

COST and MANAGEMENT ACCOUNTING

SIXTH EDITION

COST and MANAGEMENT ACCOUNTING

AN INTRODUCTION

COLIN DRURY

THOMSON
★

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Colin Drury

Publishing Director
John Yates

Publisher
Patrick Bond

Development Manager
Anna Carter

Production Editor
Alissa Chappell

Manufacturing Manager
Helen Mason

Marketing Manager
Katie Thorn

Typesetter
Saxon Graphics, Derby

Production Controller
Maeve Healy

Cover Design
Design Delux, Bath, UK

Text Design
Design Delux, Bath, UK

Printer
Canale, Italy

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For more information, contact
Thomson Learning,
High Holborn House;
50-51 Bedford Row,
London WC1R 4LR

or visit us on the World Wide Web at:
<http://www.thomsonlearning.co.uk>

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PREFACE AND ACKNOWLEDGEMENTS



The aim of the sixth edition of this book is to provide an introduction to the theory and practice of cost and management accounting. A cost accounting system is concerned with accumulating costs for inventory valuation to meet external financial accounting and internal monthly or quarterly profit measurement requirements. A management accounting system accumulates, classifies, summarizes and reports information that will assist employees within an organization in their decision-making, planning, control and performance measurement activities. This book is concerned with both cost and management accounting, with similar emphasis being placed on both systems.

Intended primarily for students who are pursuing a one-year cost and management accounting course, the book is ideal for those approaching this subject for the first time. The more advanced topics contained in the final stages of the cost and management accounting syllabuses of the professional accountancy bodies and final year degree courses are not included. These topics are included in the author's successful *Management and Cost Accounting*, the sixth edition of which is also published by Thomson Learning.

Feedback from teachers in a large number of universities indicated that they had found the content, structure and presentation of *Management and Cost Accounting* extremely satisfactory and most appropriate for students pursuing a two-year management accounting course at an advanced professional or degree level. They also indicated that there was a need for a book (based on *Management and Cost Accounting*) tailored to meet the requirements of a one-year introductory course in cost and management accounting. Many lecturers, in particular those running introductory courses, felt there was a need for an introductory text which covered the required ground in an academically sound manner and which was also appropriate for students on non-advanced courses. This book is aimed specifically at students who are pursuing a one-year non-advanced cost and management accountancy course and is particularly suitable for the following courses:

- Foundation/intermediate professional accountancy (e.g. Chartered Association of Certified Accountants, Chartered Institute of Management Accountants and one-year college foundation courses).
- Association of Accounting Technicians.
- Higher National Certificate and Diploma in business and finance.
- A first-level course for undergraduate accounting and finance or business students.

An introductory course in financial accounting is not a prerequisite, although many students will have undertaken such a course. The flexibility provided by modular courses can result in introductory classes consisting of a group of students not studying management accounting beyond an intermediate level and a further group continuing their studies beyond the intermediate level. *Cost and Management*

Accounting: An Introduction is appropriate for the former group and *Management and Cost Accounting* can be adopted by the latter. Because much of the content (and most of the examples and questions) in *Cost and Management Accounting: An Introduction* have been extracted from *Management and Cost Accounting*, lecturers can assign identical reading and questions and also recommend two separate books that are geared to the specific requirements of the students.

Structure and plan of the book

In writing this book I have adopted the same structure as that in *Management and Cost Accounting*. The major theme is that different financial information is required for different purposes. The framework is based on the principle that there are three ways of constructing accounting information. The first is cost accounting with its emphasis on producing product costs for allocating costs between cost of goods sold and inventories to meet external and internal financial accounting inventory valuation and profit measurement requirements. The second is the notion of decision-relevant costs with the emphasis on providing information to help managers to make good decisions. The third is responsibility accounting and performance measurement which focuses on both financial and non-financial information, in particular the assignment of costs and revenues to responsibility centres.

This book has 18 chapters divided into four parts. The first part (Part One) consists of two chapters and provides an introduction to cost and management accounting and a framework for studying the remaining chapters. The following three parts reflect the three different ways of constructing accounting information. Part Two consists of six chapters and is entitled 'Cost Accumulation for Inventory Valuation and Profit Measurement'. This section focuses mainly on assigning costs to products to separate the costs incurred during a period between costs of goods sold and the closing inventory valuation for internal and external profit measurement. The extent to which product costs accumulated for inventory valuation and profit measurement should be adjusted for meeting decision-making, cost control and performance measurement requirements is also considered briefly. Part Three consists of seven chapters and is entitled 'Information for Decision-making'. Here the focus is on measuring and identifying those costs which are relevant for different types of decisions. The title of Part Four is 'Information for Planning, Control and Performance Measurement'. It consists of three chapters and concentrates on the process of translating goals and objectives into specific activities and the resources that are required, via the short-term (budgeting) and long-term planning processes, to achieve the goals and objectives. In addition, the management control systems that organizations use are described and the role that management accounting control systems play within the overall control process is examined. The emphasis here is on the accounting process as a means of providing information to help managers control the activities for which they are responsible.

In devising a framework around the three methods of constructing financial information there is a risk that the student will not appreciate that the three categories use many common elements, that they overlap, and that they constitute a single overall management accounting system, rather than three independent systems. I have taken steps to minimize this risk in each section by emphasizing why financial information for one purpose should or should not be adjusted for another purpose. In short, each section of the book is not presented in isolation and an integrative approach has been taken.

Major changes in the content of the sixth edition

To accommodate the enormous changes that occurred in the theory and practice of management accounting during the 1990s the previous edition incorporated the most extensive rewrite of the text since the book was first published. Although significant changes in the content have been made to the sixth edition the major focus has been on pedagogical changes. The most notable alterations are:

- 1 New text has been added to Chapter 1 relating to the impact of information technology and the international convergence of management accounting practices.
- 2 Recently, some of the professional accountancy examination bodies have introduced aspects relating to areas that have previously been classified as advanced topics. To accommodate these changes three new chapters have been added – Chapter 10 (Cost estimation and cost behaviour), Chapter 12 (The application of linear programming to management accounting) and Chapter 14 (Decision-making under conditions of risk and uncertainty).
- 3 The introduction of illustrative boxed examples (entitled ‘Real World Views’) throughout the text highlighting the practical application of management accounting concepts and techniques by real companies operating in a range of industry sectors in various countries throughout the world.
- 4 The end-of-chapter summaries for all of the chapters have been rewritten and replaced with a comprehensive summary of the learning objectives listed at the beginning of each chapter. This will enable readers to test their knowledge of key concepts and evaluate their ability to achieve chapter learning objectives.
- 5 Revision of end-of-chapter assessment material. The assessment material consists of review questions and review problems. The review questions are short introductory questions that enable readers to assess their understanding of the main topics included in the text. Each question is followed by page numbers within parentheses that indicate where in the text the answers to specific questions can be found. The review problems are more complex and require readers to relate and apply the chapter content to various business problems. The review problems normally begin with multiple-choice problems that generally take about 10 minutes to complete. The remaining problems are more time-consuming and generally progress according to their level of difficulty. Previous editions of the book contained end-of-chapter questions where answers were only available in the *Students’ Manual* accompanying this book. These questions have now been removed from the text and incorporated in the *Students’ Manual*. This manual (containing both questions and answers) is now provided free on the accompanying website www.drury-online.com.
- 6 Previous editions of the book contained end-of-chapter questions where the answers were only available to lecturers in the *Instructors’ Manual* accompanying this book. These questions have now been removed from the text and are available for students and lecturers to access on the accompanying website www.drury-online.com. Solutions to the questions are only available to lecturers on the lecturer’s password-protected section of the website. The questions and answers are also contained in the instructors’ manual that is available in print format, free to adopting lecturers.
- 7 The introduction of case studies. The final section of this book includes a list of over 20 case studies that are available on the dedicated website for this book. Both lecturers and students can download these case studies from the open

access section of the website. Teaching notes for the case studies can be downloaded only by lecturers from the password-protected lecturer's section of the website. The cases generally cover the content of several chapters and contain questions to which there is no ideal answer. They are intended to encourage independent thought and initiative and to relate and apply your understanding of the content of this book in more uncertain situations. They are also intended to develop your critical thinking and analytical skills.

HIGHLIGHTING OF ADVANCED READING SECTIONS

Some of the professional accountancy examination bodies have introduced aspects relating to areas that have previously been classified as advanced topics. Many readers, however, will not require a comprehensive treatment of all of the topics that are contained in the book. To meet the different requirements of the readers, the more advanced material that is not essential for those readers not requiring an in-depth knowledge of a particular topic has been highlighted. The start of each advanced reading section is marked with a symbol and a vertical line is used to highlight the full section. You should check your course content to ascertain if you will need to read the highlighted advanced reading sections.

INTERNATIONAL FOCUS

The book has now become an established text in many different countries throughout the world. Because of this a more international focus has been adopted. A major feature is the presentation of boxed exhibits of surveys and practical applications of management accounting in companies in many different countries, particularly the European mainland. To simplify the presentation, however, the UK pound monetary unit has mostly been used throughout the book. Most of the assessment material has incorporated questions set by the UK professional accountancy bodies. These questions are, however, appropriate for worldwide use.

ASSESSMENT MATERIAL

Throughout this book simple illustrations have been provided. You can check your understanding of each chapter by answering the review questions. Each question is followed by page numbers within parentheses that indicate where in the text the answers to specific questions can be found. More complex review problems are also set at the end of each chapter to enable students to pursue certain topics in more depth. Fully worked solutions to the review problems are provided in a separate section at the end of the book.

This book is part of an integrated educational package. A *Students' Manual* that includes additional review problems and accompanying answers is available free to download from the accompanying website. Additional review problems and case studies are available for students and lecturers to access on the accompanying website www.drury-online.com. Solutions to the review problems and case study teaching notes are only available to lecturers on the lecturer's password-protected section of the website. The review problems and answers are also contained in the *Instructors' Manual* that is available in print format, free to adopting lecturers.

A testbank of questions accompanies this text which allows lecturers to create online, paper and local area network (LAN) tests. This CD-based product is only available through your Thomson sales representative.

In recognition of the increasing need for the integration of IT teaching into the curriculum, this book is accompanied by an online *Spreadsheet Applications Manual*, which has been written by Dr Alicia Gazely of Nottingham Business School. This explains basic spreadsheet techniques and then builds up ten spreadsheet models which illustrate, and allow students to explore, examples in the main text. The spreadsheets, guidance notes and online access are available to teachers on adoption. Further details of this package are given in the section covering the Dedicated Web-site below.

SUPPLEMENTARY MATERIAL

DEDICATED WEBSITE

The dedicated website can be found at www.drury-online.com The lecturer section is password-protected and the password is available free to lecturers who confirm their adoption of the sixth edition – lecturers should complete the registration form on the website to apply for their password, which will then be sent to them by e-mail.

The following range of material is available:

FOR STUDENTS AND LECTURERS (OPEN ACCESS):

CASE STUDIES

Internationally focused case studies. (NB Teaching notes to accompany the cases are available in the password-protected lecturer area of the site.)

MCQ'S (compiled by Colin Drury and Wayne Fiddler)

Interactive multiple choice questions to accompany each chapter. The student takes the test online to check their grasp of the key points in each chapter. Detailed feedback is provided for each question if the student chooses the wrong answer.

LINKS TO ACCOUNTING AND FINANCE SITES ON THE WEB

Including links to the main accounting firms, accounting magazines and journals and careers and job search pages.

STUDENTS MANUAL

The *Students' Manual* is now provided free from the site in PDF (Portable Document Format), the *Students' Manual* contains further questions for students which are accompanied by the supporting answers.

Extra review problems are provided, solutions to these appear in the *Instructor's Manual* on the lecturer's password-protected section of the website.

FOR LECTURERS ONLY (PASSWORD PROTECTED)

INSTRUCTORS' MANUAL

Available to download free from the site in PDF (Portable Document Format), the manual includes answers to the additional questions on the open access website.

TEACHING NOTES TO THE CASE STUDIES

To accompany the case studies available in the student area of the website.

SPREADSHEET EXERCISES *(compiled and designed by Alicia Gazely of Nottingham Trent University)*

Created in Excel to accompany the self assessment exercises in the book, the exercises can be saved by the lecturer to their own directories and distributed to students as each topic is covered. Each exercise explains a basic spreadsheet technique which illustrates, and allows the student to explore, examples in the main text.

POWERPOINT (TM) SLIDES

Powerpoint presentations to accompany each chapter.

OVERHEAD TRANSPARENCIES

Available to download as pdf files.

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wife, Bronwen, for converting the original manuscript of the earlier editions into final type-written form and for her continued help and support throughout the six editions of this book.

WALK THROUGH TOUR

Introduction to management accounting

1 There are many definitions of accounting, but the one that captures the theme of this book is the definition formulated by the American Accounting Association. It describes accounting as *the process of identifying, measuring and communicating economic information to permit informed judgements and decisions by users of the information.*

In other words, accounting is concerned with providing both financial and non-financial information that will help decision-makers to make good decisions. An understanding of accounting therefore requires an understanding of the decision-making process and an awareness of the users of accounting information.

During the past two decades many organizations in both the manufacturing and service sectors have faced dramatic changes in their business environment. Deregulation combined with extensive competition from overseas companies in domestic markets has resulted in a situation where most companies are now competing in a highly competitive global market. At the same time there has been a significant reduction in product life cycles arising from technological innovations and

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- distinguish between management accounting and financial accounting;
- identify and describe the elements involved in the decision-making, planning and control process;
- justify the view that a major objective of commercial organizations is to broadly seek to maximize the present value of future cash flows;
- explain the factors that have influenced the changes in the competitive environment;
- outline and describe the key success factors that directly affect customer satisfaction;
- identify and describe the functions of a management accounting system.

5

Learning Objectives Listed at the start of each chapter, highlighting the core coverage that you should acquire after studying each chapter.

COST BEHAVIOUR 31

The Laura company produces 100 000 identical units of a product during period 1. The costs for the period are as follows:

	(£)	(£)
Manufacturing costs:		
Direct labour	400 000	
Direct materials	200 000	
Manufacturing overheads	200 000	800 000
Non-manufacturing costs		300 000

During period 1, the company sold 50 000 units for £750 000, and the remaining 50 000 units were unsold at the end of the period. There was no opening stock at the start of the period. The profit and loss account for period 1 will be as follows:

	(£)	(£)
Sales (50 000)		750 000
Manufacturing costs (product costs):		
Direct labour	400 000	
Direct materials	200 000	
Manufacturing overheads	200 000	
	800 000	
Less closing stock (50% of 50 000 units)	400 000	
Cost of goods sold (50% of 50 000 units)		400 000
Gross profit		350 000
Less non-manufacturing costs (period costs)		300 000
Net profit		50 000

Fifty per cent of the production was sold during the period and the remaining 50% was produced for inventories. Half of the product costs are therefore identified as an expense for the period and the remainder are included in the closing inventory valuation. If we assume that the closing inventory is sold in the next accounting period, the remaining 50% of the product costs will become expenses in the next accounting period. However, all the period costs became an expense in this accounting period, because this is the period to which they relate. Note that only product costs form the basis for the calculation of cost of goods sold, and that period costs do not form part of this calculation.

Cost behaviour

A knowledge of how costs and revenues will vary with different levels of activity (or volume) is essential for decision-making. Activity or volume may be measured in terms of units of production or sales, hours worked, miles travelled, patients seen, students enrolled or any other appropriate measure of the activity of an organization.

Examples Worked accounting examples are shown throughout the text.

406 CHAPTER 15. CAPITAL INVESTMENT DECISIONS

EXHIBIT 15.4

Surveys of practice

Surveys conducted by Pike relating to the investment appraisal techniques by 100 large UK companies between 1975 and 1992 provide an indication of the changing trends in practice in large UK companies. Pike's findings relating to the percentage of firms using different appraisal methods are as follows:

	1975	1981	1986	1992
	%	%	%	%
Payback	73	81	92	94
Accounting rate of return	51	49	56	50
DCF methods (IRR or NPV)	58	68	84	88
Internal rate of return (IRR)	44	57	75	81
Net present value (NPV)	32	39	68	74

Source: Pike (1996)

A study of 300 UK manufacturing organizations by Drury *et al.* (1993) sought to ascertain the extent to which particular techniques were used. The figures below indicate the percentage of firms that often or always used a particular technique:

	All organizations	Smallest organizations	Largest organizations
	%	%	%
Payback (unadjusted)	63	56	55
Discounted payback	42	30	48
Accounting rate of return	41	35	53
Internal rate of return	57	30	85
Net present value	43	23	80

More recently a UK study by Arnold and Hatzopoulos (2000) reported that NPV has overtaken IRR as the most widely used method by larger firms. They reported that 97% of large firms use NPV compared with 84% which employ IRR.

Few studies have been undertaken in mainland Europe. The following usage rates relate to surveys undertaken in the USA and Belgium. For comparative purposes Pike's UK study is also listed:

	UK*	USA*	Belgium*
	%	%	%
Payback	94	72	50
Accounting rate of return	50	65	65
Internal rate of return	81	91	77
Net present value	74	88	60
Discounted payback		65	68

*Pike (1996)

*Taheri and Gatten (1995)

*Debrunne (1998)

Exhibits Illustrations of accounting techniques and information are presented throughout the text.

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market. To be successful companies must be innovative and develop a steady stream of new products and services and have the capability to rapidly adapt to changing customer requirements.

- Identify and describe the functions of a management accounting system.

A cost and management accounting system should generate information to meet the following requirements: (a) allocate costs between costs of goods sold and inventories for internal and external profit reporting and inventory valuation; (b) provide relevant information to help managers make better decisions; and (c) provide information for planning, control and performance measurement.

Notes

- 1 The total profits over the life of a business are identical with total net cash inflows. However, the profits calculated for a particular accounting period will be different from the net cash flows for that period. The difference arises because of the accruals concept in financial accounting. For most situations in this book, decisions that will lead to changes in profits are also assumed to lead to identical changes in net cash flows.

Key terms and concepts

Each chapter includes a section like this. You should make sure that you understand each of the terms listed below before you proceed to the next chapter. Their meanings are explained on the page numbers indicated.

- | | |
|--|---------------------------------------|
| benchmarking (p. 15) | long-run decisions (p. 10) |
| bounded rationality (p. 8) | management accounting (pp. 7, 19) |
| budget (p. 11) | management by exception (p. 12) |
| continuous improvement (p. 14) | master budget (p. 11) |
| control (p. 11) | non-value added activities (p. 14) |
| corporate ethics (p. 15) | objectives of the organization (p. 8) |
| cost accounting (p. 19) | operating decisions (p. 10) |
| cost efficient (p. 15) | performance reports (p. 11) |
| cycle time (p. 13) | planning (p. 9) |
| e-business (p. 16) | scientific (p. 9) |
| e-commerce (p. 16) | short-term decisions (p. 10) |
| employee empowerment (p. 15) | social responsibilities (p. 15) |
| enterprise resource planning systems (p. 16) | states of nature (p. 10) |
| feedback (p. 12) | strategic decisions (p. 10) |
| feedback loop (p. 12) | strategy (p. 10) |
| financial accounting (pp. 7, 8) | time-based measures (p. 13) |
| goals of the organization (p. 8) | total quality management (p. 13) |
| innovation (p. 14) | value-chain analysis (p. 15) |
| internet commerce (p. 16) | |

Key Terms and Concepts Highlighted throughout the text where they first appear alerting the student to the core concepts and techniques. Also listed at the end of each chapter with page references.



Joint product costing in the semiconductor industry

In the semiconductor industry, the production of memory chips may be viewed as a joint processing situation because the output consists of different quality chips from a common production run. The manufacturing operation is composed of three phases: fabrication, assembly, and a stress test. The first and second steps are mandatory. The third is optional and necessary to produce memory with a longer life expectancy. Of the three cases, only fabrication represents a joint production process; assembly and stress testing are separable steps.

The input to the fabrication phase is raw silicon wafers, which are first photolithographed and then baked at high temperatures. Each wafer will yield multiple chips of identical design. Upon completion of the fabrication process, the finished wafer is tested to identify usable and unusable chips. The test also identifies usable chips according to density (the number of good memory bits) and speed (the time required to access those bits).

The input to the assembly process is usable chips, which are encapsulated in ceramic and wired for use on a memory board. The encapsulation process varies according to the number of chips, which constitute a finished module. Modules of a given density may be composed of one all-good chip or multiple partially good chips. The finished modules are subjected to a nondestructive functional test to identify defective output.

If an extended life expectancy is not required, the good modules are not processed any further. A small sample of the good modules is subjected to the destructive reliability test before the finished product is considered salable. This destructive reliability test is a traditional quality control step designed to establish the 'time-to-failure' distribution of the output. The profile of this distribution will depend, in part, upon whether the modules were subjected to the optional stress test.

If a longer life expectancy is desired, the modules are stressed before being tested for reliability. This optional step exposes the modules to extreme conditions and those that survive are labelled extended-life modules. The proportion of the modules selected to undergo the stress test is under management control and can be varied with market conditions.

The final output of the process differs in quality according to a variety of dimensions. These include number of chips per module, speed, life expectancy, and temperature tolerance.

Source: Adapted from Cui-Bao, W.L. et al., (1986) Joint product costing in the semiconductor industry, *Management accounting* 13(4), pp. 28–35.



Source: Cui-Bao

Real World View Real-world cases are provided throughout the text, they help to demonstrate the theory in practice and practical application of accounting in real companies internationally.

An illustration of the two-stage process for an ABC system



We shall now use the data presented in Example 4.1 (the Enterprise Company) from Chapter 4 to illustrate ABC in more detail. This example was used to provide the relevant information to compute the overhead rates shown in Exhibit 4.2 for a traditional costing system. To refresh your memory, and to enable you to compare traditional and ABC systems, you should now refer back to Chapter 4 and read pages 92–102 relating to the two-stage allocation process for a traditional costing system. Example 4.1 and Exhibit 4.2 are now repeated so that you do not have to be constantly referring back to Chapter 4.

With the ABC system it is assumed that the activity cost centres for machining and assembling products are identical to the production cost centres used by the traditional costing system. We shall also assume that three activity cost centres have been established for each of the support functions. They are purchasing components, receiving components and disbursing materials for the materials procurement function and production scheduling, setting-up machines and a quality inspection of the completed products for the general factory support function. Exhibit 13.1 provides the additional information required for an ABC system and also shows the activity-based product cost calculations.

If you refer to column 2 in the upper section of Exhibit 13.1 you will see that the costs assigned to the production activities have been extracted from row 1 in the overhead analysis sheet shown in Exhibit 4.2, that was used for the traditional costing system to the materials procurement and the general factory support functions, and not to the activities within these support functions. However, the costs for the activities within these functions would be derived applying the same approach as that used in Exhibit 4.2, but to simplify the presentation the cost assignments to the individual activity cost centres within the material procurement and general factory support functions are not shown.

Exhibit 13.1 shows the product cost calculations for an ABC system. By referring to the second column in the upper section of this exhibit you will see that the costs assigned to the purchasing, receiving and disbursement of materials activities total £1 700 000, the same as the total allocated to the materials procurement function by the traditional system shown in Exhibit 4.2. Similarly, the total costs assigned to the production scheduling, set-up and quality inspection activities in column 2 of the upper section of Exhibit 13.1 total £1 800 000, the same as the total costs allocated to the general factory support function in Exhibit 4.2.

Now look at column 1 and 3 in the upper section of Exhibit 13.1. You will see that with the ABC system the Enterprise Company has established nine activity cost centres and seven different second-stage cost drivers. Note also that the cost drivers for the production activities are the same of those used for the traditional costing system. Based on their observations of ABC systems Kaplan and Cooper (1998) suggest that relatively simple ABC systems having 30–50 activity cost centres and many cost drivers ought to report reasonably accurate costs.

To emphasize the point that ABC systems use cause-and-effect second stage allocations the term cost driver tends to be used instead of allocation base. Cost drivers should be significant determinants of the cost of activities. For example, if the cost of processing purchase orders is determined by the number of purchase orders that each product generates, then the number of purchase orders would represent the cost driver for the cost of processing purchase orders. Other cost

Advanced Reading The more advanced material that is not essential for those readers not requiring an in-depth knowledge of a topic has been highlighted. These should be read when you have fully understood the remaining content of the chapter.



Summary

The following items relate to the learning objectives listed at the beginning of the chapter.

- **Explain why it is necessary to understand the meaning of different cost terms.**
The term 'cost' has multiple meanings and different types of costs are used in different situations. Therefore, a preceding term must be added to clarify the assumptions that underlie a measurement.
- **Define and illustrate a cost object.**
A cost object is any activity for which a separate measurement of cost is required. In other words managers often want to know the cost of something and the 'thing' that they want to know the cost of is a cost object. Examples of cost objects include the cost of a new product, the cost of operating a sales outlet and the cost of operating a specific machine.
- **Explain the meaning of each of the key terms listed at the end of this chapter.**
You should check your understanding of each of the terms listed in the key terms and concepts section below by referring to the page numbers that are shown in the parentheses following each key term.
- **Explain why in the short term some costs and revenues are not relevant for decision-making.**
In the short term some costs and revenues may remain unchanged for all alternatives under consideration. For example, if you wish to determine the costs of driving to work in your own car or using public transport, the cost of the road fund taxation licence and insurance will remain the same for both alternatives, assuming that you intend to keep your car for leisure purposes. Therefore the costs of these items are not relevant for assisting you in your decision to travel to work by public transport or using your own car. Costs that remain unchanged for all alternatives under consideration are not relevant for decision-making.
- **Distinguish between job costing and process costing.**
A job costing system relates to a costing system where each unit or batch of output of product(s) (or service(s)) is unique. This creates the need for the cost of each unit or batch to be calculated separately. In contrast a process costing system relates to situations where masses of identical units or batches are produced thus making it unnecessary to assign costs to individual units or batches of output. Instead, the average cost per unit or batch of output is calculated by dividing the total costs assigned to a product or service for the period by the number of units or batches of output for that period.
- **Describe the three purposes for which cost information is required.**
A cost and management accounting system should generate information to meet the following requirements:
 - (a) to allocate costs between cost of goods sold and inventories for internal and external profit reporting and inventory valuation;
 - (b) to provide relevant information to help managers make better decisions;
 - (c) to provide information for planning, control and performance measurement.
 A database should be maintained with costs appropriately coded or classified, so that relevant information can be extracted for meeting each of the above requirements.

Summary Bulleted list at the end of each chapter reviewing briefly the main concepts and key points covered in each chapter, linked back to the Learning Objectives.

Key examination points

Chapter 1 has provided an introduction to the scope of management accounting. It is unlikely that examination questions will be set that refer to the content of an introductory chapter. However, questions are sometimes set requiring you to outline how a costing system can assist the management of an organization. Note that the examiner may not distinguish between cost accounting and management accounting. Cost accounting is often used to also embrace management accounting. Your discussion of a cost accounting system should therefore include a description (with illustrations) of how the system provides information for decision-making, planning and control. Make sure that you draw on your experience from the whole of a first-year course and not just this introductory chapter.

Key Examination Points Important examination tips are presented at the end of each chapter. They show the main concepts to be learnt from the chapter when studying for your examinations.



Assessment material

The review questions are short questions that enable you to assess your understanding of the main topics included in the chapter. The numbers in the parentheses provide you with the page numbers to refer to if you cannot answer a specific question.

The review problems are more complex and require you to relate and apply the chapter content to various business problems. The problems are graded by their level of difficulty. The multiple-choice questions are the least demanding and normally take less than 10 minutes to complete. Fully worked solutions to the review problems are provided in a separate section at the end of the book. Further review problems with solutions for this chapter are available on the accompanying website www.drury-online.com. The website includes a *Student's Manual* and an *Instructor's Manual*. Students can access both questions and answers from the *Student's Manual* and the questions from the *Instructor's Manual*. The answers to problems in the *Instructor's Manual* are available only to lecturers on the lecturer's password-protected section of the website.

The website also includes over 20 case study problems. A list of these cases is provided on pages 584-5. The Electronic Boards case is a case study that is relevant to the introductory stages of a management accounting course.

Review questions

- 2.1 Define the meaning of the term 'cost object' and provide three examples of cost objects. (p. 28)
- 2.2 Distinguish between a direct and indirect cost. (p. 28)
- 2.3 Describe how a given direct cost item can be both a direct and indirect cost. (p. 29)
- 2.4 Provide examples of each of the following: (a) direct labour, (b) indirect labour, (c) direct materials, (d) indirect materials, and (e) indirect expenses. (p. 29)
- 2.5 Explain the meaning of the terms: (a) prime cost, (b) overheads, and (c) cost allocation. (pp. 29-30)

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Review Questions Review questions allow revision of the main issues and concepts learnt within the chapter. Page numbers next to the questions show where the answers can be found.

44 CHAPTER 2 AN INTRODUCTION TO COST TERMS AND CONCEPTS

- 2.6 Distinguish between product costs and period costs. (p. 30)
- 2.7 Provide examples of decisions that require knowledge of how costs and revenues vary with different levels of activity. (p. 32)
- 2.8 Explain the meaning of each of the following terms: (a) variable costs, (b) fixed costs, (c) semi-fixed costs, and (d) semi-variable costs. Provide examples of costs for each of the four categories. (pp. 32-35)
- 2.9 Distinguish between relevant (avoidable) and irrelevant (unavoidable) costs and provide examples of each type of cost. (pp. 35-37)
- 2.10 Explain the meaning of the term 'sunk cost'. (p. 37)
- 2.11 Distinguish between incremental and marginal costs. (p. 38)
- 2.12 What is an opportunity cost? Give some examples. (pp. 37-38)
- 2.13 Distinguish between job costing and process costing. (p. 39)
- 2.14 Explain responsibility accounting. (p. 49)

Review problems

- 2.15 Classify each of the following as being usually fixed (F), variable (V), semi-fixed (SF) or semi-variable (SV):
 - (a) direct labour;
 - (b) depreciation of machinery;
 - (c) factory rental;
 - (d) supplies and other indirect materials;
 - (e) advertising;
 - (f) maintenance of machinery;
 - (g) factory manager's salary;
 - (h) supervisory personnel;
 - (i) royalty payments.
- 2.16 Which of the following costs are likely to be controllable by the head of the production department?
 - (a) price paid for materials;
 - (b) charge for floor space;
 - (c) raw materials used;
 - (d) electricity used for machinery;
 - (e) machinery depreciation;
 - (f) direct labour;
 - (g) insurance on machinery;
 - (h) share of cost of industrial relations department.
- 2.17 If actual output is lower than budgeted output, which of the following costs would you expect to be lower than the original budget?
 - A Total variable costs
 - B Total fixed costs
 - C Variable costs per unit
 - D Fixed costs per unit

ACCA Foundation Paper 3

Review Problems Review problems allow you to relate and apply the chapter content to various business problems. Fully worked solutions are found in the back of the text.

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- Case studies with accompanying questions
- Related weblinks
- Instructor questions – answers are provided on the lecturers side of the site
- *Students' Manual* – including additional questions and accompanying answers, now available free to download from the website

For Lecturers

- *Instructors' Manual* – including model answers to Instructor questions found on the students' side of the site
- Downloadable PowerPoint slides
- Case Study Teaching Notes to accompany the case studies on the website and within the text
- Spreadsheet models to accompany exercises within the text. The models incorporate a range of spreadsheet techniques which are explained in text notes adjacent to the calculations

Supplementary resources

ExamView®

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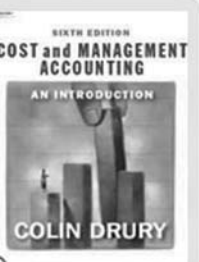
Case Studies
Individual case studies with accompanying questions, to further your understanding of the text.

Weblinks
These web links will help you to explore further the material provided within the text.

Multiple choice questions
To test your knowledge of the book, on a chapter-by-chapter basis.

Instructor questions
Extra questions for your study, with answers provided on the lecturers side.

Students' Manual
Accompanying manual including additional questions and accompanying answers, available to download from the website.



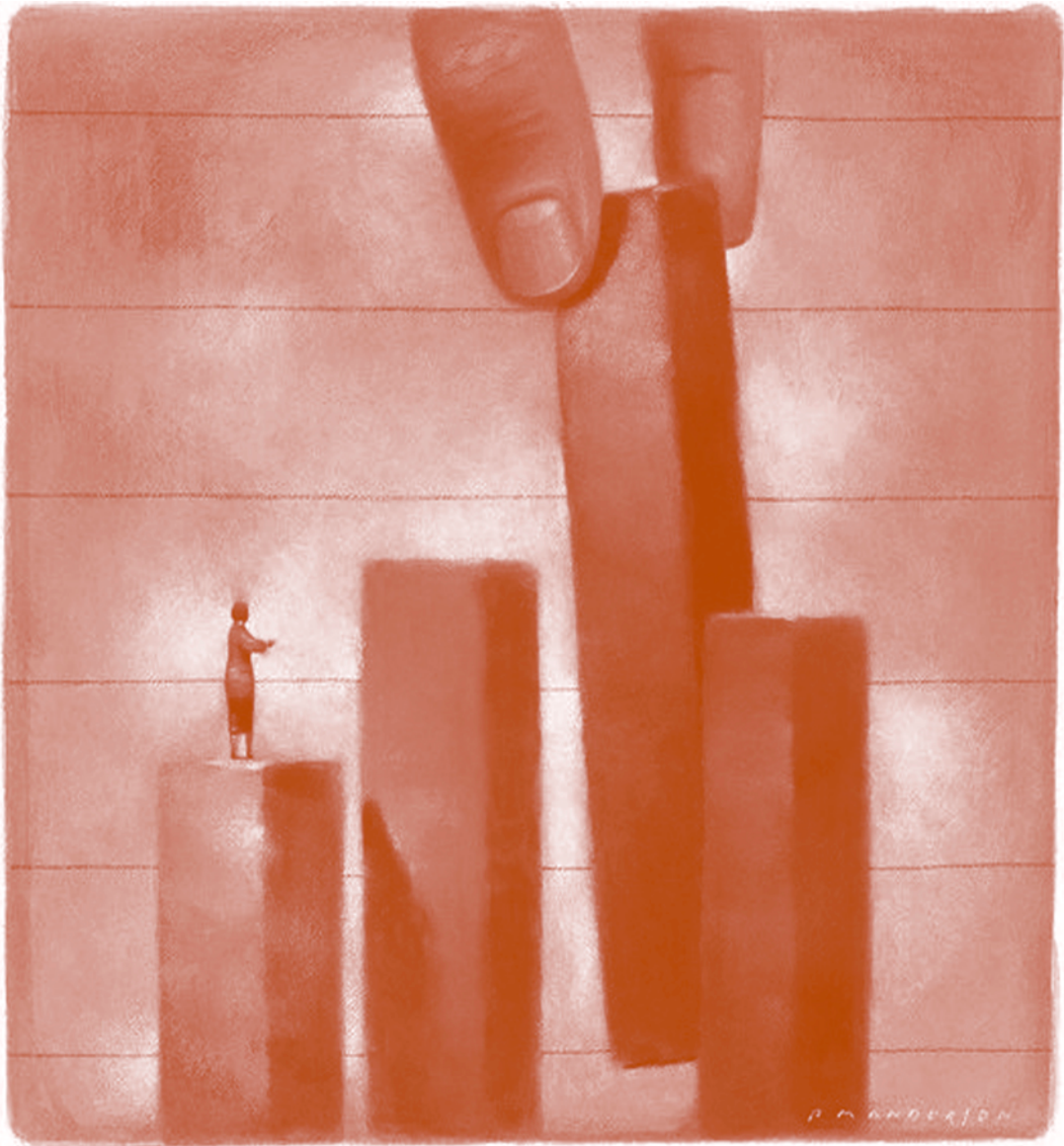
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COST and MANAGEMENT ACCOUNTING



PART 1

Introduction to Management and Cost Accounting

1 Introduction to management accounting

2 An introduction to cost terms and concepts

The objective of this section is to provide an introduction to cost and management accounting. In Chapter 1 we define accounting and distinguish between financial, management and cost accounting. This is followed by an examination of the role of management accounting in providing information to managers for decision-making, planning, control and performance measurement. In addition, the important changes that are taking place in the business environment are considered. Progression through the book will reveal how these changes are influencing management accounting systems. In Chapter 2 the basic cost terms and concepts that are used in the cost and management accounting literature are described.



