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March/June 2017 Exams

ACCA F2
FIA FMA

Management Accounting

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Contents

Paper F2

Formulae

FORMULAE SHEET

Regression analysis

$$a = \frac{\sum y}{n} - \frac{b\sum x}{n}$$

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$$

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2)}}$$

Economic order quantity

$$= \sqrt{\frac{2C_0 D}{C_h}}$$

Economic batch quantity

$$= \sqrt{\frac{2C_0 D}{C_h(1 - \frac{D}{R})}}$$

Present Value Table

Present value of 1 i.e. $(1 + r)^{-n}$

Where r = discount rate
n = number of periods until payment

Discount rate (r)

Periods (n)	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	
1	0·990	0·980	0·971	0·962	0·952	0·943	0·935	0·926	0·917	0·909	1
2	0·980	0·961	0·943	0·925	0·907	0·890	0·873	0·857	0·842	0·826	2
3	0·971	0·942	0·915	0·889	0·864	0·840	0·816	0·794	0·772	0·751	3
4	0·961	0·924	0·888	0·855	0·823	0·792	0·763	0·735	0·708	0·683	4
5	0·951	0·906	0·863	0·822	0·784	0·747	0·713	0·681	0·650	0·621	5
6	0·942	0·888	0·837	0·790	0·746	0·705	0·666	0·630	0·596	0·564	6
7	0·933	0·871	0·813	0·760	0·711	0·665	0·623	0·583	0·547	0·513	7
8	0·923	0·853	0·789	0·731	0·677	0·627	0·582	0·540	0·502	0·467	8
9	0·914	0·837	0·766	0·703	0·645	0·592	0·544	0·500	0·460	0·424	9
10	0·905	0·820	0·744	0·676	0·614	0·558	0·508	0·463	0·422	0·386	10
11	0·896	0·804	0·722	0·650	0·585	0·527	0·475	0·429	0·388	0·350	11
12	0·887	0·788	0·701	0·625	0·557	0·497	0·444	0·397	0·356	0·319	12
13	0·879	0·773	0·681	0·601	0·530	0·469	0·415	0·368	0·326	0·290	13
14	0·870	0·758	0·661	0·577	0·505	0·442	0·388	0·340	0·299	0·263	14
15	0·861	0·743	0·642	0·555	0·481	0·417	0·362	0·315	0·275	0·239	15

(n)	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%	
1	0·901	0·893	0·885	0·877	0·870	0·862	0·855	0·847	0·840	0·833	1
2	0·812	0·797	0·783	0·769	0·756	0·743	0·731	0·718	0·706	0·694	2
3	0·731	0·712	0·693	0·675	0·658	0·641	0·624	0·609	0·593	0·579	3
4	0·659	0·636	0·613	0·592	0·572	0·552	0·534	0·516	0·499	0·482	4
5	0·593	0·567	0·543	0·519	0·497	0·476	0·456	0·437	0·419	0·402	5
6	0·535	0·507	0·480	0·456	0·432	0·410	0·390	0·370	0·352	0·335	6
7	0·482	0·452	0·425	0·400	0·376	0·354	0·333	0·314	0·296	0·279	7
8	0·434	0·404	0·376	0·351	0·327	0·305	0·285	0·266	0·249	0·233	8
9	0·391	0·361	0·333	0·308	0·284	0·263	0·243	0·225	0·209	0·194	9
10	0·352	0·322	0·295	0·270	0·247	0·227	0·208	0·191	0·176	0·162	10
11	0·317	0·287	0·261	0·237	0·215	0·195	0·178	0·162	0·148	0·135	11
12	0·286	0·257	0·231	0·208	0·187	0·168	0·152	0·137	0·124	0·112	12
13	0·258	0·229	0·204	0·182	0·163	0·145	0·130	0·116	0·104	0·093	13
14	0·232	0·205	0·181	0·160	0·141	0·125	0·111	0·099	0·088	0·078	14
15	0·209	0·183	0·160	0·140	0·123	0·108	0·095	0·084	0·074	0·065	15

Annuity Table

Present value of an annuity of 1 i.e. $\frac{1-(1+r)^{-n}}{r}$

Where r = discount rate
n = number of periods

Discount rate (r)

Periods (n)	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	
1	0·990	0·980	0·971	0·962	0·952	0·943	0·935	0·926	0·917	0·909	1
2	1·970	1·942	1·913	1·886	1·859	1·833	1·808	1·783	1·759	1·736	2
3	2·941	2·884	2·829	2·775	2·723	2·673	2·624	2·577	2·531	2·487	3
4	3·902	3·808	3·717	3·630	3·546	3·465	3·387	3·312	3·240	3·170	4
5	4·853	4·713	4·580	4·452	4·329	4·212	4·100	3·993	3·890	3·791	5
6	5·795	5·601	5·417	5·242	5·076	4·917	4·767	4·623	4·486	4·355	6
7	6·728	6·472	6·230	6·002	5·786	5·582	5·389	5·206	5·033	4·868	7
8	7·652	7·325	7·020	6·733	6·463	6·210	5·971	5·747	5·535	5·335	8
9	8·566	8·162	7·786	7·435	7·108	6·802	6·515	6·247	5·995	5·759	9
10	9·471	8·983	8·530	8·111	7·722	7·360	7·024	6·710	6·418	6·145	10
11	10·37	9·787	9·253	8·760	8·306	7·887	7·499	7·139	6·805	6·495	11
12	11·26	10·58	9·954	9·385	8·863	8·384	7·943	7·536	7·161	6·814	12
13	12·13	11·35	10·63	9·986	9·394	8·853	8·358	7·904	7·487	7·103	13
14	13·00	12·11	11·30	10·56	9·899	9·295	8·745	8·244	7·786	7·367	14
15	13·87	12·85	11·94	11·12	10·38	9·712	9·108	8·559	8·061	7·606	15

(n)	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%	
1	0·901	0·893	0·885	0·877	0·870	0·862	0·855	0·847	0·840	0·833	1
2	1·713	1·690	1·668	1·647	1·626	1·605	1·585	1·566	1·547	1·528	2
3	2·444	2·402	2·361	2·322	2·283	2·246	2·210	2·174	2·140	2·106	3
4	3·102	3·037	2·974	2·914	2·855	2·798	2·743	2·690	2·639	2·589	4
5	3·696	3·605	3·517	3·433	3·352	3·274	3·199	3·127	3·058	2·991	5
6	4·231	4·111	3·998	3·889	3·784	3·685	3·589	3·498	3·410	3·326	6
7	4·712	4·564	4·423	4·288	4·160	4·039	3·922	3·812	3·706	3·605	7
8	5·146	4·968	4·799	4·639	4·487	4·344	4·207	4·078	3·954	3·837	8
9	5·537	5·328	5·132	4·946	4·772	4·607	4·451	4·303	4·163	4·031	9
10	5·889	5·650	5·426	5·216	5·019	4·833	4·659	4·494	4·339	4·192	10
11	6·207	5·938	5·687	5·453	5·234	5·029	4·836	4·656	4·486	4·327	11
12	6·492	6·194	5·918	5·660	5·421	5·197	4·988	4·793	4·611	4·439	12
13	6·750	6·424	6·122	5·842	5·583	5·342	5·118	4·910	4·715	4·533	13
14	6·982	6·628	6·302	6·002	5·724	5·468	5·229	5·008	4·802	4·611	14
15	7·191	6·811	6·462	6·142	5·847	5·575	5·324	5·092	4·876	4·675	15

Chapter 1

ACCOUNTING FOR MANAGEMENT

1. Introduction

The purpose of management accounting is to assist management in running the business in ways that will improve the performance of the business.

2. Data and information

One way of assisting management is to provide them with good information to help them with their decisions.

The information can be provided to them in different ways, but is usually in the form of reports. For example, a report analysing costs of producing each of several products may assist management in deciding which products to produce.

It is the management accountant who will be expected to provide the information, and in order to do so he/she needs to collect data.

Data consists of the facts that are gathered and stored. Data has no clear meaning until it is processed – analysed and sorted – into **information**.

3. What makes good information?

Good quality information should:

- be **A**ccurate
- be **C**omplete (but not excessive)
- be **C**ost effective (should cost less than the savings to be made)
- be **U**nderstandable (to whoever is using it)
- be **R**elevant (to the decision being made)
- be **A**ccessible (i.e. communicated by an appropriate channel (for example, be printed or be sent electronically)
- be **T**imely
- be **E**asy to use

4. The main managerial processes

The main areas of management accounting are:

- **Costing**

  Cost accounting is identifying the cost of producing an item (or providing a service) in order to, for example, assist in deciding on a selling price.

- **Planning**

  e.g. plan how many staff will be required in the factory next year

- **Decision making**

  e.g. decide on what selling price to charge for a new product

- **Control**

  e.g. check month-by-month whether the company is over or under spending on wages

- **Performance evaluation**

  Comparing the performance of mangers or departments against budgets or targets

5. The different levels of planning

- **strategic planning**

  long-term plans (e.g. 5 to 10 years) for the business

  e.g. what new offices to open? / what new products to launch?

- **tactical planning**

  medium-term, more detailed, plans – usually involving producing budgets for the next year

  e.g. how many staff to employ next year?

- **operational planning**

  short-term planning and decisions

  e.g. which supplier to choose for a purchase next week

6. Comparison of management accounting with financial accounting

Example 1

	Financial Accounting	*Management Accounting*

WHEN YOU FINISHED THIS CHAPTER YOU SHOULD ATTEMPT THE ONLINE F2 MCQ TEST

Chapter 2

SOURCES OF DATA

1. Introduction

The management accountant needs data in order to be able to process it into information.

This chapter lists various sources of data and also various sampling techniques.

2. Primary and secondary sources of data

Primary data are data that have been collected for the specific purpose.

Secondary data are data that have been collected for some other purpose but which we then use for our purposes.

3. Internal and external sources data

Internal data are data collected from our own records. These are the main source of primary data.

External data are data collected from elsewhere – e.g. the internet, government statistics, financial newspapers. These will be secondary data.

4. Sampling

It is common to collect data from a sample rather than from the whole population. Data from the sample are used as representative of the whole population.

5. Sampling methods

You should be aware of the following methods of sampling:

- **random sampling**

  Every item in the population has an equal chance of being selected

- **systematic sampling** (quasi-random)

  Select (for example) every 10th item in the population

- **stratified sampling** (quasi-random)

  Split the population into groups, and then select at random. For example, if 60% of the population are women and 40% are men, then 60% of the sample should be women and 40% men.

- **multistage sampling** (quasi-random)

  For example, suppose a company has several thousand purchase invoices filed, filling 20 files. Take a random sample of (say) 5 files, and then a random sample of (say) 20 invoices from each of these files.

- **cluster sampling** (not random)

  For example, suppose a company has 100 offices through the country, each issuing sales invoices.

  Take a random sample of (say) 5 offices and check every invoice at each of these offices.

- **quota sampling** (not random)

  Suppose the population is 60% women and 40% men, and that we want to question a sample of 200 total. Decide on a quota of 120 women (60%) and 80 men (40%) and then stop people as they appear until we have the required number of each.

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Chapter 3

PRESENTING INFORMATION

1. Introduction

The management accountant has to provide information to management to help them make decisions, and it is important that the information is presented to them in a form that is easy for them to use.

This may be in the form of a report, or a table of figures, or as a chart or graph.

Although you will not be required to produce any of these, it is important that you are aware of the various formats available.

2. Tables

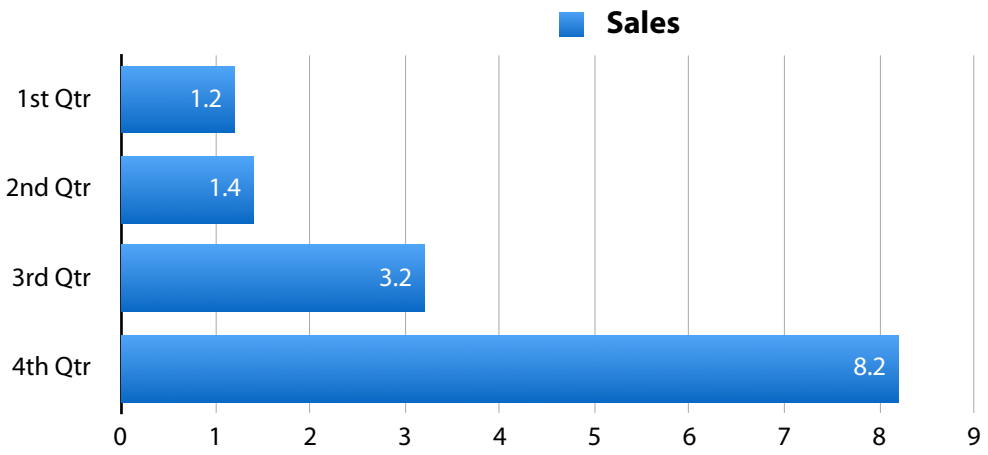
These are a way of presenting actual numbers in a format that is easy to understand. e.g.

