grade of direct labour. Five direct employees are paid $8 per hour for a guaranteed minimum of 160 hours each per month.

All of the products are first moulded on machine type 1 and then finished and sealed on machine type 2.

The machine hour requirements for each of the products are as follows.

<table>
<thead>
<tr>
<th>Product</th>
<th>Hours per unit Machine type 1</th>
<th>Hours per unit Machine type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product H</td>
<td>1.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Product Y</td>
<td>4.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Product C</td>
<td>3.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>

The capacity of the available machines type 1 and 2 are 600 hours and 500 hours per month respectively.

Details of the selling prices, unit costs and monthly demand for the three products are as follows.

<table>
<thead>
<tr>
<th>Product</th>
<th>Selling price $ per unit</th>
<th>Component cost $ per unit</th>
<th>Other direct material cost $ per unit</th>
<th>Direct labour cost at $8 per hour</th>
<th>Overheads $ per unit</th>
<th>Profit $ per unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product H</td>
<td>91</td>
<td>22</td>
<td>23</td>
<td>6</td>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>Product Y</td>
<td>174</td>
<td>19</td>
<td>11</td>
<td>48</td>
<td>62</td>
<td>34</td>
</tr>
<tr>
<td>Product C</td>
<td>140</td>
<td>16</td>
<td>14</td>
<td>36</td>
<td>52</td>
<td>22</td>
</tr>
</tbody>
</table>

Maximum monthly demand (units) 120 70 60

Although HYC uses marginal costing and contribution analysis as the basis for its decision making activities, profits are reported in the monthly management accounts using the absorption costing basis. Finished goods inventories are valued in the monthly management accounts at full absorption cost.

**Required**

(a) Calculate the machine utilisation rate for each machine each month and explain which of the machines is the bottleneck/limiting factor.  
(4 marks)

(b) Using the current system of marginal costing and contribution analysis, calculate the profit maximising monthly output of the three products.  
(4 marks)

(c) Explain why throughput accounting might provide more relevant information in HYC’s circumstances.  
(4 marks)

(d) Using a throughput approach, calculate the throughput-maximising monthly output of the three products.  
(4 marks)

(e) Explain the throughput accounting approach to optimising the level of inventory and its valuation. Contrast this approach to the current system employed by HYC.  
(4 marks)

(Total = 20 marks)
3 Ferny Chewer

Ferny Chewer Ltd manufactures tables and chairs. Details of each are:

<table>
<thead>
<tr>
<th></th>
<th>Tables</th>
<th>Chairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selling price</td>
<td>£100</td>
<td>£80</td>
</tr>
<tr>
<td>Variable costs</td>
<td>£40</td>
<td>£30</td>
</tr>
<tr>
<td>Materials (kg)</td>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>Labour (hours)</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Resources are in limited supply and the maximum available each month are:
- Materials: 24,000 kg
- Labour: 2,050 hours

Required

(a) Formulate the linear programme to maximise contribution and solve graphically. (11 marks)

(b) If one more hour of labour were to be become available, how much would Ferry Chewer Ltd be willing to pay for it (above the usual cost per hour)? (3 marks)

(c) Explain the terms slack and surplus (2 marks)

(d) Calculate the slack material and labour in Ferny Chewer (4 marks)

(Total = 20 marks)

4 LB Ltd

LB Ltd has been approached by a customer to manufacture a specialised machine. This would be a one-off order which LB Ltd would have to undertake in addition to its normal budgeted production.

The assistant accountant has prepared the following quotation:

- **Direct materials:**
  - Aluminium plating (20m² @ $10 per m²) 1 200
  - Rivets (100 @ $1 each) 2 100

- **Direct labour:**
  - Skilled (50 hrs @ $16 per hour) 3 800
  - Semi-skilled (20 hrs @ $10 per hour) 4 200
  - Overheads 5 100

- **Administration overhead @ 10% of production cost**
  - 6 140

- **Profit 20% of total cost**
  - 7 308

- **Selling price**
  - £1,848

Notes

(1) The aluminium plating is regularly used on other work within the business. It has an inventory value of $10 per m² although the current purchase price has recently risen to $12 per m².

(2) Rivets are currently held in inventory and cost $1 each although the company has no further use for them. They could be sold to a scrap merchant for $0.50 each.

(3) Skilled labourers are paid $16 per hour and are currently fully utilised on other work. If the job was undertaken it would be necessary to either work a maximum of 40 hours of overtime (paid at time and a half) and/or reduce the production of another product which earns contribution of $20 per hour.
(4) There is currently 100 hours of idle semi-skilled labour time available.

(5) Overheads represent an apportionment to cover factory fixed costs.

(6) It is policy to add 10% to the production cost of each job to cover the administration cost of orders accepted.

(7) Profit of 20% of total cost is added to each job as part of standard pricing policy.

Required

(a) Prepare the minimum price which should be quoted for the job. (10 marks)

(b) Provide examples of other factors that should be considered prior to LB Ltd’s final decision. (5 marks)

(Total = 15 marks)

5 Henry Lenny

Exam standard

A theatre has a seating capacity of 500 people and is considering engaging Henry Lenny for a performance for one night only. The fee that would be charged by Henry Lenny would be $10,000. If the theatre engages Henry Lenny, then this sum is payable regardless of the size of the audience.

Based on past experience of events of this type, the price of the ticket would be $25 per person. The size of the audience for this event is uncertain, but based on past experience it is expected to be as follows.

<table>
<thead>
<tr>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 people</td>
</tr>
<tr>
<td>400 people</td>
</tr>
<tr>
<td>500 people</td>
</tr>
</tbody>
</table>

In addition to the sale of the tickets, it can be expected that members of the audience will also purchase confectionery & drinks both prior to the performance and during the interval. The contribution that this would yield is unclear, but has been estimated as follows.

<table>
<thead>
<tr>
<th>Contribution from confectionery &amp; drinks sales</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribution of $3 per person</td>
<td>30%</td>
</tr>
<tr>
<td>Contribution of $5 per person</td>
<td>50%</td>
</tr>
<tr>
<td>Contribution of $10 per person</td>
<td>20%</td>
</tr>
</tbody>
</table>

Required

(a) Prepare a two-way data table to show the profit values that could occur from deciding to engage Henry Lenny for the performance. (5 marks)

(b) Using the probabilities provided and your answer to (a) above, show how the two-way data table can be used by the theatre management to evaluate the financial risks of the performance, including the probability of making a profit. (6 marks)

(c) Using expected values as the basis of your decision, advise the theatre management whether it is financially worthwhile to engage Henry Lenny for the performance. (5 marks)

(Total = 16 marks)
6 McDreamy  (Study Text question 15)  

McDreamy is in an industry sector which is recovering from the recent recession. The directors of the company hope next year to be operating at 85% of capacity, although currently the company is operating at only 65% of capacity. 65% of capacity represents output of 10,000 units. One hundred direct workers are employed on production for 200,000 hours in the current year.

The flexed budgets for the current year are as follows.

<table>
<thead>
<tr>
<th>Capacity level</th>
<th>55%</th>
<th>65%</th>
<th>75%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Direct materials</td>
<td>846,200</td>
<td>1,000,000</td>
<td>1,153,800</td>
</tr>
<tr>
<td>Direct wages</td>
<td>1,480,850</td>
<td>1,750,000</td>
<td>2,019,150</td>
</tr>
<tr>
<td>Production overhead</td>
<td>596,170</td>
<td>650,000</td>
<td>703,830</td>
</tr>
<tr>
<td>Selling and distribution overhead</td>
<td>192,310</td>
<td>200,000</td>
<td>207,690</td>
</tr>
<tr>
<td>Administration overhead</td>
<td>120,000</td>
<td>120,000</td>
<td>120,000</td>
</tr>
<tr>
<td>Total costs</td>
<td>3,235,530</td>
<td>3,720,000</td>
<td>4,204,470</td>
</tr>
</tbody>
</table>

Profit in any year is budgeted to be 16\(\frac{2}{3}\)% of sales.

The following percentage increases in costs are expected for next year.

<table>
<thead>
<tr>
<th>Increase</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct materials</td>
<td>6.0</td>
</tr>
<tr>
<td>Direct wages</td>
<td>3.0</td>
</tr>
<tr>
<td>Variable production overhead</td>
<td>7.0</td>
</tr>
<tr>
<td>Variable selling and distribution overhead</td>
<td>7.0</td>
</tr>
<tr>
<td>Fixed production overhead</td>
<td>10.0</td>
</tr>
<tr>
<td>Fixed selling and distribution overhead</td>
<td>7.5</td>
</tr>
<tr>
<td>Administration overhead</td>
<td>10.0</td>
</tr>
</tbody>
</table>

Required

(a) Prepare for next year a flexible budget statement on the assumption that the company operates at 85% of capacity; your statement should show both contribution and profit.  
(12 marks)

(b) State three problems which may arise from the change in capacity level.  
(3 marks)

(c) Explain in detail what is meant by the principle of controllability.  
(5 marks)

(Total = 20 marks)

7 Divisional performance measures  (Study Text question 21) Exam standard

(a) Compare and contrast the use of residual income and return on investment in divisional performance measurement, stating the advantages and disadvantages of each.  
(7 marks)

(b) Division Y of Chardonnay currently has capital employed of £100,000 and earns an annual profit after depreciation of £18,000. The divisional manager is considering an investment of £10,000 in an asset which will have a ten-year life with no residual value and will earn a constant annual profit after depreciation of £1,600. The cost of capital is 15%.

Calculate the following and comment on the results.