Introduction to management accounting

1

There are many definitions of accounting, but the one that captures the theme of this book is the definition formulated by the American Accounting Association. It describes accounting as

the process of identifying, measuring and communicating economic information to permit informed judgements and decisions by users of the information.

In other words, accounting is concerned with providing both financial and non-financial information that will help decision-makers to make good decisions. An understanding of accounting therefore requires an understanding of the decision-making process and an awareness of the users of accounting information.

During the past two decades many organizations in both the manufacturing and service sectors have faced dramatic changes in their business environment. Deregulation combined with extensive competition from overseas companies in domestic markets has resulted in a situation where most companies are now competing in a highly competitive global market. At the same time there has been a significant reduction in product life cycles arising from technological innovations and

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- distinguish between management accounting and financial accounting;
- identify and describe the elements involved in the decision-making, planning and control process;
- justify the view that a major objective of commercial organizations is to broadly seek to maximize the present value of future cash flows;
- explain the factors that have influenced the changes in the competitive environment;
- outline and describe the key success factors that directly affect customer satisfaction;
- identify and describe the functions of a management accounting system.

the need to meet increasingly discriminating customer demands. To compete successfully in today's highly competitive global environment companies have made customer satisfaction an overriding priority. They have also adopted new management approaches, changed their manufacturing systems and invested in new technologies. These changes have had a significant influence on management accounting systems. Progression through the book will reveal how these changes have influenced cost and management accounting systems, but first of all it is important that you have a good background knowledge of some of the important changes that have occurred in the business environment. This chapter aims to provide such knowledge.

The objective of this first chapter is to provide the background knowledge that will enable you to achieve a more meaningful insight into the issues and problems of cost and management accounting that are discussed in the book. We begin by looking at the users of accounting information and identifying their requirements. This is followed by a description of the decision-making process and the changing business and manufacturing environment. Finally, the different functions of management accounting are described.

The users of accounting information

Accounting is a language that communicates economic information to people who have an interest in an organization – managers, shareholders and potential investors, employees, creditors and the government. Managers require information that will assist them in their decision-making and control activities; for example, information is needed on the estimated selling prices, costs, demand, competitive position and profitability of various products/services that are provided by the organization. Shareholders require information on the value of their investment and the income that is derived from their shareholding. Employees require information on the ability of the firm to meet wage demands and avoid redundancies. Creditors and the providers of loan capital require information on a firm's ability to meet its financial obligations. Government agencies like the Central Statistical Office collect accounting information and require such information as the details of sales activity, profits, investments, stocks, dividends paid, the proportion of profits absorbed by taxation and so on. In addition the Inland Revenue needs information on the amount of profits that are subject to taxation. All this information is important for determining policies to manage the economy.

Accounting information is not confined to business organizations. Accounting information about individuals is also important and is used by other individuals; for example, credit may only be extended to an individual after the prospective borrower has furnished a reasonable accounting of his private financial affairs. Non-profit-making organizations such as churches, charitable organizations, clubs and government units such as local authorities, also require accounting information for decision-making, and for reporting the results of their activities. For example, a tennis club will require information on the cost of undertaking its various activities so that a decision can be made as to the amount of the annual subscription that it will charge to its members. Similarly, local authorities need information on the costs of undertaking specific activities so that decisions can be made as to which activities will be undertaken and the resources that must be raised to finance them.

The foregoing discussion has indicated that there are many users of accounting information who require information for decision-making. The objective of accounting is to provide sufficient information to meet the needs of the various users

at the lowest possible cost. Obviously, the benefit derived from using an information system for decision-making must be greater than the cost of operating the system.

An examination of the various users of accounting information indicates that they can be divided into two categories:

- 1 internal parties within the organization;
- 2 external parties such as shareholders, creditors and regulatory agencies, outside the organization.

It is possible to distinguish between two branches of accounting, that reflect the internal and external users of accounting information. **Management accounting** is concerned with the provision of information to people within the organization to help them make better decisions and improve the efficiency and effectiveness of existing operations, whereas **financial accounting** is concerned with the provision of information to external parties outside the organization. Thus, management accounting could be called internal accounting and financial accounting could be called external accounting. This book concentrates on management accounting.

Differences between management accounting and financial accounting

The major differences between these two branches of accounting are:

- *Legal requirements.* There is a statutory requirement for public limited companies to produce annual financial accounts regardless of whether or not management regards this information as useful. Management accounting, by contrast, is entirely optional and information should be produced only if it is considered that the benefits from the use of the information by management exceed the cost of collecting it.
- *Focus on individual parts or segments of the business.* Financial accounting reports describe the whole of the business whereas management accounting focuses on small parts of the organization, for example the cost and profitability of products, services, customers and activities. In addition, management accounting information measures the economic performance of decentralized operating units, such as divisions and departments.
- *Generally accepted accounting principles.* Financial accounting statements must be prepared to conform with the legal requirements and the generally accepted accounting principles established by the regulatory bodies such as the Financial Accounting Standards Board (FASB) in the USA and the Accounting Standards Board (ASB) in the UK. These requirements are essential to ensure the uniformity and consistency that is needed for external financial statements. Outside users need assurance that external statements are prepared in accordance with generally accepted accounting principles so that the inter-company and historical comparisons are possible. In contrast, management accountants are not required to adhere to generally accepted accounting principles when providing managerial information for internal purposes. Instead, the focus is on the serving management's needs and providing information that is useful to managers relating to their decision-making, planning and control functions.

- *Time dimension.* Financial accounting reports what has happened in the past in an organization, whereas management accounting is concerned with *future* information as well as past information. Decisions are concerned with *future* events and management therefore requires details of expected *future* costs and revenues.
- *Report frequency.* A detailed set of financial accounts is published annually and less detailed accounts are published semi-annually. Management requires information quickly if it is to act on it. Consequently management accounting reports on various activities may be prepared at daily, weekly or monthly intervals.

The decision-making process

Because information produced by management accountants must be judged in the light of its ultimate effect on the outcome of decisions, a necessary precedent to an understanding of management accounting is an understanding of the *decision-making process*.

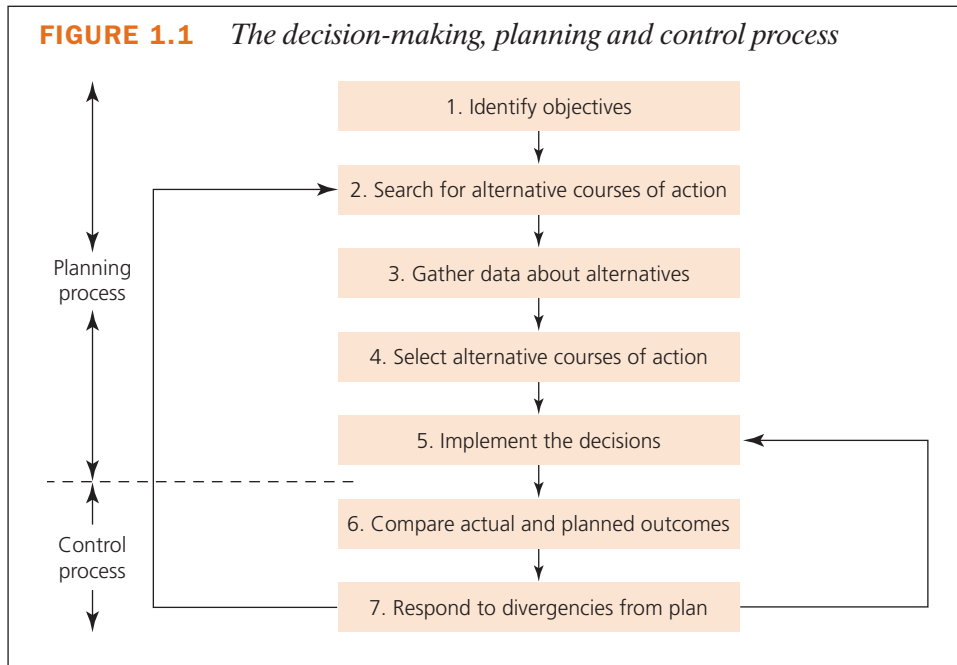
Figure 1.1 presents a diagram of a decision-making model. The first five stages represent the decision-making or the planning process. **Planning** involves making choices between alternatives and is primarily a decision-making activity. The final two stages represent the *control process*, which is the process of measuring and correcting actual performance to ensure that the alternatives that are chosen and the plans for implementing them are carried out. Let us now examine each of the items listed in Figure 1.1.

Identifying objectives

Before good decisions can be made there must be some guiding aim or direction that will enable the decision-makers to assess the desirability of favouring one course of action over another. Hence, the first stage in the decision-making process should be to specify the **goals** or **objectives of the organization**.

Considerable controversy exists as to what the objectives of firms are or should be. Economic theory normally assumes that firms seek to maximize profits for the owners of the firm (the ordinary shareholders in a limited company) or, more precisely, the maximization of shareholders' wealth. Various arguments have been used to support the profit maximization objective. There is the legal argument that the ordinary shareholders are the owners of the firm, which therefore should be run for their benefit by trustee managers. Another argument supporting the profit objective is that profit maximization leads to the maximization of overall economic welfare. That is, by doing the best for yourself, you are unconsciously doing the best for society. Moreover, it seems a reasonable belief that the interests of firms will be better served by a larger profit than by a smaller profit, so that maximization is at least a useful approximation.

Some writers (e.g. Simon, 1959) believe that businessmen are content to find a plan that provides satisfactory profits rather than to maximize profits. Because people have limited powers of understanding and can deal with only a limited amount of information at a time (Simon uses the term **bounded rationality** to describe these constraints), they tend to search for solutions only until the first acceptable solution is found. No further attempt is made to find an even better solution or to continue the



search until the best solution is discovered. Such behaviour, where the search is terminated on finding a satisfactory, rather than optimal solution, is known as **satisficing**.

Cyert and March (1969) have argued that the firm is a coalition of various different groups – shareholders, employees, customers, suppliers and the government – each of whom must be paid a minimum to participate in the coalition. Any excess benefits after meeting these minimum constraints are seen as being the object of bargaining between the various groups. In addition, a firm is subject to constraints of a societal nature. Maintaining a clean environment, employing disabled workers and providing social and recreation facilities are all examples of social goals that a firm may pursue.

Clearly it is too simplistic to say that the only objective of a business firm is to maximize profits. Some managers seek to establish a power base and build an empire; another goal is security; the removal of uncertainty regarding the future may override the pure profit motive. Nevertheless, the view adopted in this book is that, broadly, firms seek to maximize the value of future net cash inflows (that is, future cash receipts less cash payments) or to be more precise the present value of future net cash inflows.¹ This is equivalent to maximizing shareholder value. (The concept of present value is explained in Chapter 15.) The reasons for choosing this objective are as follows:

- 1 It is unlikely that any other objective is as widely applicable in measuring the ability of the organization to survive in the future.
- 2 It is unlikely that maximizing the present value of future cash flows can be realized in practice, but by establishing the principles necessary to achieve this objective you will learn how to increase the present value of future cash flows.
- 3 It enables shareholders as a group in the bargaining coalition to know how much the pursuit of other goals is costing them by indicating the amount of cash distributed among the members of the coalition.

The search for alternative courses of action

The second stage in the decision-making model is a search for a range of possible courses of action (or **strategies**) that might enable the objectives to be achieved. If the management of a company concentrates entirely on its present product range and markets, and market shares and cash flows are allowed to decline, there is a danger that the company will be unable to generate sufficient cash flows to survive in the future. To maximize future cash flows, it is essential that management identifies potential opportunities and threats in its current environment and takes specific steps immediately so that the organization will not be taken by surprise by any developments which may occur in the future. In particular, the company should consider one or more of the following courses of action:

- 1 developing *new* products for sale in *existing* markets;
- 2 developing *new* products for *new* markets;
- 3 developing *new* markets for *existing* products.

The search for alternative courses of action involves the acquisition of information concerning future opportunities and environments; it is the most difficult and important stage of the decision-making process. Ideally, firms should consider all alternative courses of action, but, in practice they consider only a few alternatives, with the search process being localized initially. If this type of routine search activity fails to produce satisfactory solutions, the search will become more widespread (Cyert and March, 1969).

Gather data about alternatives

When potential areas of activity are identified, management should assess the potential growth rate of the activities, the ability of the company to establish adequate market shares, and the cash flows for each alternative activity for various **states of nature**. Because decision problems exist in an uncertain environment, it is necessary to consider certain factors that are outside the decision-maker's control, which may occur for each alternative course of action. These uncontrollable factors are called states of nature. Some examples of possible states of nature are economic boom, high inflation, recession, the strength of competition and so on.

The course of action selected by a firm using the information presented above will commit its resources for a lengthy period of time, and how the overall place of the firm will be affected within its environment, that is, the products it makes, the markets it operates in and its ability to meet future changes. Such decisions dictate the firm's long-run possibilities and hence the type of decisions it can make in the future. These decisions are normally referred to as **long-run** or **strategic decisions**. Strategic decisions have a profound effect on the firm's future position, and it is therefore essential that adequate data are gathered about the firm's capabilities and the environment in which it operates. Because of their importance, strategic decisions should be the concern of top management.

Besides strategic or long-term decisions, management must also make decisions that do not commit the firm's resources for a lengthy period of time. Such decisions are known as **short-term** or **operating decisions** and are normally the concern of lower-level managers. Short-term decisions are based on the environment of today, and the physical, human and financial resources presently available to the firm. These are, to a considerable extent, determined by the quality of the firm's long-term decisions. Examples of short-term decisions include the following.

- 1 What selling prices should be set for the firm's products?
- 2 How many units should be produced of each product?
- 3 What media shall we use for advertising the firm's products?
- 4 What level of service shall we offer customers in terms of the number of days required to deliver an order and the after-sales service?

Data must also be gathered for short-term decisions; for example, data on the selling prices of competitors' products, estimated demand at alternative selling prices, and predicted costs for different activity levels must be assembled for pricing and output decisions. When the data have been gathered, management must decide which courses of action to take.

Select appropriate alternative courses of action

In practice, decision-making involves choosing between competing alternative courses of action and selecting the alternative that best satisfies the objectives of an organization. Assuming that our objective is to maximize future net cash inflows, the alternative selected should be based on a comparison of the differences between the cash flows. Consequently, an incremental analysis of the net cash benefits for each alternative should be applied. The alternatives are ranked in terms of net cash benefits, and those showing the greatest benefits are chosen subject to taking into account any qualitative factors. We shall discuss how incremental cash flows are measured for short-term and long-term decisions and the impact of qualitative factors in Chapters 9–15.

Implementation of the decisions

Once alternative courses of action have been selected, they should be implemented as part of the budgeting process. The **budget** is a financial plan for implementing the various decisions that management has made. The budgets for all of the various decisions are expressed in terms of cash inflows and outflows, and sales revenues and expenses. These budgets are merged together into a single unifying statement of the organization's expectations for future periods. This statement is known as a **master budget**. The master budget consists of a budgeted profit and loss account, cash flow statement and balance sheet. The budgeting process communicates to everyone in the organization the part that they are expected to play in implementing management's decisions. Chapter 16 focuses on the budgeting process.

Comparing actual and planned outcomes and responding to divergencies from plan

The final stages in the process outlined in Figure 1.1 of comparing actual and planned outcomes and responses to divergencies from plan represent the firm's control process. The managerial function of **control** consists of the measurement, reporting and subsequent correction of performance in an attempt to ensure that the firm's objectives and plans are achieved. In other words, the objective of the control process is to ensure that the work is done so as to fulfil the original intentions.

To monitor performance, the accountant produces **performance reports** and presents them to the appropriate managers who are responsible for implementing the

various decisions. Performance reports consisting of a comparison of actual outcomes (actual costs and revenues) and planned outcomes (budgeted costs and revenues) should be issued at regular intervals. Performance reports provide **feedback** information by comparing planned and actual outcomes. Such reports should highlight those activities that do not conform to plans, so that managers can devote their scarce time to focusing on these items. This process represents the application of **management by exception**. Effective control requires that corrective action is taken so that actual outcomes conform to planned outcomes. Alternatively, the plans may require modification if the comparisons indicate that the plans are no longer attainable.

The process of taking corrective action so that actual outcomes conform to planned outcomes, or the modification of the plans if the comparisons indicate that actual outcomes do not conform to planned outcomes, is indicated by the arrowed lines in Figure 1.1 linking stages 7 and 5 and 7 and 2. These arrowed lines represent '**feedback loops**'. They signify that the process is dynamic and stress the interdependencies between the various stages in the process. The feedback loop between stages 7 and 2 indicates that the plans should be regularly reviewed, and if they are no longer attainable then alternative courses of action must be considered for achieving the organization's objectives. The second loop stresses the corrective action taken so that actual outcomes conform to planned outcomes. Chapters 16–18 focus on the planning and control process.

Changing competitive environment

Prior to the 1980s many organizations in Western countries operated in a protected competitive environment. Barriers of communication and geographical distance, and sometimes protected markets, limited the ability of overseas companies to compete in domestic markets. There was little incentive for firms to maximize efficiency and improve management practices, or to minimize costs, as cost increases could often be passed on to customers. During the 1980s, however, manufacturing organizations began to encounter severe competition from overseas competitors that offered high-quality products at low prices. By establishing global networks for acquiring raw materials and distributing goods overseas, competitors were able to gain access to domestic markets throughout the world. To be successful companies now have to compete not only against domestic competitors but also against the best companies in the world.

Virtually all types of service organization have also faced major changes in their competitive environment. Before the 1980s many service organizations, such as those operating in the airlines, utilities and financial service industries, were either government-owned monopolies or operated in a highly regulated, protected and non-competitive environment. These organizations were not subject to any great pressure to improve the quality and efficiency of their operations or to improve profitability by eliminating services or products that were making losses. Furthermore, more efficient competitors were often prevented from entering the markets in which the regulated companies operated. Prices were set to cover operating costs and provide a predetermined return on capital. Hence cost increases could often be absorbed by increasing the prices of the services. Little attention was therefore given to developing cost systems that accurately measured the costs and profitability of individual services.

Privatization of government-controlled companies and deregulation in the 1980s completely changed the competitive environment in which service companies operated. Pricing and competitive restrictions were virtually eliminated. Deregulation,

intensive competition and an expanding product range created the need for service organizations to focus on cost management and develop management accounting information systems that enabled them to understand their cost base and determine the sources of profitability for their products, customers and markets. Many service organizations have only recently turned their attention to management accounting.

Focus on customer satisfaction and new management approaches

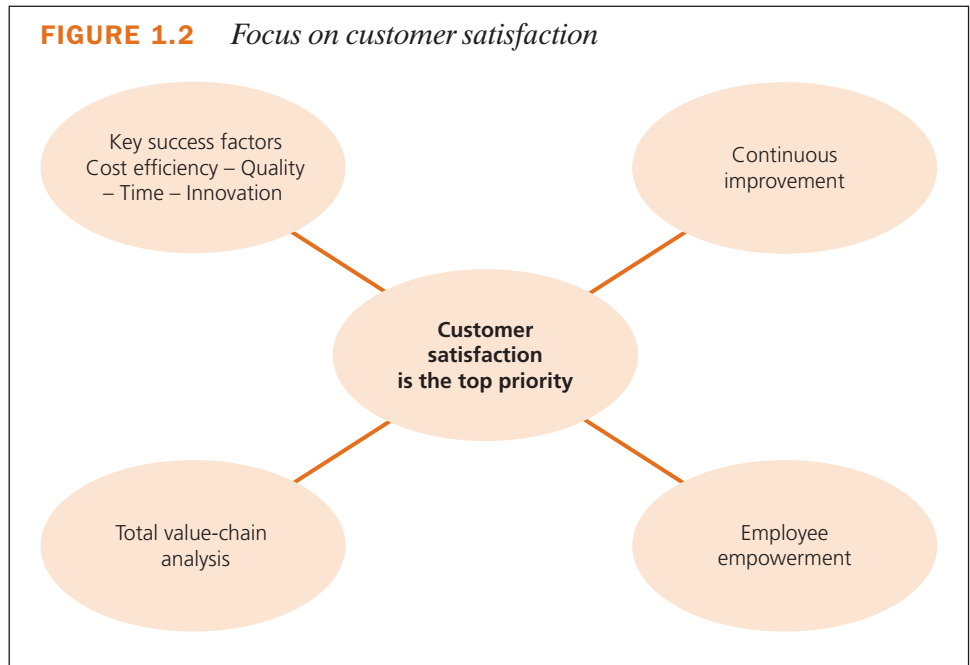
In order to compete in today's competitive environment companies have had to become more customer-driven and make customer satisfaction an overriding priority. Customers are demanding ever-improving levels of service in cost, quality, reliability, delivery, and the choice of innovative new products. Figure 1.2 illustrates this focus on customer satisfaction as the overriding priority. In order to provide customer satisfaction organizations must concentrate on those key success factors that directly affect it. Figure 1.2 identifies cost efficiency, quality, time and innovation as the key success factors. In addition to concentrating on these factors organizations are adopting new management approaches in their quest to achieve customer satisfaction. These new approaches are illustrated in Figure 1.2. They are continuous improvement, employee empowerment and total value-chain analysis. Let us now examine each of the items shown in Figure 1.2 in more detail.

The first item listed in Figure 1.2 refers to key success factors; which include cost efficiency, quality, time and innovation. Since customers will buy the product with the lowest price, all other things being equal, keeping costs low and being **cost efficient** provides an organization with a strong competitive advantage. Increased competition has also made decision errors due to poor cost information more probable and more costly. If the cost system results in distorted product costs being reported, then over-costed products will lead to higher bid prices and business lost to those competitors who are able to quote lower prices purely because their cost systems produce more accurate cost information. Alternatively, there is a danger that undercosted products will result in the acceptance of unprofitable business.

These developments have made many companies aware of the need to improve their cost systems so that they can produce more accurate cost information to determine the cost of their products, pinpoint loss-making activities and analyse profits by products, sales outlets, customers and markets.

In addition to demanding low cost product customers are demanding high quality products and services. Most companies are responding to this by focusing on **total quality management** (TQM). The goal of TQM is customer satisfaction. TQM is a term used to describe a situation where *all* business functions are involved in a process of continuous quality improvement that focuses on delivering products or services of consistently high quality in a timely fashion. The emphasis on TQM has created fresh demands on the management accounting function to expand its role by becoming involved in measuring and evaluating the quality of products and services and the activities that produce them.

Organizations are also seeking to increase customer satisfaction by providing a speedier response to customer requests, ensuring 100% on-time delivery and reducing the time taken to develop and bring new products to market. For these reasons management accounting systems now place more emphasis on **time-based measures**, which have become an important competitive variable. **Cycle time** is one measure that management accounting systems have begun to focus on. It is the length of time from



start to completion of a product or service. It consists of the sum of processing time, move time, wait time and inspection time. Move time is the amount of time it takes to transfer the product during the production process from one location to another. Wait time is the amount of time that the product sits around waiting for processing, moving, inspecting, reworking or the amount of time it spends in finished goods stock waiting to be sold and despatched. Inspection time is the amount of time making sure that the product is defect free or the amount of time actually spent reworking the product to remedy identified defects in quality. Only processing time adds value to the product, and the remaining activities are **non-value added activities** in the sense that they can be reduced or eliminated without altering the product's service potential to the customer. Organizations are therefore focusing on minimizing cycle time by reducing the time spent on such activities. The management accounting system has an important role to play in this process by identifying and reporting on the time devoted to value added and non-value added activities.

The final key success factor shown in Figure 1.2 relates to **innovation**. To be successful companies must develop a steady stream of innovative new products and services and have the capability to adapt to changing customer requirements. It has already been stressed earlier in this chapter that being later to the market than competitors can have a dramatic effect on product profitability. Companies have therefore begun to incorporate performance measures that focus on flexibility and innovation into their management accounting systems. Flexibility relates to the responsiveness in meeting customer requirements. Flexibility measures include the total launch time for new products, the length of development cycles and the ability to change the production mix quickly. Innovation measures include an assessment of the key characteristics of new products relative to those of competitors, feedback on customer satisfaction with the new features and characteristics of newly introduced products, and the number of new products launched and their launch time.

You can see by referring to Figure 1.2 that organizations are attempting to achieve customer satisfaction by adopting a philosophy of **continuous improvement**.

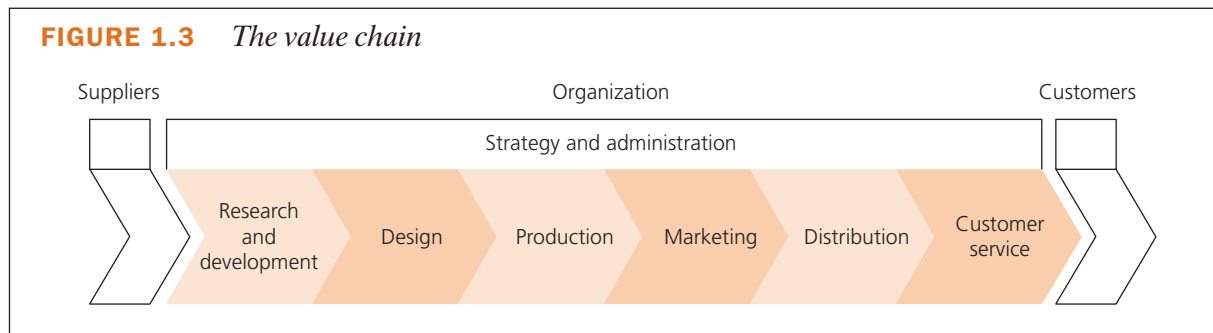
Traditionally, organizations have sought to establish standard operating procedures. Operators were expected to follow the standard procedures and management accountants developed systems and measurements that compared actual results with predetermined standards. This process created a climate whereby the predetermined standards represented a target to be achieved and maintained rather than a policy of continuous improvement. In today's competitive environment performance against static historical standards is no longer appropriate. To compete successfully companies must adopt a philosophy of continuous improvement, an ongoing process that involves a continuous search to reduce costs, eliminate waste, and improve the quality and performance of activities that increase customer value or satisfaction.

Benchmarking is a technique that is increasingly being adopted as a mechanism for achieving continuous improvement. It is a continuous process of measuring a firm's products, services or activities against the other best-performing organizations, either internal or external to the firm. The objective is to ascertain how the processes and activities can be improved. Ideally, benchmarking should involve an external focus on the latest developments, best practice and model examples that can be incorporated within various operations of business organizations. It therefore represents the ideal way of moving forward and achieving high competitive standards.

In their quest for the continuous improvement of organizational activities managers have found that they have had to rely more on the people closest to the operating processes and customers to develop new approaches to performing activities. This has led to employees being provided with relevant information to enable them to make continuous improvements to the output of processes. Allowing employees to take such actions without the authorization by superiors has come to be known as **employee empowerment**. It is argued that by empowering employees and giving them relevant information they will be able to respond faster to customers, increase process flexibility, reduce cycle time and improve morale. Management accounting is therefore moving from its traditional emphasis on providing information to managers to monitor the activities of employees to providing information to employees to empower them to focus on the continuous improvement of activities.

Increasing attention is now being given to **value-chain analysis** as a means of increasing customer satisfaction and managing costs more effectively. The value chain is illustrated in Figure 1.3. It is the linked set of value-creating activities all the way from basic raw material sources for component suppliers through to the ultimate end-use product or service delivered to the customer. Coordinating the individual parts of the value chain together to work as a team creates the conditions to improve customer satisfaction, particularly in terms of cost efficiency, quality and delivery. It is also appropriate to view the value chain from the customer's perspective, with each link being seen as the customer of the previous link. If each link in the value chain is designed to meet the needs of its customers, then end-customer satisfaction should ensue. Furthermore, by viewing each link in the value chain as a supplier–customer relationship, the opinions of the customers can be used to provide useful feedback information on assessing the quality of service provided by the supplier. Opportunities are thus identified for improving activities throughout the entire value chain. The aim is to manage the linkages in the value chain better than competitors and thus create a competitive advantage.

Finally, there are other aspects of customer satisfaction that are not specified in Figure 1.2 – namely, **social responsibility** and **corporate ethics**. Customers are no longer satisfied if companies simply comply with the legal requirements of undertaking their activities. They expect company managers to be more proactive in terms of their social responsibility. Company stakeholders are now giving high priority to social responsibility, safety and environmental issues, besides corporate ethics. In

FIGURE 1.3 *The value chain*

response to these pressures many companies are now introducing mechanisms for measuring, reporting and monitoring their environmental costs and activities. A code of ethics has also become an essential part of corporate culture. In addition, professional accounting organizations play an important role in promoting a high standard of ethical behaviour by their members. Both of the professional bodies representing management accountants in the UK (Chartered Institute of Management Accountants) and the USA (Institute of Management Accountants) have issued a code of ethical guidelines for their members and established mechanisms for monitoring and enforcing professional ethics. The guidelines are concerned with ensuring that accountants follow fundamental principles relating to integrity (not being a party to any falsification), objectivity (not being biased or prejudiced), confidentiality and professional competence and due care (maintaining the skills required to ensure a competent professional service).

The impact of information technology

During the past decade the use of information technology (IT) to support business activities has increased dramatically with the development of electronic business communication technologies known as **e-business**, **e-commerce** or **internet commerce**. These developments are having a big impact on businesses. For example, consumers are becoming more discerning when purchasing products or services because they are able to derive more information from the internet on the relative merits of the different product offerings. E-commerce has provided the potential to develop new ways of doing things that have enabled considerable cost savings to be made from streamlining business processes and generating extra revenues from the adept use of on-line sales facilities (e.g. ticketless airline bookings and internet banking). The ability to use e-commerce more proficiently than competitors provides the potential for companies to establish a competitive advantage.

One advanced IT application that has had a considerable impact on business information systems is **enterprise resource planning systems** (ERPS). The number of adopters of ERPS has increased rapidly throughout the world since they were first introduced in the mid-1990s. An ERPS comprises a set of integrated software applications modules that aim to control all information flows within a company. They cover most business functions (including accounting). Standard ERPS accounting modules incorporate many menus including bookkeeping, product profitability analysis and budgeting. All the modules are fully integrated in a common database and users can access real-time information on all aspects of the business. A major feature of ERPS systems is that

A look at a key feature of easyJet's business

As one of the pioneers in the low cost airline market, easyJet bases its business on a number of principles:

- Minimize distribution costs by using the internet to take bookings. About 90% of all easyJet tickets are sold via the Web. This makes the company one of Europe's largest internet retailers.
- Maximize efficient use of assets, by increasing turn-around time at airports.
- A 'simple-service model' means the end of free on-board catering.
- Ticketless travel, where passengers receive an e-mail confirming their booking, cuts the cost of issuing, distributing and processing tickets.
- Intensive use of IT in administration and management, aiming to run a paperless office.

Source: easyJet website (www.easyjet.com)



all data are entered only once, typically where the data originate. There are a number of ERPS packages on the market provided by companies such as SAP, Baan, Oracle and J.D. Edwards. SAP is the market leader with more than 7500 users in 90 countries (Scapens *et al.*, 1998). The introduction of ERPS has the potential to have a significant impact on the work of management accountants. In particular, ERPS substantially reduce routine information gathering and the processing of information by management accountants. Instead of managers asking management accountants for information, they can access the system to derive the information they require directly by PC

International convergence of management accounting practices

This book has become an established text in many different countries throughout the world. It is therefore assumed that the content is appropriate for use in different countries. This assumption is based on the premise that management accounting practices generally do not differ across countries. Granlund and Lukka (1998) provide support for this assumption. They argue that there is a strong current tendency towards global homogenization of management accounting practices within the industrialized parts of the world.

Granlund and Lukka distinguish between management accounting practices at the macro and micro levels. The macro level relates to concepts and techniques; in other words, it relates mainly to the content of this book. In contrast, the micro level is concerned with the behavioural patterns relating to how management accounting information is actually used. Granlund and Lukka argue that, at the macro level, the forces of convergence have started to dominate those of divergence. They identify various drivers of convergence but the most important relate to the intensified global competition, developments in information technology, the increasing tendency of transnational companies to standardize their practices, the global consultancy industry and the use of globally applied textbooks and teaching.

Firms throughout the world are adopting similar integrated enterprise resource planning systems or standardized software packages that have resulted in the standardization of data collection formats and reporting patterns of accounting information. In multinational companies this process has resulted in the standardization of the global flow of information, but it has also limited the ability to generate locally relevant information. Besides the impact of integrated IT systems, it is common for the headquarters/parent company of a transnational enterprise to force foreign divisions to adopt similar accounting practices to those of the headquarters/parent company. A large global consultancy industry has recently emerged that tends to promote the same standard solutions globally. Finally, the same textbooks are used globally and university and professional accounting syllabuses tend to be similar in different countries.