Year	*Sales $'000's*
2006	2.7
2007	3.2
2008	4.8
2009	5.1
2010	5.2

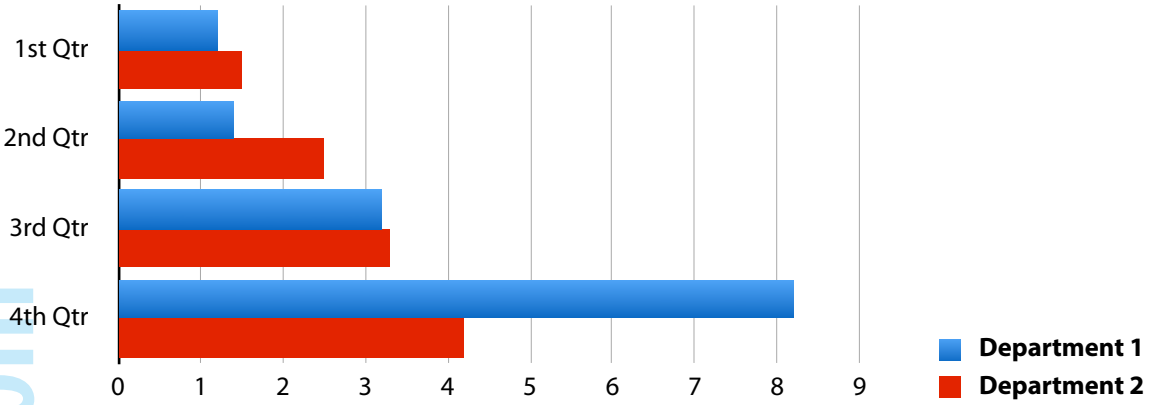
3. Charts and graphs

In many cases, management do not need to see the actual numbers (and indeed the actual numbers may confuse them). Often a chart or graph can present the information more clearly.

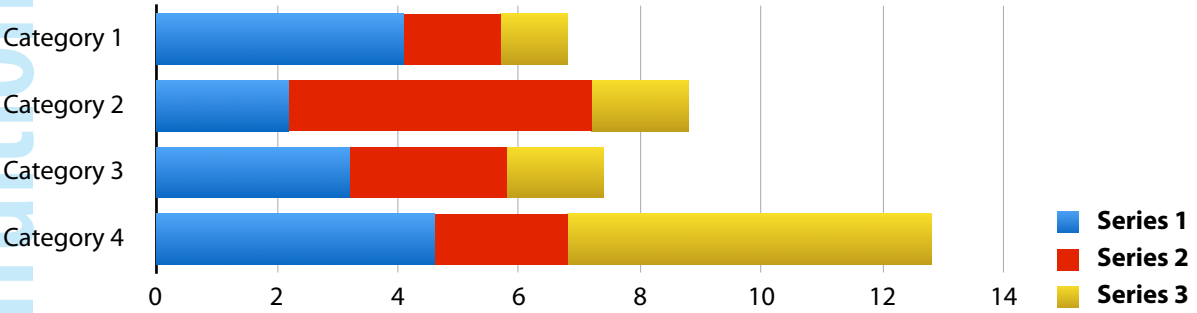
Simple bar chart:



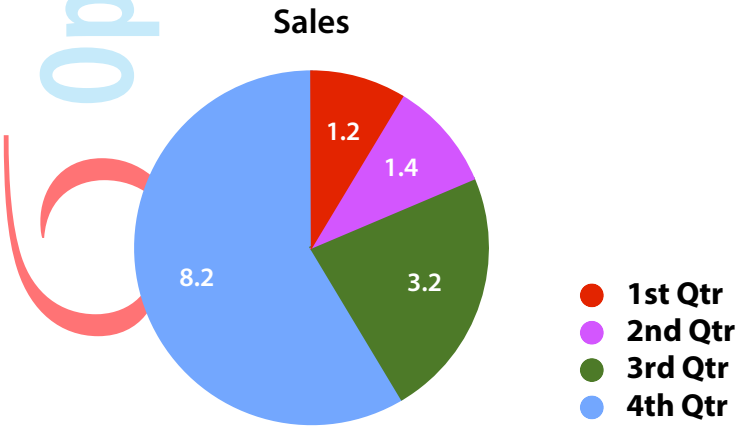
Compound bar chart:



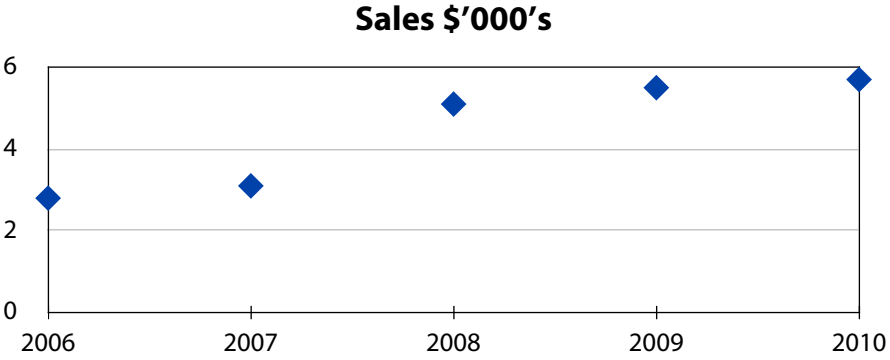
Component bar chart:



Pie chart:



Scatter graph:



Chapter 4

COST CLASSIFICATION

1. Cost classification

Cost classification is the arrangement of cost items into logical groups. For example: by their nature (materials, wages etc.); or function (administration, production etc.).

The eventual aim of costing is to determine the cost of producing a product/service; for profitability analysis, selling price determination and stock valuation purposes.

Cost unit

A cost unit is a unit of product or service in relation to which costs may be ascertained.

The cost unit should be appropriate to the type of business, for example:

Example 1

Suggest appropriate cost units for the following businesses

Solution

Business	Appropriate cost unit
Car manufacturer	
Cigarette manufacturer	
Builder	
Audit company	

Types of expenses

	$
Production/manufacturing costs	X
Administration costs	X
Selling and distribution costs	X
TOTAL EXPENSES	X

Only the production costs will be relevant in costing.

Direct costs

Direct costs are those costs which can be identified with and allocated to a particular cost unit.

TOTAL DIRECT COSTS = PRIME COST

Example 2

Direct costs

Indirect production costs (overheads)

Indirect production costs (known as production overheads) are those costs which are incurred in the course of making a product/service but which cannot be identified with a particular cost unit.

Example 3

Indirect production costs

TOTAL PRODUCTION COST = PRIME COST + PRODUCTION OVERHEADS

Non-production costs

Other costs required to run the business.

Example 4

Non-manufacturing/production costs

TOTAL COSTS = PRODUCTION COSTS + NON-PRODUCTION COSTS

2. Cost behaviour

It is expected that costs will increase as production increases (i.e. as output increases) but the exact way in which costs behave with output may differ.

Example 5

Types of behaviour

(a) Variable cost

(b) Fixed cost

(c) Stepped fixed cost

(d) Semi variable/fixed cost

Linear assumption

For this examination we will assume that total variable costs vary linearly with the level of production (or that the variable cost per unit remains constant). In practice this may not be the case, but we will not consider the effect of this until later examinations.

Behaviour of manufacturing costs

With the linear assumption all costs can be categorised as either fixed or variable. This fits together with previous definitions:

Direct costs

By their nature direct costs will be variable costs.

Indirect costs/overheads

Overheads can be fixed or variable

	Fixed	*Variable*
Direct costs	X	√
Production overheads	√	√
Non-manufacturing costs	√	√

Semi-variable costs

It is necessary to determine the fixed and variable elements of semi-variable costs. A method known as **'High-Low'** can be used to establish the fixed and variable elements. This technique is best illustrated by the use of an example.

Example 6

The total costs of a business for differing levels of output are as follows:

Output (units)	*Total Costs ($'000)*
200	30
1,000	110

(a) What are the fixed and variable elements of the total cost using the High-Low method?

(b) Describe the relationship between the output and costs in the form of a linear equation.

A better approximation of the fixed and variable elements can be obtained using Regression Analysis. This will be considered in a later chapter of these notes.

Typical cost card for a cost unit

		$/unit
Direct costs:		
- Direct materials	(2kg @ $1.50/kg)	3.00
- Direct labour	(3 hrs @ $4/hr)	12.00
Prime cost		15.00
Indirect costs		
- Variable overheads		2.00
- Fixed overheads		3.00
Full product cost		20.00

3. Responsibility centres

- **Cost centres:**

  Cost centres are areas where costs are collected e.g. individual departments or individual machines

- **Profit centres:**

  Profit centres are where both costs and revenues are collected. Many companies will have separate divisions and make the divisional manager responsible for the profit of that division.

- **Revenue centres:**

  Here, the manager is only responsible for the revenues of his division or department – not for the costs.

- **Investment centres:**

  This is like a profit centre except that the manager also has the responsibility for new capital investment (i.e. the purchase of new machines etc.). You will see in a later chapter that more thought needs to be given as to how to measure the performance of a manager of an investment centre.

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Chapter 5

ORDERING AND ACCOUNTING FOR INVENTORY

1. Introduction

In this chapter we will look at the documents used within a business in relation to the goods, and also at the various methods of valuing the closing inventories.

2. Documents used within a business for the ordering, purchasing, receiving and issuing of goods.

Ordering goods

When a department requires new material, they will send a **purchase requisition form** to the purchasing department.

The purchasing department will then send a **purchase order form** to the relevant supplier (with copies to the accounts department and to the goods receiving department).

Receiving goods from the supplier

When the goods are received by the goods receiving departments, they will check the goods against the purchase order and against the **delivery note** (which the supplier will have prepared and sent with the goods and which will list what is in the delivery).

Op.

The goods receiving department will prepare a **goods received note** giving full details of the goods that have been received and will send copies to the purchasing department and to the accounting department.

The inventory records will be updated.

Receiving the invoice from the supplier

The purchasing department will match the invoice details with the purchase order and the goods receive note, and approve it for payment.

The approved invoice will be sent to the accounting department who will enter it into the ledgers and later pay it.

Issuing of inventory

When the production department requests materials for production, they will send a **material requisition note** to the stores.

The stores will issue the material and update the inventory records.

Any unused material will be returned to the stores together with a **materials returned note** and inventory records will be updated.

If material is transferred from one production department to another, a **material transfer note** is prepared.

When finished goods are despatched to customers, a **goods despatch note** and a **delivery note** are created.

3. The valuation of inventory

There are three methods used for the valuation of closing inventory in management accounting that you need to be aware of for the exam - FIFO, LIFO, and Weighted average.

FIFO - First In First Out

This method assumes that materials are issued out of inventory in the same order in which they were delivered into inventory. As a result, the closing inventory will consist of the most recent receipts.

Example 1

JM Ltd had the following material transactions during November.

		Number of units	*Cost per unit*
Opening balance	1 November	20	4.00
Receipt	8 November	140	4.40
Issues	12 November	80	
Receipt	18 November	100	4.60
Issues	26 November	140	

Calculate the closing inventory value at the end of November using FIFO.

LIFO - Last In First Out

This method assumes that materials are issued out of inventory in the reverse order to which they were delivered into inventory.

Example 2

JM Ltd had the following material transactions during November.

		Number of units	*Cost per unit*
Opening balance	1 November	20	4.00
Receipt	8 November	140	4.40
Issues	12 November	80	
Receipt	18 November	100	4.60
Issues	26 November	140	

Calculate the closing inventory value at the end of November using LIFO.