(i) The return on divisional investment, before and after the new investment  
(ii) The divisional residual income before and after the new investment  
(8 marks)

(c) Explain the potential benefits of operating a transfer pricing system within a divisionalised company.  
(5 marks)

(Total = 20 marks)
8 AJH

AJH plc has two divisions.

Division 1 manufactures a component called the Woody which it sells on the external market as well as transferring to Division 2. Division 2 then sells the Woody after further processing as the Woody Deluxe.

The following information is available:

<table>
<thead>
<tr>
<th></th>
<th>Division 1</th>
<th>Division 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market price Woody</td>
<td>150</td>
<td>300</td>
</tr>
<tr>
<td>Market price Woody Deluxe</td>
<td>60</td>
<td>80</td>
</tr>
<tr>
<td>Production costs</td>
<td>150,000</td>
<td>150,000</td>
</tr>
<tr>
<td>External demand</td>
<td>5,000</td>
<td>3,000</td>
</tr>
</tbody>
</table>

75% of the production cost per component is variable.

Division 1 sets a transfer price of marginal cost plus 40%.

Required

Calculate the profit generated by each division

(8 marks)

9 JM Foods (Study Text question 19)

Bill is a marketing manager for JM Foods, a large chain of fast-food restaurants. The directors of the company are considering expanding into a new country.

Bill is responsible for obtaining market data to aid the strategic decision-making process.

Required

(a) Briefly discuss FIVE sources of external information that Bill may wish to consider. (10 marks)

(b) Identify and give examples of the different costs involved in obtaining external data. (5 marks)

(Total = 15 marks)
Answers

1 BD Company

Top tips. The F5 exam could include a full question on the topic so ensure you make a good attempt at this one.

To draw up a contribution breakeven chart you need to know three things.

- Selling price per can
- Variable cost per can
- Fixed costs

These can all be calculated from information in the question with varying degrees of difficulty/ease.

As CVP analysis is based on marginal costing principles and given that information in the question is provided for two time periods, you have a rather large hint that you need to split the manufacturing costs into fixed and variable components using the high-low method. It is safe to assume that the administration costs are fixed as they are the same in both time periods. Selling price per unit is a straightforward calculation.

You then have enough information to draw up the chart. You can always calculate breakeven point and margin of safety and compare them with your chart to ensure that you have marked them on the chart correctly. (Did you actually see the note in the requirements asking you to show them on the chart?)

Part (b) involves multi-product CVP analysis. The data for the chart is not difficult to derive, but the calculation of breakeven point must be based on contribution per mix, the standard mix being one own label, one BD brand.

An exam question will invariably ask for some written analysis, and this question is no exception. The points you need to make are not particularly technical, but are simply grounded in common sense. If option 2 shows the higher profit, lower breakeven point (so that not so many sales are required to cover costs) and a higher margin of safety (which means that the difference between expected sales and breakeven sales is likely to be higher), it should be the better option. There are, of course, other factors that might affect that decision.

Assumption. Manufacturing costs for the BD brand will be the same as for own label brands.

Initial workings

Manufacturing costs

We need to analyse the cost behaviour patterns by separating the manufacturing costs into their fixed and variable elements, using the high-low method.

<table>
<thead>
<tr>
<th></th>
<th>Sales</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Millions</td>
<td>$ million</td>
</tr>
<tr>
<td>20X3</td>
<td>19</td>
<td>4.45</td>
</tr>
<tr>
<td>20X2</td>
<td>18</td>
<td>4.30</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>0.15</td>
</tr>
</tbody>
</table>

Variable manufacturing cost per can = $0.15

Fixed manufacturing cost = $4.45 million – (19 million × $0.15)

= $1.6 million

Selling prices

Selling price per can in 20X3 = 6.27/19 = $0.33

∴ Unit contribution per can = $0.33 – $0.15 = $0.18

∴ Contribution per can of BD brand = $0.18 × 133 1/3% = $0.24

Variable cost per can of BD brand = $0.15 + $0.02 = $0.17

∴ Selling price per can of BD brand = $0.17 + $0.24 = $0.41
(a) **Data for chart**

<table>
<thead>
<tr>
<th>Description</th>
<th>$ million</th>
<th>$ million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable costs (19 million × $0.15)</td>
<td>2.85</td>
<td></td>
</tr>
<tr>
<td>Fixed costs: manufacturing</td>
<td>1.60</td>
<td></td>
</tr>
<tr>
<td>administration</td>
<td>1.20</td>
<td></td>
</tr>
<tr>
<td><strong>Total costs</strong></td>
<td><strong>2.80</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Breakeven point</strong></td>
<td><strong>5.65</strong></td>
<td></td>
</tr>
</tbody>
</table>

Breakeven point = \[
\frac{\text{fixed costs}}{\text{contribution}} = \frac{2.8m}{0.18} = 15.55 \text{ million cans}
\]

Margin of safety = 19m - 15.55m = 3.45 million cans = $1.14 million sales

---

(b) **Data for chart**

<table>
<thead>
<tr>
<th>Description</th>
<th>$ million</th>
<th>$ million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable costs: own label (9.5m × $0.15)</td>
<td>1.425</td>
<td></td>
</tr>
<tr>
<td>BD brand (9.5m × $0.17)</td>
<td>1.615</td>
<td></td>
</tr>
<tr>
<td>Fixed costs: manufacturing</td>
<td>1.600</td>
<td></td>
</tr>
<tr>
<td>administration</td>
<td>1.200</td>
<td></td>
</tr>
<tr>
<td>marketing</td>
<td>0.400</td>
<td></td>
</tr>
<tr>
<td><strong>Total costs</strong></td>
<td><strong>3.040</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Sales value:</strong> own label (9.5m × $0.33)</td>
<td>3.135</td>
<td></td>
</tr>
<tr>
<td>BD brand (9.5m × $0.41)</td>
<td>3.895</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7.030</strong></td>
<td></td>
</tr>
</tbody>
</table>

Our standard mix is 1 own label, 1 BD brand.
Breakeven point = \frac{\text{fixed costs}}{\text{contribution per mix}} = \frac{\$3.2m}{(0.18 + 0.24)} = \$3.2m \div \$0.42

= 7.62 \text{ million mixes} = 15.24 \text{ million cans}

\text{Margin of safety} = 19m - 15.24 \text{ million} = 3.76 \text{ million cans} = 1.88 \text{ million mixes}

= 1.88 \times (\$(0.33 + 0.41)) \text{ million sales} = $1.39 \text{ million sales}

\text{Profit} = $7.03 \text{ million} - $6.24 \text{ million} = $790,000

\text{Breakeven chart for 20X3 – 50% ‘own label’, 50% BD brand}

(c) The first chart shows a breakeven point of 15.55 million cans ($5.13m sales value) and a margin of safety of 3.45 million cans ($1.14m sales value). Forecast profit for sales of 19 million cans is $620,000.

The second chart shows a breakeven point of 15.24 million cans ($5.64m sales value) and a margin of safety of 3.76 million cans ($1.39m sales value). Forecast profit for sales of 19 million cans is $790,000.

Option 2 therefore results in a higher profit figure, as well as a lower breakeven point and increased margin of safety. On this basis it is the better of the two options.

Other factors which management should consider before making a decision

(i) The supermarket chains may put the same pressure on margins and prices of the BD brand as they do on the own label brands.

(ii) Customers may realise that the BD brand is the same product as the own label brand and may not be willing to pay the premium price.

(iii) If the mix of sales can be changed in favour of the BD brand then profits will improve still further.
2 HYC

**Top tips.** Show your workings and use a clear layout. Make sure you spend an equal amount of time on the discussions as on the calculations.

(a)

<table>
<thead>
<tr>
<th>Machine hours required</th>
<th>Product</th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H</td>
<td>Y</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Type 1</td>
<td>180</td>
<td>315</td>
<td>180</td>
<td>675</td>
</tr>
<tr>
<td>Type 2</td>
<td>120</td>
<td>175</td>
<td>120</td>
<td>415</td>
</tr>
</tbody>
</table>

Machine utilisation rate:

Machine type 1 = \( \frac{675}{600} = 112.5\% \)

Machine type 2 = \( \frac{415}{500} = 83.0\% \)

Machine type 1 has the highest utilisation rate and the rate is above 100 per cent. Therefore machine type 1 is the bottleneck/limiting factor.

(b)

<table>
<thead>
<tr>
<th>Product</th>
<th>H</th>
<th>Y</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribution per unit</td>
<td>40</td>
<td>96</td>
<td>74</td>
</tr>
<tr>
<td>Machine type 1 hours</td>
<td>1.5</td>
<td>4.5</td>
<td>3.0</td>
</tr>
<tr>
<td>Contribution per hour</td>
<td>26.67</td>
<td>21.33</td>
<td>24.67</td>
</tr>
</tbody>
</table>

Ranking:

1. H
2. Y
3. C

Allocation of machine type 1 hours according to this ranking:

- Product H: 120 units using 180 hours
- Product C: 60 units using 180 hours
- Product Y: (240/4.5) 53 units using 360 hours

(c)

A major concept underlying throughput accounting is that the majority of costs, with the exception of material and component costs, are fixed.

In HYC’s case it is clear that the labour cost, which is treated as a variable cost in traditional marginal costing, is indeed a fixed cost.

Furthermore, given the perishable nature of HYC’s products, the throughput accounting approach to inventory minimisation and maximisation of throughput would be more appropriate.