At the micro level Granlund and Lukka acknowledge that differences in national and corporate culture can result in management accounting practices differing across countries. For example, national cultures have been categorized as the extent to which: (1) the inequality between people is considered to be normal and acceptable; (2) the culture is assertive and competitive as opposed to being modest and caring; (3) the culture feels comfortable with uncertainty and ambiguity; and (4) the culture focuses on long-term or short-term outcomes. There is evidence to suggest that accounting information is used in different ways in different national cultures, such as being used in a rigorous/rigid manner for managerial performance evaluation in cultures exhibiting certain national traits and in a more flexible way in cultures exhibiting different national traits. At the macro level Granlund and Lukka argue that the impact of national culture is diminishing because of the increasing emerging pressures to follow national trends to secure national competitiveness.

Functions of management accounting

A cost and management accounting system should generate information to meet the following requirements. It should:

- 1 allocate costs between cost of goods sold and inventories for internal and external profit reporting;
- 2 provide relevant information to help managers make better decisions;
- 3 provide information for planning, control and performance measurement.

Financial accounting rules require that we match costs with revenues to calculate profit. Consequently any unsold finished goods stock or partly completed stock (work in progress) will *not* be included in the cost of goods sold, which is matched against sales revenue during a given period. In an organization that produces a wide range of different products it will be necessary, for stock (inventory) valuation purposes, to charge the costs to each individual product. The total value of the stocks of completed products and work in progress plus any unused raw materials forms the basis for determining the inventory valuation to be deducted from the current period's costs when calculating profit. This total is also the basis for determining the stock valuation for inclusion in the balance sheet. Costs are therefore traced to each individual job or product for financial accounting requirements in order to allocate the costs incurred during a period between cost of goods sold and inventories. This information is required for meeting *external* financial accounting requirements, but most organizations also produce *internal* profit reports at monthly intervals. Thus product costs are

also required for periodic internal profit reporting. Many service organizations, however, do not carry any stocks and product costs are therefore not required by these organizations for valuing inventories.

The second requirement of a cost and management accounting system is to provide relevant financial information to managers to help them make better decisions. This involves both routine and non-routine reporting. Routine information is required relating to the profitability of various segments of the business such as products, services, customers and distribution channels in order to ensure that only profitable activities are undertaken. Information is also required for making resource allocation and product mix and discontinuation decisions. In some situations cost information extracted from the costing system also plays a crucial role in determining selling prices, particularly in markets where customized products and services are provided that do not have readily available market prices. Non-routine information is required for strategic decisions. These decisions are made at infrequent intervals and include decisions relating to the development and introduction of new products and services, investment in new plant and equipment and the negotiation of long-term contracts with customers and suppliers.

Management accounting systems should also provide information for planning, control and performance measurement. Planning involves translating goals and objectives into the specific activities and resources that are required to achieve the goals and objectives. Companies develop both long-term and short-term plans and the management accounting function plays a critical role in this process. Short-term plans, in the form of the budgeting process, are prepared in more detail than the longer-term plans and are one of the mechanisms used by managers as a basis for control and performance evaluation. Control is the process of ensuring that the actual outcomes conform with the planned outcomes. The control process involves the setting of targets or standards (often derived from the budgeting process) against which actual results are measured. Performance is then measured and compared with the targets on a periodic basis. The management accountant's role is to provide managers with feedback information in the form of periodic reports, suitably analysed, to enable them to determine if operations are proceeding according to plan and identify those activities where corrective action is necessary. In particular, the management accounting function should provide economic feedback to managers to assist them in controlling costs and improving the efficiency and effectiveness of operations.

It is appropriate at this point to distinguish between cost accounting and management accounting. **Cost accounting** is concerned with cost accumulation for inventory valuation to meet the requirements of external reporting and internal profit measurement, whereas **management accounting** relates to the provision of appropriate information for decision-making, planning, control and performance evaluation. It is apparent from an examination of the literature that the distinction between cost accounting and management accounting is extremely vague with some writers referring to the decision-making aspects in terms of cost accounting and other writers using the term management accounting; the two terms are often used synonymously. In this book no attempt will be made to distinguish between these two terms.

You should now be aware from the above discussion that a management accounting system serves multiple purposes. The emphasis throughout the book is that costs must be assembled in different ways for different purposes. Most firms establish one set of accounts that serve inventory valuation and profit measurement, decision-making and performance evaluation requirements. In other words, a single database is maintained with costs appropriately coded and classified so that relevant cost information can be extracted to meet each of the above requirements. We shall examine in the next chapter how relevant cost information can be extracted from a single database and adjusted to meet different user requirements.

Summary of the contents of this book

This book is divided into four parts. The first part (Part One) consists of two chapters and provides an introduction to management and cost accounting and a framework for studying the remaining chapters. Part Two consists of six chapters and is entitled 'Cost Accumulation for Inventory Valuation and Profit Measurement'. This section focuses mainly on cost accounting. It is concerned with assigning costs to products to separate costs incurred during a period between costs of goods sold and the closing inventory valuation. The extent to which product costs accumulated for inventory valuation and profit measurement should be adjusted for meeting decision-making, cost control and performance measurement requirements is also briefly considered. Part Three consists of seven chapters and is entitled 'Information for Decision-making'. Here the focus is on measuring and identifying those costs which are relevant for different types of decisions.

The title of Part Four is 'Information for Planning, Control and Performance Measurement'. It consists of three chapters and concentrates on the process of translating goals and objectives into specific activities and the resources that are required, via the short-term (budgeting) and long-term planning processes, to achieve the goals and objectives. In addition, the management control systems that organizations use are described and the role that management accounting control systems play within the overall control process is examined. The emphasis here is on the accounting process as a means of providing information to help managers control the activities for which they are responsible.

Guidelines for using this book



A comprehensive treatment of all of the topics that are contained in this book will not be essential for all readers. To meet the different requirements of the readers, the more advanced material that is not essential for those readers not requiring a more in-depth knowledge of a particular topic has been highlighted. The start of each advanced reading section has a clearly identifiable heading and a vertical orange line is used to highlight the full section. If you do require an in-depth knowledge of a topic you may find it helpful initially to omit the advanced reading sections, or skim them, on your first reading. You should read them in detail only when you fully understand the content of the remaining parts of the chapter. It is important that you check your course content to ascertain if you need to read the advanced reading section.



The following items relate to the learning objectives listed at the beginning of the chapter.

- **Distinguish between management accounting and financial accounting.** Management accounting differs from financial accounting in several ways. Management accounting is concerned with the provision of information to internal

users to help them make better decisions and improve the efficiency and effectiveness of operations. Financial accounting is concerned with the provision of information to external parties outside the organization. Unlike financial accounting there is no statutory requirement for management accounting to produce financial statements or follow externally imposed rules. Furthermore, management accounting provides information relating to different parts of the business whereas financial accounting reports focus on the whole business. Management accounting also tends to be more future oriented and reports are often published on a daily basis whereas financial accounting reports are published semi-annually.

- **Identify and describe the elements involved in the decision-making, planning and control process.**

The following elements are involved in the decision-making, planning and control process: (a) identify the objectives that will guide the business; (b) search for a range of possible courses of action that might enable the objectives to be achieved; (c) gather data about the alternatives; (d) select appropriate alternative courses of action that will enable the objectives to be achieved; (e) implement the decisions as part of the planning and budgeting process; (f) compare actual and planned outcomes; and (g) respond to divergencies from plan by taking corrective action so that actual outcomes conform to planned outcomes or modify the plans if the comparisons indicate that the plans are no longer attainable.

- **Justify the view that a major objective of commercial organizations is to broadly seek to maximize the present value of future cash flows.**

The reasons for identifying maximizing the present value of future cash flows as a major objective are: (a) it is equivalent to maximizing shareholder value; (b) it is unlikely that any other objective is as widely applicable in measuring the ability of the organization to survive in the future; (c) although it is unlikely that maximizing the present value of future cash flows can be realized in practice it is still important to establish the principles necessary to achieve this objective; and (d) it enables shareholders as a group in the bargaining coalition to know how much the pursuit of other goals is costing them by indicating the amount of cash distributed among the members of the coalition.

- **Explain the factors that have influenced the changes in the competitive environment.**

The factors influencing the change in the competitive environment are (a) globalization of world trade; (b) privatization of government-controlled companies and deregulation in various industries; (c) changing product life cycles; (d) changing customer tastes that demand ever-improving levels of service in cost, quality, reliability, delivery and the choice of new products; and (e) the emergence of e-business.

- **Outline and describe the key success factors that directly affect customer satisfaction.**

The key success factors are cost efficiency, quality, time and innovation. Since customers will generally prefer to buy the product or service at the lowest price, all other things being equal, keeping costs low and being cost efficient provides an organization with a strong competitive advantage. Customers also demand high quality products and services and this has resulted in companies making quality a key competitive variable. Organizations are also seeking to increase customer satisfaction by providing a speedier response to customer requests, ensuring 100 per cent on-time delivery and reducing the time taken to bring new products to the

market. To be successful companies must be innovative and develop a steady stream of new products and services and have the capability to rapidly adapt to changing customer requirements.

- **Identify and describe the functions of a management accounting system.**

A cost and management accounting system should generate information to meet the following requirements: (a) allocate costs between cost of goods sold and inventories for internal and external profit reporting and inventory valuation; (b) provide relevant information to help managers make better decisions; and (c) provide information for planning, control and performance measurement.



Notes

- 1 The total profits over the life of a business are identical with total net cash inflows. However, the profits calculated for a particular accounting period will be different from the net cash flows for that period. The difference arises because of the accruals concept in financial accounting. For most situations in this book, decisions that will lead to changes in profits are also assumed to lead to identical changes in net cash flows.



Key terms and concepts

Each chapter includes a section like this. You should make sure that you understand each of the terms listed below before you proceed to the next chapter. Their meanings are explained on the page numbers indicated.

- | | |
|--|---------------------------------------|
| benchmarking (p. 15) | long-run decisions (p. 10) |
| bounded rationality (p. 8) | management accounting (pp. 7, 19) |
| budget (p. 11) | management by exception (p. 12) |
| continuous improvement (p. 14) | master budget (p. 11) |
| control (p. 11) | non-value added activities (p. 14) |
| corporate ethics (p. 15) | objectives of the organization (p. 8) |
| cost accounting (p. 19) | operating decisions (p. 10) |
| cost efficient (p. 13) | performance reports (p. 11) |
| cycle time (p. 13) | planning (p. 8) |
| e-business (p. 16) | satisficing (p. 9) |
| e-commerce (p. 16) | short-term decisions (p. 10) |
| employee empowerment (p. 15) | social responsibility (p. 15) |
| enterprise resource planning systems (p. 16) | states of nature (p. 10) |
| feedback (p. 12) | strategic decisions (p. 10) |
| feedback loop (p. 12) | strategies (p. 10) |
| financial accounting (pp. 7, 8) | time-based measures (p. 13) |
| goals of the organization (p. 8) | total quality management (p. 13) |
| innovation (p. 14) | value-chain analysis (p. 15) |
| internet commerce (p. 16) | |

Key examination points

Chapter 1 has provided an introduction to the scope of management accounting. It is unlikely that examination questions will be set that refer to the content of an introductory chapter. However, questions are sometimes set requiring you to outline how a costing system can assist the management of an organization. Note that the examiner may not distinguish between cost accounting and management accounting. Cost accounting is often used to also embrace management accounting. Your discussion of a cost accounting system should therefore include a description (with illustrations) of how the system provides information for decision-making, planning and control. Make sure that you draw off your experience from the whole of a first-year course and not just this introductory chapter.



Assessment material

The review questions are short questions that enable you to assess your understanding of the main topics included in the chapter. The numbers in parentheses provide you with the page numbers to refer to if you cannot answer a specific question.

The remaining chapters also contain review problems. These are more complex and require you to relate and apply the chapter content to various business problems. Fully worked solutions to the review problems are provided in a separate section at the end of the book.

The website also includes over 20 case study problems. A list of these cases is provided on pages 586–7. The Electronic Boards case is a case study that is relevant to the introductory stages of a management accounting course.

Review questions

- 1.1** Identify and describe the different users of accounting information. (*pp. 6–7*)
- 1.2** Describe the differences between management accounting and financial accounting. (*pp. 7–8*)
- 1.3** Explain each of the elements of the decision-making, planning and control process. (*pp. 8–12*)
- 1.4** Describe what is meant by management by exception. (*p. 12*)
- 1.5** Describe what is meant by continuous improvement, benchmarking and employee empowerment. (*pp. 14–15*)
- 1.6** Describe the different activities in the value chain. (*p. 15*)
- 1.7** Explain why firms are beginning to concentrate on social responsibility and corporate ethics. (*pp. 15–16*)
- 1.8** Describe the different functions of management accounting. (*pp. 18–19*)
- 1.9** Describe enterprise resource planning systems and their impact on management accountants. (*pp. 16–17*)



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APPENDICES

Appendix A: Present value of £1 after n years = $\frac{1}{(1+k)^n}$

Years hence	1%	2%	4%	6%	8%	10%	12%	14%	15%	16%	18%	20%	22%	24%	25%	26%	28%	30%	35%
1	0.990	0.980	0.962	0.943	0.926	0.909	0.893	0.877	0.870	0.862	0.847	0.833	0.820	0.806	0.800	0.794	0.781	0.769	0.741
2	0.980	0.961	0.925	0.890	0.857	0.826	0.797	0.769	0.756	0.743	0.718	0.694	0.672	0.650	0.640	0.630	0.610	0.592	0.549
3	0.971	0.942	0.889	0.840	0.794	0.751	0.712	0.675	0.658	0.641	0.609	0.579	0.551	0.524	0.512	0.500	0.477	0.455	0.406
4	0.961	0.924	0.855	0.792	0.735	0.683	0.636	0.592	0.572	0.552	0.516	0.482	0.451	0.423	0.410	0.397	0.373	0.350	0.301
5	0.951	0.906	0.822	0.747	0.681	0.621	0.567	0.519	0.497	0.476	0.437	0.402	0.370	0.341	0.328	0.315	0.291	0.269	0.223
6	0.942	0.888	0.790	0.705	0.630	0.564	0.507	0.456	0.432	0.410	0.370	0.335	0.303	0.275	0.262	0.250	0.227	0.207	0.165
7	0.933	0.871	0.760	0.665	0.583	0.513	0.452	0.400	0.376	0.354	0.314	0.279	0.249	0.222	0.210	0.198	0.178	0.159	0.122
8	0.923	0.853	0.731	0.627	0.540	0.467	0.404	0.351	0.327	0.305	0.266	0.233	0.204	0.179	0.168	0.157	0.139	0.123	0.091
9	0.914	0.837	0.703	0.592	0.500	0.424	0.361	0.308	0.284	0.263	0.225	0.194	0.167	0.144	0.134	0.125	0.108	0.094	0.067
10	0.905	0.820	0.676	0.558	0.463	0.386	0.322	0.270	0.247	0.227	0.191	0.162	0.137	0.116	0.107	0.099	0.085	0.073	0.050
11	0.896	0.804	0.650	0.527	0.429	0.350	0.287	0.237	0.215	0.195	0.162	0.135	0.112	0.094	0.086	0.079	0.066	0.056	0.037
12	0.887	0.788	0.625	0.497	0.397	0.319	0.257	0.208	0.187	0.168	0.137	0.112	0.092	0.076	0.069	0.062	0.052	0.043	0.027
13	0.879	0.773	0.601	0.469	0.368	0.290	0.229	0.182	0.163	0.145	0.116	0.093	0.075	0.061	0.055	0.050	0.040	0.033	0.020
14	0.870	0.758	0.577	0.442	0.340	0.263	0.205	0.160	0.141	0.125	0.099	0.078	0.062	0.049	0.044	0.039	0.032	0.025	0.015
15	0.861	0.743	0.555	0.417	0.315	0.239	0.183	0.140	0.123	0.108	0.084	0.065	0.051	0.040	0.035	0.031	0.025	0.020	0.011
16	0.853	0.728	0.534	0.394	0.292	0.218	0.163	0.123	0.107	0.093	0.071	0.054	0.042	0.032	0.028	0.025	0.019	0.015	0.008
17	0.844	0.714	0.513	0.371	0.270	0.198	0.146	0.108	0.093	0.080	0.060	0.045	0.034	0.026	0.023	0.020	0.015	0.012	0.006
18	0.836	0.700	0.494	0.350	0.250	0.180	0.130	0.095	0.081	0.069	0.051	0.038	0.028	0.021	0.018	0.016	0.012	0.009	0.005
19	0.828	0.686	0.475	0.331	0.232	0.164	0.116	0.083	0.070	0.060	0.043	0.031	0.023	0.017	0.014	0.012	0.009	0.007	0.003
20	0.820	0.673	0.456	0.312	0.215	0.149	0.104	0.073	0.061	0.051	0.037	0.026	0.019	0.014	0.012	0.010	0.007	0.005	0.002

Appendix B: Present value of an annuity of £1 received annually for n years

$$= \frac{\pounds 1}{K} \left(1 - \frac{1}{(1+K)^n} \right)$$

Years hence	1%	2%	4%	6%	8%	10%	12%	14%	15%	16%	18%	20%	22%	24%	25%	26%	28%	30%	35%	36%	37%
1	0.990	0.980	0.962	0.943	0.926	0.909	0.893	0.877	0.870	0.862	0.847	0.833	0.820	0.806	0.800	0.794	0.781	0.769	0.741	0.735	0.730
2	1.970	1.942	1.886	1.833	1.783	1.736	1.690	1.647	1.626	1.605	1.566	1.528	1.492	1.457	1.440	1.424	1.392	1.361	1.289	1.276	1.263
3	2.941	2.884	2.775	2.673	2.577	2.487	2.402	2.322	2.283	2.246	2.174	2.106	2.042	1.981	1.952	1.923	1.868	1.816	1.696	1.673	1.652
4	3.902	3.808	3.630	3.465	3.312	3.170	3.037	2.914	2.855	2.798	2.690	2.589	2.494	2.404	2.362	2.320	2.241	2.166	1.997	1.966	1.935
5	4.853	4.713	4.452	4.212	3.993	3.791	3.605	3.433	3.352	3.274	3.127	2.991	2.864	2.745	2.689	2.635	2.532	2.436	2.220	2.181	2.143
6	5.795	5.601	5.242	4.917	4.623	4.355	4.111	3.889	3.784	3.685	3.498	3.326	3.167	3.020	2.951	2.885	2.759	2.643	2.385	2.339	2.294
7	6.728	6.472	6.002	5.582	5.206	4.868	4.564	4.288	4.160	4.039	3.812	3.605	3.416	3.242	3.161	3.083	2.937	2.802	2.508	2.455	2.404
8	7.652	7.325	6.733	6.210	5.747	5.335	4.968	4.639	4.487	4.344	4.078	3.837	3.619	3.421	3.329	3.241	3.076	2.925	2.598	2.540	2.485
9	8.566	8.162	7.435	6.802	6.247	5.759	5.328	4.946	4.772	4.607	4.303	4.031	3.786	3.566	3.463	3.366	3.184	3.019	2.665	2.603	2.544
10	9.471	8.983	8.111	7.360	6.710	6.145	5.650	5.216	5.019	4.833	4.494	4.192	3.923	3.682	3.571	3.465	3.269	3.092	2.715	2.649	2.587
11	10.368	9.787	8.760	7.887	7.139	6.495	5.937	5.453	5.234	5.029	4.656	4.327	4.035	3.776	3.656	3.544	3.335	3.147	2.752	2.683	2.618
12	11.255	10.575	9.385	8.384	7.536	6.814	6.194	5.660	5.421	5.197	4.793	4.439	4.127	3.851	3.725	3.606	3.387	3.190	2.779	2.708	2.641
13	12.134	11.343	9.986	8.853	7.904	7.103	6.424	5.842	5.583	5.342	4.910	4.533	4.203	3.912	3.780	3.656	3.427	3.223	2.799	2.727	2.658
14	13.004	12.106	10.563	9.295	8.244	7.367	6.628	6.002	5.724	5.468	5.008	4.611	4.265	3.962	3.824	3.695	3.459	3.249	2.814	2.740	2.670
15	13.865	12.849	11.118	9.712	8.559	7.606	6.811	6.142	5.847	5.575	5.092	4.675	4.315	4.001	3.859	3.726	3.483	3.268	2.825	2.750	2.679
16	14.718	13.578	11.652	10.106	8.851	7.824	6.974	6.265	5.954	5.669	5.162	4.730	4.357	4.033	3.887	3.751	3.503	3.283	2.834	2.757	2.685
17	15.562	14.292	12.166	10.477	9.122	8.022	7.120	6.373	6.047	5.749	5.222	4.775	4.391	4.059	3.910	3.771	3.518	3.295	2.840	2.763	2.690
18	16.398	14.992	12.659	10.828	9.372	8.201	7.250	6.467	6.128	5.818	5.273	4.812	4.419	4.080	3.928	3.786	3.529	3.304	2.844	2.767	2.693
19	17.226	15.678	13.134	11.815	9.604	8.365	7.366	6.550	6.198	5.877	5.316	4.844	4.442	4.097	3.942	3.799	3.539	3.311	2.848	2.770	2.696
20	18.046	16.351	13.590	11.470	9.818	8.514	7.469	6.623	6.259	5.929	5.353	4.870	4.460	4.110	3.954	3.808	3.546	3.316	2.850	2.772	2.698



ANSWERS TO REVIEW PROBLEMS

Chapter 2

- 2.15** (a) SV (or variable if direct labour can be matched exactly to output)
(b) F
(c) F
(d) V
(e) F (Advertising is a discretionary cost. See Chapter 17 for an explanation of this cost.)
(f) SV
(g) F
(h) SF
(i) V
- 2.16** Controllable c, d, f
Non-controllable a, b, e, g, h
- 2.17** Item (B) will be constant within the relevant range of output.
Item (C) will be constant per unit.
If output declines fixed cost per unit will decrease.
Total variable cost will fall in line with a decline in output and therefore item A is the correct answer.
- 2.18** Answer = D
- 2.19** Total variable overheads = $17\,000 \times \text{£}3.50 = \text{£}59\,500$
Total variable overhead (£59 500) + Total fixed overhead = Total overhead (£246 500)
Total fixed overhead = $\text{£}246\,500 - \text{£}59\,500 = \text{£}187\,000$
Answer = C
- 2.20** Answer = B
- 2.21** Answer = B
- 2.22** Answer = B
- 2.23** Answer = B
- 2.24** See the description of cost behaviour in Chapter 2 for the answer to these questions. In particular the answer should provide graphs for fixed costs, variable costs, semi-fixed costs and semi-variable costs.
- 2.25** You will find the answer to this question in Chapter 2. In particular the answer should describe the classification of costs for stock valuation and profit measurement; classification for decision-making and planning; classification

for control. In addition the answer should illustrate methods of classification (see Chapter 2 for examples) within the above categories and describe the benefits arising from classifying costs in the manner illustrated.

- 2.26** See Chapter 2 for the answer to this question.
- 2.27** (a) See 'Functions of management accounting' in Chapter 1 for the answer to this question. In particular your answer should stress that the cost accountant provides financial information for stock valuation purposes and also presents relevant information to management for decision-making and planning and cost control purposes. For example, the cost accountant provides information on the costs and revenues of alternative courses of action to assist management in selecting the course of action which will maximize future cash flows. By coordinating plans together in the form of budgets and comparing actual performance with plans the accountant can pinpoint those activities which are not proceeding according to plan.
- (b) (i) Direct costs are those costs which can be traced to a cost objective. If the cost objective is a sales territory then *fixed* salaries of salesmen will be a direct cost. Therefore the statement is incorrect.
- (ii) Whether a cost is controllable depends on the level of authority and time span being considered. For example, a departmental foreman may have no control over the number of supervisors employed in his department but this decision may be made by his superior. In the long term such costs are controllable.
- (iii) This statement is correct. See 'Sunk costs' in Chapter 2 for an explanation of why this statement is correct.
- 2.28** See Chapter 2 for the answer to this question.
- 2.29** Cost information is required for the following purposes:
(a) costs for stock valuation and profit measurement;
(b) costs for decision-making;
(c) costs for planning and control.
For the alternative measures of cost that might be appropriate for each of the above purposes see Chapter 2.
- 2.30** (i) See Chapter 2 for a definition of opportunity cost and sunk cost.
- (ii) *Opportunity cost*: If scarce resources such as machine hours are required for a special contract then the cost of the contract should include the lost profit that

would have been earned on the next best alternative. This should be recovered in the contract price.

Sunk cost: The original cost of equipment used for a contract is a sunk cost and should be ignored. The change in the resale value resulting from the use of the equipment represents the relevant cost of using the equipment.

- (iii) The significance of opportunity cost is that relevant costs do not consist only of future cash outflows associated directly with a particular course of action. Imputed costs must also be included.

The significance of sunk costs is that past costs are not relevant for decision-making.

2.31 See Chapter 2 for an explanation of the terms avoidable costs and unavoidable costs and Chapter 4 for an explanation of cost centres. A cost unit is a unit of product or service for which costs are ascertained. In a manufacturing organization a cost unit will be a unit of output produced within a cost centre. In a service organization, such as an educational establishment, a cost unit might be the cost per student.

2.32 (a) (i) Schedule of annual mileage costs

	5000 miles (£)	10 000 miles (£)	15 000 miles (£)	30 000 miles (£)
Variable costs:				
Spares	100	200	300	600
Petrol	380	760	1140	2280
Total variable cost	480	960	1440	2880
Variable cost per mile	0.096	0.096	0.096	0.096
Fixed costs				
Depreciation ^a	2000	2000	2000	2000
Maintenance	120	120	120	120
Vehicle licence	80	80	80	80
Insurance	150	150	150	150
Tyres ^b	—	—	75	150
	2350	2350	2425	2500
Fixed cost per mile	0.47	0.235	0.162	0.083
Total cost	2830	3310	3865	5380
Total cost per mile	0.566	0.331	0.258	0.179

Notes

^aAnnual depreciation

$$= \frac{£5500 \text{ (cost)} - £1500 \text{ (trade-in price)}}{2 \text{ years}} = £2000$$

^bAt 15 000 miles per annum tyres will be replaced once during the two-year period at a cost of £150. The average cost per year is £75. At 30 000 miles per annum tyres will be replaced once each year.

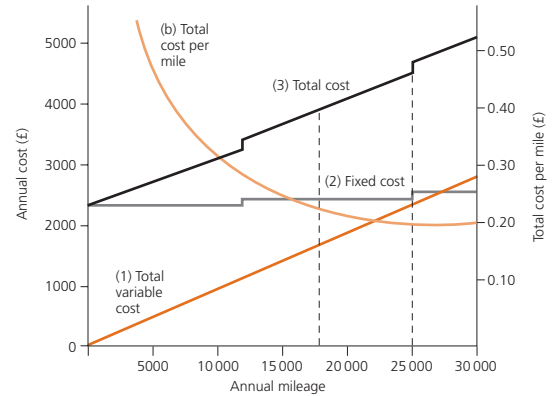
Comments

Tyres are a semi-fixed cost. In the above calculations they have been regarded as a step fixed cost. An alternative approach would be to regard the semi-fixed cost as a variable cost by dividing £150 tyre replacement by 25 000 miles. This results in a variable cost per mile of £0.006.

Depreciation and maintenance cost have been classified as fixed costs. They are likely to be semi-variable costs, but in the absence of any additional information they have been classified as fixed costs.

- (ii) See Figure 2.32.

FIGURE 2.32 The step increase in fixed cost is assumed to occur at an annual mileage of 12 500 and 25 000 miles, because tyres are assumed to be replaced at this mileage



- (iii) The respective costs can be obtained from the vertical dashed lines in the graph (Figure 2.32).
- (b) The cost per mile declines as activity increases. This is because the majority of costs are fixed and do not increase when mileage increases. However, total cost will increase with increases in mileage.

- 2.33 (a) (i)** For an explanation of sunk and opportunity costs see Chapter 2. The down payment of £5000 represents a sunk cost. The lost profit from subletting the shop of £1600 p.a. ((£550 × £12) – £5000) is an example of an opportunity cost. Note that only the £5000 additional rental is included in the opportunity cost calculation. (The £5000 sunk cost is excluded from the calculation.)
- (ii) The relevant information for running the shop is:

	(£)
Net sales	100 000
Costs (£87 000 – £5000 sunk cost)	82 000
	18 000
Less opportunity cost from subletting	1 600
Profit	16 400

The above indicates that £16 400 additional profits will be obtained from using the shop for the sale of clothing. It is assumed that Mrs Johnson will not suffer any other loss of income if she devotes half her time to running the shop.

- (b) The CIMA terminology defines a notional cost as 'A hypothetical cost taken into account in a particular situation to represent a benefit enjoyed by an entity in respect of which no actual expense is incurred.' Examples of notional cost include:
 - (i) Interest on capital to represent the notional cost of using an asset rather than investing the capital elsewhere.
 - (ii) Including rent as a cost for premises owned by the company so as to represent the lost rent income resulting from using the premises for business purposes.

Chapter 3

3.16 Overtime premium = hours overtime at \$5.10 = \$35.70
 Answer = B

3.17

	\$	\$
Direct materials		5 500
Direct expenses		14 500
Staff salaries:		
1 020 hours × \$24.00	24 480	
Overtime hours 40 hours × \$6.00	<u>240</u>	<u>24 720</u>
		<u>44 720</u>

Answer = C

3.18 Answer = D (Note that is updated from other documents besides a goods received note)

3.19 Answer = C

3.20 Production will be charged at the most recent (higher prices) resulting in lower profits and stocks will consist of the earlier (lower prices). Therefore answer = A.

3.21 Answer = D

3.22 (a) Purchases are 460 units and issues are 420 units resulting in a closing stock of 40 units. Therefore closing stock valuation = 40 units at the latest purchase price (\$1.90) = \$76. Therefore answer = D
 (b) Answer = C (see outcomes for Example 3.2 in the text)

3.23

	Receipts and issues	
Units	Price per unit	Cost
100	5 00	500
<u>150</u>	<u>5 50</u>	<u>825</u>
250	5 30	1,325
(100)	5 30	(530)
<u>100</u>	<u>6 00</u>	<u>600</u>
250	5 58	1,395
<u>(75)</u>	<u>5 58</u>	<u>(418.5)</u>
<u>175</u>	<u>5 58</u>	<u>976.50</u>

Answer = B

3.24 Answer = C

3.25
$$EOQ = \sqrt{(2DO)/H} = \sqrt{\frac{2 \times (50+5) \times 4000}{(15 \times 0.1) + 0.2}}$$

 = 509 units

Answer = D

3.26 (i) Re-order level = Maximum usage × Maximum lead time
 = 95 × 18 = 1710

Answer = C

(ii) Maximum stock = Re-order level + Re-Order quantity
 – Minimum usage during minimum lead time
 = 1710 + 1750 – (50 × 12)
 = 2860

Answer = B

3.27 Answer = D

3.28 Annual holding cost = $EOQ/2 \times \text{£4 per unit} = 250 \text{ units} \times \text{£4} = \text{£1000}$
 Annual ordering costs = Annual demand of 20 000 units/
 EOQ (500 units) × ordering cost (£25) = £1000
 Annual purchase cost = 20 000 units × £40 = £800 000
 Total annual cost = £1000 + £1000 + £800 000 = £802 000
 Answer = C

3.29 (a) Advantages:

- (i) Both the firm and the employee should benefit from the introduction of an incentive scheme. Employees should receive an increase in wages arising from the increased production. The firm should benefit from a reduction in the fixed overhead per unit and an increase in sales volume.
- (ii) The opportunity to earn higher wages may encourage efficient workers to join the company.
- (iii) Morale may be improved if extra effort is rewarded.

Disadvantages:

- (i) Incentive schemes can be complex and difficult to administer.
- (ii) Establishing performance levels leads to frequent and continuing disputes.
- (iii) The quality of the output may decline.

(b)

(i) Hourly rate

Employee A 38 × £3.00 = £114.00
 B 36 × £2.00 = £72.00
 C 40 × £2.50 = £100.00
 D 34 × £3.60 = £122.40

(ii) Piecework

Employee A (42 × £0.30) +
 (72 × £0.45) +
 (92 × £0.75) = £114
 B (120 × £0.30) +
 (76 × £0.45) = £70.20
 C (50 × £0.75) = £37.50
 D (120 × £0.30) +
 (270 × £0.45) = £157.50

Note that with the piecework system the employees are paid an agreed rate per unit produced. The piece rates are £0.30 per unit for X (6 minutes × £0.05), £0.45 for Y (9 × £0.05) and £0.75 for Z (15 × £0.05). Only employee C earns less than 75% of basic pay. Therefore C will receive a gross wage of £75. The piece rate wages should be charged directly to the products and the difference between the guaranteed minimum wage of £75 and the piecework wage of £37.50 for employee C should be charged to an appropriate overhead account.

With a bonus scheme a set time is allowed for each job and a bonus is paid based on the proportion of time saved. The calculations for each employee are:

	Time allowed (hours)	Time saved (hours)	Bonus (£)	Total wages (£)
A	$\frac{42 \times 6}{60} + \frac{72 \times 9}{60}$ $+ \frac{92 \times 15}{60} = 38$	0	0	114
B	$\frac{120 \times 6}{60} + \frac{76 \times 9}{60} = 23.4$	0	0	72
C	$\frac{50 \times 15}{60} = 12.5$	0	0	100
D	$\frac{120 \times 6}{60} + \frac{270 \times 9}{60} = 52.5$	18.5	$\frac{2}{3} \times 18.5$ $\times \text{£}3.60$ $= \text{£}44.40$	£122.40 + £44.40

Employees A, B and C do not earn a bonus because the time taken is in excess of time allowed.