Cumulative weighted average cost

This method calculates the average cost after each issue of materials.

Example 3

JM Ltd had the following material transactions during November.

		Number of units	*Cost per unit*
Opening balance	1 November	20	4.00
Receipt	8 November	140	4.40
Issues	12 November	80	
Receipt	18 November	100	4.60
Issues	26 November	140	

Calculate the closing inventory value at the end of November using the cumulative weighted average cost.

Chapter 6

INVENTORY CONTROL

1. Introduction

There are many approaches in practice to ordering goods from suppliers. In this chapter we will consider one particular approach – that of ordering fixed quantities each time.

For example, if a company needs a total of 12,000 units each year, then they could decide to order 1,000 units to be delivered 12 times a year. Alternatively, they could order 6,000 units to be delivered 2 times a year. There are obviously many possible order quantities.

We will consider the costs involved and thus decide on the order quantity that minimises these costs (the **economic order quantity**).

2. Costs involved

The costs involved in inventory ordering systems are as follows:

- the purchase cost
- the reorder cost
- the inventory-holding cost

Purchase cost

This is the cost of actually purchasing the goods. Over a year the total cost will remain constant regardless of how we decide to have the items delivered and is therefore irrelevant to our decision.

(Unless we are able to receive discounts for placing large orders – this will be discussed later in this chapter)

Re-order cost

This is the cost of actually placing orders. It includes such costs as the administrative time in placing an order, and the delivery cost charged for each order.

If there is a fixed amount payable on each order then higher order quantities will result in fewer orders needed over a year and therefore a lower total reorder cost over a year.

Inventory holding cost

This is the cost of holding items in inventory. It includes costs such as warehousing space and insurance and also the interest cost of money tied up in inventory.

Higher order quantities will result in higher average inventory levels in the warehouse and therefore higher inventory holding costs over a year.

3. Minimising costs

One obvious approach to finding the economic order quantity is to calculate the costs p.a. for various order quantities and identify the order quantity that gives the minimum total cost.

Example 1

Janis has demand for 40,000 desks p.a. and the purchase price of each desk is $25. There are ordering costs of $20 for each order placed. Inventory holding costs amount to 10% p.a. of inventory value.

Calculate the inventory costs p.a. for the following order quantities, and plot them on a graph:

(a) 500 units

(b) 750 units

(c) 1,000 units

(d) 1,250 units

5. The EOQ formula

A more accurate and time-saving way to find the EOQ is to use the formula that is provided for you in the exam.

The formula is:

$$EOQ = \sqrt{\frac{2C_oD}{C_H}}$$

Where C_o = fixed costs per order

D = annual demand

C_H = the inventory holding cost per unit per annum

(**Note:** you are not required to be able to prove this formula)

Example 2

For the information given in Example 1,

(a) use the EOQ formula to calculate the Economic Order Quantity.

(b) calculate the total inventory costs for this order quantity.

6. Quantity discounts

Often, discounts will be offered for ordering in large quantities. The problem may be solved using the following steps:

(1) Calculate EOQ ignoring discounts

(2) If it is below the quantity which must be ordered to obtain discounts, calculate total annual inventory costs.

(3) Recalculate total annual inventory costs using the order size required to just obtain the discount

(4) Compare the cost of step 2 and 3 with the saving from the discount and select the minimum cost alternative.

(5) Repeat for all discount levels

Example 3

For the information given in Example 1 the supplier now offers us discounts on purchase price as follows:

Order quantity	*discount*
0 to < 5,000	0 %
5,000 to < 10,000	1 %
10,000 or over	1.5 %

Calculate the Economic Order Quantity.

7. The Economic Batch Quantity

In the earlier examples, we assumed that we purchased goods from a supplier who delivered the entire order immediately.

Suppose instead that we have our own factory. The factory can produce many different products (using the same machines). Whenever we order a batch of one particular product then the factory will set-up the machines for the product and start producing and delivering to the warehouse immediately.

However it will take them a few days to produce the batch and during that time the warehouse is delivering to customers.

As a result the maximum inventory level in the warehouse never quite reaches the order quantity, and the formula needs changing slightly.

$$EBQ = \sqrt{\frac{2C_oD}{C_H(1-\frac{D}{R})}}$$

where:

C_O = fixed costs per batch (or set-up costs)

D = annual demand

C_H = inventory holding cost per unit per annum

R = rate of production per annum

It is also worth learning that the average inventory level in this situation will be:

$$\text{Average inventory} = \frac{EBQ}{2}(1-\frac{D}{R})$$

(Note that this formula will not be given to you in the exam)

Example 4

A company has demand for 50,000 units p.a.

They produce their own units at a cost of $30 per unit, and are capable of producing at rate of 500,000 units p.a.

Machine set-up costs are $200 for each batch.

Inventory holding costs are 10% p.a. of inventory value.

Calculate the Economic Batch Quantity, and the costs involved p.a. for that quantity.

8. Re-order level and 'safety' inventories

In the previous paragraphs we have considered the re-order quantities for inventory - that is the quantity that we should order each time.

However, in real life, it is unlikely that the supplier will deliver our order instantly - for example, it might take a week for the delivery to arrive - and therefore we need to place an order when we still have some units left. If we do not have sufficient units in inventory to last us until the delivery arrives, then we will run out of inventory and have to turn customers away.

The time between the placing of an order and the delivery arriving is known as the lead time.

The level of inventory at which time we should place a new order is known as the re-order level.

Example 5

A company has a demand from customers of 100 units per week.

The time between placing an order and receiving the goods (the lead time) is 5 weeks.

What should the re-order level be? (i.e. how many units should we still have in inventory when we place an order).

In practice, the demand per day and the lead time are unlikely to be certain.

What therefore we might do is re-order when we have more than 500 units in inventory, just to be 'safe' in case the demand over the lead time is more than 500 units. Any extra held in inventory for this reason is known as safety inventory, or buffer inventory.

Example 6

A company has a demand from customers of 100 units per week.

The time between placing an order and receiving the goods (the lead time) is 5 weeks.

The company has a policy of holding safety inventory of 100 units.

What should the re-order level be?

Alternatively, if we do know the maximum demand over the lead time and want to be certain of not running out of inventory then the re-order level needs to be equal to the maximum possible demand over the lead time.

Example 7

Demand from customers is uncertain and is between 70 and 120 units per week.

The lead time is also uncertain and is between 3 and 4 weeks.

What should the re-order level be if we are to never run out of inventory?

Although our answer to example 7 (a re-order level of 480 units) will mean that if the very worst should happen then we will still have enough units to fulfil demand, much of the time the demand will be lower than the maximum and/or the lead time will be shorter than the maximum.

If the demand over the lead time is less than the re-order level then it will mean we still have some units in inventory when the new delivery arrives.

It therefore means that the maximum inventory level will be the maximum number left in inventory, plus the number of units delivered.

The maximum number left in inventory is the re-order level less the minimum demand over the lead time.

Example 8

Demand from customers is uncertain and is between 70 and 120 units per week.

The lead time is also uncertain and is between 3 and 4 weeks.

We have a re-order quantity of 1,000 units each time.

What is the maximum inventory level?

WHEN YOU FINISHED THIS CHAPTER YOU SHOULD ATTEMPT THE ONLINE F2 MCQ TEST

Chapter 7

ACCOUNTING FOR LABOUR

1. Introduction

This chapter details various methods by which labour may be paid (remuneration methods), and also looks at various ratios which can be useful in relation to labour.

2. Direct and indirect labour costs

All costs of **indirect workers** (i.e. those not directly involved in making products, such as maintenance staff and supervisors) are **indirect costs**.

For **workers directly involved in making products**:

Direct costs are their basic pay, and any overtime premium paid for a specific job at the customer's request.

Indirect costs are general overtime premiums, bonus payments, idle time, and sick pay

3. Remuneration methods

There are three basic remuneration methods – time work, piecework, and bonus schemes.

- **Time work**

  Wages are paid on the basis of hours worked.

  For example, if an employee is paid at the rate of $5 per hour and works for 8 hours a day, the total pay will be $40 for that day.

  Employees paid on an hourly basis are often paid extra for working overtime.

  For example, an employee is paid a normal rate of $5 per hour and works 4 hours overtime for which he is paid at time-and-a half.

  The amount paid for the overtime will be 4 x 1.5 x $5 = $30.

- **Piecework**

  Wages are paid on the basis of units produced.

  For example an employee is paid $0.20 for every unit produced, with a guaranteed minimum wage of $750 per week.

  In week 1, they produce 5,000 units and so the pay will be 5,000 x $0.20 = $1,000 for the week.

  In week 2, they only produce 3,000 units, for which the pay would be 3,000 x $0.20 = $600. However, since this is below the guaranteed minimum the employee will receive $750 for the week.

- **Bonus (or incentive) schemes**

  There are many different ways in which a bonus scheme can operate, but essentially in all cases the employee is paid a standard wage but in addition receives a bonus if certain targets are achieved,

  Bonus schemes will be revisited later in these course notes.

4. Labour ratios

There are various ratios that can be useful for management when managing labour. You should be aware of the following:

- **Idle time ratio**

  Idle time is time for which the employee is being paid but during which they are not actually working (e.g. because the machine on which they work had broken down).

  $$\text{Idle time ratio} = \frac{\text{Idle hours}}{\text{Total hours}} \times 100\%$$

- **Labour turnover ratio:**

  This measures the rate at which employees are leaving the company.

  $$\text{Labour turnover rate} = \frac{\text{Replacements}}{\text{Average number of employees}} \times 100\%$$

- **Labour efficiency ratio:**

  This measures whether we are working faster or slower than expected.

  $$\text{Efficiency ratio} = \frac{\text{expected (or standard) hours to make output}}{\text{actual hours taken}} \times 100\%$$

- **Labour capacity ratio:**

  This measures whether we were able to obtain more or less working hours than we originally budgeted on being available.

  $$\text{Capacity ratio} = \frac{\text{actual hours worked}}{\text{budgeted hours}} \times 100\%$$

- **Labour production volume ratio (activity ratio):**

  This measures whether we were able to produce more or less than we expected to produce based on the budgeted hours available.

  $$\text{Production volume ratio} = \frac{\text{expected (or standard) hours to make output}}{\text{budgeted hours}} \times 100\%$$

WHEN YOU FINISHED THIS CHAPTER YOU SHOULD ATTEMPT THE ONLINE F2 MCQ TEST

Chapter 8

ACCOUNTING FOR OVERHEADS

1. Introduction

A business needs to know the cost per unit of goods or services that they produce for many reasons.

E.g. to value stock

to fix a selling price

to analyse profitability

In principle, the unit cost of materials and of labour should not be a problem, because they can be measured. It is the overheads that present the real difficulty – in particular the fixed overheads.

E.g. if the factory costs $100,000 p.a. to rent, then how much should be included in the cost of each unit?

2. Absorption of overheads

To show our approach to solving the problem referred to above, consider the following example:

Example 1

X plc produces desks.

Each desk uses 3 kg of wood at a cost of $4 per kg, and takes 4 hours to produce.

Labour is paid at the rate of $2 per hour.

Fixed costs of production are estimated to be $700,000 p.a..

The company expects to produce 50,000 desks p.a..

Calculate the cost per desk.

This method of arriving at an overhead cost p.u. (dividing total overheads by total production) is known as the absorbing of overheads.

(Note that because we need the cost p.u. for things like fixing a selling price, we will usually absorb the overheads based on estimated total cost and estimated production. This can lead to problems later because obviously our estimates may not be correct. We will deal with this problem in the next chapter.)

Although the basic approach to absorbing overheads is not difficult, there are two extra problems that can occur and that you can be asked to deal with.

We will consider each of these problems in turn, and then look at a full example.

3. First problem – more than one product produced in the same factory

In this situation we have to decide on a basis for absorption first.

There are many bases for absorption that could be used (e.g. per unit, per labour hour, per machine hour etc.)

Example 2

X plc produces desks and chairs in the same factory.

Each desk uses 3 kg of wood at a cost of $4 per kg, and takes 4 hours to produce.

Each chair uses 2 kg of wood at a cost of $4 per kg., and takes 1 hour to produce.

Labour is paid at the rate of $2 per hour.