(d)

<table>
<thead>
<tr>
<th>Product</th>
<th>H per unit</th>
<th>Y per unit</th>
<th>C per unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales revenue</td>
<td>91</td>
<td>174</td>
<td>140</td>
</tr>
<tr>
<td>Component cost</td>
<td>22</td>
<td>19</td>
<td>16</td>
</tr>
<tr>
<td>Other direct material</td>
<td>23</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>Throughput per unit</td>
<td>46</td>
<td>144</td>
<td>110</td>
</tr>
</tbody>
</table>

Machine type 1 hours:

- H: 1.5 hours
- Y: 4.5 hours
- C: 3.0 hours

Throughput per hour:

- H: 30.67
- Y: 32.00
- C: 36.76

Ranking:

1. H
2. Y
3. C
Allocation of machine type 1 hours according to this ranking:

<table>
<thead>
<tr>
<th>Product</th>
<th>Units</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product C</td>
<td>60</td>
<td>180</td>
</tr>
<tr>
<td>Product Y</td>
<td>70</td>
<td>315</td>
</tr>
<tr>
<td>Product H (105/1.5)</td>
<td>70</td>
<td>105</td>
</tr>
</tbody>
</table>

(e) The conventional cost accounting approach used by HYC views inventory as an asset. In the throughput accounting approach inventory is not viewed as an asset, but rather as a result of unsynchronised manufacturing. The existence of inventory is thus viewed as a breakdown in synchronisation and a barrier to generating profits.

In throughput accounting the ideal inventory level is zero, with the exception that a buffer inventory should be held prior to the bottleneck machine.

As regards the valuation of inventory, the throughput philosophy is that no value is added to inventory items and no profit is earned until the items are actually sold. Thus inventory is valued at its material cost only until it is sold.

This approach to inventory valuation is in contrast to the full absorption costing system used by HYC. The latter approach encourages managers to produce output just to add to work in progress or finished goods inventory, since this helps with the absorption of overheads and boosts reported profits. This behaviour will be avoided and managers will be more likely to be willing to minimise inventory if it is valued at material cost only.

3 Ferny Chewer

(a) Let \( t \) = No. of tables produced and sold per month
    \( c \) = No. of chairs produced and sold per month

Maximise contribution = 60t + 50c

Define constraints:

\[
\begin{align*}
20t + 6c & \leq 24,000 \quad \text{(materials)} \\
t + 2c & \leq 2,050 \quad \text{(labour)} \\
t, c & \geq 0 \quad \text{(non-negativity)}
\end{align*}
\]

To plot graph

\[
\begin{align*}
20t + 6c &= 24,000 & t = 0 & c = 4,000 \\
c &= 0 & t = 1,200 \\
t + 2c &= 2,050 & t = 0 & c = 1,025 \\
c &= 0 & t = 2,050 \\
Z &= 60t + 50c \\
\text{Let } Z &= 30,000 & t = 0 & c = 600 \\
c &= 0 & t = 500
\end{align*}
\]
Optimal point where materials and labour intersect

\[ 20t + 6c = 24,000 \]  \hspace{1cm} (1)
\[ t + 2c = 2,050 \]  \hspace{1cm} (2)

\[(2) \times 3 \]
\[ 3t + 6c = 6,150 \]  \hspace{1cm} (3)

\[(1) - (3) \]
\[ 17t = 17,850 \]
\[ t = 1,050 \]

Sub in (2)
\[ 1,050 + 2c = 2,050 \]
\[ 2c = 1,000 \]
\[ Z = 60t + 50c \]
\[ = (60 \times 1,050) + (50 \times 500) \]
\[ = £88,000 \]
\[ c = 500 \]
(b) Premium payable per hour = shadow price
Shadow price = lost contribution

If one more hour of labour became available the labour constraint would become

\[ T + 2c = 2,051 \]

The coordinates of the optimal point become

\[
\begin{align*}
20t + 6c &= 24,000 \quad (1) \\
t + 2c &= 2,051 \quad (2)
\end{align*}
\]

\[(2) \times 3 \quad 3t + 6c = 6,153 \quad (3)\]

\[(1) – (3) \quad 17t = 17,847 \quad (4)\]

\[ t = \frac{1,049.8}{17} \]

Sub in (2)
\[ 1,049.8 + 2c = 2,051 \]
\[ 2c = 1,001.2 \]
\[ c = 500.6 \]

\[ Z = 60t + 50c \]
\[ = (60 \times 1,049.8) + (50 \times 500.6) \]
\[ = £88,018 \]

This is an increase of £18 over the solution to (a) and is the shadow price of labour.

(c) Slack occurs when the maximum availability of a resource is not used.

If more than the required minimum of a product is produced there is said to be a surplus.

(d) Materials: \[ 20t + 6c \leq 24,000 \]

\[ T = 1,050 \]
\[ C = 500 \]

\[ 20 \times 1,050 = 21,000 \]
\[ 6 \times 500 = 3,000 \]

24,000

There is no slack material. Material is a binding constraint

Labour: \[ t + 2c \leq 2,050 \]

\[ T = 1,050 \]
\[ C = 500 \]

\[ 1 \times 1,050 = 1,050 \]
\[ 2 \times 500 = 1,000 \]

2,050

There is no slack labour. Labour is also a binding constraint
## 4 LB Ltd

(a) **Relevant Costing Statement**

<table>
<thead>
<tr>
<th>Description</th>
<th>Note</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminium plating</td>
<td>(1)</td>
<td>240</td>
</tr>
<tr>
<td>Rivets</td>
<td>(2)</td>
<td>50</td>
</tr>
<tr>
<td>Skilled labour</td>
<td>(3)</td>
<td>1,320</td>
</tr>
<tr>
<td>Semi-skilled labour</td>
<td>(4)</td>
<td>–</td>
</tr>
<tr>
<td>Overheads</td>
<td>(5)</td>
<td>–</td>
</tr>
<tr>
<td><strong>Administration overhead</strong></td>
<td>(6)</td>
<td>–</td>
</tr>
<tr>
<td><strong>Total relevant cost</strong></td>
<td></td>
<td>1,610</td>
</tr>
<tr>
<td><strong>Profit</strong></td>
<td>(7)</td>
<td>–</td>
</tr>
<tr>
<td><strong>Minimum price</strong></td>
<td></td>
<td>1,610</td>
</tr>
</tbody>
</table>

**Notes**

1. Aluminium is in regular use therefore it needs to be replaced. Value at current purchase price

   Relevant cost = 20m² × $12 = 240

2. Rivets = opportunity cost is lost scrap proceeds 100 × 50p = $50

3. Skilled labour

   Cheaper to work overtime as $24/hr is less than $36/hr (16 + 20)

   40 hrs @ $24 = 960
   10 hrs @ $36 = 360

   **Total** = 1,320

4. Semi skilled labour

   Relevant cost = nil (spare capacity)

5. Overheads – relevant cost is nil

   Incurred anyway regardless of this job.

6. Administration costs will be incurred anyway regardless of whether or not the job is accepted therefore not relevant.

7. Profit mark up not relevant as question asks for a minimum price. A minimum price is one which just covers the total of the relevant costs.

(b) **Factors include:**

- Product interdependencies
- Inflation
- Availability of cash
- Time value of money
- Impact on supplies
- Potential future contracts
- Learning curves
- Repeat business
- Restricted output/capacity
- Competition
- Recruitment
- Technical feasibility
- Political, legal and economic considerations
5 Henry Lenny

(a) Two way data table

<table>
<thead>
<tr>
<th>Contribution from confectionery &amp; drinks</th>
<th>Audience size</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>300</td>
</tr>
<tr>
<td>5</td>
<td>500</td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

(W) audience size x (ticket price & confectionery / drinks contribution) – fee of $10,000

(b) Joint probability table

<table>
<thead>
<tr>
<th>Contribution from confectionery &amp; drinks</th>
<th>Audience size</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>p 0.5</td>
</tr>
<tr>
<td>5</td>
<td>0.25</td>
</tr>
<tr>
<td>10</td>
<td>0.10</td>
</tr>
</tbody>
</table>

0.4 chance of making a loss
0.6 chance of making a profit

(c) Profit table

<table>
<thead>
<tr>
<th>Contribution from confectionery &amp; drinks</th>
<th>Audience size</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>p 0.5</td>
</tr>
<tr>
<td>5</td>
<td>0.5</td>
</tr>
<tr>
<td>10</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Expected value = sum of table = $1,248
## 6 McDreamy

**Top tips.** Make sure you read the question carefully especially on the calculation of capacity levels. Note that at 65% capacity 10,000 units are produced.

Part (b) requires you to apply your knowledge and part (c) is a straightforward regurgitation of text book knowledge.