- 3.30 (i) Current average maximum production = $30 \times 55 \text{ hrs} \times 6 \text{ units} = 9900 \text{ units}$. Proposed maximum production = $30 \times 55 \text{ hrs} \times 8 \text{ units} = 13200 \text{ units}$

Existing payment system:

Output level (units)	7 000	9 600	9 900
	£	£	£
Sales value (£11 per unit)	<u>77 000</u>	<u>105 600</u>	<u>108 900</u>
Pre-finishing VC	56 000	76 800	79 200
Direct labour:			
Guaranteed	9 600	9 600	9 600
Overtime (W1)	—	4 800	5 400
Variable overhead (W2)	560	768	792
Fixed overhead	<u>9 000</u>	<u>9 000</u>	<u>9 000</u>
Total cost	<u>75 160</u>	<u>100 968</u>	<u>103 992</u>
Profit	1 840	4 632	4 908

Proposed scheme:

Output level (units)	7 000	9 600	9 900	12 000
	£	£	£	£
Sales value	<u>77 000</u>	<u>105 600</u>	<u>108 900</u>	<u>132 000</u>
Pre-finishing VC	56 000	76 800	79 200	96 000
Direct labour at £1.40 per unit	9 800	13 440	13 860	16 800
Variable overhead (W3)	420	576	594	720
Fixed overhead	<u>9 000</u>	<u>9 000</u>	<u>9 000</u>	<u>9 000</u>
Total cost	<u>75 220</u>	<u>99 816</u>	<u>102 654</u>	<u>122 520</u>
Profit	1 780	5 784	6 246	9 480

Working:

- (W1) 9600 units requires 1600 hrs (9600/6)
 \therefore (Overtime = 400 hrs \times £12
 9900 units requires 1650 hrs (9900/6)
 \therefore (Overtime = 450 hrs \times £12
 Basic hours = 1200 hrs
 (W2) 7000 units = $7000/6 \times \text{£}0.48$
 9600 units = $9600/6 \times \text{£}0.48$
 9900 units = $9900/6 \times \text{£}0.48$
 (W3) 7000 units = $7000/8 \times \text{£}0.48$
 9600 units = $9600/8 \times \text{£}0.48$
 9900 units = $9900/8 \times \text{£}0.48$
 12 000 units = $12 000/8 \times \text{£}0.48$

- (ii) At low output levels the average wage rate per unit is £1.33 (£8/6 units), compared with £1.40 with the incentive scheme. However, once overtime is worked, the wage rate per unit of output exceeds £1.40 per unit under the incentive scheme. For example, at an output level of 9600 units the wage rate per unit of output is £1.50 (£14 400/9600).

Variable overheads vary with productive hours. Therefore variable overhead per unit will be £0.08 (£0.48/6) under the old scheme and £0.06 per unit under the new scheme (£0.48/8).

The proposed incentive scheme will also enable the maximum output level to be achieved, thus enabling maximum sales to be achieved.

- 3.31 Re-order level = Maximum usage (750) \times Maximum lead time (15 days) = 11 250 units
 Minimum stock reduction before an order is received = $11 250 - (450 \times 8 \text{ days}) = 7 650 \text{ units}$
 Maximum order size = $15 000 - 7 650 = 7 350 \text{ units}$
 Answer = 7 350 units

- 3.32 (a) $\text{EOQ} = \sqrt{(2 \times 15 000 \times 80)/(0.1333 \times 200)} = 300 \text{ units}$
 Number of orders per year = $15 000/300 = 50 \text{ orders}$
 (b) $\text{EOQ} = \sqrt{(2 \times 2 800 \times 28)/(25 \times .08)} = 280 \text{ units}$
 Holding cost = $280/2 \times \text{£}2 = \text{£}280$

- 3.33 (a) $\text{EOQ} = \sqrt{(2 \times 12 000 \times 200)/(\text{£}15 \times 0.08)} = 2 000 \text{ units}$
 (b) Revised stock costs

	£
Purchase costs (12 000 \times £15)	180 000
Order costs $\frac{12 000}{2000} \times 200$	1 200
Holding costs $\frac{2 000}{2} \times 15 \times 0.08$	<u>1 200</u>
	182 400
Original stock costs	<u>183 000</u>
Saving	<u>600</u>

Chapter 4

- 4.12 Overhead absorbed (£714 000) = Actual hours (119 000) \times Predetermined overhead rate.

Predetermined overhead rate = $\text{£}714 000/119 000 = \text{£}6$.

Budgeted overheads (£720 000) = Budgeted machine hours \times Budgeted overhead rate (£6).

Budgeted machine hours = $\text{£}720 000/\text{£}6 = 120 000 \text{ hours}$.

Answer = C

- 4.13 Budgeted overhead rate = $\text{£}258 750/11 250 \text{ hours} = \text{£}23$ per machine hour

Overheads absorbed = $\text{£}23 \times 10 980 \text{ Actual hours} = \text{£}252 540$

Overheads incurred = £254 692

Overheads absorbed = £252 540

Under-absorbed overheads = £2152

Answer = A

4.14 (i) Budgeted overhead rates and not actual overhead rates should be used as indicated in Chapter 3.
Overhead rate = £148 750/8500 hours = £17.50 per hour.
Answer = A

(ii)

	(£)
Actual overheads incurred	146 200
Overheads absorbed (7928 × £17.50)	138 740
Under-absorbed overheads	7 460

Answer = D

4.15 Budgeted machine hour rate = \$3.60 (\$180 000/50 000 hours)
Standard machine hours per unit = 1.25 (50 000 hours/40 000 units)

	\$
Overheads incurred	178 080
Overheads absorbed (38 760 units × 1.25 hours × \$3.60) =	<u>174 420</u>
Under absorbed overheads	<u>3 660</u>

Answer = B

4.16

	£
Absorbed overheads (4 500 units × £8)	36 000
Over absorbed overheads	<u>(6 000)</u>
Actual overheads incurred	<u>30 000</u>

Answer = A

4.17 Answer = D

4.18 Because production is highly automated it is assumed that overheads will be most closely associated with machine hours. The pre-determined overhead rate will therefore be £18 derived from dividing budgeted overheads (£180 000) by the budgeted machine hours (10 000). Therefore the answer is B.

4.19 Items that contribute to the over-absorption of overheads are if actual production exceeds budgeted production or actual overhead expenditure is less than budgeted expenditure. When both of these items occur overheads will be over-absorbed. Therefore the answer is D.

4.20

Direct materials	10 650
Direct labour	<u>3 260</u>
Prime cost	13 910
Production overhead (140 × \$8.50)	1 190
Non-manufacturing overheads and profit (60% × \$13 910)	<u>8 346</u>
Estimated price	<u>23 446</u>

Answer = C

4.21 Answer = D

4.22 Stores (S) = 6300 + 0.05 Maintenance (M)
M = 8450 + 0.1S
Rearranging the equations:
S = 6300 + 0.05M (1)
-0.1S = 8450 - M (2)
Multiply equation (1) by 20 and (2) by 1
20S = 126 000 + M
-0.1S = 8450 - M
19.9S = 134 450
S = £6756
Substituting for S in equation (1)
6756 = 6300 + 0.05M
0.05M = 456
M = £9126
For production department 1, the total overheads are = 17 500 + (£6756 × 60%) + (9126 × 75%) = £28 398
Answer = C

4.23 (a)

	Departments					
	Total (£)	A (£)	B (£)	C (£)	X (£)	Y (£)
Rent and rates ^a	12 800	6 000	3 600	1 200	1200	800
Machine insurance ^b	6 000	3 000	1 250	1 000	500	250
Telephone charges ^c	3 200	1 500	900	300	300	200
Depreciation ^b	18 000	9 000	3 750	3 000	1500	750
Supervisors' salaries ^d	24 000	12 800	7 200	4 000		
Heat and light ^e	<u>6 400</u>	3 000	1 800	600	600	400
	70 400					
Allocated	<u>2 800</u>	<u>1 700</u>	<u>1 200</u>	<u>800</u>	<u>600</u>	<u>3000</u>
	38 100	20 200	11 300	4900	3000	
Reapportionment of X	2 450 (50%)	1 225 (25%)	1 225 (25%)	(4900)		
Reapportionment of Y	<u>600 (20%)</u>	<u>900 (30%)</u>	<u>1 500 (50%)</u>	<u>(3000)</u>		
	<u>£41 150</u>	<u>£22 325</u>	<u>£14 025</u>			
Budgeted D.L. hours ^f	3 200	1 800	1 000			
Absorption rates	£12.86	£12.40	£14.02			

Notes

^aApportioned on the basis of floor area.

^bApportioned on the basis of machine value.

^cShould be apportioned on the basis of the number of telephone points or estimated usage. This information is not given and an alternative arbitrary method of apportionment should be chosen. In the above analysis telephone charges have been apportioned on the basis of floor area.

^dApportioned on the basis of direct labour hours.

^eMachine hours are not given but direct labour hours are. It is assumed that the examiner requires absorption to be on the basis of direct labour hours.

(b)

	Job 123 (£)	Job 124 (£)
Direct material	154.00	108.00
Direct labour:		
Department A	76.00	60.80
Department B	42.00	35.00
Department C	<u>34.00</u>	<u>47.60</u>
Total direct cost	306.00	251.40
Overhead:		
Department A	257.20	205.76
Department B	148.80	124.00
Department C	<u>140.20</u>	<u>196.28</u>
Total cost	852.20	777.44
Profit	284.07	259.15

(c) Listed selling price 1136.27 1036.59

Note

Let SP represent selling price.

Cost + 0.25SP = SP

Job 123: £852.20 + 0.25SP = 1SP

0.75SP = £852.20

Hence SP = £1136.27

For Job 124: 0.75SP = £777.44

Hence SP = £1036.59

(d) For the answer to this question see sections on materials recording procedure and pricing the issues of materials in Chapter 3.

4.24 (a) (i) Calculation of budgeted overhead absorption rates:

Apportionment of overheads to production departments

	Machine shop (£)	Fitting section (£)	Canteen (£)	Machine maintenance section (£)	Total (£)
Allocated overheads	27 660	19 470	16 600	26 650	90 380
Rent, rates, heat and light ^a	9 000	3 500	2 500	2 000	17 000
Depreciation and insurance of equipment ^a	12 500	6 250	2 500	3 750	25 000
	49 160	29 220	21 600	32 400	132 380
Service department apportionment					
Canteen ^b	10 800	8 400	(21 600)	2 400	—
Machine maintenance section	24 360	10 440	—	(34 800)	—
	84 320	48 060	—	—	132 380

Calculation of absorption bases

Product	Budgeted production	Machine shop		Fitting section	
		Machine hours per product	Total machine hours	Direct labour cost per product (£)	Total direct wages (£)
X	4200 units	6	25 200	12	50 400
Y	6900 units	3	20 700	3	20 700
Z	1700 units	4	<u>6 800</u>	21	<u>35 700</u>
			<u>52 700</u>		<u>106 800</u>

Budgeted overhead absorption rates

Machine shop	Fitting section
$\frac{\text{budgeted overheads } \pounds 84\,320}{\text{budgeted machine hours } \pounds 52\,700} = \pounds 1.60 \text{ per machine hour}$	$\frac{\text{budgeted overheads } \pounds 48\,060}{\text{budgeted direct wages } \pounds 106\,800} = 45\% \text{ of direct wages}$

Notes

^aRents, rates, heat and light are apportioned on the basis of floor area. Depreciation and insurance of equipment are apportioned on the basis of book value.

^bCanteen costs are reapportioned according to the number of employees. Machine maintenance section costs are reapportioned according to the percentages given in the question.

(ii) The budgeted manufacturing overhead cost for producing one unit of product X is as follows:

	(£)
Machine shop: 6 hours at £1.60 per hour	9.60
Fittings section: 45% of £12	<u>5.40</u>
	<u>15.00</u>

(b) The answer should discuss the limitations of blanket overhead rates and actual overhead rates. See 'Blanket overhead rates' and 'Budgeted overhead rates' in Chapter 4 for the answer to this question.

4.25 (a) Overhead rate = $\frac{\text{Budgeted overhead}}{\text{Budgeted direct wages}} \times 100$
 $= \frac{\pounds 225\,000}{\pounds 150\,000} \times 100$
 $= \underline{\underline{150\%}}$

	(£)
Direct materials	190
Direct wages	170
Production overhead (150% × £170)	<u>255</u>
Production cost	615
Gross profit ($\frac{1}{3} \times \pounds 615$)	<u>205</u>
	<u>820</u>

(c) (i) Each department incurs different overhead costs. For example, the overhead costs of department A are considerably higher than those of the other departments. A blanket overhead rate is only appropriate where jobs spend the same proportion of time in each department. See the section on blanket overhead rates in Chapter 4 for an explanation of why departmental overhead rates are preferable.

(ii) Department A machine-hour overhead rate:

$\frac{\pounds 120\,000}{40\,000 \text{ machine hours}} = \pounds 3 \text{ per machine hour}$

A machine-hour rate is preferable because machine hours appear to be the dominant activity. Also, most of the overheads incurred are likely to be related to machine hours rather than direct labour hours. Possibly one worker operates four machines since the ratio is 40 000 machine hours to 10 000 direct labour hours. If some jobs do not involve machinery but others do, then two separate cost centres should be established (one related to machinery and the other related to jobs which involve direct labour hours only).

Department B direct labour hour overhead rate:

$\frac{\pounds 30\,000}{50\,000 \text{ direct labour hours}} = \pounds 0.60 \text{ per labour hour}$

Because direct labour hours are five times greater than machine hours a direct labour hour overhead rate is recommended. A comparison of direct labour hours and direct wages for budget, actual and job 657 for department B suggests that wage rate are not equal throughout the department. Therefore the direct wages percentage method is inappropriate.

Department C direct labour hour overhead rate:

$\frac{\pounds 75\,000}{25\,000 \text{ direct labour hours}} = \pounds 3 \text{ per direct labour hour}$

This method is chosen because it is related to time and machine hours are ruled out. A comparison of budgeted direct wages and labour hours for budget, actual and job 657 for department C suggests that wage rates are equal at £1 per hour throughout the department. Therefore direct labour hours or direct wages percentage methods will produce the same results.

(d) Department A (40 machine hours × £3)	120
B (40 labour hours × £0.60)	24
C (10 labour hours × £3)	<u>30</u>
	<u>174</u>

(e) (i) Current rate (actual wages × 150%):

	Absorbed (£000s)	Actual (£000s)	Over/(under)- absorbed (£000s)
Department A	45	130	(85)
B	120	28	92
C	<u>45</u>	<u>80</u>	<u>(35)</u>
	<u>210</u>	<u>238</u>	<u>(28)</u>

(ii) Proposed rates:

	Absorbed (£000s)	Actual (£000s)	Over/(under)- absorbed (£000s)
Department A	135	130	5
B	27	28	(1)
C	<u>90</u>	<u>80</u>	<u>10</u>
	<u>252</u>	<u>238</u>	<u>14</u>

4.26 (a) The calculation of the overhead absorption rates are as follows:

Forming department machine hour rate = £6.15 per machine hour (£602 700/98 000 hours)

Finishing department labour hour rate = £2.25 per labour hour (£346 500/154 000 hours)

The forming department is mechanized, and it is likely that a significant proportion of overheads will be incurred as a consequence of employing and running the machines. Therefore a machine hour rate has been used. In the finishing department several grades of labour are used. Consequently the direct wages percentage method is inappropriate, and the direct labour hour method should be used.

(b) The decision should be based on a comparison of the incremental costs with the purchase price of an outside supplier if spare capacity exists. If no spare capacity exists then the lost contribution on displaced work must be considered. The calculation of incremental costs requires that the variable element of the total overhead absorption rate must be calculated. The calculation is:
 Forming department variable machine hour rate = £2.05 (£200 900/98 000 hours)
 Finishing department variable direct labour hour rate = £0.75 (£115 500/154 000 hours)
 The calculation of the variable costs per unit of each component is:

	A (£)	B (£)	C (£)
Prime cost	24.00	31.00	29.00
Variable overheads: Forming	8.20	6.15	4.10
Finishing	<u>2.25</u>	<u>7.50</u>	<u>1.50</u>
Variable unit manufacturing cost	<u>34.45</u>	<u>44.65</u>	<u>34.60</u>
Purchase price	£30	£65	£60

On the basis of the above information, component A should be purchased and components B and C manufactured. This decision is based on the following assumptions:

- (i) Variable overheads vary in proportion to machine hours (forming department) and direct labour hours (finishing department).
- (ii) Fixed overheads remain unaffected by any changes in activity.
- (iii) Spare capacity exists.

For a discussion of make-or-buy decisions see Chapter 10.

(c) Production overhead absorption rates are calculated in order to ascertain costs per unit of output for stock valuation and profit measurement purposes. Such costs are inappropriate for decision-making and cost control. For an explanation of this see the section in Chapter 4 titled 'Different costs for different purposes'.

4.27 (i) Percentage of direct material cost = $\frac{£250\,000}{£100\,000} \times 100 = 250\%$

Direct labour hour rate = £250 000/50 000 hours = £5 per hour

(ii) Percentage material cost = 250% × £7000 = £17 500
 Direct labour cost = 800 × £5 = £4000

(iii) Overhead incurred £350 000
 Overhead absorbed £275 000 (55 000 × £5)
 Under absorption of overhead £75 000
 The under absorption of overhead should be regarded as a period cost and charged to the profit and loss account.

(iv) The answer should stress the limitations of the percentage of direct material cost method and justify why the direct labour hour method is the most frequently used method in non-machine paced environments. See Appendix 4.2 for a more detailed answer to this question.

4.28 (a) It is easier to allocate service department B first because it provides services to both of the other service departments.

	Centre 1 (£)	Centre 2 (£)	Service A (£)	Service B (£)	Service C (£)
	2000	3500	300	500	700
Service B	250 (50%)	100 (20%)	100 (20%)	(500)	50 (10%)
	2250	3600	400		750
Service A	180 (45%)	180 (45%)	(400)	40 (10%)	
	2430	3780		40	750
Service C	450 (60%)	300 (40%)			(750)
	2880	4080		40	
Service B	20 (50%)	8 (20%)	8 (20%)	(40)	4 (10%)
	2900	4088	8		4
Service A	4 (45%)	4 (45%)	(8)		
Service C (Balance shared equally)	2	2			(4)
Total	2906	4094			

(b) It would appear that the department is machine intensive so it is preferable to use machine hours. The overhead absorption rate per machine hour is £0.969 (£2906/3000 machine hours).

Chapter 5

5.9 Answer = B

5.10 Answer = D

5.11 The profits in the financial accounts exceed the profits in the cost accounts by £4958 (£79 252 – £74 294). A stock increase represents a reduction in the cost of sales and thus an increase in profits. Therefore the stock increase in the financial accounts must have been £4958 greater than the increase in the cost accounts. The stock increase in the cost accounts was £13 937 (£24 053 – £10 116) so the increase in the financial accounts was £18 895 (£13 937 + £4958). Thus, the closing stock in the financial accounts was £28 112 (£9217 + £18 895).
Answer = D

5.12 In the financial accounts there is a total stock decrease of £2900 (£1000 materials and £1900 finished goods) and a decrease of £3200 in the costs accounts (£1200 materials and £2000 finished goods). Since a stock decrease represents an increase in cost of goods sold and a decrease in profits the cost accounting profit will be £300 less than the financial accounting profit. In other words, the financial accounting profit will be £300 greater than the cost accounting profit.
Answer = A

5.13

	Cost accounts	Financial accounts	Difference
Stock increase	£33 230	£15 601	£17 629

The stock increase shown in the cost accounts is £17 629 more than the increase shown in the financial accounts. Closing stocks represent expenses to be deferred to future accounting periods. Therefore the profit shown in the cost accounts will be £176 129 (£158 500 + £17 629).
Answer = C

5.14 Where substantial costs have been incurred on a contract and it is nearing completion the following formula is often used to determine the attributable profit to date:

$$2/3 \times \text{Notional profit} \times \frac{\text{cash received}}{\text{value of work certified}}$$

$$= 2/3 \times (£1.3\text{m} - £1\text{m}) \times £1.2\text{m}/£1.3\text{m} = £276 923$$
 Answer = B

5.15 Answer = A (Note that if half of the contract is complete the prudence concept advocates that less than half of the profit should be taken).

5.16 Answer = D

5.17 The company's cost accounts are not integrated with the financial accounts. For a description of a non-integrated accounting system see 'Interlocking accounts' in Chapter 5. The following accounting entries are necessary:

Cost ledger control account

		(£)			(£)
Sales a/c	410 000	1.5.00	Balance b/f	302 000	
Capital under construction a/c	50 150		Stores ledger a/c – Purchases	42 700	
Balance c/f	237 500		Wages control a/c	124 000	
			Production overhead a/c	152 350	
			WIP a/c – Royalty	2 150	
			Selling overhead a/c	22 000	
			Profit	52 450	
				<u>697 650</u>	<u>697 650</u>

Stores ledger control account

		(£)			(£)
1.5.00	Balance b/f	85 400	WIP a/c	63 400	
	Cost ledger control a/c – Purchases	42 700	Production overhead a/c	1 450	
			Capital a/c	7 650	
			31.5.X0 Balance c/f	55 600	
				<u>£128 100</u>	<u>£128 100</u>

Wages control account

		(£)			(£)
Cost ledger control a/c	124 000		Capital a/c	12 500	
			Production	35 750	
			WIP a/c	7 550	
				<u>£124 000</u>	<u>£124 000</u>

Production overhead control account

		(£)			(£)
Stores ledger a/c	1 450		Capital a/c	30 000	
Wages control a/c	35 750		WIP a/c – Absorption (balancing figure)	152 000	
Cost ledger control a/c	152 350		Costing P/L a/c (under absorption)	7 550	
				<u>£189 550</u>	<u>£189 550</u>

Work in progress control account

		(£)			(£)
1.5.00	Balance b/f	167 350	Finished goods control a/c (balancing figure)	281 300	
	Stores ledger a/c – Issues	63 400			
	Wages control a/c	75 750	31.5.X0 Balance c/f ^a	179 350	
	Production overhead absorbed	152 000			
	Cost ledger control a/c – Royalty	2 150			
		<u>£460 650</u>			<u>£460 650</u>

Finished goods control account

		(£)			(£)
1.5.00	Balance b/f	49 250	Cost sales a/c ^b	328 000	
	WIP a/c	281 300	31.5.X0 Balance c/f	2 550	
		<u>£330 550</u>		<u>£330 550</u>	

Capital under construction account

		(£)			(£)
Stores ledger a/c	7 650		Cost ledger control a/c	50 150	
Wages control a/c	12 500				
Production overhead absorbed	30 000				
	<u>£50 150</u>			<u>£50 150</u>	

Sales account

		(£)			(£)
Costing P/L a/c	£410 000		Cost ledger control a/c	£410 000	

Cost of sales account

		(£)			(£)
Finished goods a/c ^b	£328 000		Cost P/L a/c	£328 000	

Selling overhead account

(£)		(£)	
Cost ledger control a/c	£22 000	Costing P/L a/c	£22 000

Costing profit and loss account

(£)		(£)	
Selling overhead a/c	22 000	Sales a/c	410 000
Production overhead (under absorbed)	7 550		
Cost of sales a/c	328 000		
Profit – Cost ledger control a/c	52 450		
	<u>£410 000</u>		<u>£410 000</u>

Notes

^aClosing balance of work in progress = £167 350 (opening balance)
 £12 000 (increase per question)
 £179 350

^bTransfer from finished goods stock to cost of sales account: £410 000 sales × (100/125) = £328 000

5.18 (a)

Stores ledger control account

(£)		(£)	
Opening balances b/f	24 175	Materials issued:	
Creditors – materials purchased	76 150	Work in progress control	26 350
		Production overhead control	3 280
		Closing stock c/f	70 695
	<u>£100 325</u>		<u>£100 325</u>

Wages control account

(£)		(£)	
Direct wages:		WIP	15 236
Wages accrued a/c	17 646	Capital equipment a/c	2 670
Employees' contributions a/c	4 364	Factory overhead (idle time)	5 230
Indirect wages:		Factory overhead (indirect wages)	4 232
Wages accrued a/c	3 342		
Employees' contributions a/c	890		
Balances (Wages accrued a/c)	1 126		
	<u>27 368</u>		<u>27 368</u>

Work in progress control account

(£)		(£)	
Opening balance b/f	19 210	Finished goods control – cost of goods transferred	62 130
Stores ledger – materials issued	26 350	Closing stock c/f	24 360
Wages control direct wages (15 236 × 150%)	22 854		
Production overhead control: overhead absorbed (15 236 × 150%)	22 854		
Profit and loss a/c: stock gain ^a	2 840		
	<u>£86 490</u>		<u>£86 490</u>

Finished goods control account

(£)		(£)	
Opening balance b/f	34 164	Profit and loss a/c: cost of sales	59 830
Working in progress: cost of goods sold	62 130	Closing stock c/f (difference)	36 464
	<u>£96 294</u>		<u>£96 294</u>

Production overhead control account

(£)		(£)	
Prepayments b/f	2 100	Work in progress: absorbed overheads (15 236 × 150%)	22 854
Stores ledger: materials issued for repairs	3 280	Capital under construction a/c: overheads absorbed (2670 × 150%)	4 005
Wages control: idle time of direct workers	5 230	Profit and loss a/c: underabsorbed overhead balance	183
Wages control: indirect workers' wages (3342 + 890)	4 232		
Cash/creditors: other overheads incurred	12 200		
	<u>£27 042</u>		<u>£27 042</u>

Profit and loss account

(£)		(£)	
Cost of goods sold	59 830	Sales	75 400
Gross profit c/f	15 570		
	<u>£75 400</u>		<u>£75 400</u>
Selling and distribution overheads	5 240	Gross profit b/f	15 570
Production overhead control: underabsorbed overhead	183	Stock gain ^a : WIP control	2 840
Net profit c/f	12 987		
	<u>£18 410</u>		<u>£18 410</u>

Note

^aThe stock gain represents a balancing figure. It is assumed that the stock gain arises from the physical count of closing stocks at the end of the period.

Note that value of materials transferred between batches will be recorded in the subsidiary records, but will not affect the control (total) accounts.

- (b) (i) Large increase in raw material stocks. Is this due to maintaining uneconomic stock levels or is it due to an anticipated increase in production to meet future demand?
 (ii) WIP stock gain.
 (iii) Idle time, which is nearly 25% of the total direct wages cost.
 (iv) The gross direct wages are £22 010 (£17 646 + £4364), but the allocation amounts to £23 136 (£15 236 + £5230 + £2670).
- (c) Stocks are valued at the end of the period because they represent unexpired costs, which should not be matched against sales for the purpose of calculating profits. Stocks represent unexpired costs, which must be valued for inclusion in the balance sheet. Manufacturing expense items such as factory rent are included in the stock valuations because they represent resources incurred in transforming the materials into a more valuable finished product. The UK financial accounting regulations (SSAP 9) states that 'costs of stocks (and WIP) should comprise those costs which have been incurred in bringing the product to its present location and condition, including all related production overheads.'

5.19 (a) **Raw materials stores account**

	(£)		(£)
Balance b/d	49 500	Work in progress	104 800
Purchases	108 800	Loss due to flood to P&L a/c	2 400
		Balance c/d	51 100
	<u>£158 300</u>		<u>£158 300</u>
Balance b/d	51 100		

Work in progress control account

	(£)		(£)
Balance b/d	60 100	Finished goods	222 500
Raw materials	104 800	Balance c/d	56 970
Direct wages	40 200		
Production overhead	74 370		
	<u>£279 470</u>		<u>£279 470</u>
Balance b/d	56 970		

Finished goods control account

	(£)		(£)
Balance b/d	115 400	Cost of sales	212 100
Work in progress	222 500	Balance c/d	125 800
	<u>£337 900</u>		<u>£337 900</u>
Balance b/d	125 800		

Production overhead

	(£)		(£)
General ledger control	60 900	Work in progress	
Notional rent (3 × £4000)	12 000	(185% × £40 200)	74 370
Overhead over absorbed	1 470		
	<u>£74 370</u>		<u>£74 370</u>

General ledger control account

	(£)		(£)
Sales	440 000	Balance b/d	
Balance c/d	233 870	(49 500 + 60 100 + 115 400)	225 000
		Purchases	108 800
		Direct wages	40 200
		Production overhead	60 900
		Notional rent	12 000
		P & L a/c	226 970
		(profit for period: see (b))	
	<u>673 870</u>		<u>673 870</u>

(b) *Calculation of profit in cost accounts*

	(£)	(£)
Sales		440 000
Cost of sales	212 100	
Loss of stores	<u>2 400</u>	
Less overhead over absorbed	214 500	
Profit	<u>1 470</u>	<u>213 030</u>
		<u>226 970</u>

Reconciliation statement^a

	(£)	(£)	(£)
Profit as per cost accounts			226 970
Differences in stock values:			
Raw materials opening stock	1500		
Raw materials closing stock	900		
WIP closing stock	<u>1030</u>	3 430	
WIP opening stock	3900		
Finished goods opening stock	4600		
Finished goods closing stock	<u>3900</u>	<u>(12 400)</u>	(8 970)
Add items not included in financial accounts:			
Notional rent			<u>12 000</u>
Profit as per financial accounts			<u>230 000</u>

Note

“Stock valuations in the financial accounts may differ from the valuation in the cost accounts. For example, raw materials may be valued on a LIFO basis in the cost accounts, whereas FIFO or weighted average may be used in the financial accounts. WIP and finished stock may be valued on a marginal (variable costing) basis in the cost accounts, but the valuation may be based on an absorption costing basis in the financial accounts. To reconcile the profits, you should start with the profit from the cost accounts and consider what the impact would be on the profit calculation if the financial accounting stock valuations were used. If the opening stock valuation in the financial accounts exceeds the valuation in the cost accounts then adopting the financial accounting stock valuation will reduce the profits. If the closing stock valuation in the financial accounts exceeds the valuation in the cost accounts then adopting the financial accounting stock valuation will increase profits. Note that the notional rent is not included in the financial accounts and should therefore be deducted from the costing profit in the reconciliation statement.

- (c) The over recovery of overhead could be apportioned between cost of goods sold for the current period and closing stocks. The justification for this is based on the assumption that the under/over recovery is due to incorrect estimates of activity and overhead expenditure, which leads to incorrect allocations being made to the cost of sales and closing stock accounts. The proposed adjustment is an attempt to rectify this incorrect allocation.

The alternative treatment is for the full amount of the under/over recovery to be written off to the cost accounting profit and loss account in the current period as a period cost. This is the treatment recommended by SSAP 9.

5.20 (a) *HR Construction plc – Contract Accounts*

	A (£000)	B (£000)	A (£000)	B (£000)
Stores	700	150	Stores returns	80
Plant	1000	150	Transfers to B	40
Transfers from A	—	40	Materials c/fwd	75
Plant hire	200	30	Plant c/fwd ^a	880
Labour	300	270	Cost of work not certified c/fwd	160
Overhead	75	18	Balance – Cost of work certified c/fwd	1065
Direct expenses	25	4		453
	<u>2300</u>	<u>662</u>		<u>2300</u>
Cost of work certified b/fwd	1065	453	Attributable sales revenue ^c	1545
Profit recognized this period ^b	<u>480</u>	<u>—</u>	Loss recognized this period ^b	33
	<u>1545</u>	<u>453</u>		<u>1545</u>
Cost of work not certified c/fwd	160	20		
Plant b/fwd	880	144		
Materials b/fwd	75	15		

Notes

^aValue at the start of the year less one year’s depreciation for Contract A and 3 months’ depreciation for Contract B.

^bThe profits/(losses) recognized for the period are calculated as follows:

	Contract A (£000)	Contract B (£000)
Cost of work certified	1065	453
Cost of work not certified	160	20
Estimated costs to complete	<u>135</u>	<u>110</u>
Estimated cost of the contracts	1360	583
Contract price	<u>2000</u>	<u>550</u>
Estimated profit/(loss)	<u>640</u>	<u>(33)</u>

Profit recognized (Value certified (1500)/Contract price (£2000) × £640 = £480 000 for Contract A.

An alternative more prudent approach would have been to multiply the estimated profit by cash received/contract price.

Applying the prudence concept the full anticipated loss is recognized in the current period.

Profit recognized plus cost of work certified for A

Cost of work certified less loss recognized for B.

(b) *Balance sheet extracts*

	Contract A (£000)	Contract B (£000)
<i>Fixed assets</i>		
Plant at cost	1000	150
Depreciation	<u>120</u>	<u>6</u>
Written down value	880	144
<i>Debtors</i>		
Attributable sales	1545	420
Less cash received	<u>1440</u>	<u>460</u>
	<u>105</u>	<u>(40)</u>
<i>Work-in-progress</i>		
Total costs incurred to date	1225	473
Included in cost of sales	<u>1065</u>	<u>453</u>
	<u>160</u>	<u>20</u>

The loss of 33 000 for Contract A will be shown as a deduction from the total company profits. Alternatively, the loss can be deducted from the total costs incurred to date thus reflecting the fact that £33 000 of the total losses have been recognized during the current period.

(c) See 'job costing systems and process costing systems' in Chapter 2 and 'contract costing' in Chapter 5 for the answer to this question.

Chapter 6

6.12 Actual output is 100 units greater than expected so expected output = 2 700 kg
Following the approach described in Chapter 6 the cost per unit is calculated as follows:

$$\frac{\text{Input cost less scrap value of normal loss (300} \times \text{£3)}}{\text{Expected output (2700 kg)}} = \text{£7.50}$$

Initial cost – £900 = (2700 × £7.50 = 20 250)

Initial cost = £21 150

Answer = D

6.13

	Units
Opening stock	400
Input	<u>3000</u>
	3400
Closing stock	(200)
Actual losses (normal + abnormal)	<u>(400)</u>
Output	<u>2800</u>

Answer = A

6.14 The input cost consists of materials of £9000 plus conversion costs of £13 340 giving a total of £22 340.

Cost per unit =

$$\frac{\text{Input cost (£22 340) less scrap value of normal loss (100} \times \text{£3)}}{\text{Expected output (2000} \times \text{0.95 = 1900 units)}}$$

= £11.60

Answer = B

6.15 Answer = C

6.16 Completed units (9850) plus closing WIP equivalent units (0.3 × 450) = 9985 units

Answer = D

6.17

	Units Cost completed (£)	Normal loss equiv. units	Abnormal loss equiv. units	Total equiv. units	Cost per unit (£)	
Materials	90 000	36 000	3000 (100%)	1000 (100%)	40 000	2.25
Conversion cost	70 200	36 000	2250 (75%)	750 (75%)	39 000	<u>1.80</u>
						<u>4.05</u>

Cost of abnormal loss:

Materials 1000 × £2.25 = £2250

Conversion cost 750 × £1.80 = £1350
£3600

Answer = A

6.18 Abnormal gain debited to process account and credited to abnormal gain account:

	(£)	(£)
Materials (160 × £9.40)	1504	
Conversion cost (160 × 0.75 × £11.20)	<u>1344</u>	
		2848
Lost sales of scrap (180 × £2)		<u>(360)</u>
Net cost credited to profit and loss account		<u>2528</u>

Answer = C

6.19 Input = Opening WIP (2000 units) + Material input (24 000) = 26 000

Output = Completed units (19 500) + Closing WIP (3000) + Normal Loss (2400) = 24 900

Abnormal Loss = 1100 units (Balance of 26 000 – 24 900)

Equivalent units (FIFO)

	Completed units less Opening WIP equiv. units	Closing WIP equiv. units	Abnormal loss equiv. units	Total equiv. units
Materials	17 500 (19 500 – 2000)	3000 (100%)	1100 (100%)	21 600
Conversion	18 700 (19 500 – 800)	1350 (45%)	1100 (100%)	21 150

It is assumed that losses are detected at the end of the process and that the answer should adopt the short-cut method and ignore the normal loss in the cost per unit calculations.