Fixed costs of production are estimated to be $700,000 p.a..

The company expect to produce 30,000 desks and 20,000 chairs p.a.

(Overheads are to be absorbed on a labour hour basis)

Calculate the cost per unit for desks and chairs

In practice it would be up to the Management Accountant to decide on the most appropriate basis.

In examinations it will be made obvious to you which basis to use, but read the question carefully.

4. Second problem – more than one department in the factory.

In this situation we need first to **allocate** and **apportion** the overheads between each department. We can then **absorb** the overheads in each department separately in the same way as before.

Example 3

X plc produces desks and chairs in the same factory. The factory has two departments, assembly and finishing.

Each desk uses 3 kg of wood at a cost of $4 per kg., and takes 4 hours to produce – 3 hours in assembly and 1 hour in finishing.

Each chair uses 2 kg of wood at a cost of $4 per kg, and takes 1 hour to produce – ½ hour in assembly and ½ hour in finishing.

All labour is paid at the rate of $2 per hour.

Fixed costs of production are estimated to be $700,000 p.a.. Of this total, $100,000 is the salary of the supervisors – $60,000 to Assembly supervisor, and $40,000 to Finishing supervisor.

The remaining overheads are to be split 40% to Assembly and 60% to Finishing.

The company expects to produce 30,000 desks and 20,000 chairs.

(Overheads to be absorbed on a labour hour basis)

Calculate the cost per unit for desks and for chairs

The charging of supervisors' salaries to the relevant department is known as **allocation** of overheads.

The splitting or sharing of overheads between departments (as in the remaining $600,000 in our example) is known as the **apportionment** of overheads.

A fuller example of allocating and apportioning overheads:

Example 4

Production overhead costs for the period

	$
Factory rent	20,000
Factory heat	5,000
Processing Dept – supervisor	15,000
Packing Dept – supervisor	10,000
Depreciation of equipment	7,000
Factory canteen expenses	18,000
Welfare costs of factory employees	5,000
	80,000

	Processing Dept	*Packing Dept*	*Canteen*
Cubic space	50,000 m^3	25,000 m^3	5,000 m^3
NBV equipment	$300,000	$300,000	$100,000
No. of employees	50	40	10

Allocate and apportion production overhead costs amongst the three departments using a suitable basis.

5. Reapportionment of service cost centre overheads

Factory cost centres can be broken down into two types:

PRODUCTION COST CENTRES - these make the cost units.

SERVICE COST CENTRES - these do work for the production cost centres and one another.

We therefore need to transfer all service cost centre overheads to the production centres so that all production overheads for the period are shared between the production cost centres alone - as it is through these cost centres that cost units flow.

No Inter Service Work Done

If there is just one service department, or if there is more than one service department but there is no work done by one service department for another, then reapportionment is done using a suitable basis (e.g. canteen costs by the number of employees).

Example 5

Reapportion the canteen costs in Example 4 to the production cost centres.

Inter-Service Work Done

The problem is a little more complicated if there is more than one service cost centre and where they do work for one another. The way to deal with this is the reciprocal method.

The reciprocal method can be carried out in one of two ways:

- either the continuous or repeated distribution (tabular) method; or
- the algebraic method.

Example 6

	Production Depts		*Service Centres*	
	X	*Y*	*Stores*	*Maintenance*
	$	*$*	*$*	*$*
Allocated and apportioned overheads	70,000	30,000	20,000	15,000
Estimated work done by the service centres for other departments:				
Stores	50%	30%	-	20%
Maintenance	45%	40%	15%	-

Reapportion service department costs to departments using:
(a) repeated distribution method; and
(b) algebraic method.

Chapter 9

THE MANAGEMENT ACCOUNTANT'S PROFIT STATEMENT – ABSORPTION COSTING

1. Introduction

In the previous chapter we stated that the cost per unit is normally calculated in advance using estimated or budgeted figures. This is for several reasons. For instance, we need an estimate of the cost before we can fix a selling price. In addition, the estimated cost per unit provides a benchmark for control purposes. The Management Accountant can check regularly whether or not units are costing more or less than estimated and attempt to take corrective action if necessary.

As a result, the Management Accountant's Profit Statement (or Operating Statement) takes a different form than that of the Financial Accountant's Income Statement

The statement is usually prepared monthly, and its objective is to show whether the profit is higher or lower than that expected, and to list the reasons for any differences.

The statement starts with the profit that should have been made if all the costs had been the same as on the standard cost card.

It then lists all the reasons for any differences in profit (or **variances**) to end with the actual profit.

However, in calculating the budgeted profit for individual months, absorption costing causes a problem when the expected production in a month differs from that used to absorb fixed overheads for the cost card.

This problem is illustrated in the following example

2. Illustration

Example 1

X plc produces one product – desks.

Each desk is budgeted to require 4 kg of wood at $3 per kg, 4 hours of labour at $2 per hour, and variable production overheads of $5 per unit.

Fixed production overheads are budgeted at $20,000 per month and average production is estimated to be 10,000 units per month.

The selling price is fixed at $35 per unit.

There is also a variable selling cost of $1 per unit and fixed selling cost of $2,000 per month.

During the first two months X plc expects the following levels of activity:

	January	*February*
Production	11,000 units	9,500 units
Sales	9,000 units	11,500 units

(a) Prepare a cost card using absorption costing
(b) Set out budget Profit Statements for the months of January and February.

3. Hourly absorption rates

The previous example assumed that fixed overheads were absorbed on a unit basis. A popular question in the exam is to be asked to calculate the amount of any over or under - absorption when fixed overheads are absorbed on an hourly basis

Example 2

Y plc budgets on working 80,000 hours per month and having fixed overheads of $320,000. During April, the actual hours worked are 78,000 and the actual fixed overheads are $315,500.

Calculate:
(a) the overhead absorption rate per hour.
(b) the amount of any over or under-absorption of fixed overheads in April

Chapter 10

THE MANAGEMENT ACCOUNTANT'S PROFIT STATEMENT – MARGINAL COSTING

1. Overview

Some businesses only want to know the variable cost of the units they make, regarding fixed costs as period costs. The variable cost is the extra cost each time a unit is made, fixed costs being effectively incurred before any production is started.

The variable production cost of a unit is made up of:

	$
Direct materials	X
Direct labour	X
Variable production overheads	X
Marginal cost of a unit	X

Marginal costing

Variable production costs are included in cost per unit (i.e. treated as a **product cost**).

Fixed costs are deducted as a period cost in the profit statement.

2. Contribution

Contribution is an important concept in marginal costing. Contribution is an abbreviation of "contribution towards fixed costs and profit".

It is the difference between selling price and all variable costs (including non-production variable costs), usually expressed on a per unit basis.

	$	$
Selling price:		X
Less: Variable production costs	X	
Variable non-production costs	X	(X)
Contribution	X	X

Note: Contribution takes account of all variable costs. Marginal cost takes account of variable production costs only and inventory is valued at marginal cost.

Example 1

X plc produces one product – desks.

Each desk is budgeted to require 4 kg of wood at $3 per kg, 4 hours of labour at $2 per hour, and variable production overheads of $5 per unit.

Fixed production overheads are budgeted at $20,000 per month and average production is estimated to be 10,000 units per month.

The selling price is fixed at $35 per unit.

There is also a variable selling cost of $1 per unit and fixed selling cost of $2,000 per month.

During the first two months, X plc expects the following levels of activity:

	January	*February*
Production	11,000 units	9,500 units
Sales	9,000 units	11,500 units

All other results were as budgeted.

(a) Prepare a cost card using marginal costing
(b) Set out Profit Statements for the months of January and February.

Example 2

Prepare a reconciliation of absorption and marginal costing profits

	January	*February*
	$	*$*
Absorption costing		
Marginal costing		
Difference		

The difference in profit arises from the different inventory valuations which are the result of the difference in treatment of the fixed production overheads.

Effects

The delay in charging some production overheads under absorption costing leads to the following situations.

Example 3

Compare profits under marginal and absorption costing for the following situations

(a) Production > Sales
(b) Production < Sales
(c) Production = Sales

WHEN YOU FINISHED THIS CHAPTER YOU SHOULD ATTEMPT THE ONLINE F2 MCQ TEST

Chapter 11

PROCESS COSTING – INTRODUCTION

1. Introduction

Process costing is a method of applying costing systems to goods or services that are produced in a series of processes. Every unit is assumed to have involved the same amount of work and therefore the costs for a period are charged to processes or operations, and unit costs are calculated by dividing process costs by the quantity of units produced.

2. Calculation of cost per unit

- Calculate the total of all costs incurred in the process during a period.
  - If using absorption costing then include all overheads.
  - If using marginal costing then only include variable overheads.
- Divide the total cost by the number of units produced to arrive at a cost per unit.

Example 1

During February the following costs were incurred in a process:

Materials	$20,000
Labour	$10,000
Overheads	$8,000

2,000 units were produced.

Calculate the cost per unit.

3. Process T-Accounts

If a T-account is shown in the examination, then the entries are as follows:

- **Debit** the Process Account with each cost incurred
- **Credit** the Process Account with the unit cost previously calculated.

It is normal and useful to have 2 columns in the Process Account – one for units and one for $'s

Example 2

Prepare a Process Account for the information in example 1.

Process Account

	units	$		units	$

4. Problem areas

There are three problem areas that can occur in the examinations

- **Losses**

  Some of the units started in a process may not end up as finished output due to loss or damage

- **Work-in-progress**

  At the start and end of a period there may be some units in the process that are only partly finished and which need more work in the next process

- **Joint Products**

  More than one product may be produced in the same process.

These problems will be covered in the following chapters.

Chapter 12

PROCESS COSTING – LOSSES

1. Introduction

In many processes it is unlikely that the output units will equal the input units. For example, in the manufacture of beer it is very unlikely that the litres produced will equal the number of litres that were input, due to evaporation.

We need to deal with any losses in our costings.

2. Normal loss

Normal loss is the amount of loss that is expected from the process, based on past experience. It is also known as the **expected loss**.

In our costings, we spread the process costs over the number of units that we expect to produce.

Example 1

During March the following costs were incurred in a process:

Materials (1,000 kg)	$12,000
Labour	$7,000
Overheads	$8,000

A normal loss of 10% was expected. The actual output was 900 kg.

Calculate the cost per kg, and prepare a Process Account.

3. Normal loss with a scrap value

The word 'loss', when used in process costing, does not just mean units that are lost but also units that were damaged. Any damaged units may be saleable as scrap.

If there are any expected scrap proceeds from damaged units, then these scrap proceeds are subtracted from the total costs of the process before spreading over the units we expect to produce.

Example 2

During April, the following costs were incurred in a process:

Materials (3,000 kg)	$30,000
Labour	$12,000
Overheads	$10,800

A normal loss of 10% was expected. The actual output was 2,700 kg.

Losses have a scrap value of $5 per unit.

Calculate the cost per kg and prepare a Process Account and a Loss Account.

4. Abnormal losses

Even though we may expect a normal loss of (for example) 10% to occur each month, it is unlikely that we will actually lose exactly 10% each month. Some months we will probably lose more than 10%, and some months less than 10%.

Any excess loss in any month is known as an **abnormal** (or **unexpected**) **loss**.

We prepare costings as normal, taking into account any normal loss, and spreading the total cost over the units that we expect to produce.

Any abnormal losses are charged separately at the full cost per unit.

(Note: we always assume that any abnormal losses are sold for scrap at the same price as normal losses).

Example 3

During May, the following costs were incurred in a process:

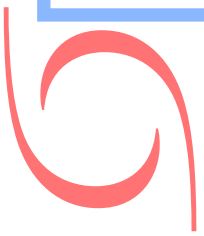
Materials (1,000 kg)	$9,000
Labour	$18,000
Overheads	$13,500

A normal loss of 10% of input was expected.

Actual output was 850 kg.

Losses are sold as scrap for $9 per kg.

Calculate the cost per kg and prepare a Process Account and a Loss Account.



5. Abnormal Gains

In the same way that the actual output may be less than that expected, in some months it may be more than expected.

If this happens, then we say that we have an **abnormal gain**.

The treatment of abnormal gains is exactly the same as for abnormal losses.

Example 4

During June the following costs were incurred in a process:

Materials (2,000 kg)	$18,000
Labour	$36,000
Overheads	$27,000

A normal loss of 10% of input was expected.