(a) **Flexible budget statement for next year operating at 85% capacity**

<table>
<thead>
<tr>
<th>Workings</th>
<th>13,077 units</th>
<th>$</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>1</td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>Sales revenue</td>
<td>9</td>
<td>5,911,484</td>
<td></td>
</tr>
<tr>
<td>Variable costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct materials</td>
<td>2</td>
<td>1,386,162</td>
<td></td>
</tr>
<tr>
<td>Direct wages</td>
<td>3</td>
<td>2,357,129</td>
<td></td>
</tr>
<tr>
<td>Variable production overhead</td>
<td>4</td>
<td>489,734</td>
<td></td>
</tr>
<tr>
<td>Variable selling and distribution overhead</td>
<td>5</td>
<td>69,962</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4,302,987</td>
</tr>
<tr>
<td>Contribution</td>
<td></td>
<td>1,608,497</td>
<td></td>
</tr>
<tr>
<td>Fixed costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production overhead</td>
<td>6</td>
<td>330,000</td>
<td></td>
</tr>
<tr>
<td>Selling and distribution overhead</td>
<td>7</td>
<td>161,250</td>
<td></td>
</tr>
<tr>
<td>Administration overhead</td>
<td>8</td>
<td>132,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>623,250</td>
</tr>
<tr>
<td>Profit</td>
<td></td>
<td>985,247</td>
<td></td>
</tr>
</tbody>
</table>

**Workings**

1. 65% of capacity = 10,000 units
   
   $\therefore$ 100% of capacity = 10,000 $\div$ 0.65 = 15,385 units
   
   $\therefore$ 85% of capacity = (10,000 $\div$ 0.65) $\times$ 0.85 = 13,077 units
   
   $\therefore$ 75% of capacity = 11,538
   
   $\therefore$ 55% of capacity = 8,462

2. Current direct material cost per unit = $1,000,000 $\div$ 10,000
   
   $\therefore$ Flexible budget allowance for next year = $100 $\times$ 1.06 $\times$ 13,077
   
   $\therefore$ Flexible budget allowance for next year = $1,386,162

3. Current direct wages cost per unit = $1,750,000 $\div$ 10,000
   
   $\therefore$ Flexible budget allowance for next year = $175 $\times$ 1.03 $\times$ 13,077
   
   $\therefore$ Flexible budget allowance for next year = $2,357,129

4. Production overhead increases by $53,830 for an increase in activity of (10,000 – 8,462) units
   
   $\therefore$ Variable production overhead per unit = $35
   
   $\therefore$ Variable overhead allowance for 85% capacity = 13,077 $\times$ $35 = $457,695
   
   Plus 7% increase = $32,039
   
   Total allowance = $489,734
5 Selling overhead increases by $7,690 for an increase in activity of (10,000 – 8,462) units.

\[ \therefore \text{Variable cost per unit} = \$5 \]

\[ \therefore \text{Variable overhead allowance for 85\% capacity} = 13,077 \times \$5 = \$65,385 \]

Plus 7\% increase $4,577

Total allowance $69,962

6

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total production overhead at 65% activity</td>
<td>$650,000</td>
</tr>
<tr>
<td>Less variable overhead (10,000 \times $35 (W4))</td>
<td>$350,000</td>
</tr>
<tr>
<td>Fixed overhead this year</td>
<td>$300,000</td>
</tr>
<tr>
<td>Plus 10% increase</td>
<td>$30,000</td>
</tr>
<tr>
<td>Total allowance</td>
<td>$330,000</td>
</tr>
</tbody>
</table>

7

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total selling overhead at 65% activity</td>
<td>$200,000</td>
</tr>
<tr>
<td>Less variable overhead (10,000 \times $5 (W5))</td>
<td>$50,000</td>
</tr>
<tr>
<td>Fixed overhead this year</td>
<td>$150,000</td>
</tr>
<tr>
<td>Plus 7.5% increase</td>
<td>$11,250</td>
</tr>
<tr>
<td>Total allowance</td>
<td>$161,250</td>
</tr>
</tbody>
</table>

8 Administration overhead = $120,000 \times 1.1 = $132,000

9 The cost and selling price structure is as follows.

<table>
<thead>
<tr>
<th>Description</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales price</td>
<td>100.00</td>
</tr>
<tr>
<td>Profit</td>
<td>16.67</td>
</tr>
<tr>
<td>Cost</td>
<td>83.33</td>
</tr>
</tbody>
</table>

\[ \therefore \text{Profit as a percentage of cost} = \frac{16.67}{83.33} \times 100\% = 20\% \text{ of cost} \]

\[ \text{Total cost} (\$4,302,987 + \$623,250) = \$4,926,237 \]

Profit at 20\% of cost $985,247

\[ \therefore \text{Sales value} = 5,911,484 \]

(b) Three problems which may arise from the change in capacity level are as follows.

(i) There is likely to be a requirement for additional cash for working capital, for example inventory levels and debtors will probably increase. This additional cash may not be available.

(ii) It will probably be necessary to recruit more direct labour. The activities involved in advertising, interviewing and training may lead to increased costs.

(iii) It may be necessary to reduce the selling price to sell the increased volume. This could have an adverse effect on profits.

(c) The principle of controllability is that managers of responsibility centres should only be held accountable for costs over which they have some influence.

Controllable costs are items of expenditure which can be directly influenced by a given manager within a given time span.

Care must be taken to distinguish between controllable costs and uncontrollable costs in variance reporting. The controllability principle is that managers of responsibility centres should only be held accountable for costs over which they have some influence. From a motivation point of view this is important because it can be very demoralising for managers who feel that their performance is being judged on the basis of something over which they have no influence. It is also important from a control point of view in that control reports should ensure that information on costs is reported to the manager who is able to take action to control them.
Responsibility accounting attempts to associate costs, revenues, assets and liabilities with the managers most capable of controlling them. As a system of accounting, it therefore distinguishes between controllable and uncontrollable costs.

Most variable costs within a department are thought to be controllable in the short term because managers can influence the efficiency with which resources are used, even if they cannot do anything to raise or lower price levels.

A cost which is not controllable by a junior manager might be controllable by a senior manager. For example, there may be high direct labour costs in a department caused by excessive overtime working. The junior manager may feel obliged to continue with the overtime to meet production schedules, but his senior may be able to reduce costs by hiring extra full-time staff, thereby reducing the requirements for overtime.

A cost which is not controllable by a manager in one department may be controllable by a manager in another department. For example, an increase in material costs may be caused by buying at higher prices than expected (controllable by the purchasing department) or by excessive wastage (controllable by the production department) or by a faulty machine producing rejects (controllable by the maintenance department).

Some costs are non-controllable, such as increases in expenditure items due to inflation. Other costs are controllable, but in the long term rather than the short term. For example, production costs might be reduced by the introduction of new machinery and technology, but in the short term, management must attempt to do the best they can with the resources and machinery at their disposal.

7 Divisional performance measures

Top tips. Parts (a) and (b) require you to demonstrate knowledge you should have picked up directly from the Text. No application skills are required at all in this instance.

That being said, it is vital that you do not learn the advantages and disadvantages of ROI and RI in a parrot fashion as they underlie the very core of the subject. You must understand how and why ROI affects managerial behaviour, for example. You are just as likely to get a written question on this area as a calculation-based one.

The calculations required in (b) should not have caused you any problems.

Part (c) is basic book knowledge and so you should have been able to score quite a few of the marks available.

(a) The residual income (RI) for a division is calculated by deducting from the divisional profit an imputed interest charge, based on the investment in the division.

The return on investment (ROI) is the divisional profit expressed as a percentage of the investment in the division.

Both methods use the same basic figure for profit and investment, but residual income produces an absolute measure whereas the return on investment is expressed as a percentage.

Both methods suffer from disadvantages in measuring the profit and the investment in a division which include the following.

(i) Assets must be valued consistently at historical cost or at replacement cost. Neither valuation basis is ideal.

(ii) Divisions might use different bases to value inventory and to calculate depreciation.

(iii) Any charges made for the use of head office services or allocations of head office assets to divisions are likely to be arbitrary.
In addition, return on investment suffers from the following disadvantages.

(i) Rigid adherence to the need to maintain ROI in the short term can discourage managers from investing in new assets, since average divisional ROI tends to fall in the early stages of a new investment. Residual income can overcome this problem by highlighting projects which return more than the cost of capital.

(ii) It can be difficult to compare the percentage ROI results of divisions if their activities are very different: residual income can overcome this problem through the use of different interest rates for different divisions.

(b) (i) Return on divisional investment (ROI)

<table>
<thead>
<tr>
<th></th>
<th>Before investment</th>
<th>After investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Divisional profit</td>
<td>£18,000</td>
<td>£19,600</td>
</tr>
<tr>
<td>Divisional investment</td>
<td>£100,000</td>
<td>£110,000</td>
</tr>
<tr>
<td>Divisional ROI</td>
<td>18.0%</td>
<td>17.8%</td>
</tr>
</tbody>
</table>

The ROI will fall in the short term if the new investment is undertaken. This is a problem which often arises with ROI, as noted in part (a) of this solution.

(ii) Divisional residual income

<table>
<thead>
<tr>
<th></th>
<th>Before investment</th>
<th>After investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Divisional profit</td>
<td>£18,000</td>
<td>£19,600</td>
</tr>
<tr>
<td>Less imputed interest:</td>
<td>£100,000 \times 15%</td>
<td>£110,000 \times 15%</td>
</tr>
<tr>
<td></td>
<td>15,000</td>
<td>16,500</td>
</tr>
<tr>
<td>Residual income</td>
<td>3,000</td>
<td>3,100</td>
</tr>
</tbody>
</table>

The residual income will increase if the new investment is undertaken. The use of residual income has highlighted the fact that the new project returns more than the cost of capital (16% compared with 15%).

(c) Potential benefits of operating a transfer pricing system within a divisionalised company

(i) It can lead to goal congruence by motivating divisional managers to make decisions, which improve divisional profit and improve profit of the organisation as a whole.

(ii) It can prevent dysfunctional decision making so that decisions taken by a divisional manager are in the best interests of his own part of the business, other divisions and the organisation as a whole.

(iii) Transfer prices can be set at a level that enables divisional performance to be measured ‘commercially’. A transfer pricing system should therefore report a level of divisional profit that is a reasonable measure of the managerial performance of the division.