Answer = C

6.20 Closing stock = Opening stock (Nil) + Input (13 500) – Completed units (11 750) = 1750 units
 It is assumed that materials are fully complete (£5.75) and labour and overheads are partly complete (£2.50)
 Value of closing stock = (1750 × £5.75) + (1750 × £2.50) = £14 437.50
 Answer = B

6.21

Actual input	2500 kg
Normal wastage (10%)	250
Abnormal loss	<u>75</u>
Balance = Good production	<u>2175</u>

Answer = A

6.22 *Equivalent units (FIFO)*

	Completed units less opening WIP equiv. units	Closing WIP equiv. units	Abnormal loss equiv. units*	Total equiv. units
Materials	23 000 (24 000 – 1000)	3500	500	27 000
Conversion cost	23 300 (24 000 – 700)	2800 (80%)	300 (60%)	26 400

Note
 *Total input (30 000 + 1000) – ((30 000 × 10%) + 24 000 + 3500) = 500

It is assumed that the answer should adopt the short-cut method and ignore the normal loss in the cost per unit calculation.

(a) Answer = (iii)
 (b) Answer = (i)

6.23 Input = Opening WIP (2400) + Material input (58 000) = 60 400 litres
 Output = Completed units (52 500) + Normal loss (5% × 58 000 = 2900) + Closing WIP (3000) = 58 400
 Abnormal loss = 60 400 – 58 400 = 2000 litres
 It is assumed that the short-cut method described in Appendix 6.1 is adopted whereby the normal loss is not included in the equivalent units calculation. The computation of equivalent units is as follows:

Cost element	Completed units	Abnormal loss equivalent units	Closing WIP equivalent units	Total equivalent units
Materials	52 500	2000	3000	57 500
Conversion cost	52 500	2000	1500	56 000

Answer = D

6.24 (a) The debit side (input) indicates that 4 000 units were input into the process but the output recorded on the credit side is 3850 units thus indicating that the balance must represent an abnormal loss of 150 units. The accounting entries for abnormal losses are to debit the abnormal loss account and credit the process account. Therefore the answer is A.
 (b) and (c)
 The calculation of the closing WIP value and the cost of finished goods is as follows:

Cost element	Total cost (\$)	Completed units	Abnormal loss equivalent units	Closing WIP equivalent units	Total equivalent units	Cost per unit (\$)	Closing WIP (\$)
Materials ¹	15 300	2750	150	700	3600	4.25	2 975.00
Labour	8 125	2750	150	350	3250	2.50	875.00
Production overhead	<u>3 498</u>	2750	150	280	3180	<u>1.10</u>	<u>308.00</u>
	<u>27 923</u>					<u>7.85</u>	4 158.00
							Finished goods (2750 × \$7.85) 21 587.50
							Abnormal loss (150 × \$7.85) <u>1 177.50</u>
							<u>27 923.00</u>

Note
¹£16 000 materials less £700 scrap value of the normal loss. The above computation is based on the short-cut method described in the Appendix of Chapter 6.

Therefore the answer is B for part both parts (b) and (c).

6.25

Completed units less opening WIP equivalent units 4000 (4100 less 40% × 250 units)
 Abnormal loss 275
 Closing WIP 45 (150 × 30%)
 Equivalent units 4320

It is assumed that the short-cut method (see Appendix 6.1) will be used in respect of normal losses.

Answer = C

6.26

Cost per unit of output
 = $\frac{\text{Input cost (£52 500 + £9625 = 62 125)} - \text{less expected loss } (0.25 \times 3500 \times £8 = £7000)}{\text{Expected output } (0.75 \times 3500)}$
 = £21

Value of actual output = 2800 × £21 = £58 800

Answer = C

Note that there is an abnormal gain of 175 units (Actual output of 2800 units less expected output of 2625 units)

The debit side of the process account will consist of:

Input cost (3500 kg)	= £62 125
Abnormal gain (175 kg at £21)	= <u>3 675</u>
	<u>65 800</u>

The following entries will be made on the credit side:

Normal loss (875 kg at £8)	= £7 000
Value of actual output	= <u>£58 800</u>
	<u>£65 800</u>

6.27 (a) *Production statement*

	Input	Output	
Opening stock	3 400	Finished stock	36 000
Input	37 000	WIP	3 200
	<u>40 400</u>	Normal loss	<u>1 200</u>
			<u>40 400</u>

Cost statement

	Opening stock (£)	Current cost (£)	Total cost (£)	Completed units (£)	Normal loss (£)	WIP equivalent units (£)	Total equivalent units (£)	Cost per unit (£)	WIP (£)
Materials	25 500	276 340	301 840	36 000	1200	3200	40 400	7.47	23 904
Conversion cost	30 600	336 000	<u>366 600</u>	36 000	1200	1600	38 800	<u>9.45</u>	<u>15 120</u>
			<u>668 440</u>					<u>16.92</u>	<u>39 024</u>
					Normal loss (1200 × £16.92)		20 304		
					Completed units (36 000 × £16.92)		<u>609 112</u>		<u>629 416</u>
									<u>668 440</u>

The question does not indicate at what stage in the production process the normal loss is detected. It is assumed that the normal loss is detected at the end of the production process, consequently it is not allocated to WIP. Therefore the total cost of production transferred to finished stock is £629 416.

If the short-cut method described in Chapter 6 is adopted and the normal loss equivalent units are excluded from the above unit cost calculations, the closing WIP valuation is £40 240 and the value of completed production is £628 200. This is equivalent to the following calculation, which apportions the normal loss between completed production and WIP on the basis of equivalent production:

	Completed production (£)	WIP (£)
Materials normal loss (1200 × £7.47 = £8964)	8 232 (36 000/39 200)	732 (3200/39 200)
Conversion cost normal loss (1200 × £9.45 = £11 340)	<u>10 857</u> (36 000/37 600)	<u>483</u> (1600/37 600)
Normal loss allocation	19 089	1 215
WIP per cost statement		39 024
Completed production	<u>609 112</u>	
	<u>628 201</u>	<u>40 239</u>

- (b) The following characteristics distinguish process costing from job costing:
- (i) The cost per unit of output with a process costing system is the average cost per unit, whereas job costing traces the actual cost to each individual unit of output.
 - (ii) Job costing requires that a separate order and job number be used to collect the cost of each individual job.
 - (iii) With a process costing system, each unit of output is similar, whereas with a job costing system each unit of output is unique and requires different amounts of labour, material and overheads.
 - (iv) With a job costing system, costs are accumulated for each order and WIP is calculated by ascertaining the costs that have been accumulated within the accounting period. With a process costing system, costs are not accumulated for each order and it is necessary to use the equivalent production concept to value WIP.
 - (v) With a process costing system, the allocation of costs to cost of goods sold and closing stocks is not as accurate, because each cost unit is not separately identifiable. Consequently WIP is estimated using the equivalent production concept.

6.28 (a)

Cost element	Current period costs (£)	Completed units less opening WIP equiv. units	Closing WIP equiv. units	Current total equiv. units	Cost per unit (£)
Materials	2255	2800	1300	4100	0.55
Conversion costs ^a	<u>3078</u>	3300	975	4275	0.72
	<u>5333</u>				
			(£)	(£)	
Completed production:					
Opening WIP (£540 + £355)		895			
Materials (2800 × £0.55)		1540			
Conversion cost (3300 × £0.72)		<u>2376</u>			
			4811		
Closing work in progress:					
Materials (1300 × £0.55)		715			
Conversion cost (975 × £0.72)		<u>702</u>			
			1417		
			<u>6228</u>		

Note

^aBonus = Current total equivalent units (4275) – Expected output (4000) = 275 units × £0.80 = £220

Labour cost = 6 men × 37 hours × £5 = £1110 + Bonus (£220) = £1330
Conversion cost = £1748 overhead + £1330 labour = £3078

Process account

	(£)	(£)	
Opening WIP	895	Completed output	4811
Materials	2255	Closing WIP	1417
Labour and overhead	<u>3078</u>		
	<u>6228</u>		<u>6228</u>

- (b) (i) In most organizations the purchasing function is centralized and all goods are purchased by the purchasing department. To purchase goods, user departments complete a purchase requisition. This is a document requesting the purchasing department to purchase the goods listed on the document.
- (ii) See 'Materials recording procedure' in Chapter 3 for the answer to this question.

6.29 (a) Opening WIP (100) + input – closing WIP (200) = Normal loss (0.10 × input) + output (1250)
Input – Normal loss (0.10 × input) = 1250 – 100 + 200
0.90 input = 1350
Input = 1500 (1350/0.9)

- (b) The short cut approach is adopted resulting in the normal loss not being included in the calculation of equivalent units (see Appendix 6.1).

	Completed units less opening WIP equivalent units	Closing WIP equiv. units	Current total equiv. units
Materials	1 150 (1 250 – 100)	200	1 350
Conversion cost	1 220 (1 250 – 30)	80 (200 × 40%)	1 300

- (c) Cost per unit = Input cost/current total equivalent units
Conversion cost = 1 300 × £1.50 = £1950
With materials the normal loss will be deducted from the input cost to derive the cost per unit so that:
Materials = 1350 × £2.60 = £3510 + (10% × 1500 × £2) = £3810.

6.30 (a) Calculation of input for process 1

	(litres)	(£)
Opening stock	4 000	10 800
Receipts	20 000	61 000
Less closing stock	<u>(8 000)</u>	<u>(24 200)</u>
Process input	<u>16 000</u>	<u>47 600</u>
Output	(litres)	
Completed units	8 000	
Closing WIP	5 600	
Normal loss (15% of input)	<u>2 400</u>	
	<u>16 000</u>	

Because input is equal to output, there are no abnormal gains or losses.

Calculation of cost per unit (Process 1)

It is assumed that the loss occurs at the point of inspection. Because WIP has passed the inspection point, the normal loss should be allocated to both completed units and WIP.

(1) Element of cost	(2) £	(3) Completed units	(4) Normal loss	(5) Closing WIP	(6) Total equiv. units	(7) Cost per unit	(8) = (5) × (7) WIP
Materials	47 600	8000	2400	5600	16 000	£2.975	£16 660
Conversion cost ^a	21 350	8000	1800	4200	14 000	£1.525	£6 405
	<u>68 950</u>					<u>£4.50</u>	<u>£23 065</u>

Note

^aConversion cost = direct labour (£4880) + direct expenses (£4270) + overhead (250% × £4880)

Cost of normal loss (£)

Materials	2400 × £2.975 = 7140
Conversion cost	1800 × £1.525 = <u>2745</u>
	<u>9885</u>

The apportionment of normal loss to completed units and WIP is as follows:

	Completed units	WIP
Materials	(8000/13 600 × £7140 = £4200)	(5600/13 600) × £7140 = £2940
Conversion	(8000/12 200 × £2745 = £1800)	(4200/12 000) × £2746 = £945
	<u>£6000</u>	<u>£3885</u>

The cost of completed units and WIP is as follows:

	(£)	(£)
Completed units: 8000 units × £4.50	36 000	
Share of normal loss	<u>6 000</u>	42 000
WIP: Original allocation	23 065	
Share of normal loss	<u>3 885</u>	<u>26 950</u>
		<u>68 950</u>

For an explanation of the above procedure see Appendix 6.1.

Where the normal loss is apportioned to WIP and completed units, a simple (but less accurate) approach is to use the short-cut approach and not to include the normal loss in the unit cost statement. The calculation is as follows:

Element of cost	Completed units (£)	Closing WIP	Total equiv. units	Cost per unit (£)	WIP (£)
Materials	47 600	8000	5600	3.50	19 600
Conversion cost	21 350	8000	4200	<u>1.75</u>	<u>7 350</u>
				<u>£5.25</u>	<u>£26 950</u>
				Completed units 8000 × £5.25 =	£42 000

Process 1 account – May 2000

	(litres)	(£)	(litres)	(£)
Materials	16 000	47 600	Transfers to process 2	8 000 42 000
Labour		4 880	Normal loss	2 400 —
Direct expenses		4 270	Closing stock C/f	5 600 26 950
Overheads absorbed		<u>12 200</u>		
	<u>16 000</u>	<u>68 950</u>	<u>16 000</u>	<u>68 950</u>

With process 2, there is no closing WIP. Therefore it is unnecessary to express output in equivalent units. The cost per unit is calculated as follows:

$$\frac{\text{cost of production less scrap value of normal loss}}{\text{expected output}} = \frac{£54 000^a}{(90\% \times 8000)} = £7.50$$

Note

^aCost of production = transferred in cost from process 1 (42 000) + labour (£6000) + overhead (£6000).

Process 2 account – May 2000

	Litres	(£)	Litres	(£)
Transferred from Process 1	8000	42 000	Finished goods store ^b	7500 56 250
Labour		6 000	Normal loss	800 —
Overheads absorbed		6 000	Closing stock	— —
Abnormal gain ^a		<u>300 2 250</u>		
	<u>8300</u>	<u>56 250</u>	<u>8300</u>	<u>56 250</u>

Finished goods account

	Litres	(£)
Ex Process 2	7500	56 250

Abnormal gain account

	(£)	Litres	(£)
Profit and loss account	<u>2250</u>	Process 2 account	300 <u>2250</u>

Notes

^aInput = 8000 litres. Normal output = 90% × 8000 litres = 7200 litres. Actual output = 7500 litres. Abnormal gain = 300 litres × £7.50 per litre = £2250.

^b7500 litres at £7.50 per litre.

(b) If the materials can be replaced then the loss to the company will consist of the replacement cost of materials. If the materials cannot be replaced then the loss will consist of the lost sales revenue less the costs not incurred as a result of not processing and selling 100 litres.

Chapter 7

7.11

	(£)
Joint costs apportioned to P (4500/9750 × £117 000) =	54 000
Further processing costs (4500 × £9) =	<u>40 500</u>
Total cost	94 500
Sales revenues (4050 × £25)	<u>101 250</u>
Profit	<u>6 750</u>
Answer = A	

7.12 Answer = D

7.13 Total sales revenue = £1 080 000 (£18 × 10 000 + £25 × 20 000 + £20 × 20 000)
 Joint costs to be allocated = £270 000 (277 000 total output cost – £2 × 3500 by-product sales revenue)
 Costs allocated to product 3 = 270 000 × (£20 × 20 000)/£1 080 000 = £100 000
 Unit cost of product 3 = £5 per unit (£100 000/20 000 units)

Answer = C

7.14 (a) Output = 12 500kg input less 20% normal loss = 10 000 kg.
 Input costs = £102 000 (£45 625 + £29 500 + 26 875)
 Cost per unit
 = $\frac{\text{Input cost less scrap value of normal loss (2500} \times \text{£4)}}{\text{Expected output (10 000 kg)}}$
 = £9.20
 Total cost of output = £92 000 (10 000 × £9.20)

(b) Joint costs to be allocated = £92 000 – by-product income (10 000 × 0.10 × £2) = £90 000

Product	Units	%	NRV at split-off	Total NRV	Joint cost allocation	Total profit	Profit per unit
A	5 000	50	10(20-10)	50 000	30 000	$\left[\frac{50\,000}{150\,000} \right]$ 20 000	4
B	4 000	40	25	100 000	60 000	$\left[\frac{100\,000}{150\,000} \right]$ 40 000	10
C	$\frac{1\,000}{10\,000}$	$\frac{10}{100}$	2				
Total				150 000	90 000		

The profit per unit for product A is £4 and for B is £10.

7.15 (a)

	Product X (£)	Material B (£)
Apportionment of joint costs (W1)	35 400	106 200
Further processing costs	18 000	—
	53 400	106 200
Sales (W2)	50 400	180 000
Profit/(loss)	(3 000)	73 800
Profit/(loss) per kg (W3)	(0.33)	2.46

Workings:

(W1) X = (£141 600/40 000 kg) × 10 000 kg
 B = (£141 600/40 000 kg) × 30 000 kg
 (W2) X = 9000 kg at £5.60, B = 30 000 × £6
 (W3) X = £3000/9000 kg, B = £73 800/30 000 kg

(b) The answer should stress that a joint products costs cannot be considered in isolation from those of other joint products. If product X was abandoned the joint costs apportioned to X would still continue and would have to be absorbed by material B. Therefore no action should be taken on product X without also considering the implications for material B. Note that the process as a whole is profitable. The decision to discontinue product X should be based on a comparison of those costs which would be avoidable if X were discontinued with the lost sales revenue from product X. Joint costs

apportionments are appropriate for stock valuation purposes but not for decision-making purposes.
 (c) An alternative method is to apportion joint costs on the basis of net realizable value at split-off point. The calculations are as follows:

	Sales value	Costs beyond split-off point	Net-realizable value at split-off point	Joint cost apportionment
Product X	50 400	18 000	32 400	21 600 (W1)
Material A	180 000	—	180 000	120 000 (W2)
			212 400	141 600

Workings:

(W1) (£32 400/£212 400) × £141 600
 (W2) (£180 000/£212 400) × £141 600

The revised profit calculation for product X is:

	(£)
Sales	50 400
Less Joint costs	21 600
Processing costs	18 000
Profit	10 800
Profit per kg	£1.20 (£10 800/9000 kg)

Apportionment methods based on sales value normally ensure that if the process as a whole is profitable, then each of the joint products will be shown to be making a profit. Consequently it is less likely that incorrect decisions will be made.

7.16 (a) See Chapters 6 and 7 for an explanation of the meaning of each of these terms.

(b) No specific apportionment method is asked for in this problem. It is recommended that the joint costs should be apportioned (see Chapter 7) according to the sales value at split-off point:

Product	Sales value (£)	Proportion to total (%)	Joint costs apportioned (£)
A	60 000	20	40 000
B	40 000	13.33	26 660
C	200 000	66.67	133 340
	300 000	100.00	200 000

(c) Assuming all of the output given in the problem can be sold, the initial process is profitable – the sales revenue is £300 000 and the joint costs are £200 000. To determine whether further processing is profitable the additional revenues should be compared with the additional relevant costs:

	A (£)	B (£)	C (£)
Additional relevant revenues	10 (20-10)	4 (8-4)	6 (16-10)
Additional relevant costs	14	2	6
Excess of relevant revenue over costs	(4)	2	—

Product B should be processed further, product A should not be processed further, and if product C is processed further, then profits will remain unchanged.

7.17 (a) Operating statement for October 2000

	(£)	(£)
Sales: Product A (80 000 × £5) =	400 000	
Product B (65 000 × £4) =	260 000	
Product C (75 000 × £9) =	<u>675 000</u>	1 335 000
Operating costs	1 300 000	
Less closing stock ^a	<u>200 000</u>	
		<u>1 100 000</u>
Profit		<u>235 000</u>

Note

^aProduction for the period (kg):

	A	B	C	Total
Sales requirements	80 000	65 000	75 000	
Closing stock	<u>20 000</u>	<u>15 000</u>	<u>5 000</u>	
Production	<u>100 000</u>	<u>80 000</u>	<u>80 000</u>	<u>260 000</u>

Therefore

Closing stock = 40 000 kg at £5 per kg

(b) Evaluation of refining proposal

	A	B	C	Total (£)
Incremental revenue per kg (£)	12	10	11.50	
Variable cost per kg (£)	<u>4</u>	<u>6</u>	<u>12.00</u>	
Contribution per kg (£)	<u>8</u>	<u>4</u>	<u>(0.50)</u>	
Monthly production (kg)	<u>100 000</u>	<u>80 000</u>	<u>80 000</u>	
Monthly contribution (£)	800 000	320 000	(40 000)	1 080 000
Monthly fixed overheads (specific to B)		360 000		360 000
Contribution to refining general fixed costs (£)	800 000	(40 000)	(40 000)	720 000
Refining general fixed overheads				<u>700 000</u>
Monthly profit				<u>20 000</u>

1. It is more profitable to sell C in its unrefined state and product B is only profitable in its refined state if monthly sales are in excess of 90 000 kg (£360 000 fixed costs/£4 contribution per unit).
2. If both products B and C are sold in their unrefined state then the refining process will yield a profit of £100 000 per month (£800 000 product A contribution less £700 000 fixed costs).
3. The break-even point for the refining process if only product A were produced is 87 500 kg (£700 000 fixed costs/£8 contribution per unit). Consequently if sales of A declined by 12½%, the refining process will yield a loss. Note that 80 000 kg of A were sold in October.

Chapter 8

- 8.9 Fixed overhead = £2 per unit (£60 000/30 000 units)
 Because production exceeded sales by 180 units a sum of £360 (180 × £2) is included in the stock valuation and not charged as an expense of the current period. Fixed overheads of £4640 (£5000 monthly cost – £360) are therefore charged as an expense for the period.

	(£)
Contribution (2220 units sales × £5.50)	12 210
Fixed overheads charged as an expense	<u>4 640</u>
Profit	<u>7 570</u>

Answer = B

- 8.10 Because closing inventory exceeds opening inventory, production exceeds sales so that absorption costing will be greater than the marginal costing profit by the amount of fixed overheads included in the increase in inventories. Therefore the absorption profit is:
 Marginal costing profit (37 500) + fixed overheads included in the increase in inventories (£4 × 250 units) = £38 500.
 Answer = C

- 8.11 Contribution = £4 per unit (£10 selling price – £6 variable cost)
 Profit = Total contribution (250 000 × £4) – fixed costs (200 000 × £2) = £600 000
 Answer = B

- 8.12 (a) Fixed overheads per unit = \$15 000/10 000 units = \$1.50
 Production exceeds sales so that absorption costing will be greater than the marginal costing profit by the amount of fixed overheads included in the increase in inventories. Therefore the absorption profit will exceed the marginal costing profit by \$750 (500 units × \$1.50).
 Answer = (iii)

(b)

	\$	\$
Sales (10 300 × \$6.40)		65 920
Cost of sales:		
Variable costs (10 300 × \$3.60)	37 080	
Fixed overheads (10 300 × \$1.50)	<u>15 450</u>	
		52 530
Under-absorbed fixed overheads (\$15 700 – \$15 000)	<u>700</u>	53 230
Profit		<u>12 690</u>

Answer = (ii)

- 8.13 Stocks have increased by 2500 units thus resulting in fixed overheads of £20 000 (2500 units at £8) being absorbed in the stock movements with the absorption costing system. Therefore the absorption costing system will record £20 000 less than the fixed overheads incurred for the period. In other words, the marginal costing system will record £20 000 more fixed costs resulting in profit of £22 000 being reported.
 Answer = B

- 8.14 The profit difference is due to the fixed overheads being incorporated in the stock movements with the absorption costing system.
 Profit difference = £9750 (£60 150 – £50 400)
 Fixed overheads in stock movement = £9750
 Physical stock movement = 1500 units
 Fixed overhead rate per unit = £9750/1500 units = £6.50
 Answer = D

- 8.15 Answer = B (unavoidable costs are not relevant for decision-making and the remaining statements are correct).

8.16 (a) Fixed production overhead per unit = £3
(£300 000/100 000 units)

Absorption costing	£000	£000
Sales (£50 × 100 000)		5000
Cost of sales:		
Opening stock	–	
Production costs		
Variable (£19 × 120 000)	2280	
Fixed (£3 × 120 000)	<u>360</u>	
	2640	
Closing stock (£22 × 20 000)	(440)	
Over-absorption (20 000 units × £3)	(60)	
		<u>(2140)</u>
Gross profit		2860
Selling costs		
Fixed		(150)
Variable (£2 × 100 000)		<u>(200)</u>
Net profit		<u>2510</u>

(b)

Marginal costing	£000	£000
Sales (£50 × 100 000)		5000
Cost of sales:		
Opening stock	—	
Production costs		
Variable (£19 × 120 000)	<u>2280</u>	
	2280	
Closing stock (£19 × 20 000)	(380)	
Variable selling costs	200	
		<u>(2100)</u>
Contribution		2900
Fixed costs		
Production		(300)
Selling		<u>(150)</u>
Net profit		<u>2450</u>

8.17

	(£)
Calculation of product cost	
Materials	10
Labour	<u>2</u>
Variable production cost	12
Variable distribution cost	<u>1</u>
Total variable cost	13
Fixed overhead (£10 000/1000 units)	<u>10</u>
Total costs	<u>23</u>

The product costs for stock valuation purposes are as follows:
 Variable costing £12 (variable production cost)
 Absorption costing £22 (variable production cost + fixed manufacturing overhead)

It is assumed that all of the fixed overhead relates to production. Note that the distribution cost is per unit *sold* and not per unit *produced*.

(a) (i) Variable costing

	t₁	t₂	t₃
Opening stock	1 200	1 200	1 200
Production	<u>12 000</u>	<u>12 000</u>	<u>12 000</u>
	13 200	13 200	13 200
Closing stock	<u>1 200</u>	<u>1 200</u>	<u>1 200</u>
Cost of sales	12 000	12 000	12 000
Sales at £25 per unit	<u>25 000</u>	<u>25 000</u>	<u>25 000</u>
Gross profit	13 000	13 000	13 000
Distribution costs	1 000	1 000	1 000
Fixed labour costs	5 000	5 000	5 000
Fixed overhead costs	<u>5 000</u>	<u>5 000</u>	<u>5 000</u>
Net profit	<u>£2 000</u>	<u>£2 000</u>	<u>£2 000</u>
Total profit £6000			

Absorption costing

	t₁	t₂	t₃
	(£)	(£)	(£)
Opening stock	2 200	2 200	2 200
Production	<u>22 000</u>	<u>22 000</u>	<u>22 000</u>
	24 200	24 200	24 200
Closing stock	<u>2 200</u>	<u>2 200</u>	<u>2 200</u>
Cost of sales	22 000	22 000	22 000
Sales at £25 per unit	<u>25 000</u>	<u>25 000</u>	<u>25 000</u>
Gross profit	3 000	3 000	3 000
Distribution cost	<u>1 000</u>	<u>1 000</u>	<u>1 000</u>
Net profit	<u>£2 000</u>	<u>£2 000</u>	<u>£2 000</u>
Total profit £6000			

(ii) Variable costing

	t₁	t₂	t₃
	(£)	(£)	(£)
Opening stock	1 200	7 200	4 800
Production	<u>18 000</u>	<u>9 600</u>	<u>8 400</u>
	19 200	16 800	13 200
Closing stock	<u>7 200</u>	<u>4 800</u>	<u>1 200</u>
Cost of sales	12 000	12 000	12 000
Sales at £25 per unit	<u>25 000</u>	<u>25 000</u>	<u>25 000</u>
Gross profit	13 000	13 000	13 000
Distribution costs	1 000	1 000	1 000
Fixed labour costs	5 000	5 000	5 000
Fixed overhead costs	<u>5 000</u>	<u>5 000</u>	<u>5 000</u>
Net profit	<u>£2 000</u>	<u>£2 000</u>	<u>£2 000</u>
Total profit £6000			

Absorption costing

	t₁	t₂	t₃
	(£)	(£)	(£)
Opening stock	2 200	13 200	8 800
Production	<u>33 000</u>	<u>17 600</u>	<u>15 400</u>
	35 200	30 800	24 200
Under/(over) recovery	<u>(5 000)</u>	<u>2 000</u>	<u>3 000</u>
	30 200	32 800	27 200
Closing stock	<u>13 200</u>	<u>8 800</u>	<u>2 200</u>
Cost of sales	17 000	24 000	25 000
Sales at £25 per unit	<u>25 000</u>	<u>25 000</u>	<u>25 000</u>
Gross profit	8 000	1 000	—
Distribution cost	<u>1 000</u>	<u>1 000</u>	<u>1 000</u>
Net profit	<u>£7 000</u>	<u>—</u>	<u>£(1 000)</u>
Total profit £6 000			

(iii) Variable costing

	t_1 (£)	t_2 (£)	t_3 (£)
Opening stock	1 200	7 200	4 800
Production	<u>12 000</u>	<u>12 000</u>	<u>12 000</u>
	13 200	19 200	16 800
Closing stock	<u>7 200</u>	<u>4 800</u>	<u>1 200</u>
Cost of sales	6 000	14 400	15 600
Sales at £25 per unit	<u>12 500</u>	<u>30 000</u>	<u>32 500</u>
Gross profit	6 500	15 600	16 900
Distribution costs	500	1 200	1 300
Fixed labour costs	5 000	5 000	5 000
Fixed overhead costs	<u>5 000</u>	<u>5 000</u>	<u>5 000</u>
Net profit	<u>£(4 000)</u>	<u>£4 400</u>	<u>£5 600</u>
Total profit £6000			

Absorption costing

	t_1 (£)	t_2 (£)	t_3 (£)
Opening stock	2 200	13 200	8 800
Production	<u>22 000</u>	<u>22 000</u>	<u>22 000</u>
	24 200	35 200	30 800
Closing stock	<u>13 200</u>	<u>8 800</u>	<u>2 200</u>
Cost of sales	11 000	26 400	28 600
Sales at £25 per unit	<u>12 500</u>	<u>30 000</u>	<u>32 500</u>
Gross profit	1 500	3 600	3 900
Distribution cost	<u>500</u>	<u>1 200</u>	<u>1 300</u>
Net profit	<u>£1 000</u>	<u>£2 400</u>	<u>£2 600</u>
Total profit £6000			

(b) For the answer to this question see Chapter 8: Note that profits are identical for both systems in (i), since production equals sales. In (ii) and (iii) profits are higher with absorption costing when production exceeds sales, whereas profits are higher with variable costing when production is less than sales. Taking the three periods as a whole there is no change in the level of opening stock in t_1 compared with the closing stock in t_3 , so that the disclosed profit for the three periods is the same under both systems. Also note that the differences in profits disclosed in (a) (ii) and (a) (iii) is accounted for in the fixed overheads included in the stock valuation changes.

Chapter 9

9.11 Answer = C

9.12 BEP = Fixed costs/PV ratio
 PV ratio = Contribution/Sales = £275 000/£500 000 = 0.55
 BEP = £165 000/0.55 = £300 000
 Answer = D

9.13 Required sales revenue =

$$\frac{\text{Fixed costs (£75 000)} + \text{Target profit (£150 000)}}{\text{PV ratio (0.75)}}$$
 = £300 000
 Units of output = £300 000/£10 unit selling price
 = 30 000 units
 Answer = D

9.14 Budgeted total contribution = £125 000 (5000 units × £25)
 The margin of safety is positive thus indicating a budgeted profit. Therefore fixed costs must be less than £125 000 for a budgeted profit to occur. Only one of the potential items (item A) meets this requirement.
 Answer = A

9.15 Average contribution to sales ratio = $\frac{(40\% \times 1) + (50\% \times 3)}{4} = 47.5\%$

Break-even point is at the point where 47.5% of the sales equal the fixed costs (i.e. £120 000/0.475 = £252 632).

In other words, the break-even point = $\frac{\text{Fixed costs}}{\text{PV ratio}}$

Answer = C

9.16 Contribution/sales (%) = (0.33 × 40% Aye) + (0.33 × 50% Bee) + (0.33 × ? Cee) = 48%
 Cee = 54% (Balancing figure)

The total contribution/sales ratio for the revised sales mix is:
 (0.40 × 40% Aye) + (0.25 × 50% Bee) + (0.35 × 54% Cee)
 = 47.4%

Answer = C

9.17 Sales	100	110 (100 + 10%)
Variable cost	60	60
Contribution	40	50
Increase = 25%		

Answer = D

9.18 Items (i) and (ii) will reduce variable costs and thus increase the contribution/sales ratio. Item (iii) will result in a reduction in selling price and the c/s ratio whereas it is assumed that with item (iv) that sales to other countries will be at a higher selling price thus resulting in a higher average contribution and c/s ratio. The reduction in selling price for item (v) will result in a reduced contribution and lower ratio. Therefore items (i), (ii) and (iv) will result in an increase in the ratio.
 Answer = B

9.19 Break-even point in sales value = Fixed costs (£76 800)/
 Profit-volume ratio
 (i.e. contribution/sales ratio)
 = £76 800/(0.40)
 = £192 000
 Actual sales = £224 000
 Margin of safety = £32 000 (in sales revenues)
 Margin of safety in units = £2000 (£32 000/£16)
 Answer = A

- 9.20 (a) Budgeted contribution per unit = $\$11.60 - \$3.40 - (5\% \times \$11.60) = \7.62
 Break-even point (units) = $(\$430\,500 + 198\,150) / \$7.62 = 82\,500$ units
 Break-even point (sales value) = $82\,500 \times \$11.60 = \$957\,000$
 Budgeted sales = $\$1\,044\,000$ ($90\,000 \times \$11.60$)
 Margin of safety (\$) = $\$1\,044\,000 - \$957\,000 = \$87\,000$
 Margin of safety (%) = $\$87\,000 / \$1\,044\,000 = 8.33\%$
 Answer = B
- (b) Budgeted contribution per unit = $\$12.25 - \$3.40 - (8\% \times \$12.25) = \7.87
 Break-even point (units) = $(\$430\,500 + 198\,150) / \$7.87 = 79\,879$ units
 Answer = C

- 9.21 (a) Answer = A
 (b) The increase in fixed costs will result in an increase in the break-even point. The only correct alternative that is listed is item C. This indicates an increase in the break-even point sales value.

- 9.22 (a) An increase in fixed costs will result in a lower break-even point (i.e. the number of units sold to break even). Therefore *t* will decrease.
 Answer = (iii)
- (b) The slope of the profit line is represented by the change in contribution per unit. The diagram indicates that sales are 800 units in excess of the break-even point (represented by *t*) and these 800 units generate a profit of \$16 000 (represented by *W*). Profit is equal to contribution above the break-even point so the contribution per unit is \$20 ($\$16\,000 / 800$ units). Additional sales can thus be expected to generate an additional contribution and profit of \$28 000 (1400 units \times \$20).
 Answer = (iii)

- 9.23 (i) p = total sales revenue
 q = total cost (fixed cost + variable cost)
 r = total variable cost
 s = fixed costs at the specific level of activity
 t = total loss at the specific level of activity
 u = total profit at that level of activity
 v = total contribution at the specific level of activity
 w = total contribution at a lower level of activity
 x = level of activity of output sales
 y = monetary value of cost and revenue function for level of activity
- (ii) At event *m* the selling price per unit decreases, but it remains constant. Note that *p* is a straight line, but with a lower gradient above *m* compared with below *m*.
 At event *n* there is an increase in fixed costs equal to the dotted line. This is probably due to an increase in capital expenditure in order to expand output beyond this point. Also note that at this point the variable cost per unit declines as reflected by the gradient of the variable cost line. This might be due

- to more efficient production methods associated with increased investment in capital equipment.
- (iii) Break-even analysis is of limited use in a multi-product company, but the analysis can be a useful aid to the management of a small single product company. The following are some of the main benefits:
- (a) Break-even analysis forces management to consider the functional relationship between costs, revenue and activity, and gives an insight into how costs and revenue change with changes in the level of activity.
- (b) Break-even analysis forces management to consider the fixed costs at various levels of activity and the selling price that will be required to achieve various levels of output.