Actual output was 1,840 kg.

Losses are sold as scrap for $9 per kg.

Calculate the cost per kg, and prepare a Process Account and a Loss Account.

Chapter 13

PROCESS COSTING – WORK-IN-PROGRESS

1. Introduction

At the end of a process there may be some units that have been started but not completed. These are known as **closing work-in-progress**. They are still there at the start of the next period, waiting to be finished. They are therefore **opening work-in-progress** of the next period.

2. Equivalent units

In our costings we still wish to calculate the cost of a finished unit. For costing purposes we assume the work done on 100 units that are only half finished is equivalent to 50 fully finished units. Therefore, 100 units each 50% finished is regarded as 50 equivalent complete units.

3. Closing Work-in-Progress (no opening Work-In-Progress)

When we have closing work-in-progress, we calculate a cost per unit for each category of cost, using equivalent units. The total cost per unit is the sum of these separate costs.

Example 1

During January the following costs were incurred in a process:

Materials (1,000 units)	$5,000
Labour	$2,760
Overheads	$3,440

During the month, 800 units were finished and transferred to the next process.

The remaining 200 units were WIP and were complete as follows:

Materials	100%
Labour	60%
Overheads	30%

(a) calculate the cost per unit;
(b) value the finished output and the WIP;
(c) prepare Process Account.

4. Opening and Closing W-I-P.

When there is opening W-I-P, there are two alternative approaches to the costings.

- First-in-first-out (FIFO)

  Under this approach it is assumed that the opening W-I-P is the first to be finished. All the costs brought forward for the W-I-P are treated as costs of these specific units, and the current period's expenditure is allocated over the work done in the current period.

- Weighted Average

  Under this approach, **all** the costs related to current period's output (including the value of the
  W-I-P brought forward) are allocated over all the units of the current period.

5. FIFO

Example 2

During July, the following costs were incurred

Materials (30,000 units)	$24,900
Labour and overheads	$20,075

At the beginning of July, there were 15,000 units of work in progress valued as follows:

Materials (100% complete)	$9,000
Labour and overheads (40% complete)	$1,250

At the end of July, there were 5,000 units of work-in-progress. They were 100% complete for materials and 50% complete for labour and overheads.

(a) calculate how many units were completed during July
(b) calculate the cost per unit
(c) value the finished items and the closing work-in-progress
(d) prepare a Process Account.
(Note: use the FIFO approach and assume no losses)

6. Weighted average

One problem with the FIFO approach is that completed units are valued at two different costs depending on whether or not they were opening work-in-progress.

The **weighted average** approach values all finished units at an average cost.

Example 3

During July, the following costs were incurred

Materials (30,000 units)	$24,900
Labour and overheads	$20,075

At the beginning of July, there were 15,000 units of work in progress valued as follows:

Materials (100% complete)	$9,000
Labour and overheads (40% complete)	$1,250

At the end of July, there were 5,000 units of work-in-progress. They were 100% complete for materials and 50% complete for labour and overheads.

(a) calculate how many units were completed during July
(b) calculate the cost per unit
(c) value the finished items and the closing work-in-progress
(d) prepare a Process Account.
(Note: use the weighted average approach and assume no losses)

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Chapter 14

PROCESS COSTING – JOINT PRODUCTS

1. Introduction

Sometimes, one process may produce several products. In this case we need to decide on a cost per unit for each of the products. These products, produced in the same process, are known as **joint products**.

Joint products refer to our main products with full sales value. However, there may be an additional product (or products) which is produced incidentally and has a relatively low sales value (effectively a waste product). This is known as a **by-product**.

2. Accounting treatment

- Any sale proceeds of a by-product are subtracted from the joint costs of the process.
- The net total cost of the process is then split between the joint products.
- For the examination, there are two ways of splitting the joint costs:
  - The physical units basis
  - The market value at the point of separation basis.

3. Physical units basis

Under this method, the same cost per unit is applied to all the joint products

Example 1

During August, the following costs were incurred in a process:

Materials (3,500 kg)	$5,000
Labour and overheads	$2,300

The production from the process was as follows:

	kg	
Product A	1,000	selling price $5 per kg
Product B	2,000	selling price $2 per kg
by-product X	500	scrap value $0.20 per kg

Calculate a cost per kg and profit per kg for A and B *using the physical units basis*.

4. Market value basis

Under this method the costs per unit are calculated so as to be in the same proportions as the market values of each product

Example 2

During August, the following costs were incurred in a process:

Materials (3,500 kg)	$5,000
Labour and overheads	$2,300

The production from the process was as follows:

	kg	
Product A	1,000	selling price $5 per kg
Product B	2,000	selling price $2 per kg
by-product X	500	scrap value $0.20 per kg

Sales during the period were 800 kg of A and 1,500 kg of B.

Calculate a cost per kg and profit per kg for A and B *using the market value basis*

5. Net-realisable value approach

The market value approach is not always possible. This is because the products will often require further work (and therefore costs) after leaving the process. We have to use the net realisable value at a point of separation as an approximation to the market value.

The net realisable value is the final market value less costs incurred after leaving the joint process.

Example 3

During September the following costs were incurred in a process:

Materials (3,500 kg)	$5,000
Labour and overheads	$2,300

The production from the process was as follows:

	kg	
Product A	1,000	selling price $8.40 per kg
Product B	2,000	selling price $4.50 per kg
by-product X	500	scrap value $0.20 per kg

All the output of A and B incurred further processing at a cost of $4.80 per kg for A and $2.20 per kg for B.

Calculate a cost per kg for A and B *using the net realisable value* approach.

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Chapter 15

JOB, BATCH, AND SERVICE COSTING

1. Introduction

Most costing questions in the examination relate to the costing of units of production which has been explained in earlier chapters. However, there are three situations which need slightly different thinking - job costing, batch costing, and service costing.

2. Job Costing

Job costing is relevant in the situation where a customer orders a specific job (as opposed to simply purchasing goods that we already produce in quantity).

In this situation the job is costed separately, with all associated costs listed to arrive at a total cost.

Example 1

The estimated costs for job XXX are as follows:

Direct materials 4 kgs at $25 per kg

Labour 10 hours @ $5 per hour

Variable overheads are recovered at the rate of $2 per direct labour hour.

Fixed production overheads are absorbed at the rate of $4 per direct labour hour.

Other, non-production, overheads are charged at the rate of $100 per job.

What is the total cost of job XXX?

3. Batch costing

Batch costing is effectively the same as job costing except that we cost out a batch of units.

Once we have calculated the cost of a batch, we then divide the cost by the number of units in the batch to arrive at a cost per unit.

Example 2

Job YYY is the production of a batch of 1,000 units and the estimated costs are as follows:

Direct materials 50 kgs at $25 per kg

Labour 100 hours @ $5 per hour

Variable overheads are recovered at the rate of $6 per direct labour hour.

Fixed production overheads are absorbed at the rate of $10 per direct labour hour.

Other, non-production, overheads are charged at the rate of $200 per job.

What is the cost per unit produced?

4. Service costing

Service industries are those that provide a service as opposed to manufacturing a product. Examples include hotels, hairdressers, and airlines.

Just as with normal costing for manufacturing businesses, we need a cost unit, but the problem is what to use as the cost unit.

Usually it will be what is known as a composite cost unit, which is a combination of two variables.

For example, a train company may calculate the cost per passenger kilometer,

A hotel may calculate the cost per guest per night.

Example 3

Last year an airline carried a total of 150,000 kg of excess baggage over a total distance of 6,000 km. The total cost of the extra fuel was $27,000,000.

What was the cost per kg/km?

Chapter 16

ALTERNATIVE COST ACCOUNTING

1. Introduction

This chapter briefly explains four more recent developments in costing which are improvements on the traditional techniques that we have been dealing with in the previous chapters.

You will not be required to perform any calculations – they will come in a later examination – but you are required to be aware of the ideas.

2. Activity based costing (ABC)

ABC deals with the way we charge overheads to the different products that we make.

You will remember from an earlier chapter that the traditional way is to take the total overheads and calculate an absorption rate – often a rate per labour hour – and then to charge this to the individual products on the basis of the number of hours each product takes to make.

With ABC, we identify the area where overheads are being incurred and then decide what it the reason or cause for these overheads. For example, one area where overheads may be incurred is in the department that receives the raw materials for production. We may decide that the reason we are incurring these overheads is the number of deliveries received (we call this the cost driver).

We then charge the different products with this part of the overheads on the basis of the number of deliveries received for each of the products we are making.

Not only does this result in more accurate costings but more importantly we can then investigate whether it is possible to have fewer deliveries received (by ordering more raw materials each time) and therefore potentially reduce the total overhead and save costs.

3. Target costing

Target costing is particularly useful when a new product is being launched.

There are basically 4 steps involved:

First, we decide on a realistic selling price for the new product. We do this by looking at the prices competitors charge or maybe by using market research.

Secondly, we decide on our objective. For example, maybe we require all our products to generate a profit of 40% of the selling price.

Thirdly, we put the two together and calculate the maximum cost that we can allow in order to achieve our objective – this is the target cost.

For example, suppose we identify that a realistic selling price for our new product is $100, and we require a profit of 40% on selling prices. This would result in a target cost of $60.

Fourthly, we estimate the actual cost of production, and if this is above the target cost we look for ways of reducing the cost to the target cost.

The most important way of achieving this is by examining the design of the product and looking to see if we can change the design in ways that will reduce the costs without needing a reduction in the selling price.

4. Life-cycle costing

Traditional costing tends to budget costs over just the short term – usually over the coming year. However this can create problems. Many new products will have low sales initially, but sales will rise as the products become popular. If sales are low in the early years, then overheads per unit are likely to be high, giving high unit costs. Whereas in later years, when sales are higher, the overheads per unit are likely to be lower, giving lower unit costs.

Life-cycle costing tries to take account of all costs and all production over the entire life of the product which can lead to much more sensible decisions regarding, for example, the pricing policy.

5. Total quality management

Poor quality costs a company money. This can be for two reasons – firstly, if the workers are not performing well there is high wastage and excess labour costs if they work slowly. Secondly, if poor quality goods are delivered to customers then there is the cost of replacing faulty goods, or guarantee work, and of lost goodwill.

There is a much greater focus these days on improving quality and reducing the costs associated with poor quality. This can involve such things as employing better skilled workers, training employees better, and also the cost of greater quality control procedures to try and avoid delivering poor quality goods to the customers.

Total quality management involves getting the entire workforce motivated to improve quality, and assessing the costs and benefits involved in improving quality.

Chapter 17

BUDGETING

1. Introduction

Budgeting is an essential tool for management accounting for both planning and controlling future activity. In this chapter we will discuss the benefits of budgeting, the types of budget, and the preparation of budgets.

2. What is budgeting

Most companies prepare budgets – generally once a year they budget for the coming year.

Although this usually includes a forecast Income Statement for the year, the budget is actually a set of plans.

For example, a manufacturing company needs to plan their material and labour requirements for the coming year. In order to do this they will generally have to forecast their expected sales units for the year i.e. a sales budget. Then they will be in position to budget their production units for the year i.e. a production budget. Once they have budgeted how many units to produce they are in a position to estimate how much material and how much labour they will require i.e. a materials usage budget and a labour budget.

None of the budgets so far mentioned will be in money terms – they will be expressed in units of production, or kg of material, or hours of labour – but they each represent a plan for the year.

When all the individual budgets (or **functional budgets**) have been prepared, then it will be possible to cost them out in money terms and prepare a forecast Income Statement.

3. Benefits of budgeting

Planning

Controlling

Co-ordination

Authorising and delegating

Evaluation of performance

Communicating and motivating

4. Principal budget factor

As previously discussed, the budget needs to be prepared in stages – for example we normally will need to know the budget production (in units) before we can budget how much material will be needed (in kg).

The first thing that the person in charge of the budget process must do is decide where to start! For most companies the starting point will be a sales budget. Once it has been decided how many units the company expects to sell it is then possible to produce a production budget and so on.

However, this will not always be the starting point. Suppose, for example, that the company is a manufacturer of desks for which wood is the main material. Suppose also that during the coming year there is expected to be only a limited supply of wood available. In this situation the starting point will be to budget the amount of wood available, then budget how many units the company is capable of producing (a production budget) and then how many they expect to sell (a sales budget).