(iv) It should ensure that divisional autonomy is not undermined. A well-run transfer pricing system helps to ensure that a balance is kept between divisional autonomy to provide incentives and motivation, and centralised authority to ensure that the divisions are all working towards the same target, the benefit of the organisation as a whole.
## 8 AJH

<table>
<thead>
<tr>
<th>Division 1</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External sales</strong> (5,000 × 150)</td>
<td>$750,000</td>
</tr>
<tr>
<td><strong>Internal sales</strong> (3,000 × 63 (w1))</td>
<td>$189,000</td>
</tr>
<tr>
<td>Less: production costs (8,000 × 60)</td>
<td>($480,000)</td>
</tr>
<tr>
<td>Non-production costs</td>
<td>($150,000)</td>
</tr>
<tr>
<td><strong>Profit</strong></td>
<td><strong>$309,000</strong></td>
</tr>
</tbody>
</table>

**Division 2**

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External sales</strong> (3,000 × 300)</td>
</tr>
<tr>
<td>Less: Production costs (3,000 × 80)</td>
</tr>
<tr>
<td>Internal costs (3,000 × 63)</td>
</tr>
<tr>
<td>Non-production costs</td>
</tr>
<tr>
<td><strong>Profit</strong></td>
</tr>
</tbody>
</table>

(W1) Transfer price

$60 × 75% = 45
40% mark-up = 18
63

## 9 JM Foods

**Top tips.** Ensure that you refer back to the scenario throughout your answer to part (a) to maximise your score.

(a) There are many sources of external information available to Bill.

**Business directories**

Business directories are a form of secondary data.

Bill could use business directories to compile a list of competing fast-food restaurants currently operating in the new country.

**Government agencies**

The government is a major source of economic information and information about industries and popular trends. Many government publications are available online and can be downloaded for free.

Official government statistics on consumer tastes and trends as well as socio-demographic data could help to indicate whether the proposed expansion is commercially viable. The data could also influence the food that the company chooses to offer to the new market.

**Information from customers**

Bill should encourage the company to send out customer satisfaction surveys and conduct market research.

Customer comments and complaints in existing markets could influence the ingredients used and the food offered in the new country.

**Information from suppliers**

Bill could research and contract a range of potential suppliers in the new country.

This would provide valuable cost data to feed into budgets and any investment appraisal techniques that the directors may wish to use as part of the decision-making process.
The internet

The internet can be used to provide information about suppliers and competitors.

For example, Bill could visit the websites of competitors already operating in the proposed country to obtain details of the products/services they offer.

Such data will give the directors an idea of the prices they can expect to charge in the new country and the margins they can expect to earn on each product.

(b) Direct search costs are directly attributable to the activities performed to obtain external data. For example, download fees or the costs of a market research survey.

Indirect access costs include management and employee time spent finding useful information. They also include costs incurred as a result of wasted management and employee time on unsuccessful and excessive searches.

Management costs are the costs incurred in the recording, processing and dissemination of external information. They also include costs attributable to time wasted on excessive processing due to information overload.

Infrastructure costs are costs attributable to the tools and equipment used to obtain external data. For example, installation and maintenance of computer networks and internal electronic communications.

Time-theft costs include lost time, the cost of monitoring and wasted time caused by the abuse of internet and email facilities.
END OF ANSWER BANK

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ANF513
Appendix A: Pilot paper
Fundamentals Pilot Paper – Skills module

Performance Management

Time allowed
Reading and planning: 15 minutes
Writing: 3 hours

ALL FOUR questions are compulsory and MUST be attempted.

Do NOT open this paper until instructed by the supervisor.
During reading and planning time only the question paper may be annotated. You must NOT write in your answer booklet until instructed by the supervisor.
This question paper must not be removed from the examination hall.

The Association of Chartered Certified Accountants
Answer ALL FOUR questions

1. Triple Limited makes three types of gold watch – the Diva (D), the Classic (C) and the Poseur (P). A traditional product costing system is used at present; although an activity based costing (ABC) system is being considered. Details of the three products for a typical period are:

<table>
<thead>
<tr>
<th>Hours per unit</th>
<th>Materials Cost per unit ($)</th>
<th>Production Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour hours</td>
<td>Machine hours</td>
<td></td>
</tr>
<tr>
<td>Product D</td>
<td>½</td>
<td>1½</td>
</tr>
<tr>
<td>Product C</td>
<td>1¼</td>
<td>1</td>
</tr>
<tr>
<td>Product P</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Direct labour costs $6 per hour and production overheads are absorbed on a machine hour basis. The overhead absorption rate for the period is $28 per machine hour.

Required:

(a) Calculate the cost per unit for each product using traditional methods, absorbing overheads on the basis of machine hours. (3 marks)

Total production overheads are $654,500 and further analysis shows that the total production overheads can be divided as follows:

<table>
<thead>
<tr>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs relating to set-ups</td>
</tr>
<tr>
<td>Costs relating to machinery</td>
</tr>
<tr>
<td>Costs relating to materials handling</td>
</tr>
<tr>
<td>Costs relating to inspection</td>
</tr>
<tr>
<td>Total production overhead</td>
</tr>
</tbody>
</table>

The following total activity volumes are associated with each product line for the period as a whole:

<table>
<thead>
<tr>
<th>Number of Set ups</th>
<th>Number of movements of materials</th>
<th>Number of inspections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product D</td>
<td>75</td>
<td>12</td>
</tr>
<tr>
<td>Product C</td>
<td>115</td>
<td>21</td>
</tr>
<tr>
<td>Product P</td>
<td>480</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>670</td>
<td>120</td>
</tr>
</tbody>
</table>

Required:

(b) Calculate the cost per unit for each product using ABC principles (work to two decimal places). (12 marks)

(c) Explain why costs per unit calculated under ABC are often very different to costs per unit calculated under more traditional methods. Use the information from Triple Limited to illustrate. (4 marks)

(d) Discuss the implications of a switch to ABC on pricing and profitability. (6 marks)
Simply Soup Limited manufactures and sells soups in a JIT environment. Soup is made in a manufacturing process by mixing liquified vegetables, melted butter and stock (stock in this context is a liquid used in making soups). They operate a standard costing and variances system to control its manufacturing processes. At the beginning of the current financial year they employed a new production manager to oversee the manufacturing process and to work alongside the purchasing manager. The production manager will be rewarded by a salary and a bonus based on the directly attributable variances involved in the manufacturing process.

After three months of work there is doubt about the performance of the new production manager. On the one hand, the cost variances look on the whole favourable, but the sales director has indicated that sales are significantly down and the overall profitability is decreasing.

The table below shows the variance analysis results for the first three months of the manager’s work.

Table 1

<table>
<thead>
<tr>
<th></th>
<th>Month 1</th>
<th>Month 2</th>
<th>Month 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Price Variance</td>
<td>$1,125</td>
<td>$1,200</td>
<td>$1,225</td>
</tr>
<tr>
<td>Material Mix Variance</td>
<td>$1,800</td>
<td>$2,253</td>
<td>$2,800</td>
</tr>
<tr>
<td>Material Yield Variance</td>
<td>$2,126</td>
<td>$5,844</td>
<td>$9,752</td>
</tr>
<tr>
<td>Total Variance</td>
<td>$4,226</td>
<td>$7,197</td>
<td>$10,352</td>
</tr>
</tbody>
</table>

The actual level of activity was broadly the same in each month and the standard monthly material total cost was approximately $145,000.

The standard cost card is as follows for the period under review:

<table>
<thead>
<tr>
<th></th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.90 litres of liquified</td>
<td>0.72</td>
</tr>
<tr>
<td>vegetables @ $0.80/litre</td>
<td></td>
</tr>
<tr>
<td>0.05 litres of melted</td>
<td>0.20</td>
</tr>
<tr>
<td>butter @ $4/litre</td>
<td></td>
</tr>
<tr>
<td>1.10 litres of stock</td>
<td>0.55</td>
</tr>
<tr>
<td>@ $0.50/litre</td>
<td></td>
</tr>
</tbody>
</table>

Total cost to produce 1 litre of soup 1.47

Required:

(a) Using the information in table 1:

(i) Explain the meaning of each type of variances above (price, mix and yield but excluding the total variance) and briefly discuss to what extent each type of variance is controllable by the production manager. (6 marks)

(ii) Evaluate the performance of the production manager considering both the cost variance results above and the sales director’s comments. (6 marks)

(iii) Outline two suggestions how the performance management system might be changed to better reflect the performance of the production manager. (4 marks)

(b) The board has asked that the variances be calculated for Month 4. In Month 4 the production department data is as follows:

Actual results for Month 4

<table>
<thead>
<tr>
<th></th>
<th>Bought</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquified vegetables:</td>
<td>82,000</td>
<td>112,000</td>
</tr>
<tr>
<td>Melted butter:</td>
<td>4,900</td>
<td></td>
</tr>
<tr>
<td>Stock:</td>
<td>122,000</td>
<td></td>
</tr>
</tbody>
</table>

Actual production was 112,000 litres of soup

Required:

Calculate the material price, mix and yield variances for Month 4. You are not required to comment on the performance that the calculations imply. Round variances to the nearest $.

(9 marks)

(25 marks)
3 BFG Limited is investigating the financial viability of a new product the S-pro. The S-pro is a short-life product for which a market has been identified at an agreed design specification. The product will only have a life of 12 months.

The following estimated information is available in respect of S-pro:

1. Sales should be 120,000 in the year in batches of 100 units. An average selling price of $1,050 per batch of 100 units is expected. All sales are for cash.

2. An 80% learning curve will apply for the first 700 batches after which a steady state production time will apply, with the labour time per batch after the first 700 batches being equal to the time for the 700th batch. The cost of the first batch was measured at $2,500. This was for 500 hours at $5 per hour.

3. Variable overhead is estimated at $2 per labour hour.

4. Direct material will be $500 per batch of S-pro for the first 200 batches produced. The second 200 batches will cost 90% of the cost per batch of the first 200 batches. All batches from then on will cost 90% of the batch cost for each of the second 200 batches. All purchases are made for cash.

5. S-pro will require additional space to be rented. These directly attributable fixed costs will be $15,000 per month.

A target net cash flow of $130,000 is required in order for this project to be acceptable.

Note: The learning curve formula is given on the formula sheet. At the learning rate of 0.8 (80%), the learning factor (b) is equal to -0.3219.