You should refer to Chapter 9 for a discussion of more specific issues of break-even analysis. Break-even analysis can be a useful tool, but it is subject to a number of assumptions that restrict its usefulness (see, especially, 'Cost-volume-profit analysis assumptions').

9.24 Preliminary calculations:

	Sales (units)	Profit/(loss)
November	30 000	£40 000
December	35 000	£60 000
Increase	5 000	£20 000

An increase in sales of 5000 units increases contribution (profits) by £20 000. Therefore contribution is £4 per unit. Selling price is £10 per unit (given) and variable cost per unit will be £6.

At £30 000 unit sales:

$$\begin{aligned} \text{Contribution} &\text{ minus Fixed costs} = \text{Profit} \\ \text{£120 000} &\text{ minus ?} = \text{£40 000} \\ \therefore \text{Fixed costs} &= \text{£80 000} \end{aligned}$$

The above information can now be plotted on a graph. A break-even chart or a profit-volume graph could be constructed. A profit-volume graph avoids the need to calculate the profits since the information can be read directly from the graph. (See Figure 1 for a break-even chart and Figure 2 for a profit-volume graph.)

- (a) (i) Fixed costs = £80 000.
 (ii) Variable cost per unit = £6.
 (iii) Profit-volume = $\frac{\text{Contribution per unit (£4)}}{\text{Selling price per unit (£10)}} \times 100 = 40\%$
 (iv) Break-even point = 20 000 units.
 (v) The margin of safety represents the difference between actual or expected sales volume and the break-even point. Therefore the margin of safety will be different for each month's sales. For example, the margin of safety in November is 10 000 units ($30\,000$ units $- 20\,000$ units). The margin of safety can be read from Figure 2 for various sales levels.
- (b) and (c) See the sections on 'The accountants' cost-volume-profit model' and 'Cost-volume-profit analysis assumptions' in Chapter 9 for the answers.

FIGURE 1 Break-even chart

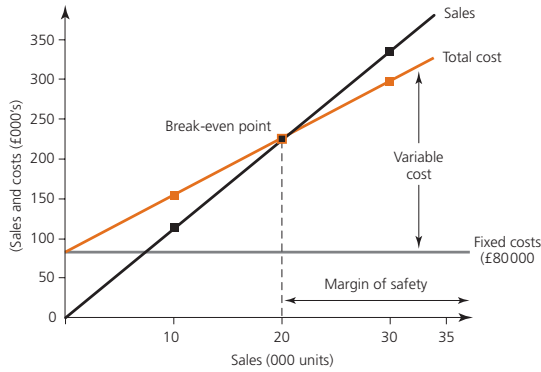
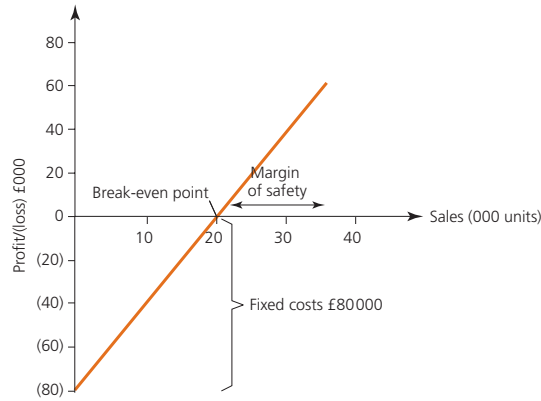


FIGURE 2 Profit-volume graph



9.25 (a)

	August (£)	September (£)	Change (£)
Sales	80 000	90 000	10 000
Cost of sales	50 000	55 000	5 000
Selling and distribution	8 000	9 000	1 000
Administration	15 000	15 000	Nil

The only activity measure that is given is sales revenue. An increase in sales of £10 000 results in an increase in cost of sales of £5000 and an increase in selling and distribution costs of £1000. It is therefore assumed that the increase is attributable to variable costs and variable cost of sales is 50% of sales and variable selling and distribution costs are 10% of sales.

Fixed costs are derived by deducting variable costs from total costs for either month. The figures for August are used in the calculations below:

	Total cost (£)	Variable cost (£)	Fixed cost (Balance) (£)
Cost of sales	50 000	40 000	10 000
Selling and distribution	8 000	8 000	Nil
Administration	15 000	Nil	<u>15 000</u>
			<u>25 000</u>

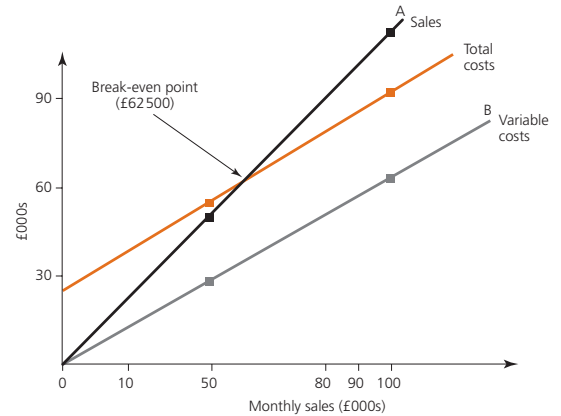
Total cost = £25 000 fixed costs + variable costs (60% of sales)
 (b) The following items are plotted on the graph (Figure 3):

	Variable cost	Total cost
Zero sales	Nil	£25 000 fixed cost
£80 000 sales	£48 000 (60%)	£73 000
£90 000 sales	£54 000 (60%)	£79 000
£50 000 sales	£30 000 (60%)	£55 000
£100 000 sales	£60 000	£85 000

Break-even point

$$= \frac{\text{Fixed costs (£25 000)}}{\text{Contribution to sales ratio (0.40)}} = \text{£62 500 sales}$$

FIGURE 3 Contribution break-even graph



Area of contribution = Area AOB

(c)

	(£)
Actual sales = 1.3 × Break-even sales (£62 500)	= 81 250
Contribution (40% of sales)	= 32 500
Fixed costs	= 25 000
Monthly profit	= 7 500
Annual profit	= 90 000

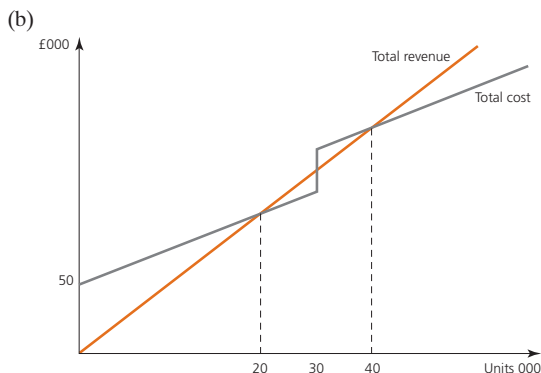
(d)

	(£)
Annual contribution from single outlet (£32 500 × 12)	= 390 000
Contribution to cover lost sales (10%)	= 39 000
Specific fixed costs	= 100 000
Total contribution required	<u>529 000</u>

Required sales = £529 000/0.4 = £1 322 500

(e) The answer should draw attention to the need for establishing a sound system of budgeting and performance reporting for each of the different outlets working in close conjunction with central office. The budgets should be merged together to establish a master budget for the whole company.

- 9.26 (a) Let x = number of units of output
 Total cost for 30 000 units or less = $\text{£}50\,000 + 5x$ (where 5 = variable cost per unit)
 Total cost for more than 30 000 units = $\text{£}100\,000 + 5x$



- (c) There are two break-even points resulting in the production plan being profitable only between 20 000 and 30 000 units and above 40 000 units. The production plan should be set based on these considerations.

9.27

$$\text{Break-even point} = \frac{\text{Fixed costs}}{\text{Contribution per unit}}$$

Product X	25 000 units (£100 000/£4)
Product Y	25 000 units (£200 000/£8)
Company as a whole	57 692 units (£300 000/£5.20 ^a)

Note:

^aAverage contribution per unit

$$= \frac{(70\,000 \times \text{£}4) + (30\,000 \times \text{£}8)}{100\,000 \text{ units}}$$

$$= \text{£}5.20$$

The sum of the product break-even points is less than the break-even point for the company as a whole. It is incorrect to add the product break-even points because the sales mix will be different from the planned sales mix. The sum of the product break-even points assumes a sales mix of 50% to X and 50% to Y. The break-even point for the company as a whole assumes a planned sales mix of 70% to X and 30% to Y. CVP analysis will yield correct results only if the planned sales mix is equal to the actual sales mix.

9.28

Workings:	(000)
Sales	1000
Variable costs	<u>600</u>
Contribution	400
Fixed costs	<u>500</u>
Profit/(loss)	<u>(100)</u>

Unit selling price = $\text{£}20$ (£1m/50 000)
 Unit variable cost = $\text{£}12$ (£600 000/50 000)
 Unit contribution = $\text{£}8$

- (a) Sales commission will be $\text{£}2$ per unit, thus reducing the contribution per unit to $\text{£}6$. The break-even point will be 83 333 units ($\text{£}500\,000/\text{£}6$) or $\text{£}1\,666\,666$ sales value. This requires an increase of 67% on previous sales and the company must assess whether or not sales can be increased by such a high percentage.

- (b) A 10% decrease in selling price will decrease the selling price by $\text{£}2$ per unit and the revised unit contribution will be $\text{£}6$:

	(£)
Revised total contribution (65 000 × £6)	390 000
Less fixed costs	<u>500 000</u>
Profit/(loss)	<u>(110 000)</u>

The estimated loss is worse than last year and the proposal is therefore not recommended.

- (c) Wages will increase by 25% – that is, from $\text{£}200\,000$ to $\text{£}250\,000$ – causing output to increase by 20%.

	(£)
Sales	1 200 000
Direct materials and variable overheads	480 000
Direct wages	<u>250 000</u>
Contribution	730 000
Less fixed costs	<u>550 000</u>
Profit/(loss)	<u>(80 000)</u>

This represents an improvement of $\text{£}20\,000$ on last year's loss of $\text{£}100\,000$.

- (d) Revised selling price = $\text{£}24$

Let X = Revised sales volume

$$\begin{aligned} \therefore \text{sales revenue less (variable costs + fixed costs)} &= \text{Profit} \\ 24X \text{ less } (12X + 800\,000) &= 0.1(24X) \\ \therefore 9.6X &= 800\,000 \\ \therefore X &= 83\,333 \text{ units} \end{aligned}$$

Clearly this proposal is preferable since it is the only proposal to yield a profit. However, the probability of increasing sales volume by approximately 67% plus the risk involved from increasing fixed costs by $\text{£}300\,000$ must be considered.

Chapter 10

10.11	Low	650 patients	\$17 125
	High	1260 patients	18 650
	Difference	610 patients	1 525

Variable cost per patient = $\$1525/610 = \2.50
 Total fixed cost using 650 patients = Total cost (\$17 125) – variable cost ($650 \times \$2.50$) = $\$15\,500$
 Estimated cost for 850 patients = Variable costs ($850 \times \$2.50$) + $\$15\,500 = \$17\,625$
 Answer = C

- 10.12 It is assumed that advertising generates sales. Therefore advertising is the independent variable and sales revenue the dependent variable. The lowest value of the independent variable is $\text{£}2500$ and the highest is $\text{£}6500$. An increase in advertising expenditure of $\text{£}4000$ ($6.5 - 2.5$) results in additional sales revenue of $\text{£}100\,000$ so that each $\text{£}1$ sales results in additional sales of $\text{£}25$. Based on $\text{£}6500$ advertising the sales revenue is $\text{£}162\,500$ ($6500 \times \text{£}25$) so the balance $\text{£}62\,500$ ($\text{£}225\,000 - \text{£}162\,500$) represents the non-variable element. Therefore sales revenue = $\text{£}62\,500 + (\text{£}25 \times \text{advertising expenditure})$
 Answer = A

10.13 An increase in activity of 5000 units results in an increase in costs of £150 000 so that the variable element is £30 per unit (£150 000/5000 units).
Answer = B

10.14

	Hours	\$
High	5800	23 000
Low	3250	15 350
change	2550	7 650

Variable charge per hour = \$3 (\$7650/2550)
At 5800 hours the variable cost is \$17 400 and the total cost is \$23 000 giving a fixed cost of \$5600. In period 5 the estimated variable cost is \$18 150 (5500 × 1.10 × \$3) and the fixed cost is \$5880 (\$5600 × 1.05). Therefore the estimated total cost is \$24 030.
Answer = B

10.15 Estimated variable costs at 500 units:

	£
Direct costs	7500
Production overheads (50%)	500
Selling costs (80%)	<u>1000</u>
	<u>9000</u>

Variable cost per unit = £18.00 (£9000/500 units)
Total costs for 1000 units = £18 000 (1000 × £18.00)
variable + fixed production (£500) + fixed selling (£250) = £18 750.
Profit = Sales revenue £35 000 – £18 750 total costs = £16 250
Answer = B

10.16 Formulae 10.4 and 10.5 (see Chapter 10) were given in the examination for this question. Applying formula 10.5:

$$b = \frac{(11 \times 13\,467) - (440 \times 330)}{(11 \times 17\,986) - (440)^2} = 0.6917$$

Applying formula 10.4
 $a = (330/11) - (0.6917 \times 440)/11 = 2.33$
Answer = C

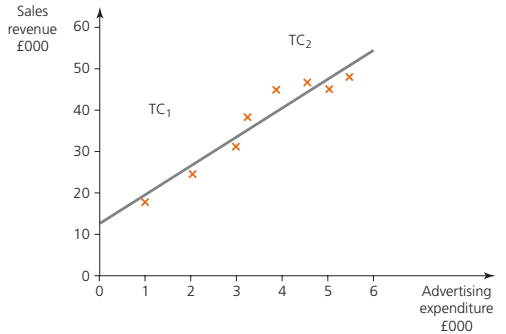
10.17 It is assumed that advertising generates sales. Therefore advertising is the independent variable and sales revenue the dependent variable. Applying formula 10.5 (see Chapter 10) which was provided in the examination paper:

$$b = \frac{(6 \times 447\,250\,000) - (13\,500 \times 192\,000)}{(6 \times 32\,150\,000) - (13\,500)^2} = 8.714$$

Answer = C

10.18 Applying formula 10.4:
 $a = (200/4) - (17.14 \times 5.75)/4 = 25.36$
Answer = A

10.19 (a) Advertising expenditure is the independent variable (x) and sales revenue the dependent variable (y).



(b) Formulae 10.4 and 10.5 (see Chapter 10) were given in the examination for this question. Applying formula 10.5:

$$b = \frac{(8 \times 1055.875) - (26.35 \times 289.5)}{(8 \times 101.2625) - (26.35)^2} = 818.675/115.7775 = 7.07$$

Applying formula 10.4
 $a = (289.5/8) - (7.07 \times 26.35)/8 = 12.9$
Therefore the regression line is $y = 12.9 + 7.07x$ where x and y are expressed in £000s. The line of best fit is shown in the graph in (a)

10.20 (a) (i) High- and low-point method

	Machine hours 000s	Fuel oil expenses (£000's)
High point (June 2000)	48	680
Low point (January 2000)	26	500
Difference	<u>22</u>	<u>180</u>

Variable cost per machine hour £8.182 (£180/22)
Substituting for January 2000

	(£000's)
Variable cost (26 × £8.182) =	212.73
Fixed Cost (difference)	<u>287.27</u>
Total cost	<u>500.00</u>

The total cost equation is $y = 287.27 + 8.182x$

(ii) Least-squares regression method

	Hours x	Fuel oil y	x ²	xy
July	34	640	1 156	21 760
August	30	620	900	18 600
September	34	620	1 156	21 080
October	39	590	1 521	23 010
November	42	500	1 764	21 000
December	32	530	1 024	16 960
January	26	500	676	13 000
February	26	500	676	13 000
March	31	530	961	16 430
April	35	550	1 225	19 250
May	43	580	1 849	24 940
June	<u>48</u>	<u>680</u>	<u>2 304</u>	<u>32 640</u>
$\Sigma x = 420$ = 35	$\Sigma x = 6840$ = 570	$\Sigma x^2 = 15\,212$	$\Sigma xy = 241\,670$	

$$\Sigma y = Na + bx \quad (1)$$

$$\Sigma xy = \Sigma xa + b\Sigma x^2 \quad (2)$$

Substituting from the above table:

$$6840 = 12a + 420b \quad (1)$$

$$241\,670 = 420a + 15\,212b \quad (2)$$

Multiply equation (1) by 35 (= 420/12):

$$239\,400 = 420a + 14\,700 \quad (3)$$

Subtract equation (3) from equation (2):

$$2270 = 512b, \text{ and so } b = 2270/512 = 4.4336$$

Substitute in equation (1), giving

$$6840 = 12a + 420 \times 4.4336, \text{ so } a = \frac{6840 - 1862.112}{12}$$

$$= 414.824$$

$$y = 414.82 + 4.43x$$

(b) For the answer to this question see Chapter 10.

(c) An r^2 calculation of 0.25 means that 75% of the total variation of y from its mean is not caused by variations in x (machine hours). This means that a large proportion of changes in fuel oil expenses do not result from changes in machine hours. The cost must depend on factors other than machine hours. Other measures of activity might be examined in order to test whether they are closely related to changes in costs. If other measures do not yield a close approximation then this might indicate that cost is dependent on several variables. In these circumstances multiple regression techniques should be used.

Chapter 11

11.12 (a)

	X	Y	Z	Total
Demand (units)	4 000	5 500	7 000	
Materials (kg)	20 000	22 000	42 000	84 000
Labour (hours)	4 000	4 125	10 500	18 625

Labour is the limiting factor.

Answer = (i)

(b)

	X	Y	Z
	\$	\$	\$
Selling price	28	22	30
Variable cost	17	13	24
Contribution	11	9	6
kg	5	4	6
Contribution per kg (\$)	2.20	2.25	1
Ranking	2	1	3

Answer = (iv)

11.13 Based on the contribution per limiting factor (materials) the rankings are products (iii), (ii) and (i). Minimum demand requirements for product (i) = 8000 kg leaving a balance of 27 000 kg to be allocated as follows:
 Product (iii) maximum demand = 2000
 Product (ii) maximum output from the unallocated materials = 3000 units (15 000kg/5kg)
 Answer = B (with a minimum demand of 1000 units for product (i).

11.14 Total materials required = $(2000 \times 36/6) + (1500 \times 24/6) + (4000 \times 15/6) = 28\,000$ kg
 Answer = B

11.15 The 400 labour hours unused capacity has zero relevant cost. The remaining 100 hours can be obtained from diverting production from product X. The relevant cost of this alternative consists of the labour cost (100 hours \times £12) plus the lost contribution from the use of these labour hours (100/2 \times £4 = £200), giving a total of £1400 (see 'Determining the relevant costs of direct labour' in Chapter 11 for an explanation of this point). In other words, the relevant cost is the lost contribution before deducting unavoidable labour costs. The other alternative is to work overtime resulting in an additional (relevant) cost of £1800 (100 hours at £18 per hour). Therefore it is cheaper to divert labour hours from the production of product X.
 Therefore answer = C

11.16 The relevant cost consists of the additional acquisition and installation costs less realizable value. Therefore the relevant cost is £150 000 + £25 000 - £10 000 = £165 000.
 Answer = C

11.17 The material is in regular use and if used will have to be replaced at a cost of £1950 (600 \times £3.25). The cash flow consequences are £1950.
 Answer = D

11.18 Assuming that fixed costs will remain unchanged whether or not the company makes or buys the components the relevant cost of manufacture will be the variable cost. Under these circumstances the company should only purchase components if the purchase price is less than the variable cost. Therefore the company should only purchase component T.
 Answer = D

11.19 Incremental cost of new employees = £40 000 \times 4 = £160 000
 Supervision is not an incremental cost.
 Incremental costs of retraining
 = £15 000 + £100 000 replacement cost = £115 000
 Retraining is the cheaper alternative and therefore the relevant cost of the contract is £115 000.
 Answer = B

11.20 Answer = B (All of the remaining items are not relevant costs)

11.21 The material is readily available and the use of the materials will necessitate their replacement. The relevant cost is therefore the replacement cost of £4050 (1250 kg at £3.24).
 Answer = B

11.22 Specific (avoidable) fixed overheads per division = $£262.5 \times 60\% = £157.5/3 = £52.5$
 The specific fixed costs are deducted from the divisional contributions to derive the following contributions (£000's) to general fixed costs:
 Division A = £17.5
 Division B = £157.5
 Division C = -£22.5
 Only divisions A and B should remain open since they both provide positive contributions to general fixed costs.
 Answer = B

11.23 The relevant costs are as follows:

	£
Material V	900 (1)
Material I	6 500 (2)
Material C	2 050 (3)
Department 1	— (4)
Department 2	26 000 (5)
Overheads	— (6)
Minimum price	<u>35 450</u>

Notes:

- 1 The original purchase price is a sunk cost. The impact of using the materials on the contract will be the lost cash flows of £900 (300kg × £3) from the sale of the materials.
- 2 The original purchase price is a sunk cost. Because the materials are in continuous use their usage will result in their replacement at £6.50 per litre.
- 3 The alternative use of the 300kg in stock would be to use them as a substitute for material Y thus saving purchase costs of £1050 (300/2 × £7). Therefore the impact of using these materials on the contract results in additional costs associated with material Y of £1050. In addition, 250kg of materials C will be purchased for £1000 (250kg at £4 per kg) giving a total relevant cost of £2050.
- 4 Because there is spare capacity no additional labour costs will be incurred in undertaking the contract.
- 5 To obtain the labour for this contract the company has a choice of two alternatives. First, work overtime at an additional labour cost to the company of £30 000 (2000 hours × 1.5 × £10). Second labour can be diverted from other production at a lost contribution of £26 000 (2000 hours × (labour cost + lost contribution)). In other words, the relevant cost is the lost contribution before deducting unavoidable labour costs (see 'Determining the relevant costs of direct labour' in Chapter 11 for an explanation of this point). It is cheaper to divert labour from other production. Therefore relevant cost = £26 000.
- 6 There are no additional overheads incurred in undertaking the contract so the relevant cost is zero.

11.24 (a)

	V (£)	W (£)	X (£)	Y (£)	Z (£)
Selling price	<u>16</u>	<u>15</u>	<u>18</u>	<u>15</u>	<u>30</u>
Material	3	5	4	7	6
Skilled labour	6	6	9	3	12
Unskilled labour	2.4	2.4	1.2	1.2	4.8
Variable overhead	<u>2</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>4</u>
Total variable cost	<u>13.4</u>	<u>15.4</u>	<u>16.2</u>	<u>12.2</u>	<u>26.8</u>
Contribution	2.6	(0.4)	1.8	2.8	3.2
Number of skilled hours	1	1	1.5	0.5	2
Contribution per skilled hour	2.6	(0.4)	1.2	5.6	1.6
Ranking	2	Drop	4	1	3
Skilled hours allocated (W1)	3000		5500	3500	18 000
			(Balance)		

The product mix will be:

	£
Y (7000 units × £2.80 contribution)	19 600
V (3000 units × £2.60 contribution)	7 800
Z (9000 units × £3.20 contribution)	28 800
X (5500 hours × £1.80 contribution)	6 600
1.5 hours	—
Total contribution	<u>62 800</u>
Less fixed costs	<u>22 800</u>
Maximum profit	<u>40 000</u>

Workings:

(W1) Maximum units demanded X skilled hours per unit.

- (b) If the labour hours constraint is removed the output of product X should be increased to the maximum demand of 6000 units. At present the constraint on skilled labour hours results in a lost contribution of £4201 (6000 units less 3666 units allocated in (a) × £1.80 unit contribution). Therefore the company should consider ways of removing this constraint. As long as the costs of removing the constraint are less than £4201, total profit will increase. Product W should be dropped from the range provided it does not affect the sales of other products.

11.25 (a)

	Relevant costs of the project
Material A	(1 750)
Material B	8 000
Direct labour	7 000
Net cost of machinery	<u>4 750</u>
Relevant cost	18 000
Contract price	<u>30 000</u>
Contribution	<u>12 000</u>

Notes:

- (1) There is a saving in material costs of £1750 if material A is not used.
- (2) The actual cost of material B represents the incremental cost.
- (3) The hiring of the labour on the other contract represents the additional cash flows of undertaking this contract.
- (4) The net cost of purchasing the machinery represents the additional cash flows associated with the contract.

- (5) Supervision and overheads will still continue even if the contract is not accepted and are therefore irrelevant.
- (b) The report should indicate that the costs given in the question do not represent incremental cash flows arising from undertaking the contract. As the company is operating at an activity level in excess of break-even point any sales revenue in excess of £18 000 incremental costs will provide an additional contribution which will result in an increase in profits. Assuming that the company has spare capacity, and that a competitor is prepared to accept the order at £30 000, then a tender price slightly below £30 000 would be appropriate.
- (c) Before accepting the contract the following non-monetary factors should be considered.
 - (i) Is there sufficient spare capacity to undertake the project?
 - (ii) Is the overseas customer credit worthy?
 - (iii) Has the workforce the necessary skills to undertake the project?
 - (iv) Is the contract likely to result in repeat business with the customer?
- (d) If the company were operating below the break-even point, acceptance of the order would provide a further contribution towards fixed costs and reduce the existing loss. In the short term it is better to accept the order and reduce the total loss but if, in the long run, there are not enough orders to generate sufficient contributions to cover total fixed costs, then the company will not survive.

11.26 (a)

	North East (£)	South coast (£)
Material X from stock (i)	19 440	
Material Y from stock (ii)		49 600
Firm orders of material X (iii)	27 360	
Material X not yet ordered (iv)	60 000	
Material Z not yet ordered (v)		71 200
Labour (vi)	86 000	110 000
Site management (vii)	—	—
Staff accommodation and travel for site management (viii)	6 800	5 600
Plant rental received (ix)	(6000)	—
Penalty clause (x)		28 000
	193 600	264 400
Contract price	288 000	352 000
Net benefit	94 400	87 600

- (b) (i) If material X is not used on the North East contract the most beneficial use is to use it as a substitute material thus avoiding future purchases of £19 440 (0.9 × 21 600). Therefore by using the stock quantity of material X the company will have to spend £19 440 on the other materials.
- (ii) Material Y is in common use and the company should not dispose of it. Using the materials on the South coast contract will mean that they will have to be replaced at a cost of £49 600 (£24 800 × 2). Therefore the future cash flow impact of taking on the contract is £49 600.

- (iii) It is assumed that with firm orders for materials it is not possible to cancel the purchase. Therefore the cost will occur whatever future alternative is selected. The materials will be used as a substitute material if they are not used on the contract and therefore, based on the same reasoning as note (i) above, the relevant cost is the purchase price of the substitute material (0.9 × £30 400).
- (iv) The material has not been ordered and the cost will only be incurred if the contract is undertaken. Therefore additional cash flows of £60 000 will be incurred if the company takes on the North East contract.
- (v) The same principles apply here as were explained in note (iv) and additional cash flows of £71 200 will be incurred only if the company takes on the South coast contract.
- (vi) It is assumed that labour is an incremental cost and therefore relevant.
- (vii) The site management function is performed by staff at central headquarters. It is assumed that the total company costs in respect of site management will remain unchanged in the short term whatever contracts are taken on. Site management costs are therefore irrelevant.
- (viii) The costs would be undertaken only if the contracts are undertaken. Therefore they are relevant costs.
- (ix) If the North East contract is undertaken the company will be able to hire out surplus plant and obtain a £6000 cash inflow.
- (x) If the South coast contract is undertaken the company will have to withdraw from the North East contract and incur a penalty cost of £28 000.
- (xi) The headquarter costs will continue whichever alternative is selected and they are not relevant costs.
- (xii) It is assumed that there will be no differential cash flows relating to notional interest. However, if the interest costs associated with the contract differ then they would be relevant and should be included in the analysis.
- (xiii) Depreciation is a sunk cost and irrelevant for decision-making.

11.27 (a) (i)

Product	A (£)	B (£)	C (£)
Selling price	15	12	11
Less variable costs:			
Materials	(5)	(4)	(3)
Labour	(3)	(2)	(1.5)
Variable overhead (1)	(3.50)	(2)	(1.5)
Contribution	3.50	4	5

Note:

- (1) Fixed overheads are apportioned to products on the basis of sales volume and the remaining overheads are variable with output.

(ii)

Product	B (£)	C (£)
Selling price	12	9.50
Less variable costs:		
Materials	(4)	(3)
Labour	(2)	(1.80)
Variable overhead	(2)	(1.50)
Contribution	<u>4</u>	<u>3.20</u>

(b) (i)

Product	A	B	C	Total
Total contribution	350 000	480 000	400 000	1 230 000
Less fixed costs:				
Labour				(220 000)
Fixed administration				(900 000)
Profit				<u>110 000</u>

(ii)

Product	B	C	Total
Total contribution ^a	480 000	576 000	1 056 000
Less fixed costs:			
Labour ^b			(160 000)
Fixed administration ^c			(850 000)
Profit			<u>46 000</u>

Notes:

^aB = 120 000 units × £4 contribution,

C = 18 000 units × £3.20 contribution.

^b(25% × £320 000 for B) plus (25% × £160 000 × 2 for C).

^cFixed administration costs will decline by 1/3 of the amount apportioned to Product A (100/300 × £900 000). Therefore fixed overheads will decline from £900 000 to £850 000.

(c) Product A should not be eliminated even though a loss is reported for this product. If Product A is eliminated the majority of fixed costs allocated to it will still continue and will be borne by the remaining products. Product A generates a contribution of £350 000 towards fixed costs but the capacity released can be used to obtain an additional contribution from Product C of £176 000 (£576 000 – £400 000). This will result in a net loss in contribution of £174 000. However, fixed cost savings of £110 000 (£50 000 administration apportioned to Product A plus £100 000 labour for A less an extra £40 000 labour for Product C) can be obtained if Product A is abandoned. Therefore there will be a net loss in contribution of £64 000 (£174 000 – £110 000) and profits will decline from £110 000 to £64 000.

11.28 Profits will be increased up to the point where marginal cost equals marginal revenue (see Chapter 2 for a definition of marginal cost and marginal revenue). The following schedule shows the calculation of marginal cost and marginal revenues for different output levels.

Demand Units	Selling Price per unit (£)	Total Revenue (£)	Marginal Revenue (£)	Cost per unit (£)	Total Cost (£)	Marginal Cost (£)
		units × unit selling price		units × cost per unit		
1100	48	52 800	52 800	22	24 200	24 200
1200	46	55 200	2 500	21	25 200	1 000
1300	45	58 500	3 300	20	26 000	800
1400	42	58 800	300	19	26 600	600

Marginal cost exceeds marginal revenue at output levels above 1300 units. Therefore profits are maximized at an output level of 1300 units and a selling price of £45 per unit.

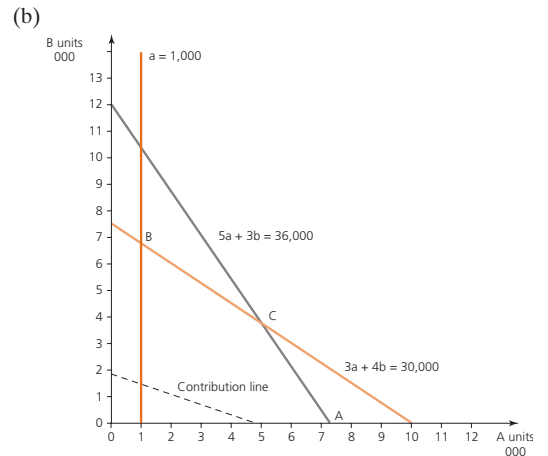
Chapter 12

12.6. The feasible output area is BCDA (see Chapter 12 for an explanation). To determine the optimal output level at which profits are maximized the objective function line (i.e. the contribution line OF) is extended to the right by a series of parallel lines. These lines take on higher total contribution levels as they are moved to the right. The aim is to determine the highest contribution attainable within the feasible region. This will occur at point D.

12.7 The feasible output area is the area to the left where constraints (1) and (3) intersect. To determine the optimal output level at which profits are maximized the objective function dotted line is extended to the right by a series of parallel lines. These lines take on higher total contribution levels as they are moved to the right. The aim is to determine the highest contribution attainable within the feasible region. This will occur at the point where constraint 1 intersects with the x-axis. Answer = D

12.8 Where the objective function is to minimize total costs the potential optimal solutions will be at the points closest to the origin that fall within the feasible region. Therefore the optimal solution will be at either points E or D. Note that total costs are lower for E compared with A since E and A entail the same output of U units but E has a lower output of A units. Answer = C

12.9 (a) Objective is to maximize profit:
 Let a = the number of units of A to be produced
 Let b = the number of units of B to be produced
 Objective function: $9a + 23b$
 Constraints:
 Non-negativity $b \geq 0$
 Minimum requirement of A $a \geq 1,000$
 Materials $3a + 4b \leq 30,000$
 Labour $5a + 3b \leq 36,000$



The feasible output region is ABC. To determine the contribution line, a random total contribution is selected. It is easier to establish a random

contribution if it is based on a common denominator for the objective function $9a + 23b$. If a random contribution of £41 400 is selected this could be obtained by producing 4600 units of A (£41 400/£9) or 1800 units of B (£41 400/£23). The objective function line for a total contribution of £41 400 is therefore drawn from 4600 units of A and 1800 units of B. This is represented by the dashed line in the diagram. To determine the optimal output level at which profits are maximized, the objective function dashed line is extended to the right by a series of parallel lines. These lines take on higher total contribution levels as they are moved to the right. The aim is to determine the highest contribution attainable within the feasible region. This will occur at the point B. At this point the equations $a = 1000$ and $3a + 4b = 30\,000$ are the binding constraints. Given that $a = 1000$ we can determine the value for b in the second equation:

$$3(1000) + 4b = 30\,000$$

so that, $b = 6750$.

Therefore the optimal production plan is to produce 1000 units of A and 6750 units of B.