In general terms, the first budget to be prepared should be whatever factor it is that limits the growth of the company – it may be the level of demand (so a sales budget will be prepared first) or, as for the example in the previous paragraph, it may be the availability of raw material (so a material budget will be prepared first).

The factor that limits the company is known as the **principal budget factor**. The management accountant needs to identify the principal budget factor and it is this factor that will be budgeted first.

5. The preparation of budgets

Example 1

The XYZ company produces three products, X, Y, and Z. For the coming accounting period budgets are to be prepared using the following information:

Budgeted sales

Product X 2,000 units at $100 each

Product Y 4,000 units at $130 each

Product Z 3,000 units at $150 each

Standard usage of raw material

	Wood (kg per unit)	*Varnish (litres per unit)*
Product X	5	2
Product Y	3	2
Product Z	2	1
Standard cost of raw material	$8	$4

Inventories of finished goods

	X	*Y*	*Z*
Opening	500u	800u	700u
Closing	600u	1,000u	800u

Inventories of raw materials

	Wood (kg)	*Varnish (litres)*
Opening	21,000	10,000
Closing	18,000	9,000

Labour

	X	*Y*	*Z*
Standard hours per unit	4	6	8

Labour is paid at the rate of $3 per hour

Prepare the following budgets:

(a) Sales budget (quantity and value)
(b) Production budget (units)
(c) Material usage budget (quantities)
(d) Material purchases budget (quantities and value)
(e) Labour budget (hours and value)

6. Type of budgets

Fixed budget

Flexed budget

Flexible budget

Example 2

A company has prepared the following fixed budget for the coming year.

Sales	10,000 units
Production	10,000 units

	$
Direct materials	50,000
Direct labour	25,000
Variable overheads	12,500
Fixed overheads	10,000
	$97,500

Budgeted selling price $10 per unit.

At the end of the year, the following costs had been incurred for the actual production of 12,000 units.

	$
Direct materials	60,000
Direct labour	28,500
Variable overheads	15,000
Fixed overheads	11,000
	$114,500

The actual sales were 12,000 units for $122,000

(a) Prepare a flexed budget for the actual activity for the year

(b) Calculate the variances between actual and flexed budget, and summarise in a form suitable for management.

(Use a marginal costing approach)

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Chapter 18

BEHAVIOURAL ASPECTS OF BUDGETING

1. Introduction

In the previous chapter we looked at how budgets are prepared. In this chapter we will consider how the budget can affect the behaviour of managers.

2. Motivation

An important use of budgets is for them to become the targets for managers. This will only work if our managers are motivated to attempt to achieve (or to perform better than) the targets that have been set.

It is therefore important that consideration is given as to how best to motivate the managers.

3. Factors that influence motivation

The main factors influencing how well the managers will be motivated are:

(1) to what extent they were involved in preparing the budgets and therefore in setting the targets

(2) how easy or difficult will it be for the managers to achieve the targets

(3) how the managers will be rewarded for achieving their targets (or punished for not achieving them!)

We will consider each of these factors briefly in the following paragraphs.

4. Participation in the preparation of budgets

There are two basic approaches to the way budgets are prepared:

(1) one approach is for top management to prepare the budgets and then to impose them on their managers. This is known as **top-down budgeting**

(2) the alternative approach is to get the managers to prepare their own budgets and for top management to then approve them (after obviously due discussion). This is known as **bottom-up budgeting**.

The second approach – bottom-up budgeting – is a **participative** approach and is regarded as being more motivational for the managers because they were involved in setting their own targets. The danger is that they deliberately budget targets that are easy for them to achieve – it is up to top management to be aware of this and to question the managers well before approving the budgets.

5. The impact of targets

It is important that the targets are demanding of the managers – the purpose of them is to help improve the performance of the business – but at the same time they need to be achievable by the managers. If the manager feels that it is simply not possible to achieve his or her target, then there is the danger that they just stop trying completely.

6. Incentive schemes

The most common way of motivating managers to improve is to reward them - the level of the reward being dependent on the degree to which they achieve, or better, their targets.

The reward can be given in several ways, such as the following:

(1) the promise of promotion

(2) an increase in salary

(3) a cash bonus

(4) a bonus given in shares in the company

Chapter 19

SEMI-VARIABLE COSTS

1. Introduction

The chapter relates to semi-variable costs i.e. part fixed and part variable. It may be necessary for you in the examination to identify the fixed and variable elements and in this chapter we will revise the 'high-low' method and also explain Regression Analysis.

2. High-Low Method

This is a quick and easy approach that estimates fixed and variable costs by comparing the highest and lowest activity levels.

Example 1

Electricity costs for the first 6 months of the year are as follows:

	Units produced	*Cost ($)*
January	340	2,260
February	300	2,160
March	380	2,320
April	420	2,400
May	400	2,300
June	360	2,266

Calculate the fixed and variable costs using the high-low method.

3. Problems with the high-low approach

4. Regression

If there is a reasonable degree of linear correlation between two variables, we can use regression analysis to calculate the equation of the best fit for the data.

This is known as **least squares linear regression**.

If the equation relating two variables, × and y, is

$y = a + bx$

then the values of a and b may be calculated using the following formulae (which are given in the examination)

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - \left(\sum x\right)^2}$$

$$a = \frac{\sum y}{n} - \frac{b\sum x}{n}$$

Example 2

The following table shows the number of units produced each month and the total cost incurred:

	Units	*Cost ($ '000)*
January	100	40
February	400	65
March	200	45
April	700	80
May	600	70
June	500	70
July	300	50

Calculate the regression line, y = a + bx

5. Problems with regression analysis

6. The correlation coefficient

Pearson's correlation coefficient is a measure of how linear the relationship between variables is.

A correlation coefficient of +1 indicates perfect positive linear correlation, whereas -1 indicates perfect negative linear correlation.

The further away from + or – 1, the less linear correlation exists.

The correlation coefficient may be calculated using the following formula (which is given to you in the examination)

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{\left(n\sum x^2 - \left(\sum x\right)^2\right)\left(n\sum y^2 - \left(\sum y\right)^2\right)}}$$

Example 3

Using the data in example 2, calculate the correlation coefficient

7. Coefficient of determination

The **coefficient of determination** is the square of the coefficient of correlation (r^2).

It is a measure of how much of the variation in the dependent variable is 'explained' by the variation of the independent variable.

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Chapter 20

TIME SERIES ANALYSIS

1. Introduction

Managers often wish to look at the trend of costs or sales over time as a basis for forecasting the future. It is unlikely in practice that past results will follow a smooth pattern for various reasons.

Of particular interest to us in this chapter are seasonal variations which we can attempt to identify.

2. Definitions

- **Time series:** a set of observations taken at equal intervals of time e.g. monthly

Variations in observations:

- **Trend:** the underlying pattern of a time series when the short term fluctuations have been smoothed out.
- **Cyclical Variations:** the wave-like appearance of a number of time series graph when taken over a number of years. Generally this corresponds to the influence of booms and slumps in the industry.
- **Seasonal variations:** the regular rise and fall over shorter periods of time. For example, umbrella sales are likely to be higher than average every winter and lower than average every summer.
- **Random (residual) variations:** these are other, unpredictable variations.

3. Moving averages

In order to estimate the trend and the seasonal variations, we use the method of moving averages.

Example 1

Set out below are the sales per quarter (in 000's of units) of a company over the last 3 years.

	Quarter			
	1	*2*	*3*	*4*
2000	80	87	82	90
2001	90	95	93	102
2002	105	112	103	116

Identify the trend and calculate the average seasonal variation.

4. The multiplicative model

In the previous example we calculated the seasonal variations in terms of units.

However, if the trend is increasing it would perhaps be more sensible to accept an increasing seasonal variation.

The **multiplicative model** deals with this by measuring the actual seasonal variation as a percentage of trend.

Example 2

Using the data from example 1 together with the trend already calculated, calculate the average seasonal variation using the multiplicative model.

Chapter 21

INDEX NUMBERS

1. Introduction

The purpose of index numbers is to show the rate of change of a variable from one specified time to another. The most common use is as a way of measuring the effect of inflation on prices.

2. Simple index numbers

Simple index numbers are based on a single item. There are two types: price relative and quantity relative.

A **price relative** index number shows changes in the price of an item over time.

A **quantity relative** index number shows changes in quantity over time.

$$\text{Simple price index} = \frac{P_1}{P_0} \times 100$$

$$\text{Simple quantity index} = \frac{q_1}{q_0} \times 100$$

Example 1

The price of coffee was \$2.40 in 2006, \$2.50 in 2007, and \$2.60 in 2008

Calculate the price index for 2007 and 2008 using 2006 as base year.

Example 2

Sales of tea were 8,200 packets in 2008, 9,000 packets in 2009 and 9,400 packets in 2010.

Calculate the quantity index for 2009 and 2010 using 2008 as a base year.

3. Laspeyre and Paasche index numbers

In order, for example, to measure the overall effect of inflation, it is more sensible to consider the change in price of a typical 'shopping basket' of goods rather than looking at just one item.

To make sure that we are only measuring the effect of price inflation, it is important to compare the same shopping basket in terms of quantities.

The Laspeyre price index uses base period quantities, whereas the Paasche price index uses current period quantities.

$$\text{Laspeyre price index} = \frac{\sum(p_1 \times q_0)}{\sum(p_0 \times q_0)} \times 100$$

$$\text{Paasche price index} = \frac{\sum(p_1 \times q_1)}{\sum(p_0 \times q_1)} \times 100$$

Example 3

Below are stated the quantities and unit prices for a typical 'shopping basket' in each of the year 2008, 2009, and 2010.

	2008		*2009*		*2010*	
	quantity	*price p.u.*	*quantity*	*price p.u.*	*quantity*	*price p.u.*
Coffee	20	$4.00	15	$4.50	15	$4.80
Sugar	15	$0.60	18	$0.70	20	$1.00
Bread	30	$0.80	35	$1.00	40	$1.10

Calculate price index numbers for 2009 and 2010, with 2008 as a base year, using:

(a) Laspeyre

(b) Paasche

3. Advantages and disadvantages

Laspeyre price index

Paasche price index

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Chapter 22

INTEREST

1. Introduction

The purpose of this chapter and the next chapter is to consider a key area for management accountants – the appraisal of capital investments.

In this chapter we will look at interest on capital and continue in the next chapter with the use of these techniques in investment appraisal.

2. Simple interest

A sum of money invested or borrowed is known as the **principal**.

When money is invested it earns interest; similarly when money is borrowed, interest is payable.

With **simple interest**, the interest is receivable or payable each year, but is not added to the principal.

Example 1

A man invests $200 on 1 January each year. On 31 December each year simple interest is credited at 15% but this interest is put in a separate account and does not itself earn interest.

Find the total amount standing to his credit on 31 December following his fourth payment of $200.

3. Compound interest

With **compound interest** the interest is added each year to the principal and in the following year the interest is calculated on the total.

Example 2

A man invests $500 now for 3 years with interest at 10% p.a.

How much will be in his account after 3 years?

The amount (A) at the end of the n'th year is given by:

$A = P(1+r)^n$

This is also known as the **future value** (or **terminal value**)

Example 3

A man invests $800 at 6%p.a. for 5 years.

How much will be in his account at the end of 5 years?

4. Effective Rate

For simplicity, the previous compound interest examples have assumed that interest is calculated only once a year.

However in practice interest may be calculated on a monthly or even daily basis. The same formula can still be used, but we need to distinguish between the nominal and annual percentage rates.

There are usually two rates quoted by financial institutions. The first is the **nominal rate** and the other, the rate actually earned, is known as the **effective** or the **annual percentage rate** (APR).

Example 4

A credit card company charges a nominal rate of 2% per month.

If a customer has purchased $100 worth of goods on his credit, calculate the amount she will owe after one year, and also the annual percentage rate (APR)

5. Discounting

In the previous example we calculated the future value of cash flows by adding on (or compounding) the interest.

We can do the same exercise in reverse to calculate the amount now that is equivalent to future flows, by removing interest.

This exercise is known as **discounting** and the equivalent amount is known as the **present value**.

Example 5

What amount now is equivalent to $800 in 4 years time, with interest at 10% p.a.?