Required:

(a) Prepare detailed calculations to show whether product S-pro will provide the target net cash flow. (12 marks)

(b) Calculate what length of time second batch will take if the actual rate of learning is:

(i) 80%;
(ii) 90%.

Explain which rate shows the faster learning. (5 marks)

(c) Suggest specific actions that BFG could take to improve the net cash flow calculated above. (25 marks)
4 The following information relates to Preston Financial Services, an accounting practice. The business specialises in providing accounting and taxation work for dentists and doctors. In the main the clients are wealthy, self-employed and have an average age of 52.

The business was founded by and is wholly owned by Richard Preston, a dominant and aggressive sole practitioner. He feels that promotion of new products to his clients would be likely to upset the conservative nature of his dentists and doctors and, as a result, the business has been managed with similar products year on year.

You have been provided with financial information relating to the practice in appendix 1. In appendix 2, you have been provided with non-financial information which is based on the balanced scorecard format.

Appendix 1: Financial information

<table>
<thead>
<tr>
<th></th>
<th>Current year</th>
<th>Previous year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turnover ($'000)</td>
<td>945</td>
<td>900</td>
</tr>
<tr>
<td>Net profit ($'000)</td>
<td>187</td>
<td>180</td>
</tr>
<tr>
<td>Average cash balances ($'000)</td>
<td>21</td>
<td>20</td>
</tr>
<tr>
<td>Average debtor/trade receivables days (industry average 30 days)</td>
<td>18 days</td>
<td>22 days</td>
</tr>
<tr>
<td>Inflation rate (%)</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Appendix 2: Balanced Scorecard (extract)

Internal Business Processes

<table>
<thead>
<tr>
<th></th>
<th>Current year</th>
<th>Previous year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error rates in jobs done</td>
<td>16%</td>
<td>10%</td>
</tr>
<tr>
<td>Average job completion time</td>
<td>7 weeks</td>
<td>10 weeks</td>
</tr>
</tbody>
</table>

Customer Knowledge

<table>
<thead>
<tr>
<th></th>
<th>Current year</th>
<th>Previous year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of customers</td>
<td>1220</td>
<td>1500</td>
</tr>
<tr>
<td>Average fee levels ($)</td>
<td>775</td>
<td>600</td>
</tr>
<tr>
<td>Market Share</td>
<td>14%</td>
<td>20%</td>
</tr>
</tbody>
</table>

Learning and Growth

<table>
<thead>
<tr>
<th></th>
<th>Current year</th>
<th>Previous year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of revenue from non-core work</td>
<td>4%</td>
<td>5%</td>
</tr>
<tr>
<td>Industry average of the proportion of revenue from non-core work in accounting practices</td>
<td>30%</td>
<td>25%</td>
</tr>
<tr>
<td>Employee retention rate</td>
<td>60%</td>
<td>80%</td>
</tr>
</tbody>
</table>

Notes

1. Error rates measure the number of jobs with mistakes made by staff as a proportion of the number of clients serviced.

2. Core work is defined as being accountancy and taxation. Non-core work is defined primarily as pension advice and business consultancy. Non core work is traditionally high margin work.

Required:

(a) Using the information in appendix 1 only, comment on the financial performance of the business (briefly consider growth, profitability, liquidity and credit management).  
(b) Explain why non financial information, such as the type shown in appendix 2, is likely to give a better indication of the likely future success of the business than the financial information given in appendix 1.
(c) Using the data given in appendix 2 comment on the performance of the business. Include comments on internal business processes, customer knowledge and learning/growth, separately, and provide a concluding comment on the overall performance of the business.

End of Question paper
Formulae Sheet

Learning curve

\( Y = ax^b \)

Where \( y \) = average cost per batch
\( a \) = cost of first batch
\( x \) = total number of batches produced
\( b \) = learning factor (\( \log LR / \log 2 \))
\( LR \) = the learning rate as a decimal

Regression analysis

\( y = a + bx \)

\[
b = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2}
\]
\[
a = \frac{\sum y - b \sum x}{n}
\]

\[
r = \frac{n \sum xy - \sum x \sum y}{\sqrt{n \sum x^2 - (\sum x)^2 n \sum y^2 - (\sum y)^2}}
\]

Demand curve

\( P = a - bQ \)

\[
b = \frac{\text{change in price}}{\text{change in quantity}}
\]
\( a = \text{price when } Q = 0 \)
Pilot Paper F5
Performance Management

21: APPENDIX A: PILOT PAPER

(a) Traditional cost per unit

<table>
<thead>
<tr>
<th>Material</th>
<th>$</th>
<th>$</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour ($/hour)</td>
<td>3</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Direct costs</td>
<td>23</td>
<td>21</td>
<td>31</td>
</tr>
<tr>
<td>Production overhead ($/machine hour)</td>
<td>42</td>
<td>28</td>
<td>84</td>
</tr>
<tr>
<td>Total production cost/unit</td>
<td>65</td>
<td>49</td>
<td>115</td>
</tr>
</tbody>
</table>

(b) ABC cost per unit

Examiners note: Each step required has been given its own sub-heading to make the procedure clear. The basic principle is to find an overhead cost per unit of activity for each element of overhead cost. In some cases it might then be possible to find an overhead cost per unit directly, here it is probably easier to split overheads between each product type first and then find a cost per unit as shown.

(i) Total overheads

These were given at $654,500

(ii) Total machine hours (needed as the driver for machining overhead)

<table>
<thead>
<tr>
<th>Product</th>
<th>Hours/unit</th>
<th>Production units</th>
<th>Total hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>1½</td>
<td>750</td>
<td>1,125</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>1,250</td>
<td>1,250</td>
</tr>
<tr>
<td>P</td>
<td>5</td>
<td>7,000</td>
<td>21,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>23,375</td>
</tr>
</tbody>
</table>

(iii) Analysis of total overheads and cost per unit of activity

<table>
<thead>
<tr>
<th>Type of overhead</th>
<th>Driver</th>
<th>%</th>
<th>Total overhead $</th>
<th>Level of driver activity</th>
<th>Cost/driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set-ups</td>
<td>Number of set-ups</td>
<td>35</td>
<td>229,075</td>
<td>670</td>
<td>341.90</td>
</tr>
<tr>
<td>Machining</td>
<td>Machine hours</td>
<td>20</td>
<td>130,900</td>
<td>23,375</td>
<td>5.60</td>
</tr>
<tr>
<td>Materials handling</td>
<td>Material movements</td>
<td>15</td>
<td>98,175</td>
<td>120</td>
<td>818.13</td>
</tr>
<tr>
<td>Inspection</td>
<td>Number of inspections</td>
<td>30</td>
<td>196,350</td>
<td>1,000</td>
<td>196.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100</td>
<td>654,500</td>
<td></td>
</tr>
</tbody>
</table>

(iv) Total overheads by product and per unit

<table>
<thead>
<tr>
<th>Overhead</th>
<th>Activity</th>
<th>$ Cost</th>
<th>Product D Activity</th>
<th>$ Cost</th>
<th>Product C Activity</th>
<th>$ Cost</th>
<th>Product P Activity</th>
<th>$ Cost</th>
<th>Total Activity</th>
<th>$ Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set-ups</td>
<td>75</td>
<td>25,643</td>
<td>115</td>
<td>39,319</td>
<td>480</td>
<td>164,113</td>
<td>670</td>
<td>229,075</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machining</td>
<td>1,125</td>
<td>6,500</td>
<td>21</td>
<td>7,000</td>
<td>21,000</td>
<td>117,600</td>
<td>23,375</td>
<td>130,900</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material Handling</td>
<td>12</td>
<td>9,817</td>
<td>21</td>
<td>17,181</td>
<td>87</td>
<td>71,177</td>
<td>120</td>
<td>98,175</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>150</td>
<td>29,453</td>
<td>180</td>
<td>35,343</td>
<td>670</td>
<td>131,554</td>
<td>1,000</td>
<td>196,350</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total overhead cost</td>
<td></td>
<td>71,213</td>
<td>98,843</td>
<td>484,444</td>
<td></td>
<td></td>
<td></td>
<td>654,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Units produced</td>
<td>750</td>
<td>1,250</td>
<td>7,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Costs per unit</td>
<td>$94.95</td>
<td>$79.07</td>
<td>$69.21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</table>

(v) Cost per unit

<table>
<thead>
<tr>
<th>D</th>
<th>$</th>
<th>$</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct costs (from (a))</td>
<td>23.00</td>
<td>21.00</td>
<td>31.00</td>
</tr>
<tr>
<td>Overheads (from (iv))</td>
<td>94.95</td>
<td>79.07</td>
<td>69.21</td>
</tr>
<tr>
<td></td>
<td>117.95</td>
<td>100.07</td>
<td>100.21</td>
</tr>
</tbody>
</table>
21: APPENDIX A: PILOT PAPER

(c) Comment

The overhead costs per unit are summarized below together with volume of production.

<table>
<thead>
<tr>
<th>Product</th>
<th>D</th>
<th>C</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>750</td>
<td>1,250</td>
<td>7,000</td>
</tr>
<tr>
<td>Conventional overheads</td>
<td>$42</td>
<td>$28</td>
<td>$34</td>
</tr>
<tr>
<td>ABC overheads</td>
<td>$55</td>
<td>$79</td>
<td>$69</td>
</tr>
</tbody>
</table>

The result of the change to Activity-Based Costing is clear; the overhead cost of D and C have risen whilst that of P has fallen.

This is in line with the comments of many who feel that ABC provides a fairer unit cost better reflecting the effort required to make different products. This is illustrated here with product P which may take longer to make than D or C, but once production has started the process is simple to administer. This may be due to having much longer production lines.