12.10 (a) Let M = number of units of Masso produced and sold. Let R = number of units of Russo produced and sold. The linear programming model is as follows:

Maximize $Z = 40M + 50R$ (production contributions)
 subject to
 $M + 2R \leq 700$ (machining capacity)
 $2.5M + 2R \leq 1000$ (assembly capacity)
 $M \leq 400$ (maximum output of Masso constraint)
 $R \leq 400$ (maximum output of Russo constraint)
 $M \geq 0$
 $R \geq 0$

The constraints are plotted on the graph as follows:
 Machining constraint: line from $(M = 700, R = 0)$ to $(R = 350, M = 0)$
 Assembly constraint: line from $(M = 400, R = 0)$ to $(R = 500, M = 0)$
 Output of Masso constraint: line from $M = 400$
 Output of Russo constraint: line from $R = 400$

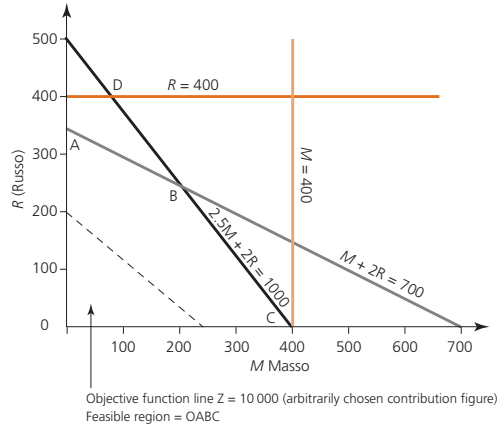
At the optimum point (B in the graph) the output mix is as follows:

	(£)
200 units of Masso at a contribution of £40 per unit =	8 000
250 units of Russo at a contribution of £50 per unit =	<u>12 500</u>
Total contribution	20 500
Less fixed costs (£7000 + £10 000)	<u>17 000</u>
Profit	<u>3 500</u>

The optimum output can be determined exactly by solving the simultaneous equations for the constraints that intersect at point B:

$$2.5M + 2R = 1000 \quad (1)$$

$$M + 2R = 700 \quad (2)$$



Subtract equation (2) from equation (1):

$$1.5M = 300$$

$$M = 200$$

Substituting in equation (1):

$$2.5 \times 200 + 2R = 1000$$

$$R = 250$$

(b) Machining capacity

If we obtain additional machine hours, the line $M + 2R = 700$ will shift upward. Therefore the revised optimum point will fall on the line BD. If one extra machine hour is obtained, the constraints $M + 2R = 700$ and $2.5M + 2R$ will still be binding and the new optimum plan can be determined by solving the following equations:

$$M + 2R = 701 \text{ (revised machining constraint)}$$

$$2.5M + 2R = 1000 \text{ (unchanged assembly constraint)}$$

The values for M and R when the above equations are solved are $M = 199.33$ and $R = 250.83$.

Therefore Russo is increased by 0.83 units and Masso is reduced by 0.67 units and the change in contribution will be as follows:

Increase in contribution from Russo $(0.83 \times £50)$	= 41.50	
Decrease in contribution from Masso $(0.67 \times £40)$	= <u>(26.80)</u>	
Increase in contribution		14.70

Hence the value of an independent marginal increase in machine capacity is £14.70 per hour.

Assembly capacity

With an additional hour of assembly capacity, the new optimum plan will be given by the solution of the following equations:

$$M + 2R = 700 \text{ (unchanged machining constraint)}$$

$$2.5M + 2R = 1001 \text{ (revised assembly constraint)}$$

The values for M and R when the above equations are solved are $M = 200.67$ and $R = 249.67$. Therefore Masso is increased by 0.67 units and Russo is decreased by 0.33 units, and the change in contribution will be as follows:

Increase in contribution from Masso $(0.67 \times £40)$	= 26.80	
Decrease in contribution from Russo $(0.33 \times £50)$	= <u>(16.50)</u>	
Increase in contribution		10.30

Hence the value of an independent marginal increase in assembly capacity is £10.30 per hour.

- (c) The assumptions underlying the above calculations are:
 - (i) linearity over the whole output range for costs, revenues and quantity of resources used;
 - (ii) divisibility of products (it is assumed that products can be produced in fractions of units);
 - (iii) divisibility of resources (supplies of resources may only be available in specified multiples);
 - (iv) the objectives of the firm (it is assumed that the single objective of a firm is to maximize short-term contribution);
 - (v) all of the available opportunities for the use of the resources have been included in the linear programming model.

Chapter 13

13.16

	W (£000)	X (£000)	Y (£000)
Gross margin	1100	1750	1200
Less customer related costs:			
Sales visits at £500 per visit	55	50	85
Order processing at £100 per order placed	100	100	150
Despatch costs at £100 per order placed	100	100	150
Billing and collections at £175 per invoice raised	<u>157</u>	<u>210</u>	<u>262</u>
Profit/(loss)	<u>688</u>	<u>1290</u>	<u>553</u>
Ranking	2	1	3

Answer = C

13.17 Budgeted number of batches per product:

$$D = 1000 (100\ 000/100)$$

$$R = 2000 (100\ 000/50)$$

$$P = \frac{2000 (50\ 000/25)}{5000}$$

Budgeted machine set-ups:

$$D = 3\ 000 (1000 \times 3)$$

$$R = 8\ 000 (2000 \times 4)$$

$$P = \frac{12\ 000 (2000 \times 6)}{23\ 000}$$

$$\text{Budgeted cost per set-up} = \frac{£150\ 000}{23\ 000} = £6.52$$

$$\text{Budgeted set-up cost per unit of R} = \frac{£6.52 \times 4}{50} = £0.52$$

Answer = A

- 13.18 (a) (i) Service (or support) centres (see Chapter 4) exist to provide services of various kinds to other units within the organization. They provide essential services to support the production process, but they do not deal directly with the products produced. Examples include stores and maintenance departments.

- (ii) A production centre is a centre where units of output are actually made. Examples include machining and assembly centres.

Overheads are assigned to service centres and the total costs of the service centres are allocated to production centres resulting in all overheads being assigned only to production centres.

Overhead rates are established for each production centre and service centre costs are assigned to production within the production centre overhead rates.

- (b) See 'A comparison of traditional and ABC systems' and 'Volume-based and non-volume-based cost drivers' in Chapter 13 for the answer to this question.

- 13.19 The answer to the question should describe the two-stage overhead allocation process and indicate that most cost systems use direct labour hours in the second stage. In today's production environment direct labour costs have fallen to about 10% of total costs for many firms and it is argued that direct labour is no longer a suitable base for assigning overheads to products. Using direct labour encourages managers to focus on reducing direct labour costs when they represent only a small percentage of total costs.

Approaches which are being adopted include:

- (i) Changing from a direct labour overhead-recovery rate to recovery methods based on machine time. The justification for this is that overheads are caused by machine time rather than direct labour hours and cost.
- (ii) Implementing activity-based costing systems that use many different cost drivers in the second stage of the two-stage overhead allocation procedure.

The answer should then go on to describe the benefits of ABC outlined in Chapter 13. Attention should also be drawn to the widespread use of direct labour hours by Japanese companies. According to Hiromoto¹ Japanese companies allocate overhead costs using the direct labour cost/hours to focus design engineers' attention on identifying opportunities to reduce the products' labour content. They use direct labour to encourage designers to make greater use of technology because this frequently improves long-term competitiveness by increasing quality, speed and flexibility of manufacturing.

Notes

¹Hiromoto, T. (1988) 'Another hidden edge – Japanese management accounting', *Harvard Business Review*, July/August, pp. 22–6.

- 13.20 (a) Total machine hours = $(120 \times 4 \text{ hrs}) + (100 \times 3 \text{ hrs}) + (80 \times 2 \text{ hrs}) + (120 \times 3 \text{ hrs}) = 1300 \text{ hrs}$

$$\text{Machine hour overhead rate} = \frac{£10\ 430 + £5250 + £3600 + £2100 + £4620}{1300 \text{ hrs}} = £20 \text{ per machine hour}$$

Product	A (£)	B (£)	C (£)	D (£)
Direct material	40	50	30	60
Direct labour	28	21	14	21
Overheads at £20 per machine hour	<u>80</u>	<u>60</u>	<u>40</u>	<u>60</u>
	<u>148</u>	<u>131</u>	<u>84</u>	<u>141</u>
Units of output	120	100	80	120
Total cost	£17 760	£13 100	£6720	£16 920

(b)

Costs	Cost driver (£)	Cost driver transactions	Cost per unit (£)
Machine department	10 430	Machine hours 1300 hours	8.02
Set-up costs	5 250	Production runs 21	250
Stores receiving	3 600	Requisitions raised 80 (4 × 20)	45
Inspection/quality control	2 100	Production runs 21	100
Materials handling	4 620	Number of orders executed 42	110

Note

Number of production runs = Total output (420 units)/20 units per set-up.
 Number of orders executed = Total output (420 units)/10 units per order.
 The total costs for each product are computed by multiplying the cost driver rate per unit by the quantity of the cost driver consumed by each product.

	A	B	C	D
Prime costs	8 160 (£68 × 120)	7 100	3520	9 720
Set ups	1 500 (£250 × 6)	1 250 (£250 × 5)	1000	1 500
Stores/receiving	900 (£45 × 20)	900	900	900
Inspection/quality	600 (£100 × 6)	500	400	600
Handling/despatch	1 320 (£110 × 12)	1 100 (£110 × 10)	880	1 320
Machine dept cost*	<u>3 851</u>	<u>2 407</u>	<u>1284</u>	<u>2 888</u>
Total costs	<u>16 331</u>	<u>13 257</u>	<u>7984</u>	<u>16 928</u>

Note

*A = 120 units × 4 hrs × £8.02; B = 100 units × 3 hrs × £8.02

(c) Cost per unit

Costs from (a)	148.00	131.00	84.00	141.00
Costs from (b)	<u>136.09</u>	<u>132.57</u>	<u>99.80</u>	<u>141.07</u>
Difference	(11.91)	1.57	15.80	0.07

Product A is over-costed with the traditional system. Products B and C are under-costed and similar costs are reported with Product D. It is claimed that ABC more accurately measures resources consumed by products. Where cost-plus pricing is used, the transfer to an ABC system will result in different product prices. If activity-based costs are used for stock valuations then stock valuations and reported profits will differ.

Chapter 14

14.7 The calculation of accurate expected values are dependent on the accuracy of the probability distribution. It also takes no account of risk. Therefore the answer is D.

14.8 Expected income with advertising = (£200 000 × 0.95) + (£70 000 × 0.05) = £193 500
 Expected income without advertising = (£200 000 × 0.7) + (£70 000 × 0.3) = £161 000
 The maximum amount the company should pay for advertising is the increase in expected value of £32 500. Therefore the answer is A.

14.9 Answer = A

14.10 Expected value of new building = (0.8 × £2 million) + (0.2 × £1 million) – £1 million = £0.8 million
 Expected value of upgrade = (0.7 × £2 million) + (0.3 × £1 million) – upgrade (?) = £1.7 million – upgrade

Cost of upgrade to make the company financially indifferent = £0.9 million (1.7 – 0.8 million)
 Answer = B

14.11 (a)

Expected cash flows	Ranking
L = (£500 × 0.2) + (£470 × 0.5) + (£550 × 0.3) = £500	2
M = (£400 × 0.2) + (£550 × 0.5) + (£570 × 0.3) = £526	1
N = (£450 × 0.2) + (£400 × 0.5) + (£475 × 0.3) = £432.5	4
O = (£360 × 0.2) + (£400 × 0.5) + (£420 × 0.3) = £398	5
P = (£600 × 0.2) + (£500 × 0.5) + (£425 × 0.3) = £497.5	3

Answer = B

(b) Without additional information machine M (see part a) will be purchased. If perfect information is obtained the choice will be matched with the level of demand. Therefore if the market condition is predicted to be poor P will be chosen and if the market condition is predicted to be good or excellent M will be chosen. The expected values of these outcomes is:

(£600 × 0.2 for P) + (£550 × 0.5 for M) + (£570 × 0.3 for M) = £566

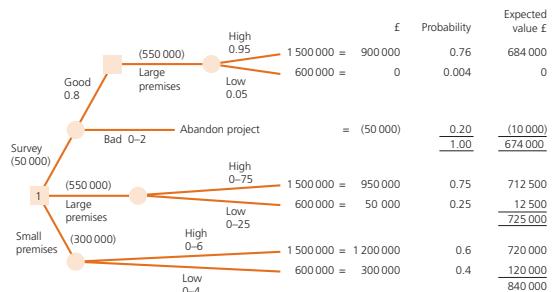
This represents an increase in £40 000 expected value (£566 – £526)

Answer = D

14.12 The decision tree is shown in Figure 14.12. The company is faced with choosing between three alternatives at the decision point (represented by the box labelled 1 in the diagram). The circles represent the possible outcomes that can occur and the probabilities of these outcomes are shown on the lines emanating from the circles. Note that for the first alternative (undertaking the survey) the probabilities for the two branches in the top right hand corner of the diagram are derived from the joint probabilities of two events occurring (i.e. the multiplication of the probability of one event occurring by the probability of the other event occurring). Therefore the probabilities are 0.76 (0.95 × 0.8), 0.004 (0.8 × 0.05) and 0.2 (1 × 0.2).

The highest expected value is £840 000 for the third alternative (build the small premises without any survey) and, based on the expected value decision rule, this alternative should be chosen.

FIGURE 14.12 Decision tree



Chapter 15

- 15.11 Using the interpolation method the IRR is:

$$15\% + \frac{£3664}{(£3664 + £21\,451)} \times (20\% - 15\%) = 15.7\%$$

Answer = A

- 15.12 Because the same amount is paid each period the cumulative (annuity) discount tables in Appendix B can be used. For 12 periods at 3% the annuity factor is 9.954. The present value 3 months from now will be £2986 (300×9.954). Assuming that the first payment is made at the beginning of month 3 this is the equivalent to the end of month 2 for discounting purposes. Therefore it is necessary to discount the present value back two months (periods) to today (time zero). Using the discount factor from Appendix A for 3% and 2 periods the present value at time zero is £2816 ($£2986 \times 0.9426$). Therefore the answer is A.

- 15.13 Answer = B

- 15.14

Time	Cash flow (£000)	Discount factor at 8%	Present value (£000)
0	(20 000)	1.0	(20 000)
1–4	3 000	3.312	9 936
5–8	7 000	2.435 (5.747 – 3.312)	17 045
10	(10 000)	0.463	(4 630)
		NPV	<u>2 351</u>

Note that the discount factors for periods 1–4 and 5–8 are derived from the annuity tables since the cash flows are constant per period for the time period involved.
Answer = D

- 15.15 Applying formula 15.5 shown in Chapter 15:

$$IRR = 10\% + \left(\frac{383}{383 - (-246)} \right) (15\% - 10\%)$$

$$IRR = 10\% + \left(\frac{383}{383 + 246} \right) \times 5\%$$

$$IRR = 10\% + \left(\frac{383}{629} \right) \times 5\%$$

$$IRR = 10\% + 3\% = 13\%$$

Answer = B

- 15.16 Answer = A (Note that if the cash inflows exceeded the outflows the line from the y axis would start from above zero).

- 15.17 The present value of a perpetuity can be calculated using the formula:

Cash flow per period/the interest rate

The above formula is based on the assumption that the first cash flow is received in one period's time but the question states that the first cash flow is received immediately.

Let CF represent the annual cash flow

$$CF + CF/0.08 = £5\,000$$

$$0.08CF + CF = £5\,000 \times 0.08$$

$$1.08CF = £400$$

$$CF = £400/1.08 = £370.37$$

Answer = A

- 15.18 The annual percentage rate (APR) IS 12.68%, which is based on annual payments.

$$\text{Monthly interest rate} = \sqrt[12]{1.1268} - 1 = 0.01 \text{ so that } r = 1\%$$

In other words a monthly interest rate compounded for 12 periods at 1% is equivalent to an annual rate of 12.68%. This is derived from using the compound interest formula used in the chapter = $(1 + 0.01)^{12} - 1 = 0.1268 = 12.68\%$

To determine the future value of an annuity where a constant amount is invested each period the future value

$$= A \left[\frac{(1+r)^n - 1}{r} \right] \text{ where } r \text{ is the rate of interest per period and } A \text{ is the annuity amount.}$$

$$\text{Future value} = 50 \times \left[\frac{1.01^{13 \times 12} - 1}{.01} \right] = £18\,610$$

Answer = D

- 15.19 Because the investment is a constant amount each period we can use the annuity future value formula shown in the answer to question 15.18.

$$\text{Future value} = £5 \times \left[\frac{1.005^{12 \times 5} - 1}{.005} \right] = £348.85$$

Answer = C

- 15.20 Because the investment is a constant amount each period we can use the annuity future value formula shown in the answer to question 15.18:

$$\text{Future value} = A \left[\frac{(1+r)^n - 1}{r} \right] \text{ where } r \text{ is the rate of interest per period and } A \text{ is the annuity amount.}$$

$$£7000 = A \times \left[\frac{1.005^{12 \times 5} - 1}{.005} \right]$$

$$£7000 = 69.77A$$

$$A = £100.33$$

Answer = C

- 15.21 The loan represents the present value of a series of repayments over a three year period. Since the payments are constant per period we can use the following annuity present value formula:

$$\text{Present value} = \frac{A}{r} \left[1 - \frac{1}{(1+r)^n} \right]$$

where A is the annuity amount and r is the interest rate per period.

The annual interest rate must be converted to a monthly rate since we are dealing with monthly repayments.

$$\text{Monthly interest rate} = \sqrt[12]{1.10} - 1 = .0079 \text{ (i.e. } 0.79\%)$$

$$\text{Present value (2000)} = \frac{A}{0.0079} \left[1 - \frac{1}{1.0079^{36}} \right]$$

$$2000 = \frac{A}{0.0079} (0.2467)$$

$$2000 (0.0079) = 0.2467A$$

$$A = 15.8 / .2467 = £64.04$$

Answer = B

15.22 Investment 1

Time	Cash Flows £000	Discount factor at 10%	Present Value £000
0	(75)	1	(75)
1-4	25	3.17	79.25
5	5	0.621	<u>3.105</u>
			<u>7.355</u>

Investment 2

Time	Cash Flows £000	Discount factor at 10%	Present Value £000
0	(100)	1	(100)
1-∞	11	1/0.1 = 10	<u>110</u>
			<u>10</u>

Investment 3

Time	Cash Flows £000	Discount factor at 10%	Present Value £000
0	(125)	1	(125)
1	30	0.909	27.27
2	40	0.826	33.04
3	50	0.751	37.55
4	60	0.683	40.98
5	(10)	0.621	<u>(6.21)</u>
			<u>7.63</u>

Since investment 2 has the highest net present value it would be the preferred investment.

15.23 (a) Applying the formula shown in question 15.18:

$$\text{Future value} = 50 \times \left[\frac{1.01^{10 \times 12} - 1}{0.01} \right] = £11\,501.94$$

We must now compound forward a further 5 years at an annual rate of 15%:

$$£11\,501.95 \times (1.15)^5 = £23\,134.53$$

(b) (i)

Loan 1

APR of 9.38% results in a monthly rate of $\sqrt[12]{1.0938} = 1.0075$ so that $r = .0075$ (i.e. .75%)

The loan represents the present value of a series of repayments over a three year period. Since the payments are constant per period we can use the following annuity present value formula:

$$\text{Present value} = \frac{A}{r} \left[1 - \frac{1}{(1+r)^n} \right]$$

where A is the annuity amount and r is the interest rate per period.

$$\text{Present value (2000)} = \frac{A}{0.0075} \left[1 - \frac{1}{1.0075^{36}} \right]$$

$$2000 = \frac{A}{0.0075} (0.23585)$$

$$2000 (0.0075) = 0.23585A$$

$$A = 15 / .23585 = £63.60$$

Loan 2

APR of 12.68% results in a monthly rate of $\sqrt[12]{1.1268} = 1.01$ so that $r = .01$ (i.e. 1%)

$$\text{Present value (2000)} = \frac{A}{0.01} \left[1 - \frac{1}{1.01^{24}} \right]$$

$$2000 = \frac{A}{.01} (0.2124)$$

$$2000 (.01) = 0.2124A$$

$$A = 20 / .2124 = £94.16$$

(ii)

Loan 1 total amount repaid = £63.60 × 36 = £2289.60

Loan 2 total amount repaid = £94.16 × 24 = £2259.84

Loan 2 is the slightly cheaper loan

15.24 (a) (i) Average capital invested

$$= \frac{£50\,000 + £10\,000}{2} = £30\,000$$

For an explanation of why the project's scrap value is added to the initial cost to calculate the average capital employed, you should refer to note 1 at the end of Chapter 15.

Note that the mid-point of the project's life is two years and the written down value at the end of year 2 is £30 000.

Average annual profit (Project A)

$$= \frac{£25\,000 + £20\,000 + £15\,000 + £10\,000}{4}$$

$$= £17\,500$$

Average annual profit (Project B)

$$= \frac{£10\,000 + £10\,000 + £14\,000 + £26\,000}{4}$$

$$= £15\,000$$

Average annual return:

$$\text{A} \quad \left(\frac{£17\,500}{£30\,000} \times 100 \right)$$

$$\text{B} \quad \left(\frac{£15\,000}{£30\,000} \times 100 \right)$$

(ii) Payback period:

$$\text{Project A} \quad \left(1 + \frac{£15\,000}{£30\,000} \right)$$

$$\text{Project B} \quad \left(2 + \frac{£10\,000}{£24\,000} \right)$$

(iii)

Year	Project A Cash inflows (W1) (£)	Project B Cash inflows (W1) (£)	Discount factor	Project A PV (£)	Project B PV (£)
1	35 000	20 000	0.909	31 815	18 180
2	30 000	20 000	0.826	24 780	16 520
3	25 000	24 000	0.751	18 775	18 024
4	20 000	36 000	0.683	13 660	24 588
4	10 000	10 000	0.683	<u>6 830</u>	<u>6 830</u>
				95 860	84 142
				Investment cost (50 000)	(50 000)
				NPV	<u>45 860</u>
					<u>34 142</u>

Workings:

(W1) Cash flows = Profit + depreciation.

Note that the estimated resale value is included as a year 4 cash inflow.

- (b) See Chapter 15 for the answer to this section of the problem.
- (c) Project A is recommended because it has the highest NPV and also the shortest payback period.

15.25 (a) The IRR is where:

$$\begin{aligned} \text{annual cash inflows} \times \text{discount factor} &= \text{investment cost} \\ \text{i.e. } 4000 \times \text{discount factor} &= \text{£14 000} \\ \text{Therefore } \text{discount factor} &= \frac{\text{£14 000}}{\text{£4 000}} \\ &= 3.5 \end{aligned}$$

We now work along the five-row table of the cumulative discount tables to find the discount rate with a discount factor closed to 3.5. This is 13%. Therefore the IRR is 13%.

- (b) The annual saving necessary to achieve a 12% internal rate of return is where:

$$\begin{aligned} \text{annual savings} \times 12\% \text{ discount factor} &= \text{investment cost} \\ \text{i.e. } \text{annual savings} \times 3.605 &= \text{£14 000} \\ \text{Therefore annual savings} &= \frac{\text{£14 000}}{3.605} \\ &= \underline{\underline{\text{£3 883}}} \end{aligned}$$

- (c) NPV is calculated as follows:

£4000 received annually from years 1–5:	(£)
£4000 × 3.791 discount factor	15 164
Less investment cost	<u>14 000</u>
NPV	<u>1 164</u>

- 15.26 (a) Project A = 3 years + $\frac{350 - 314}{112} = 3.32$ years
 Project B = 3.0 years
 Project C = 2.00 years

- (b) Accounting rate of return = average profit/average investment

$$\begin{aligned} \text{Project A} &= 79/175 = 45\% \\ \text{Project B} &= 84/175 = 48\% \\ \text{Project C} &= 70/175 = 40\% \end{aligned}$$

Note that average profit = (sum of cash flows – investment cost)/project's life.

- (c) The report should include:

- (i) NPVs of each project (project A = £83 200 (W1), project B = £64 000 (W2), project C = £79 000 (W3). A simple description of NPV should also be provided. For example, the NPV is the amount over and above the cost of the project which could be borrowed, secure in the knowledge that the cash flows from the project will repay the loan.
- (ii) The following rankings are based on the different evaluation procedures:

Project	IRR	Payback	ARR	NPV
A	2	3	2	1
B	3	2	1	3
C	1	1	3	2

- (iii) A discussion of each of the above evaluation procedures.

- (iv) IRR is subject to the following criticisms:
 1. Multiple rates of return can occur when a project has unconventional cash flows.
 2. It is assumed that the cash flows received from a project are re-invested at the IRR and not the cost of capital.
 3. Inability to rank mutually exclusive projects.
 4. It cannot deal with different sized projects. For example, it is better to earn a return of 35% on £100 000 than 40% on £10 000.

Note that the above points are explained in detail in Chapter 15.

- (v) Payback ignores cash flows outside the payback period, and it also ignores the timing of cash flows within the payback period. For example, the large cash flows for project A are ignored after the payback period. This method may be appropriate for companies experiencing liquidity problems who wish to recover their initial investment quickly.
- (vi) Accounting rate of return ignores the timing of cash flows, but it is considered an important measure by those who believe reported profits have a significant impact on share prices.
- (vii) NPV is generally believed to be the theoretically correct evaluation procedure. A positive NPV from an investment is supposed to indicate the increase in the market value of the shareholders' funds, but this claim depends upon the belief that the share price is the discounted present value of the future dividend stream. If the market uses some other method of valuing shares then a positive NPV may not represent the increase in market value of shareholders' funds. Note that the cash flows have been discounted at the company's cost of capital. It is only suitable to use the company's cost of capital as the discount rate if projects A, B and C are equivalent to the average risk of all the company's existing projects. If they are not of average risk then project risk-adjusted discount rates should be used.
- (viii) The projects have unequal lives. It is assumed that the equipment will not be replaced.
- (ix) It is recommended that NPV method is used and project A should be selected.

- (d) Stadler prefers project C because it produces the highest accounting profit in year 3. Stadler is assuming that share prices are influenced by short-run reported profits. This is in contrast with theory, which assumes that the share price is the discounted present value of the future dividend stream. Stadler is also assuming that the market only has access to reported historical profits and is not aware of the future benefits arising from the projects. The stock market also obtains company information on future prospects from sources other than reported profits. For example, press releases, chairman's report and signals of future prosperity via increased dividend payments.

Workings

(W1) Project A = $(100 \times 0.8333) + (110 \times 0.6944) + (104 \times 0.5787) + (112 \times 0.4823) + (138 \times 0.4019) + (160 \times 0.3349) + (180 \times 0.2791) - \text{£}350$

(W2) Project B = $(40 \times 0.8333) + (100 \times 0.6944) + (210 \times 0.5787) + (260 \times 0.4823) + (160 \times 0.4019) - \text{£}350$

(W3) Project C = $(200 \times 0.8333) + (150 \times 0.6944) + (240 \times 0.5787) + (40 \times 0.4823) - \text{£}350$

(b) Gross profit = \$88 000 $(0.55 \times \$160\,000)$
 Cost of sales = \$72 000 $(\$160\,000 - \$88\,000)$
 Purchases = Cost of sales (\$72 000) + closing stock $(\$18\,700) - \text{opening stock } (\$16\,600)$
 = \$74 100
 Answer = (ii)

Chapter 16

16.10 Answer = A

16.11

	(£)	(£)
Cash sales		22 000
Credit sales		
April $(70\% \times 0.6 \times 0.98 \times \text{£}70\,000)$	28 812	
March $(27\% \times 0.6 \times \text{£}60\,000)$	<u>9 720</u>	<u>38 532</u>
		<u>60 532</u>

Answer = C

16.12 Number of units required to meet demand:

	Units
Sales	10 000
Add losing stock	500
Less opening stock	<u>(600)</u>
	<u>9 900</u>

There is a loss of 10% so the production required to meet demand is 11 000 units $(9900/0.9)$
 Answer = D

16.13 Answer = B

16.14 Answer = A

16.15

	Kg
Materials required to meet production requirements $(7200 \times 3\text{kg})$	21 600
Add budgeted closing stock	500
Less opening stock	<u>(400)</u>
Budgeted purchases	<u>21 700</u>

Answer = D

16.16 (a) Cash received = Sales (\$160 000) + Opening debtors $(\$27\,500) - \text{Closing debtors } (\$19\,400)$
 = \$168 100

Answer = (iv)

16.17 (a) Raw materials:

(Units)	March	April	May	June
Opening stock	100	110	115	110
Add: Purchases	<u>80</u>	<u>80</u>	<u>85</u>	<u>85</u>
	180	190	200	195
Less: Used in production	<u>70</u>	<u>75</u>	<u>90</u>	<u>90</u>
Closing stock	<u>110</u>	<u>115</u>	<u>110</u>	<u>105</u>
(Units) Finished production:				
Opening stock	110	100	91	85
Add: Production	<u>70</u>	<u>75</u>	<u>90</u>	<u>90</u>
	180	175	181	175
Less: Sales	<u>80</u>	<u>84</u>	<u>96</u>	<u>94</u>
Closing stock	<u>100</u>	<u>91</u>	<u>85</u>	<u>81</u>

(b) Sales:

					Total
(at £219 per unit)	£17 520	£18 396	£21 024	£20 586	<u>£77 526</u>
Production cost:					
Raw materials	3 024 (1)	3 321 (2)	4 050	4 050	14 445
(using FIFO)					
Wages and variable costs	<u>4 550</u>	<u>4 875</u>	<u>5 850</u>	<u>5 850</u>	<u>21 125</u>
	<u>£7 574</u>	<u>£8 196</u>	<u>£9 900</u>	<u>£9 900</u>	<u>£35 570</u>

Debtors:

Closing debtors = May + June sales = £41 610

Creditors:

June purchases 85 units \times £45 £3825

Notes:

(1) 70 units \times £4320/100 units = £3024.

(2) $(30 \text{ units} \times \text{£}4320/100 \text{ units} + (45 \text{ units} \times \text{£}45)) = \text{£}3321.$

Closing stocks:

Raw materials 105 units \times £45 £4725

Finished goods 81 units \times £110⁽¹⁾ £8910

Note:

⁽¹⁾Materials (£45) + Labour and Variable Overhead (£65).

It is assumed that stocks are valued on a variable costing basis.

(c) Cash budget:

	March (£)	April (£)	May (£)	June (£)
Balance b/fwd	6 790	4 820	5 545	132 415
Add: Receipts				
Debtors (two months' credit)	7 680	10 400	17 520	18 396
Loan	<u>—</u>	<u>—</u>	<u>120 000</u>	<u>—</u>
	(A) <u>14 470</u>	<u>15 220</u>	<u>143 065</u>	<u>150 811</u>
Payments:				
Creditors (one month's credit)	3 900	3 600	3 600	3 825
		$(80 \times \text{£}45)$		
Wages and variable overheads	4 550	4 875	5 850	5 850
Fixed overheads	1 200	1 200	1 200	1 200
Machinery	<u>—</u>	<u>—</u>	<u>—</u>	<u>112 000</u>
Interim dividend	<u>—</u>	<u>—</u>	<u>—</u>	<u>12 500</u>
	(B) <u>9 650</u>	<u>9 675</u>	<u>10 650</u>	<u>135 375</u>
Balance c/fwd	(A) - (B) <u>4 820</u>	<u>5 545</u>	<u>132 415</u>	<u>£15 436</u>

(d) *Master budget:*

Budgeted trading and profit and loss account for the four months to 30 June

	(£)	(£)
Sales		77 526
Cost of sales: Opening stock finished goods	10 450	
<i>Add:</i> Production cost	<u>35 570</u>	
	46 020	
<i>Less:</i> Closing stock finished goods	<u>8 910</u>	<u>37 110</u>
		40 416
<i>Less:</i> Expenses		
Fixed overheads (4 × £1200)	4 800	
<i>Depreciation</i>		
Machinery and equipment	15 733	
Motor vehicles	3 500	
Loan interest (2/12 × 7½% of £120 000)	<u>1 500</u>	<u>25 533</u>
		14 883
<i>Less:</i> Interim dividends		<u>12 500</u>
		2 383
<i>Add:</i> Profit and loss account balance b/fwd		<u>40 840</u>
		<u>£43 223</u>

Budgeted balance sheet as at 30 June

	Cost (£)	Depreciation to date (£)	Net (£)
<i>Fixed assets</i>			
Land and buildings	500 000	—	500 000
Machinery and equipment	236 000	100 233	135 767
Motor vehicles	<u>42 000</u>	<u>19 900</u>	<u>22 100</u>
	<u>778 000</u>	<u>120 133</u>	<u>657 867</u>
<i>Current assets</i>			
Stock of raw materials		4 725	
Stock of finished goods		8 910	
Debtors		41 610	
Cash and bank balances		<u>15 436</u>	
		70 681	
<i>Less:</i> Current liabilities			
Creditors	3 825		
Loan interest owing	1 500	5 325	<u>65 356</u>
			<u>£723 223</u>
			(£)
<i>Capital employed</i>			
Ordinary share capital £1 shares (fully paid)			500 000
Share premium			60 000
Profit and loss account			<u>43 233</u>
			603 223
Secured loan (7½%)			<u>120 000</u>
			<u>£723 223</u>

(e) See the section of cash budgets in Chapter 16 for possible ways to improve cash management.

16.18 *Task 1*

Alderley Ltd Budget Statements 13 weeks to 4 April

(a) Production Budget

	Elgar units	Holst units
Budgeted sales volume	845	1235
<i>Add</i> closing stock ^a	78	1266
<i>Less</i> Opening stock	<u>(163)</u>	<u>(361)</u>
Units of production	<u>760</u>	<u>1140</u>

(b) Material Purchases Budget

	Elgar kg	Holst kg	Total kg
Material consumed	5320 (760 × 7)	9120 (1140 × 8)	14 440
<i>Add</i> raw material closing stock ^b			2 888
<i>Less</i> raw material opening stock			<u>(2 328)</u>
Purchases (kg)			<u>15 000</u>

(c) Purchases (£) (1500 × £12)

£180 000

(d) Production Labour Budget

	Elgar hours	Holst hours	Total hours
Standard hours produced ^c	6080	5700	11 780
Productivity adjustment (5/95 × 11 780)			<u>620</u>
Total hours employed			12 400
Normal hours employed ^d			<u>11 544</u>
Overtime hours			<u>856</u>

(e) Labour cost

	£
Normal hours (11 544 × £8)	92 352
Overtime (856 × £8 × 125%)	<u>8 560</u>
Total	<u>100 912</u>

Notes:

^aNumber of days per period = 13 weeks × 5 days = 65

Stock: Elgar = (6/65) × 845 = 78, Holst = (14/65) × 1235 = 266

^b(13/65) × (5320 + 9120) = 2888

^cElgar 760 × 8 hours = 6080, Holst 1140 × 5 hours = 5700

^d24 employees × 37 hours × 13 weeks = 11 544

Task 2

(a) Four ways of forecasting future sales volume are:

- (i) Where the number of customers is small it is possible to interview them to ascertain what their likely demand will be over the forecasting period.
- (ii) Produce estimates based on the opinion of executives and sales personnel. For example, sales personnel may be asked to estimate the sales of each product to their customers, or regional sales managers may estimate the total sales for each of their regions.
- (iii) Market research may be necessary where it is intended to develop new products or new markets. This may involve interviews with existing and potential customers in order to estimate potential demand.
- (iv) Estimates involving statistical techniques that incorporate general business and market conditions and past growth in sales.