The formula for this is

$$P = \frac{A}{(1+r)^n}$$

However tables are provided in the examination which give the discount factors $\left(\frac{1}{(1+r)^n}\right)$ at different rates of interest for different numbers of years.

Example 6

What is the present value of $2,500 receivable in 12 years time, with interest at 13% p.a.?

6. Annuities

An annuity is regular payment of the same amount each year.

The present value of an annuity is given by the formula:

$$P = \frac{A\left(1-\frac{1}{(1+r)^n}\right)}{r}$$

but again, tables are provided for this in the examination.

Example 7

Interest rate is 12% p.a.

What is the present value of $500 receivable in 1 years time and thereafter every year for a total of 8 receipts?

Example 8

A man expects to receive $1,000 in each of 9 years, with the first receipt being in 4 years time.

What is the present value of the receipts if interest is 8% p.a.?

7. Perpetuities

Perpetuity is an annuity that is expected to continue for an indefinitely long period of time.

The present value of a perpetuity is given by the formula:

$$P = \frac{A}{r}$$

Example 9

Interest rate is 12% p.a.

What is the present value of $5,000 receivable in 1 years time and thereafter in perpetuity?

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Chapter 23

INVESTMENT APPRAISAL

1. Introduction

In this chapter we will apply the discounting techniques covered in the previous chapter to the appraisal of capital investments.

2. Net Present Value

Under this approach to investment appraisal we look at all the expected cash flows that will arise from an investment.

If overall the investment generates a cash surplus then we will accept and invest; if however there is an overall cash deficit then we will reject the investment.

However, we also need to take into account interest on the investment in the project. This is either because we have needed to borrow money and therefore be paying interest, or because we are using money that could otherwise have been invested and be earning interest.

In either case, we account for the interest by discounting the future cash flows to get the present value. The overall surplus or deficit is known as the **Net Present Value**.

Example 1

A new project will cost $80,000 and is expected to last 4 years. At the end of 4 years it is expected to have a scrap value of $10,000.

The project is expected to generate operating cash flows each year as follows:

Year 1	20,000
Year 2	30,000
Year 3	40,000
Year 4	10,000

Assume that all operating cash flows occur at the ends of years.

If interest is 10% p.a., calculate the Net Present Value of the project and state your decision as to whether or not we should invest.

3. Internal Rate of Return

One problem in practice with basing our decision on the Net Present Value is that it will usually be impossible for a company to determine their cost of capital (or interest cost) accurately.

In these circumstances, it is therefore often useful to calculate a 'breakeven' interest rate of the project.

This is known as the **Internal Rate of Return** (IRR) and is the rate of interest at which the project gives a NPV of zero.

Example 2

For the project detailed in Example 1.

Calculate the net present value at interest of 15% and hence estimate the Internal Rate of Return of the project.

4. Payback Period

One problem with basing decision on the net present value of a project is that the cash flows are only estimates, and if the estimate are wrong then the decision could be wrong.

It is likely to be the earlier cash flows that are the most certain whereas the further into the future that we are estimating the more uncertain the cash flows are likely to be.

The **payback period** is the number of years it takes to get back the original investment in cash terms. The shorter the payback period, the more certain we are that the project will actually pay for itself.

The **discounted payback period** is exactly the same except that it takes into account the time value of money by measuring how many years it takes to get back the original investment looking at the discounted cash flow each year.

Example 3

A new project will cost $100,000 and will last for 5 years with no scrap value.

The project is expected to generate operating cash flows each year as follows:

Year 1	20,000
Year 2	30,000
Year 3	40,000
Year 4	50,000
Year 5	30,000

The cost of capital is 10%

(a) Calculate the payback period
(b) Calculate the discounted payback period

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Chapter 24

VARIANCE ANALYSIS

1. Introduction

In earlier chapters we looked at the layout of the management accountant's profit statements.

Unlike the financial accountant, the purpose for the management accountant is to explain (usually monthly) why the actual profit is different from the budgeted profit.

If the reasons for the difference can be identified, the information can be used for control purposes e.g. an overspend in one month can be investigated and attempts made to correct any problem for future months.

2. Total variances

Example 1

A company has prepared the following standard cost card:

	$ per unit
Materials (4 kg at $4.50 per kg)	18
Labour (5 hrs at $5 per hr)	25
Variable overheads (5 hrs at $2 per hr)	10
Fixed overheads (5 hrs at $3 per hr)	15
	$68

Budgeted selling price $75 per unit.

Budgeted production	8,700 units
Budgeted sales	8,000 units

There is no opening inventory

The actual results are as follows:

Sales:	8,400 units for $613,200
Production:	8,900 units with the following costs:

Materials (35,464 kg)	163,455
Labour (Paid 45,400hrs; worked 44,100 hrs)	224,515
Variable overheads	87,348
Fixed overheads	134,074

Prepare a flexed budget and calculate the total variances

3. Analysis of cost variances

The total variance that we have calculated for materials indicates that the actual expenditure on materials was not $18 per unit. However, this could be either because we used the wrong amount of materials (which should have been 4 kg per unit) or that we paid the wrong price (which should have been $4.50 per kg). More likely of course, it would be a combination of the two.

We will therefore analyse this and the other variances in as much detail as possible.

Example 2

Using the data from example 1, analyse each of the cost variances.
Materials
Labour
Variable Overheads
Fixed Overheads

4. Sales Variances

Although we have already calculated the sales variances in example 1, you may be asked to calculate them independently.

Example 3

Using data from example 1, calculate the Sales price variance and the Sales volume variance

5. Marginal costing

In the previous examples, the company had been using absorption costing. They could alternatively have been using marginal costing. The variances are all calculated exactly as before, with the exception of the sales volume variance, and the fixed overhead variance.

Example 4

Using data from example 1, calculate the sales volume variance and the fixed overhead variance, on the assumption that the company is using marginal costing.

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Chapter 25

PERFORMANCE MEASUREMENT OVERVIEW

1. Introduction

This chapter introduces the idea of performance measurement and its importance for the management accountant.

2. The Mission Statement

This statement expresses the overall purpose of the organisation.

It will generally contain four elements:

◉ a purpose	why the company exists
◉ a strategy	the range of activities in which the business intends to compete, and how it intends to compete
◉ policies and standards	guidelines which help staff decide what to do to carry out the strategy
◉ values	the beliefs and moral principles which lie behind the firm's culture

Here is an example of an actual mission statement:

"McDonalds' vision is to be the world's best quick service restaurant experience. Being the best means providing outstanding quality, service, cleanliness, and value, so that we make every customer in every restaurant smile"

3. Goals and Objectives

Having decided on the company's mission, it is then necessary to have goals and objectives.

Goals are statements of general intentions, whereas **objectives** are more specific.

An example of a goal is: to improve profits

An example of an objective is: to increase the profit by 20% within 2 years.

4. Critical Success Factors and Key Performance Indicators

Having decided on the objectives of the business, it is important that we measure how well they are achieving these objectives.

There are two parts to this. First they must decide what are the **critical success factors** (CSF's) – the performance requirements that are most fundamental to being successful.

For example, two of McDonalds' CSF's could be quality, and speed of service.

Secondly, they must then decide how they are going to measure their performance in these areas. For this they need **key performance indicators** (KPI's) – aspects to which they can actually put numbers to, that indicate whether they are doing better or worse.

For example, McDonalds might decide to measure quality by asking customers to complete a form scoring the quality between 1 to 5, and then recording the average score. They could decide to measure speed of service by keeping records of the time taken to serve each customer and recording the average service time in minutes.

- As you will see in later chapters, it is important that a company has a range of KPI's – both financial (measuring, for example, profitability) and non-financial (measuring, for example, quality).

Chapter 26

FINANCIAL PERFORMANCE MEASUREMENT

1. Introduction

Financial statements are prepared to assist users in making decisions. They therefore need interpreting, and the calculation of various ratios makes it easier to compare the state of a company with previous years and with other companies.

In this chapter we will look at the various ratios that you should learn for the examination.

2. The main areas

When attempting to analyse the financial statements of a company, there are several main areas that should be looked at:

- **Profitability**
- **Liquidity**
- **Gearing**

We will work through an example to illustrate the various ratios that you should learn under each heading.

3. Worked example

Example 1

Statements of Financial Position as at 31 December

	2007		*2006*	
	$	*$*	*$*	*$*
ASSETS				
Non-current assets		1,341		826
Current assets				
Inventory	1,006		871	
Receivables	948		708	
Cash	360		100	
		2,314		1,679
		3,655		2,505
EQUITY AND LIABILITIES				
Share capital and reserves		2,190		1,401
Non-current liabilities		500		400
Current liabilities		965		704
		3,655		2,505

Income statement for the year ended 31 December

	2007	*2006*
	$	*$*
Revenue	7,180	5,435
Cost of sales	5,385	4,212
Gross profit	1,795	1,223
Distribution costs	335	254
Administrative expenses	670	507
Profit from operations	790	462
Finance costs	50	52
Profit before taxation	740	410
Company tax expense	262	144
Profit after taxation	478	266

You are required to calculate the profitability, liquidity and gearing ratios.

Profitability

$$\text{Return on capital employed} = \frac{\text{Profit before interest and tax}}{\text{Total long term capital}}$$

(= capital + reserves + long-term liabilities)

$$\text{Net profit margin} = \frac{\text{Profit before interest and tax}}{\text{Revenue}}$$

$$\text{Asset turnover} = \frac{\text{Revenue}}{\text{Total long term capital}}$$

NB: ROCE = asset turnover × net profit margin

$$\text{Gross profit margin} = \frac{\text{Gross profit}}{\text{Revenue}}$$

Liquidity

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

$$\text{Quick ratio (or acid test)} = \frac{\text{Current assets} - \text{Inventory}}{\text{Current liabilities}}$$

$$\text{Inventory days} = \frac{\text{Inventory}}{\text{Cost of sales}} \times 365 \text{ days}$$

$$\text{Average collection period (receivables days)} = \frac{\text{Trade receivables}}{\text{Revenue}} \times 365 \text{ days}$$

$$\text{Average payment period (payables days)} = \frac{\text{Trade payables}}{\text{Purchases}} \times 365 \text{ days}$$

Gearing

$$\text{Gearing} = \frac{\text{Non-current liabilities}}{\text{Share capital and reserves}} \%$$

4. Limitations of ratio analysis

You must learn the various ratios, however, it is important that you are able to discuss briefly the relevance of the various ratios, and also their limitations.

Very few of the ratios mean much on their own – most are only useful when compared with the ratios for previous years or for similar companies.

Many of the ratios use figures from the Statement of Financial Position. These only represent the position at one point in time, which could be misleading. For example, the level of receivables could be unusually high at the year end, simply because a lot of invoicing was done just before the year end. Perhaps more sensible in that sort of case would be to use the average for the year. Normally in the examination you will be expected simply to use Statement of Financial Position figures at the end of the year, but do be prepared to state the problem if relevant.

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Chapter 27

NON-FINANCIAL PERFORMANCE MEASUREMENT

1. Introduction

In the previous chapter we looked at various measures of financial performance. However it is important to have a range of performance measures considering non-financial and well as financial matters. This is particularly important in the case of service businesses where such things as quality are of vital importance if the business is to grow in the long-term.

In this chapter we will consider the various areas where performance measures are likely to be needed.

Various authors have summarised the areas in different ways – two well-known ones are Fitzgerald and Moons Building Blocks, and Kaplan and Nortons Balance Scorecard. You will not be tested specifically on Fitzgerald and Moon, or on Kaplan and Norton, but you should be aware of the areas that they consider important and be able to suggest performance indicators under the various headings.

2. Fitzgerald and Moon

Fitzgerald and Moon focussed on performance measures for service businesses and suggested the following areas as needing performance indicators:

- **Financial performance**
- **Competitive performance**
- **Quality**
- **Flexibility**
- **Resource utilisation**
- **Innovation**

3. Kaplan and Nortons Balance Scorecard

Kaplan and Norton also stated the importance of having a range of perfomance measures and forming a balance between them. They grouped them under the following headings, which they called perspectives:

- **Customer satisfaction perspective**
- **Process efficiency (or internal business) perspective**
- **Growth (or innovation and learning) perspective**
- **Financial perspective**

4. Value for money

Of importance to all businesses, but especially for state organisations such as health care, is the concept of getting value for money.