Products D and C are relatively minor volume products but still require a fair amount of administrative time by the production department, i.e. they involve a fair amount of “hassle”. This is explained by the following table of activities per 1,000 units produced.

<table>
<thead>
<tr>
<th>Get-ups</th>
<th>Material movements</th>
<th>Inspections</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>100</td>
<td>16</td>
</tr>
<tr>
<td>C</td>
<td>92</td>
<td>17</td>
</tr>
<tr>
<td>P</td>
<td>69</td>
<td>12</td>
</tr>
</tbody>
</table>

This table highlights the problem:

- Product P has fewer set-ups, material movements and inspections per 1,000 units than or C
- As a consequence product P’s overhead cost per unit for these three elements has fallen.
- The machining overhead cost per unit for P is still two or three times greater than for products D or C, but because this overhead only accounts for 20% of the total overhead this has a small effect on total cost.
- The overall result is P’s fall in production overhead cost per unit and the rise in those figures for D and C

(d) Pricing and Profitability

Switching to ABC can, as in this case, substantially change the costs per unit calculations. Consequently if an organization’s selling prices are determined by a version of cost-plus pricing then the selling prices would alter.

In this case the selling price of D and C would rise significantly, and the selling price of P would fall. This, at first glance may be appealing however:

- Will the markets for D and C tolerate a price rise? There could be competition to consider. Will customers be willing to pay more for a product simply because Triple Ltd has changed its cost allocation methods?
- Product P is a high volume product. Reducing its selling price will have a dramatic effect on revenue and contribution. One would have to question whether such a reduction would be compensated for by increased volumes.

Alternatively, one could take the view that prices are determined by the market and therefore if Triple Ltd switches to ABC, it is not the price that would change but the profit or margin per unit that would change.

This can change attitudes within the business. Previously high margin products (under a traditional overhead absorption system) would be shown as less profitable. Salesmen (possibly profit motivated) can begin to push the sales of different products seeking higher personal rewards. (Assuming commission based on profits per unit sold)

It must always be remembered that if overheads are essentially fixed then they should be ignored in business decision making. Switching to ABC can change reported profits per unit but it is contribution per unit that is perhaps more important.

SIMPLY SOUP Limited

6) Meaning and controllability of the variances

Material Price Variance

Indicates whether Simply Soup has paid more (adverse) or less (favourable) for its input materials than the standard prices set for the period. For example, if a new supplier had to be found and the price paid was more than the standard price then Simply Soup would incur an extra cost. This extra cost is the price variance.

Price variances are controllable to the extent that Simply Soup can choose its suppliers. On the other hand, vegetables are a seasonal and weather dependent crop and therefore factors outside Simply Soups control can influence prices in the market. The key issue is that the production manager will not control the price paid that is the job of the Purchasing Manager.

Material Mix Variance

Considers the cost of a change in the mix of the ingredients to make soup. For example adding less butter (which is expensive) and more stock (which is cheaper) will be a cheaper mix than the standard mix. A cheaper mix will result in a favourable variance.
The recipe determines the mix. The recipe is entirely under the control of the production manager.

Material Yield Variance

This shows the productivity of the manufacturing process. If the process produces more soup than expected then the yield will be good (favourable). At the moment 2.05 litres of input produces 1 litre of soup, if 2.05 litres of input produces more than 1 litre of soup then the yield is favourable. Greater yield than expected can be a result of operational efficiency or a change in mix.

The production manager controls the operational process so should be able to control the yield. Poor quality ingredients can damage yield but the production manager should be in control of quality and reject dubious ingredients. The production manager is also responsible for things like spillage. Higher spillage can also reduce yield.

(ii) Production manager’s performance

Cost Efficiency

The production manager has produced significant favourable cost variances. The total favourable variance has risen from $4,226 to $10,352 in the first three months. This last figure represents approximately 7.1% of the standard monthly spend.

The prices for materials have been rising but are probably outside the control of the production manager. The rising prices may have put pressure on the production manager to cheapen the mix.

The mix has become cheaper. This could be seen as a cost efficient step. However, Simply Soup must question the quality implications of this (see later).

The yield results are the most significant. The manager is getting far more out of the process than is usual. The new mix is clearly far more productive than before. This could easily be seen as an indicator of good performance as long as the quality is maintained.

Quality

The concern is that the production manager has sacrificed quality for lower cost and greater quantity. The sales director has indicated that sales are falling, perhaps an indication that the customers are unhappy with the product when compared to competitor offers. The greater yield and cheaper mix may well have produced a tasteless soup.

Overall

Overall there has to be concern about the production manager’s performance. Cost control and efficiency are important but not at the expense of customer satisfaction and quality. We do not have figures for the extent to which sales have been damaged and small reductions may be acceptable.

(iii) Changes to the performance management system

The performance management system needs to take account of the quality of the soup being produced and the overall impact a decision has on the business.

Quality targets need to be agreed with the manager. These are difficult to quantify but not impossible. For example soup consistency (thickness) is measurable. Regular tasting will indicate a fall in quality; tasters could give the soup a mark out of 10 on taste, colour, smell etc.

The production manager should not be rewarded for producing lots of cheap soup that cannot be sold. The performance management system should reflect the overall effect that decisions have. If the production manager’s actions have reduced sales then sales volume variances should be allocated to the production manager as part of the performance assessment.

(b) Variance calculations

Material Price Variance

Mixed Vegetables: \[ \frac{69,700}{82,000} - 0.8 \times 82,000 = \$4,100 \] (A)

Butter: \[ \frac{21,070}{4,900} - 4 \times 4,900 = \$1,470 \] (A)

Stock: \[ \frac{58,560}{122,000} - 0.5 \times 122,000 = \$2,440 \] (F)
Material Mix Variance
Mixed Vegetables: \((62,000 - 91,712.2^*) \times 0.80 = 7,770\) (F)
Butter: \((4,900 - 5,095.1) \times 4 = 780\) (F)
Stock: \((122,000 - 112,092.7) \times 0.50 = 4,954\) (A)
Total Mix Variance \(= 3,596\) (F)
Note: it is only the total mix variance that is a valid variance here
Total input volume = \((62,000 + 4,900 + 122,000) = 208,900\)
* Standard mix for mixed vegetables is \(= 91,712.2\)
Note: alternate approaches are acceptable.

Material Yield Variance
\(112,000 - 101,902.4 \times 1.47 = 14,843\) (F)
The standard inputs add up to 2.05 units \((0.9 + 0.5 + 1.1)\). This produces 1 ltr of soup. The actual inputs were 208,900 litres and therefore the standard expected output should be
\[208,900 \times \frac{1}{2.05} = 101,902.4\] litres

3 BFG Limited

<table>
<thead>
<tr>
<th>(a)</th>
<th>Sales</th>
<th>120,000 units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Revenue</td>
<td>$1,260,000</td>
<td></td>
</tr>
<tr>
<td>Costs:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct materials (W1)</td>
<td>$514,000</td>
<td></td>
</tr>
<tr>
<td>Direct Labour (W2)</td>
<td>$315,423</td>
<td></td>
</tr>
<tr>
<td>Variable overhead</td>
<td>$126,169</td>
<td></td>
</tr>
<tr>
<td>Rent</td>
<td>$180,000</td>
<td></td>
</tr>
<tr>
<td>Net cash flow</td>
<td>$124,408</td>
<td></td>
</tr>
<tr>
<td>Target cash flow</td>
<td>$130,000</td>
<td></td>
</tr>
</tbody>
</table>

The target cash flow will not be achieved.

Workings:

(1) Direct material: Batches

<table>
<thead>
<tr>
<th>Batches</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>First 200 @ $500</td>
<td>100,000</td>
</tr>
<tr>
<td>Second 200 @ $450</td>
<td>90,000</td>
</tr>
<tr>
<td>Remaining 800 @ $405</td>
<td>324,000</td>
</tr>
<tr>
<td>Total</td>
<td>514,000</td>
</tr>
</tbody>
</table>

(2) Direct labour

For first seven hundred batches \(y = ax^6\)
\[y = 2,500 \times 700 = 1,750,000\] 
\[y = 303,461.045\]
Total cost for first 700 batches = \(303,461.045 \times 700 = 212,423\)
All batches after the first 700 will have the same cost as the 700th batch. To calculate the cost of the 700th batch we need to take the cost of 699 batches from the cost of 700 batches.

For 699 batches \(y = ax^6\)
\[y = 2,500 \times 699 = 1,747,500\] 
\[y = 303,600.726\]
Total cost for first 699 batches = \(303,600.726 \times 699 = 212,217\)
Cost of 700th batch is \(212,423 - 212,217 = 206\)
Total cost for the 12 months of production
\[212,423 + (206 \times 500) = 315,423\]

(3) Variable overhead is $2 per hour or 40% of direct labour
(b) To calculate the learning factor $BFG$ will have had to measure the time taken to make the first batch (500 hours) and then the time taken to make the second batch. The learning rate measures the relationship between the average time taken between two points as production doubles. The easiest way to measure the learning rate is when the production doubles between the first and second batches.

At 80%  
<table>
<thead>
<tr>
<th>Time for first batch</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average time for two batches @ 80%</td>
<td>$500 \times 0.8 = 400$</td>
</tr>
<tr>
<td>Total time for two batches</td>
<td>$2 \times 400 = 800$</td>
</tr>
<tr>
<td>Time for second batch</td>
<td>$800 - 500 = 300$</td>
</tr>
</tbody>
</table>

At 90%  
<table>
<thead>
<tr>
<th>Time for first batch</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average time for two batches @ 90%</td>
<td>$500 \times 0.9 = 450$</td>
</tr>
<tr>
<td>Total time for two batches</td>
<td>$2 \times 450 = 900$</td>
</tr>
<tr>
<td>Time for second batch</td>
<td>$900 - 500 = 400$</td>
</tr>
</tbody>
</table>

The 80% learning rate reduces the time taken for the two successive batches above by a greater amount (or faster). Hence the 80% learning rate is the faster learning.