(b) Interviewing customers and basing estimates on the opinions of sales personnel are likely to be more appropriate for existing products and customers involving repeat sales. Market research is appropriate for new products or markets and where the market is large and anticipated revenues are likely to be sufficient to justify the cost of undertaking the research.

Statistical estimates derived from past data are likely to be appropriate where conditions are likely to be stable and past demand patterns are likely to be repeated through time. This method is most suited to existing products or markets where sufficient data is available to establish a trend in demand.

(c) The major limitation of interviewing customers is that they may not be prepared to divulge the information if their future plans are commercially sensitive. There is also no guarantee that the orders will be placed with Alderley Ltd. They may place their orders with competitors.

Where estimates are derived from sales personnel there is a danger that they might produce over-optimistic estimates in order to obtain a favourable performance rating at the budget setting stage. Alternatively, if their future performance is judged by

their ability to achieve the budgeted sales they may be motivated to underestimate sales demand.

Market research is expensive and may produce unreliable estimates if inexperienced researchers are used. Also small samples are often used which may not be indicative of the population and this can result in inaccurate estimates.

Statistical estimates will produce poor demand estimates where insufficient past data is available, demand is unstable over time and the future environment is likely to be significantly different from the past. Statistical estimates are likely to be inappropriate for new products and new markets where past data is unavailable.

16.19 (a) (i) Cash budget for weeks 1–6

	Week 1 (£)	Week 2 (£)	Week 3 (£)	Week 4 (£)	Week 5 (£)	Week 6 (£)
Receipts from debtors ^a	24 000	24 000	28 200	25 800	19 800	5 400
Payments:						
To material suppliers ^b	8 000	12 500	6 000	nil	nil	nil
To direct workers ^c	3 200	4 200	2 800	nil	nil	nil
For variable overheads ^d	4 800	3 200	nil	nil	nil	nil
For fixed overhead ^e	8 300	8 300	6 800	6 800	6 800	6 800
Total payments	24 300	28 200	15 600	6 800	6 800	6 800
Net movement	(300)	(4 200)	12 600	19 000	13 000	(1 400)
Opening balance (week 1 given)	1 000	700	(3 500)	9 100	28 100	41 100
Closing balance	700	(3 500)	9 100	28 100	41 100	39 700

Notes

^aDebtors:

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Units sold ^f	400	500	400	300	—	—
Sales (£)	24 000	30 000	24 000	18 000	—	—
Cash received (70%)		16 800	21 000	16 800	12 600	
(30%)			7 200	9 000	7 200	5 400
Given	24 000	7 200				
Total receipts (£)	24 000	24 000	28 200	25 800	19 800	5 400

^fSales in week 4 = opening stock (600 units) + production in weeks 1 and 2 (1000 units) less sales in weeks 1–3 (1300 units) = 300 units.

^bCreditors:

	Week 1 (£)	Week 2 (£)	Week 3 (£)	Week 4	Week 5	Week 6
Materials consumed at £15	9 000	6 000	—	—	—	—
Increase in stocks	3 500	—				
Materials purchased	12 500	6 000				
Payment to suppliers (given)	8 000	12 500	6 000	nil	nil	nil

^cWages:

	Week 1 (£)	Week 2 (£)	Week 3 (£)	Week 4	Week 5	Week 6
Wages consumed at £7	4 200	2 800	nil	nil	nil	nil
Wages paid (given)	3 200	4 200	2 800	—	—	—

^dVariable overhead payment = budgeted production × budgeted cost per unit.

^eFixed overhead payments for weeks 1–2 = fixed overhead per week (£9000), less weekly depreciation (£700).

Fixed overhead payments for weeks 3–6 = £8300 normal payment less £1500 per week.

(ii) Comments

1. Finance will be required to meet the cash deficit in week 2, but a lowering of the budgeted material stocks at the end of week 1 would reduce the amount of cash to be borrowed at the end of week 2.
2. The surplus cash after the end of week 2 should be invested on a short-term basis.

3. After week 6, there will be no cash receipts, but cash outflows will be £6800 per week. The closing balance of £39 700 at the end of week 6 will be sufficient to finance outflows for a further 5 or 6 weeks (£39 700/£6800 per week).

(b) The answer should include a discussion of the matching concept, emphasizing that revenues and expenses may not be attributed to the period when the associated cash inflows and outflows occur. Also, some items of expense do not affect cash outflow (e.g. depreciation).

Chapter 17

17.19 Answer = A

17.20 Residual income = £120 000 – (18% × £650 000) = £3000
Answer = A

17.21 Divisional managers do not control the cash function. Therefore controllable net assets should exclude the cash overdraft so controllable net assets are £125 000 (£101 000 + £24 000).

Controllable residual income = £69 000 (Profit before interest and tax)
Less cost of capital = 12 500 (10% × 125 000)
Residual income = 56 500
Answer = B

17.22 Working backwards to derive the divisional contribution:

	£
Cost of capital charge	150 000 (£1.25m × 12%)
Residual income	47 200
Profit	197 200
Depreciation	247 500
Fixed costs	487 000
Total contribution	931 700
Contribution per unit = £31.06 (£931 700/30 000 units)	

Answer = D

17.23 (a)

	Flexed budget	Actual results	Variance
Sales (units)	9 750	9 750	
Production (units)	11 000	11 000	
	£000	£000	£000
Sales revenue	292.5 = (30 × 9750)	325	32.5 favourable
Cost of sales:			
Opening stock	0	0	
Production costs:			
Materials	55 = (5 × 11 000)	65	10 adverse
Labour	99 = (9 × 11 000)	100	1 adverse
Fixed production overheads	96 (1) = (8 × 12 000)	95	1 favourable
	250	260	10 adverse
Closing stock	27.5 = (£22 × (11 000 – 9750))	27.5	
	222.5	232.5	
Profit	70	92.5	22.5 favourable

(b) The variance will have arisen because the actual selling price was greater than the budgeted price. The adverse materials variance may have resulted either because the number of kg used, or the amount paid per kg, was greater than expected.

17.24 (a) A fixed budget refers to a budget which is designed to remain unchanged irrespective of the level of activity, whereas a flexible budget is a budget which adjusts the expense items for different levels of activity. See 'Flexible budgets' in Chapter 17 for an explanation of the objectives of flexible budgeting.

(b) (i)

Direct labour	£180 000	£202 500	£225 000
Direct labour hours	48 000	54 000	60 000
<i>Flexible budget (overhead expenditure):</i>			
Activity levels	80%	90%	100%
Direct labour hours	48 000	54 000	60 000
Variable costs	(£)	(£)	(£)
Indirect labour at £0.75 per direct labour hour	36 000	40 500	45 000
Consumable supplies at £0.375 per direct labour hour	18 000	20 250	22 500
Canteen and other welfare services at 6% of direct plus indirect wages	12 960	14 580	16 200
Semi-variable: variable (W1)	<u>9 600</u>	<u>10 800</u>	<u>12 000</u>
	76 560	86 130	95 700
Semi-variable: fixed (W1)	8 000	8 000	8 000
Fixed costs:			
Depreciation	18 000	18 000	18 000
Maintenance	10 000	10 000	10 000
Insurance	4 000	4 000	4 000
Rates	15 000	15 000	15 000
Management salaries	<u>25 000</u>	<u>25 000</u>	<u>25 000</u>
	156 560	166 130	175 700

Workings:

(W1) Obtained by using High and Low points method:

			(£)
High	64 000	Direct labour hours	20 800
Low	<u>40 000</u>	Direct labour hours	<u>16 000</u>
	<u>24 000</u>		<u>4 800</u>

$\frac{£4\ 800}{24\ 000} = £0.20$ per direct labour hour

$64\ 000 \times £0.20 = £12\ 800$ variable costs

Total costs £20 800

∴ Fixed costs £8 000

(ii) Variable cost

(57 000/60 000 × £95 700)	90 915
Fixed costs	<u>80 000</u>
Budgeted cost allowance	<u>170 915</u>

17.25 (a) (i) Activity varies from month to month, but quarterly budgets are set by dividing total annual expenditure by 4.
 (ii) The budget ought to be analysed by shorter intervals (e.g. monthly) and costs estimated in relation to monthly activity.
 (iii) For control purposes monthly comparisons and cumulative monthly comparisons of planned and actual expenditure to date should be made.
 (iv) The budget holder does not participate in the setting of budgets.
 (v) An incremental budget approach is adopted. A zero-based approach would be more appropriate.

(vi) The budget should distinguish between controllable and uncontrollable expenditure.
 (b) The information that should flow from a comparison of the actual and budgeted expenditure would consist of the variances for the month and year to date analysed into the following categories:
 (i) controllable and uncontrollable items;
 (ii) price and quantity variances with price variance analysed by inflationary and non-inflationary effects.
 (c) (i) Flexible budgets should be prepared on a monthly basis. Possible measures of activity are number of patient days or expected laundry weight.
 (ii) The laundry manager should participate in the budgetary process.
 (iii) Costs should be classified into controllable and non-controllable items.
 (iv) Variances should be reported and analysed by price and quantity on a monthly and cumulative basis.
 (v) Comments should be added explaining possible reasons for the variances.

17.26

Task 1:

Performance Statement – Month to 31 October

Number of guest days = Original budget			9 600
	Flexed budget		11 160
		Flexed budget	Actual
		(£)	(£)
			Variance
			(£)
<i>Controllable expenses</i>			
Food (1)	23 436	20 500	2936F
Cleaning materials (2)	2 232	2 232	0
Heat, light and power (3)	2 790	2 050	740F
Catering staff wages (4)	8 370	8 400	30A
	<u>36 828</u>	<u>33 182</u>	<u>3646F</u>
<i>Non-controllable expenses</i>			
Rent, rates, insurance and depreciation (5)	1 860	1 860	0

Notes:

- (1) £20 160/9600 × 11 160.
- (2) £1920/9600 × 11 160.
- (3) £2400/9600 × 11 160.
- (4) £11 160/40 × £30.
- (5) Original fixed budget based on 30 days but October is a 31-day month (£1800/30 × 31).

Task 2:

(a) See the sections on the multiple functions of budgets (motivation) in Chapter 16, and 'Setting financial performance targets' in Chapter 17 for the answers to this question.
 (b) Motivating managers ought to result in improved performance. However, besides motivation, improved performance is also dependent on managerial ability, training, education and the existence of a favourable environment. Therefore motivating managers is not guaranteed to lead to improved performance.
 (c) The use of a fixed budget is unlikely to encourage managers to become more efficient where budgeted expenses are variable with activity. In the original performance report actual expenditure for 11.160 guest days is compared with budgeted expenditure for 9600 days. It is misleading to compare actual costs at one level of activity with budgeted costs at another

level of activity. Where the actual level of activity is above the budgeted level adverse variances are likely to be reported for variable cost items. Managers will therefore be motivated to reduce activity so that favourable variances will be reported. Therefore it is not surprising that Susan Green has expressed concern that the performance statement does not reflect a valid reflection of her performance. In contrast, most of Brian Hilton's expenses are fixed and costs will not increase when volume increases. A failure to flex the budget will therefore not distort his performance.

To motivate, challenging budgets should be set and small adverse variances should normally be regarded as a healthy sign and not something to be avoided. If budgets are always achieved with no adverse variances this may indicate that undemanding budgets may have been set which are unlikely to motivate best possible performance. This situation could apply to Brian Hilton who always appears to report favourable variances.

17.27 (a) Return on investment (ROI)

Division A	£
Profit	35 000
Net assets	150 000

Return on investment = $35\,000/150\,000 = 23.3\%$

Division B	£
Profit	70 000
Net assets	325 000

Return on investment = $70\,000/325\,000 = 21.5\%$

Residual income (RI)

Division A = $£35\,000 - (150\,000 \times 0.15) = £12\,500$

Division B = $£70\,000 - (325\,000 \times 0.15) = £21\,250$

Division A has a higher ROI but a lower residual income.

(b) Return on investment would be the better measure when comparing divisions as it is a relative measure (i.e. based on percentage returns)

(c) Appropriate aspects of performance include:

- competitiveness;
- financial performance;
- quality of service;
- flexibility;
- innovation;
- resource utilization efficiency.

Chapter 18

18.16 A favourable labour efficiency variance indicates that actual hours used were less than the standard hours produced. The favourable variance was £7800. Therefore the standard hours produced were 18 700 ($17\,500 + £7800/£6.50$).

Answer = D

$$\begin{aligned} 18.17 \text{ (a) Material price} &= (SP - AP)AQ = (AQ \times SP) - (AQ \times AP) \\ &= (53\,000 \text{ kg} \times £2.50) - £136\,000 = \\ &= £3\,500A \end{aligned}$$

Answer = (ii)

$$\begin{aligned} \text{(b) Material usage} &= (SQ - AQ)SP = (27\,000 \times 2 \text{ kg} = \\ &= 54\,000 \text{ kg} - 53\,000) £2.5 = £2500F \end{aligned}$$

Answer = (i)

$$\begin{aligned} 18.18 \text{ Wage rate} &= (SP - AP)AH = (AH \times SP) - (AH \times AP) \\ &= (14\,000 \times £10 = £140\,000) - £176\,000 = \\ &= £36\,000A \end{aligned}$$

$$\begin{aligned} \text{Labour efficiency} &= (SH - AH)SP = (5500 \times 3 \text{ hours} = \\ &= 16\,500 \text{ hours} - 14\,000 \text{ hours}) \times £10 \\ &= £25\,000F \end{aligned}$$

Answer = D

$$\begin{aligned} 18.19 \text{ (a) Standard hours for actual output} &= (650 \text{ units} \times 0.25 \\ &= 162.5 \text{ hours}) \\ \text{Actual hours taken} &= (7 \text{ hours} \times 3 \text{ days} \times 8 \text{ employees}) \\ &= 168 \text{ hours} \\ \text{Idle time} &= 168 \text{ hours} - 162.5 \text{ hours} = 5.5 \text{ hours} \\ \text{Efficiency variance} &= (10.5 \text{ hours} \times \$12) = \$126 \\ &= \text{Favourable} \end{aligned}$$

Answer = (iv)

$$\begin{aligned} \text{(b) Wage rate} &= (SP - AP)AH = (AH \times SP) - (AH \times AP) \\ &= (168 \times \$12) - \$2275 = \$259A \end{aligned}$$

Answer = (ii)

$$18.20 \text{ Standard cost} = 31\,000 \text{ repairs} \times 24/60 \text{ hours} \times \$10.60 = \$131\,440$$

Actual cost = \$134 540 (standard cost plus adverse labour variance of \$3100)

Actual labour hours = 12 400 (31 000 repairs \times 0.4 hours) given that actual hours are the same as the standard hours due to a zero labour efficiency variance

Actual wage rate = $\$10.85$ ($\$134\,540/12\,400 \text{ hours}$)

Answer = C

18.21 Over-absorbed fixed overheads will result in a favourable total fixed overhead variance. Only item B results in a favourable total fixed overhead variance.

Answer = B

$$18.22 \text{ Standard fixed overhead rate} = \frac{\text{Budgeted cost (£48 000)}}{\text{Budgeted output (4800 units)}} = £10$$

Overheads incurred = Budgeted cost + Expenditure variance (£2000) = £50 000

Overheads absorbed = £50 000 - Under-absorption (£8000) = £42 000

Actual number of units produced = $£42\,000/£10 = 4200$

Answer = C

$$18.23 \text{ Budgeted fixed overhead hour rate} = £135\,000/9000 = £15$$

$$\text{Capacity variance} = [\text{Actual hours (9750)} - \text{Budgeted hours (9000)}] \times £15 = £11\,250F$$

Answer = B

18.24 Budgeted sales margin = \$66 000 (12 000 units × (\$15 – \$9.50))
 Actual sales margin = \$43 200 (10 800 × (\$13.50 – \$9.50))
 Variance = \$22 800A
 Note that the actual margin is derived from using the standard cost and not the actual cost.
 Answer = A

18.25 Variance = (Actual sales volume of 9800 units) – (Budgeted sales volume of 10 000 units) × budgeted profit margin (£5) = £1000 Adverse
 Answer = C

18.26 Variance = (Actual sales volume of 3500 units) – (Budgeted sales volume of 3000 units) × budgeted contribution margin (£50 – £31) = £9500 Favourable
 Answer = A

18.27 (a) Fixed overhead expenditure variance = Budgeted fixed overheads (£2 500 000) – Actual fixed overheads (£2 890 350) = £390 350 Adverse
 Volume variance = (Actual production of 70 000 units) – Budgeted production of 62 500 units) × Budgeted fixed overhead absorption rate per unit (£2 500 000/62 500 units) = £300 000 Favourable
 See Chapter 18 for an explanation of each of the variances.

(b) Budgeted fixed overhead absorption rate per hour = £5 (£2 500 000/500 000 hours)
 Efficiency variance = (Standard quantity of input hours for actual production) – (Actual input hours) × Fixed overhead absorption rate
 = (70 000 units × 500 000 hours/62 500 units = 560 000 hours – 525 000 hours) × £5 = £175 000 Favourable
 Capacity variance = (Actual hours of input = 525 000) – (budgeted hours of input = 500 000) × Fixed overhead absorption rate (£5) = £125 000 Favourable
 See Chapter 18 for an explanation of each of the variances.

18.28 1. *Preliminary calculations*
 The standard product cost and selling price are calculated as follows:

	(£)
Direct materials	
X (10 kg at £1)	10
Y (5 kg at £5)	25
Direct wages (5 hours × £3)	15
Fixed overhead (5 hours × 200% of £3)	<u>30</u>
Standard cost	80
Profit (20/(100 – 20)) × £80	<u>20</u>
Selling price	<u>100</u>

The actual profit for the period is calculated as follows:

	(£)	(£)
Sales (9500 at £110)		1 045 000
Direct materials: X	115 200	
Y	225 600	
Direct wages (46 000 × £3.20)	147 200	
Fixed overhead	<u>290 000</u>	<u>778 000</u>
Actual profit		<u>267 000</u>

It is assumed that the term ‘using a fixed budget’ refers to the requirement to reconcile the budget with the original fixed budget.

	(£)	(£)
Material price variance: (standard price – actual price) × actual quantity		
X: (£1 – £1.20) × 96 000	19 200 A	
Y: (£5 – £4.70) × 48 000	<u>14 440 F</u>	4800 A
Material usage variance: (standard quantity – actual quantity) × standard price		
X: (9500 × 10 = 95 000 – 96 000) × £1	1 000 A	
Y: (9500 × 5 = 47 500 – 48 000) × £5	<u>2 500 A</u>	3500 A
The actual materials used are in standard proportions. Therefore there is no mix variance.		
Wage rate variance: (standard rate – actual rate) × actual hours (£3 – £3.20) × 46 000	9 200 A	
Labour efficiency variance: (standard hours – actual hours) × standard rate (9500 × 5 = 47 500 – 46 000) × £3	<u>4 500 F</u>	4 700 A
Fixed overhead expenditure: budgeted fixed overheads – actual fixed overheads (10 000 × £30 = £300 000 – £290 000)		10 000 F
Volume efficiency variance: (standard hours – actual hours) × fixed overhead rate (47 500 – 46 000) × £6	9 000 F	
Volume capacity variance: (actual hours – budgeted hours) × fixed overhead rate (46 000 – 50 000) × £6	<u>24 000 A</u>	15 000 A
Sales margin price variance: (actual margin – standard margin) × actual sales volume (£30 – £20) × 9500	95 000 F	
Sales margin volume variance: (actual sales volume – budgeted sales volume) × Standard margin (9500 – 10 000) × £20	<u>10 000 A</u>	<u>85 000 F</u>
Total variance		<u>67 000 F</u>

	(£)
Budgeted profit (10 000 units at £20)	200 000
Add favourable variances (see above)	<u>67 000</u>
Actual profit	<u>267 000</u>

18.29 (a) Standard product cost for one unit of product XY

	(£)
Direct materials (8 kg (W2) at £1.50 (W1) per kg)	12.00
Direct wages (2 hours (W4) at £4 (W3) per hour)	8.00
Variable overhead (2 hours (W4) at £1 (W5) per hour)	<u>2.00</u>
	<u>22.00</u>

Workings

- (W1) Actual quantity of materials purchased at standard price is £225 000 (actual cost plus favourable material price variance).
Therefore standard price = £1.50 (£225 000/150 000 kg).
- (W2) Material usage variance = 6000 kg (£9000/£1.50 standard price).
Therefore standard quantity for actual production = 144 000 kg (150 000 – 6000 kg).
Therefore standard quantity per unit = 8 kg (144 000 kg/18 000 units).
- (W3) Actual hours worked at standard rate = £128 000 (£136 000 – £8000).
Therefore standard rate per hour = £4 (£128 000/32 000 hours).
- (W4) Labour efficiency variance = 4000 hours (£16 000/£4).
Therefore standard hours for actual production = 36 000 hours (32 000 + 4000).
Therefore standard hours per unit = 2 hours (36 000 hours/18 000 units).
- (W5) Actual hours worked at the standard variable overhead rate is £32 000 (£38 000 actual variable overheads less £6000 favourable expenditure variance).
Therefore, standard variable overhead rate = £1 (£32 000/32 000 hours).

- (b) See 'Types of cost standards' in Chapter 18 for the answer to this question.

- 18.30 (a) (i) A fixed overhead volume variance only occurs with an absorption costing system. The question indicates that a volume variance has been reported. Therefore the company must operate an absorption costing system and report the sales volume variance in terms of profit margins, rather than contribution margins.

$$\begin{aligned} \text{Budgeted profit margin} &= \text{Budgeted profit} \\ &= (£4250) / \text{Budgeted volume (1500 units)} \\ &= £2.83 \end{aligned}$$

$$\begin{aligned} \text{Adverse sales volume variance in units} &= \\ &= £850 / £2.83 = 300 \text{ units} \end{aligned}$$

Therefore actual sales volume was 300 units below budgeted sales volume

$$\text{Actual sales volume} = 1200 \text{ units (1500 units} - 300 \text{ units)}$$

- (ii) Standard quantity of material used per units of output:

$$\text{Budgeted usage (750 kg) / Budgeted production (1500 units)} = 0.5 \text{ kg}$$

$$\begin{aligned} \text{Standard price} &= \text{Budgeted material cost} \\ &= (£4500) / \text{Budgeted usage (750 kg)} = £6 \end{aligned}$$

$$\begin{aligned} \text{Material usage variance} &= (\text{Standard quantity} - \\ &\text{Actual Quantity}) \times \text{Standard price} \end{aligned}$$

$$\begin{aligned} £150A &= (1550 \times 0.5 \text{ kg} = 775 \text{ kg} - \text{AQ}) \times £6 \\ - £150 &= 4650 - 6AQ \end{aligned}$$

$$6AQ = 4800$$

$$\text{Actual quantity used} = 800 \text{ kg}$$

- (iii) Material price variance = (Standard price – Actual price) × Actual purchases

$$£1000F = (£6 - \text{Actual price}) \times 1000 \text{ kg}$$

$$£1000F = £6000 - 1000AP$$

$$1000AP = £5000$$

$$AP = £5 \text{ per kg}$$

$$\text{Actual material cost} = 1000 \text{ kg} \times £5 = £5000$$

$$\begin{aligned} \text{(iv) Standard hours per unit of output} &= \frac{\text{Budgeted hours (1125)}}{\text{Budgeted output (1500 units)}} \\ &= 0.75 \text{ hours} \end{aligned}$$

$$\text{Standard wage rate} = \text{Budgeted labour cost}$$

$$= (£4500) / \text{Budgeted hours (1125)}$$

$$= £4$$

$$\begin{aligned} \text{Labour efficiency variance} &= (\text{Standard hours} - \\ &\text{Actual hours}) \times \text{Standard rate} \end{aligned}$$

$$£150A = (1550 \times 0.75 = 1162.5 - \text{Actual hours})$$

$$\times £4 - £150 = £4650 - 4AH$$

$$4AH = £4800$$

$$\text{Actual hours} = 1200$$

- (v) Total labour variance = Standard cost – Actual cost
(£200A + £150A) = (1550 × 0.75 hrs × £4) –

$$\text{Actual cost}$$

$$£350A = £4650 - \text{Actual cost}$$

$$\text{Actual cost} = £5000$$

- (vi) Standard variable overhead cost per unit

$$\begin{aligned} &= \frac{\text{Budgeted variable overheads (2250)}}{\text{Budgeted output (1500 units)}} \\ &= £1.50 \text{ hours} \end{aligned}$$

$$\begin{aligned} \text{Total variable overhead variance} &= \text{Standard cost} \\ &- \text{Actual cost} \end{aligned}$$

$$= (£600A + £75A) = (1550 \times £1.50 = £2325) -$$

$$\text{Actual cost}$$

$$£675A = £2325 - \text{Actual cost}$$

$$\text{Actual cost} = £3000$$

- (vii) Fixed overhead expenditure variance =

$$\text{Budgeted cost} - \text{Actual cost}$$

$$£2500F = £4500 - \text{Actual cost}$$

$$\text{Actual cost} = £2000$$

- (b) See Chapter 18 for an explanation of the causes of the direct material usage, direct labour rate and sales volume variances

18.31 (a) Material price:

$$(\text{standard price} - \text{actual price}) \times \text{actual quantity}$$

$$= (£3 - £4) \times 22 000 = £22 000 \text{ A}$$

Material usage:

$$(\text{standard quantity} - \text{actual quantity}) \times \text{standard price}$$

$$= ((1400 \times 15 = 21 000) - 22 000) \times £3 = 3000 \text{ A}$$

Wage rate:

$$(\text{standard rate} - \text{actual rate}) \times \text{actual hours}$$

$$= (£4 - £5) \times 6800 = £6800 \text{ A}$$

Labour efficiency:

$$((1400 \times 5 = 7000) - 6800) \times £4 = £800 \text{ F}$$

Fixed overhead expenditure:

$$(\text{budgeted fixed overheads} - \text{actual fixed overheads})$$

$$= (1000 \times £5 = £5000 - £6000) = £1000 \text{ A}$$

Volume efficiency:

$$(\text{standard hrs} - \text{actual hrs}) \times \text{FOAR}$$

$$= (1400 \times 5 = 7000 - 6800) \times £1 = 200 \text{ F}$$

Volume capacity:

$$(\text{actual hrs} - \text{budgeted hrs}) \times \text{FOAR}$$

$$= (6800 - 5000) \times £1 = £1800 \text{ F}$$

Variable overhead efficiency:

$$(\text{standard hrs} - \text{actual hrs}) \times \text{VOAR}$$

$$= (7000 - 6800) \times £2 = £400 \text{ F}$$

Variable overhead expenditure:

$$(\text{flexed budgeted variable overheads} - \text{actual variable overheads})$$

$$= (6800 \times £2 - £11 000) = £2600 \text{ F}$$

Sales margin price:
 (actual margin – standard margin) ×
 actual sales volume
 (£102 – £80 = £22 – £20) × 1200 = £2400 F

Sales margin volume:
 (actual sales – budgeted sales) × standard
 margin (1200 – 1000) × £20 = 4000 F

Reconciliation of budgeted and actual profit

	(£)		
	Adverse	Favourable	
	(£)	(£)	
Budgeted profit			20 000
Sales margin price		2 400	
Sales margin volume		4 000	
Material price	22 000		
Material usage	3 000		
Wage rate	6 800		
Labour efficiency		800	
Fixed overhead expenditure	1 000		
Fixed overhead efficiency		200	
Fixed overhead capacity		1 800	
Variable overhead expenditure		2 600	
Variable overhead efficiency		400	
	<u>32 800</u>	<u>12 200</u>	
Net adverse variance			<u>20 600</u>
Actual profit/(loss)			<u>(600)</u>

(b)

Stores ledger control account

Creditors	66 000	WIP	63 000
	<u>66 000</u>	Material usage variance	<u>3 000</u>
			<u>66 000</u>

Variance accounts

Creditors	22 000	Wages control	800
Stores ledger		(labour efficiency)	2 000
(material usage)	3 000	Fixed overhead (volume)	2 600
Wages control (wage rate)	6 800	Variable overhead	400
Fixed overhead		(expenditure)	2 600
(expenditure)	1 000	Variable overhead	400
		(efficiency)	27 000
	<u>32 800</u>	Costing P + L a/c (balance)	<u>32 800</u>

Costing P + L account

Cost of sales	96 000	Sales	122 400
Variance account		Loss for period	600
(net variances)	<u>27 000</u>		
	<u>123 000</u>		<u>123 000</u>

WIP control account

Stores ledger	63 000	Finished goods stock	112 000
Wages control	28 000		
Fixed factory overhead	7 000		
Variable factory overhead	14 000		
	<u>112 000</u>		<u>112 000</u>

Wages control account

Wages accrued account	34 000	WIP	28 000
Labour efficiency variance	<u>800</u>	Wage rate variance	<u>6 800</u>
	<u>34 800</u>		<u>34 800</u>

Fixed factory overhead account

Expense creditors	6 000	WIP	7 000
Volume variance	<u>2 000</u>	Expenditure variance	<u>1 000</u>
	<u>8 000</u>		<u>8 000</u>

Variable factory overhead account

Expense creditors	11 000	WIP	14 000
Expenditure variance	2 600		
Efficiency variance	<u>400</u>		
	<u>14 000</u>		<u>14 000</u>

Finished goods stock

WIP	112 000	Cost of sales	96 000
	<u>112 000</u>	Closing stock c/fwd	<u>16 000</u>
			<u>112 000</u>

Cost of sales account

Finished goods stock	96 000	Cost P + L a/c	96 000
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CASE STUDIES AVAILABLE FROM THE WEBSITE

The dedicated website for this book includes over 20 case studies. Both students and lecturers can download these case studies from the open access website. The authors of the cases have provided teaching notes for each case and these can be downloaded only by lecturers from the password-protected lecturer's section of the website.

The cases generally cover the content of several chapters and contain questions to which there is no ideal answer. They are intended to encourage independent thought and initiative and to relate and apply the content of this book to more uncertain situations. They are also intended to develop critical thinking and analytical skills. Details relating to the cases that are available from the website are as follows:

Anjo Ltd

Lin Fitzgerald, Loughborough University Business School

Variance analysis that provides the opportunity for the case to be used as a role-playing exercise.

Berkshire Threaded Fasteners Company

John Shank, The Amos Tuck School of Business Administration, Dartmouth College

Cost analysis for dropping a product, for pricing, for product mix and product improvement.

Berkshire Toy Company

D. Crawford and E.G. Henry, State University of New York (SUNY) at Oswego

Variance analysis, performance evaluation, responsibility accounting and the balanced scorecard.

Blessed Farm Partnership

Rona O'Brian, Sheffield Hallam University

Strategic decision-making, evaluation of alternatives, ethics, sources of information.

Bohemia Industries

Colin Drury, Huddersfield University Business School

The application of variable and absorption costing for internal monthly profit reporting.

Company A

Mike Tayles, University of Hull Business School and Paul Walley, Warwick Business School.

Evaluation of a product costing system and suggested performance measures to support key success factors.

Company B

Mike Tayles, University of Hull Business School and Paul Walley, Warwick Business School.

The impact of a change in manufacturing strategy and method upon product costing and performance measurement systems.

Dumbellow Ltd

Stan Brignall, Aston Business School

Marginal costing versus absorption costing, relevant costs and cost-volume-profit analysis.

Electronic Boards plc

John Innes, University of Dundee, and Falconer Mitchell, University of Edinburgh

A general case that may be used at an introductory stage to illustrate the basics of management accounting and the role it can play within a firm.

Endeavour Twoplise Ltd

Antony Head, Brenda McDonnell, Jayne Rastrick, Sheffield Hallam University, and Susan Richardson, University of Bradford Management Centre

Functional budget and master budget construction, budgetary control and decision-making.

Fleet Ltd

Lin Fitzgerald, Loughborough University Business School

Outsourcing decision involving relevant costs and qualitative factors.

Global Ltd

Susan Richardson, University of Bradford Management Centre

Cash budgeting, links between cash and profit, pricing/bidding, information system design and behavioural aspects of management control.

Gustavvson, AB

Colin Drury, Huddersfield University Business School

Alternative choice of cost centres and their implications for overhead assignments for various decisions.

Hardhat Ltd

Stan Brignall, Aston Business School

Cost–volume–profit analysis.

High Street Reproduction Furniture Ltd

Antony Head, Rona O’Brian, Jayne Rastrick, Sheffield Hallam University, and Sue Richardson, University of Bradford Management Centre

Relevant costs, strategic decision-making and limiting factors.

Majestic Lodge

John Shank, The Amos Tuck School of Business Administration, Dartmouth College

Relevant costs and cost–volume–profit analysis.

Merrion Products Ltd

Peter Clarke, University College Dublin

Cost–volume–profit analysis, relevant costs and limiting factors.

Moult Hall

Antony Head, Brenda McDonnell, Jayne Rastrick, Sheffield Hallam University, and Susan Richardson, University of Bradford Management Centre

Organizational objectives, strategic decision-making, evaluation of alternatives, relevant costs, debating the profit ethos, break-even analysis.

Oak City

R.W. Ingram and W.C. Parsons, University of Alabama, and W.A. Robbins, Attorney, Pearson and Sutton

Cost allocation in a government setting to determine the amount of costs that should be charged to business for municipal services. The case also includes ethical considerations.

Quality Shopping

Rona O’Brian, Sheffield Hallam University

Departmental budget construction, credit checking, environmental issues, behavioural issues and management control systems.

Rawhide Development Company

Bill Doolin, University of Waikato, and Deryl Northcott, University of Manchester

Capital investment appraisal involving relevant cash flows, uncertainty, application of spreadsheet tools and social considerations.

Rogatec Ltd.

Antony Head, Brenda McDonnell, Jayne Rastrick, Sheffield Hallam University, and Susan Richardson, University of Bradford Management Centre

Standard costing and variance analysis, budgets, ethics, sources of information.

The Beta Company

Peter Clarke, University College Dublin

Cost estimation involving regression analysis and relevant costs.

Traditions Ltd.

Antony Head, Brenda McDonnell, Jayne Rastrick, Sheffield Hallam University, and Susan Richardson, University of Bradford Management Centre

Relevant cost analysis relating to a discontinuation decision and budgeting.

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