(c) Possible actions to improve the net cash flows are:
- Increase the price charged. The question states that an agreed specification has been reached, however further research may reveal that a higher price could be tolerated by the market. Equally a form of price skimming may be possible to improve short term net cash flow.
- Reduce the labour cost per batch by removing unnecessary operations or processes. It may be possible to simplify the design without damaging the ability to achieve the price stated.
- Improve the learning rate. This may involve improving the training or the quality of people involved in the production process. This does take time and costs money in the short run.
- Consider substitute materials (without damaging the product specification). Also look for new suppliers to reduce the input cost.
- Consider ways to reduce the level of variable overhead incurred by the product.
- Investigate whether the production of product X could take place in existing space and hence avoid the extra rent charge. The negotiate the rent charge with the landlord.

4 Preston Financial Services

(a) Financial analysis

There are various financial observations that can be made from the data.
- Turnover is up 5% – this is not very high but is at least higher than the rate of inflation indicating real growth. This is encouraging and a sign of a growing business.
- The main weakness identified in the financial results is that the net profit margin has fallen from 20% to 19.8% suggesting that cost control may be getting worse or fee levels are being competed away.
- Profit is up 3.9%. In absolute terms profits are impressive given that Richard Preston is the sole partner owning 100% of the business.
- Average cash balances are up 5% – indicating improved liquidity. Positive cash balances are always welcome in a business.
- Average debtors days are down by 3 days – indicating improved efficiency in chasing up outstanding debts. It is noticeable that Preston’s days are lower than the industry average indicating strong working capital management. The only possible concern may be that Richard is being particularly aggressive in chasing up outstanding debts.

Overall, with a possible concern about margins and low growth, the business looks in good shape and would appear to have a healthy future.

(b) Financial performance indicators will generally only give a measure of the past success of a business. There is no guarantee that a good past financial performance will lead to a good future financial performance. Clients may leave and costs may escalate turning past profits to losses in what can be a very short time period.

Non financial measures are often termed “indicators of future performance”. Good results in these measures can lead to a good financial performance. For example if a business delivers good quality to its customers then this could lead to more custom at higher prices in the future.

Specifically the information is appendix 2 relates to the non financial measures within the balanced scorecard.

Internal business processes are a measure of internal efficiency. Interestingly these measures can indicate current cost efficiency as much as any future result.
Customer knowledge measure how well the business is dealing with its external customers. A good performance here is very likely to lead to more custom in the future.

Innovation and learning measures that way the business develops. New products would be reflected here along with indicators of staff retention. Again this is much more focused on the future than the present.

Measuring performance by way of non-financial means is much more likely to give an indication of the future success of a business.

(c) The extra non-financial information gives much greater insight into key operational issues within the business and paints a bleaker picture for the future.

Internal business processes

Error rates
Error rates for jobs done are up from 10% to 16%, probably a result of reducing turnaround times to improve delivery on time percentages. This is critical as users expect the accounts to be correct. Errors could lead to problems for clients with the Inland Revenue, bankers, etc. What is worse, Richard could be sued if clients lose out because of such errors. One could say that errors are unlikely to be revealed to clients. Businesses rarely advertise mistakes that have been made. They should of course put mistakes right immediately.

Customer Knowledge

Client retention
The number of clients has fallen dramatically – this is alarming and indicates a high level of customer dissatisfaction. In an accountancy practice one would normally expect a high level of repeat work – for example, tax computations will need to be done every year. Clearly existing clients are not happy with the service provided.

Average fees
It would appear that the increase in revenue is thus due to a large increase in average fees rather than extra clients – average fee is up from $600 to $775, an increase of 29%! This could explain the loss of clients in itself, however there could be other reasons.

Market share
The result of the above two factors is a fall in market share from 20% to 14%. Looking at revenue figures one can estimate the size of the market as having grown from $4.5m to $6.75m, an increase of 50%. Compare to this, Preston’s figures are particularly worrying. The firm should be doing much better and looks to being left behind by competitors.

Learning and Growth

Non-core services
The main weakness of the firm seems to be its lack of non-core services offered. The industry average revenue from non-core work has increased from 25% to 30% but Richard’s figures have dropped from 5% to 4%. It would appear that most clients are looking for their accountants to provide a wider range of products but Richard is ignoring this trend.

Employee retention
Employee turnover is up indicating that the staff are dissatisfied. Continuity of staff at client is important to ensure a quality product. Conservative clients may resent revealing personal financial details to a variety of different people each year. Staff turnover is possibly a result of extra pressure to complete jobs more quickly without the satisfaction of a job well done. Also staff may realise that the lack of range of services offered by the firm will limit their own experience and career paths.

Conclusion
In conclusion, the financial results do not show the full picture. The firm has fundamental weaknesses that need to be addressed if it is to grow into the future. At present it is being left behind by a changing industry and changing competition. It is vital that Richard reassesses his attitude and ensures that the firm has a better fit with its business environment.

In particular he should seek to develop complementary services and reduce errors on existing work.
### APPENDIX A: PILOT PAPER

#### Pilot Paper F5

**Performance Management**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th>Marking Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (a)</td>
<td>For each product</td>
<td>1 mark</td>
<td>3 marks</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>Total machine hours</td>
<td>2 marks</td>
<td>12 marks</td>
</tr>
<tr>
<td></td>
<td>Cost per driver calculation</td>
<td>3 marks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overheads split by product table</td>
<td>4 marks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cost per unit calculation</td>
<td>3 marks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td>Explanation</td>
<td>4 marks</td>
<td></td>
</tr>
<tr>
<td>(d)</td>
<td>Comment on pricing, markets, customers and profitability</td>
<td>6 marks</td>
<td>25 marks</td>
</tr>
<tr>
<td></td>
<td>Total</td>
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<th>Marking Scheme</th>
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<td>2 (a)</td>
<td>For each variance</td>
<td>1 mark</td>
<td>6 marks</td>
</tr>
<tr>
<td></td>
<td>Explanation of meaning of variance</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brief discussion of controllability</td>
<td>1 mark</td>
<td></td>
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<tr>
<td>(b)</td>
<td>Comment on cost variance</td>
<td>1 mark</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Price:</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Outside Production Managers Control</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Rising prices pressures</td>
<td>1 mark</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mix</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cheaper mix and comment</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Yield</td>
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<td>High yield results and comment</td>
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</tr>
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<td>Quality</td>
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<tr>
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<td>Comment on quality implications</td>
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<td>Overall summary</td>
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<td>(c)</td>
<td>Improvements to performance measurement system</td>
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<td>For each sensible suggestion 2 marks</td>
<td>4 marks</td>
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<tr>
<td>(d)</td>
<td>Variance calculations</td>
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<td>9 marks</td>
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<tr>
<td></td>
<td>Price: 1 mark for each ingredient</td>
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<td></td>
<td>Mix:</td>
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<td></td>
<td>Yield:</td>
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<td>Method marks should be awarded as appropriate</td>
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<td>Total</td>
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<th></th>
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<th>Marking Scheme</th>
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</thead>
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<tr>
<td>3 (a)</td>
<td>Sales</td>
<td>1 mark</td>
<td>12 marks</td>
</tr>
<tr>
<td></td>
<td>Direct material</td>
<td>2 marks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Direct labour first seven months</td>
<td>3 marks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>last five months</td>
<td>3 marks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Variable overhead</td>
<td>1 mark</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rent</td>
<td>1 mark</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Decision</td>
<td>1 mark</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total for part (a)</td>
<td>1 mark</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>Second batch times 80%</td>
<td>2 marks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>90%</td>
<td>2 marks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comment on faster learning</td>
<td>1 mark</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total for part (b)</td>
<td>1 mark</td>
<td>5 marks</td>
</tr>
<tr>
<td>(c)</td>
<td>Actions to improve net cash flow</td>
<td></td>
<td>8 marks</td>
</tr>
<tr>
<td></td>
<td>(2 marks per explained idea)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total for part (c)</td>
<td></td>
<td>25 marks</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. (a) Financial commentary
   - Turnover growth: 2 marks
   - Profitability: 2 marks
   - Cash position: 2 marks
   - Debtor management: 2 marks
   - Total: 8 marks

(b) Future performance
   - General explanation with example: 2 marks
   - Comment on each area: 3 marks
   - Total: 5 marks

(c) Assessment of future prospects.
   - Internal business processes
     - Error rates: 3 marks
     - Not revealed to clients: 1 mark
   - Customer knowledge
     - Retention: 1 mark
     - Fee levels: 2 marks
     - Market share size: 1 mark
   - Learning and growth
     - Lack of product range: 2 marks
     - Employee retention: 2 marks
   - Total: 12 marks
   - Total: 25 marks
END OF APPENDIX A
Appendix B: Mathematical formulae
Mathematical formulae

Learning curve

\[ Y = ax^b \]

Where
- \( Y \) = cumulative average time per unit to produce \( x \) units
- \( a \) = the time taken for the first unit of output
- \( x \) = the cumulative number of units
- \( b \) = learning factor \((\log \text{LR}/\log 2)\)
- \( \text{LR} \) = the learning rate as a decimal

Demand curve

\[ P = a - bQ \]

\[ b = \frac{\text{change in price}}{\text{change in quantity}} \]

- \( a \) = price when \( Q = 0 \)
- \( \text{MR} = a - 2bQ \)