To achieve value for money, three areas should be considered:

- **Economy**

  Paying a ‚fair' price for resources

- **Effectiveness**

  Being successful at what we are trying to achieve

- **Efficiency**

  Using resources well – getting as much out as possible for what goes in

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Chapter 28

DIVISIONAL PERFORMANCE MEASUREMENT

1. Introduction

The previous chapters have concentrated on ways of measuring the performance of a business.

Many businesses are divisionalised in that there are separate managers responsible for separate parts (or divisions) of the business, and it is important to be able to measure the performance of individual divisions and of their managers.

Non-financial measures are just as important as for the whole business, but it is with regard to the financial performance that we need to give a little more thought. It would be misleading to compare divisions simply on their final profits in that larger divisions would be expected to report higher profits without necessarily being managed better. It is therefore important that the profitability is related to the size of the division.

You should be aware of two ways of measuring the profitability of a division – the return on investment (ROI) and the residual income (RI) – and these will be explained in the following paragraphs.

2. Return on Investment (ROI)

Perhaps the most obvious way of measuring the profitability of a division is to express the profit as a percentage of the amount invested in the division.

$$\text{Return on Investment} = \frac{\text{profit}}{\text{net assets}} \times 100\%$$

Example 1

A division reports a profit of $50,000 on net assets in their Statement of Financial Position of $400,000.

Calculate the Return on Investment for the division

3. Residual Income (RI)

This measure is a little less obvious.

We take the profit of the division, and subtract from it notional (or ‚pretend') interest of a target rate applied to the net assets from the Statement of Financial Position.

Example 2

A division reports a profit of $50,000 on net assets in their Statement of Financial Position of $400,000.

The company has a target rate of return of 10%.

Calculate the Residual Income of the division.

4. Advantages and limitations of ROI and RI

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Paper F2

ANSWERS TO EXAMPLES

Chapter 1

No examples

Chapter 2

No examples

Chapter 3

No examples

Chapter 4

Example 6

	units	*cost*
High	1,000	110,000
Low	200	30,000
Difference	800	80,000

Therefore, variable cost = $\frac{80{,}000}{800}$ = **$100** per unit

Using in 'high',	total cost	=	$110,000
	variable cost (1,000 × $100)		$100,000
Therefore,	fixed cost	=	$10,000
Therefore,	y = 100x +10,000		

Chapter 5

Example 1

	Receipts			Issues		Balance		
	Units	Unit cost	Total cost	Units	Unit cost	Units	Unit cost	Total cost
		$	$		$		$	$
Op Bal						20	4.00	80.00
8 Nov	140	4.40	616.00			140	4.40	616.80
						160		696.80
12 Nov				20	4.00			
				60	4.40			
				80		80	4.40	352.00
18 Nov	100	4.60	460.00			100	4.60	460.00
						180		812.00
26 Nov				80	4.40			
				60	4.60			
				140		40	4.60	184.00

Example 2

	Receipts			Issues		Balance		
	Units	Unit cost	Total cost	Units	Unit cost	Units	Unit cost	Total cost
		$	$		$		$	$
Op Bal						20	4.00	80.00
8 Nov	140	4.40	616.00			140	4.40	616.80
						160		696.80
12 Nov				80	4.40	20	4.00	80.00
						60	4.40	264.00
						80		344.00
18 Nov	100	4.60	460.00			100	4.60	460.00
						180		804.00
26 Nov				100	4.60	20	4.00	80.00
				40	4.40	20	4.40	88.00
				140		40		168.00

Example 3

	Receipts			Issues		Balance		
	Units	Unit cost $	Total cost $	Units	Unit cost $	Units	Unit cost $	Total cost $
Op Bal						20	4.00	80.00
8 Nov	140	4.40	616.00			140	4.40	616.80
						160	4.359	696.80
12 Nov				80	4.359	80	4.359	348.40
18 Nov	100	4.60	460.00			100	4.60	460.00
						180	4.49111	808.40
26 Nov				140	4.49111	40	4.49111	**179.64**

Chapter 6

Example 1

		($20 per order)		(10%×$25=$2.50 p.u.)	
Order quantity	Number of order	Reorder cost p.a. (a)	Average inventory	Stockholding cost p.a. (b)	Total inventory (a + b)
500	80	1,600	250	625	2225
750	53.33	1,067	375	938	2005*
1000	40	800	500	1250	2050
1250	32	640	625	1563	2203

Example 2

$$EOQ = \sqrt{\frac{2C_oD}{C_H}} = \sqrt{\frac{2 \times £20 \times 40,000}{£2.50}} = \mathbf{800\ units}$$

			$
Reorder cost:	$= \frac{40,000}{800}$	$= 50 \times \$20 =$	1,000
Inventory holding cost	$= \frac{800}{2}$	$= 400 \times \$2.50 =$	1,000
		Total inventory costs	$2,000p.a.

Example 3

Order quantity = EOQ = 800 units:

	$	
Purchase cost: 40,000 × $25	1,000,000	
Inventory costs	2,000	
	$1,002,000	p.a.

Order quantity = 5,000 units

		$
Purchase cost:	40,000 × 99% × $25	990,000
Inventory costs:		
Reorder:	$\frac{40,000}{5,000} = 8 \times \$20 =$	160
Inventory holding:	$\frac{5,000}{2} = 2,500 \times 99\% \times \$2.50 =$	6,188
		$996,348 p.a.

Order quantity = 10,000 units

		$
Purchase cost:	40,000 × 98.5% × $25	985,000
Inventory costs:		
Reorder:	$\frac{40,000}{10,000} = 4 \times \$20 =$	80
Inventory holding:	$\frac{10,000}{2} = 5,000 \times 98.5\% \times \$2.50 =$	12,313
		$997,393 p.a.

Order quantity of 5,000 units is the best option.

Example 4

$$EBQ = \sqrt{\frac{2C_oD}{C_H(1-\frac{D}{R})}} = \sqrt{\frac{2 \times 200 \times 50,000}{3\,(1-\frac{50,000}{500,000})}} = \textbf{2,722 units}$$

		$
Reorder costs:	=	3,674
Inventory holding cost	=	3,675
	Total inventory costs	$7,349 p.a.

Example 5

Re-order level = demand over the lead time = 5 × 100 = 500 units

Example 6

Demand of the lead time = 500 units (see answer 5)
Safety inventory 100 units
Re-order level 600 units

Example 7

Re-order level = maximum lead time x maximum demand = 4 × 120 = 480 units

Example 8

Re-order level = 480 units (see answer 7)
Minimum demand over lead time = minimum lead time x minimum demand per week = 3 x 70 = 210 units
Therefore, maximum inventory left when the new order arrives = 480 - 210 = 270 units
The new delivery will be of 1,000 units, therefore the maximum inventory = 270 + 1,000 = 1,270 units

Chapter 7

No Answers

Chapter 8

Example 1

	$ p.u.
Material (3kg × $4)	12
Labour (4hrs × $2)	8
Overheads ($700,000 ÷ 50,000)	14
	$34

Example 2

Total overheads	$700,000
Total labour hours	
Desks (30,000 × 4hr)	120,000
Chairs (20,000 × 1 hr)	20,000
	140,000hrs

Overhead absorption rate: $\frac{\$700,000}{140,000\ hr}$ = $5 per hour

Costs cards:

	Desks		*Chairs*
Materials (3kg × $4)	12	(2kg × $4)	8
Labour (4hrs × $2)	8	(1hr × $2)	2
Overheads (4kg × $5)	20	(1hr × $5)	5
	$40		$15

Example 3

Total overheads:	*Total*	*Assembly*	*Finishing*
Supervisors	100,000	60,000	40,000
Other	600,000	240,000	360,000
(40:60)			
	$700,000	$300,000	$400,000

Total hours:		
Desks (30,000 × 3 hr; 30,000 × 1 hr)	90,000	30,000
Chairs (20,000 × ½ hr; 20,000 × ½ hr)	10,000	10,000
	100,000 hrs	40,000 hrs
O.A.R	$3 per hr	$10 per hr

Cost cards:

		desk		*chair*
Materials		12		8
Labour		8		2
Overheads:				
Assembly	9		1.50	
Finishing	10		5.00	
		19		6.50
		$39		$16.50

Example 4

	Total	*Processing*	*Packing*	*Canteen*
Factory rent (cubic space)	20,000	12,500	6,250	1,250
Factory Heat (cubic space)	5,000	3,125	1,563	312
Supervisors	25,000	15,000	10,000	–
Depreciation (NBV equipment)	7,000	3,000	3,000	1,000
Canteen	18,000	–	–	18,000
Welfare (No of employees)	5,000	2,500	2,000	500
	$80,000	$36,125	$22,813	$21,062

Example 5

	Processing	*Packing*	*Canteen*
Already apportioned	36,125	22,813	21,062
Recharge canteen (no. of employees)	11,701	9,361	(21,062)
	$47,826	$32,174	–

Example 6

Repeated distribution method

	X	*Y*	*Stores*	*Maintenance*
Already allocated	70,000	30,000	20,000	15,000
Recharge stores	10,000	6,000	(20,000)	4,000
			–	19,000
Recharge maintenance	8,550	7,600	2,850	(19,000)
				–
Recharge stores	1,425	855	(2,850)	570
			–	
Recharge maintenance	257	228	85	(570)
				–
Recharge stores	43	25	(85)	17
			–	
Recharge maintenance	8	7	2	(17)
				–
Recharge stores	1	1	(2)	
	$90,284	$44,716	–	

Algebraic method

Stores: $S = 20,000 + 0.15M$ (1)

Maintenance $M = 15,000 + 0.20S$ (2)

Replace M in (1): $S = 20,000 + 2,250 + 0.03S$

$0.97S = 22,250$

$S = 22,250/0.97 = \$22,938$

Replace S in (2): $M = 15,000 + 0.20 \times 22,938$

$M = \$19,588$

	X	*Y*	*Stores*	*Maintenance*
Already allocated	70,000	30,000	20,000	15,000
Recharge stores:				
($22,938)	11,469	6,881	(22,938)	4,588
Recharge maintenance:				
($19,588)	8,815	7,835	2,938	(19,588)
	$90,284	$44,716	–	–

Chapter 9

Example 1

(a) Cost cards:

	$ p.u
Materials (4kg × $3)	12
Labour (4hrs × $2)	8
Var. overheads	5
Fixed overheads ($20,000/10,000)	2
	$27p.u
Selling price	$35p.u
Standard profit	$8p.u

(b) Income Statements

		January		*February*
Sales	(9,000 × $35)	315,000	(11,500 × $35)	402,500
Cost of sales:				
Opening inventory		–	(2,000 × $27)	54,000
Materials	(11,000 × $12)	132,000	(9,500 ×$12)	114,000
Labour	(11,000 × $8)	88,000	(9,500 × $8)	76,000
Variable o/h	(11,000 × $5)	55,000	(9,500 × $5)	47,500
Fixed o/h	(11,000 × $2)	22,000	(9,500 × $2)	19,000
		297,000		310,500
Less: Closing inventory	(2,000 × $27)	(54,000)		–
		243,000		310,500
Standard Gross Profit	(9,000 × $8)	72,000	(11,500 × $8)	92,000
Adjustment for over/(under) absorption of fixed overheads		2,000		(1,000)
Actual fixed o/h's: 20,000			Actual: 20,000	
Absorbed: 22,000			Absorbed: 19,000	
Actual Gross Profit		74,000		91,000
Less: selling costs				
Variable	(9,000 × $1)	(9,000)	(11,500 × $1)	(11,500)
Fixed		(2,000)		(2,000)
Actual Net Profit		$63,000		$77,500

Example 2

(a) Overhead absorption rate = $\frac{320{,}000}{80{,}000}$ =$4 per hour

(b) Amount absorbed =78,000 × $4 = $312,000
Actual overheads = $315,500
Amount under absorbed = 315,500 – 312,000 = $3,500

Chapter 10

Example 1

(a) Cost card

	$ p.u
Materials (4kg × $3)	12
Labour (4hrs × $2)	8
Var. overheads	5
Marginal cost	$25p.u
Selling price	$35p.u
Marginal cost	(25)
Variable selling cost	(1)
Standard profit	$9p.u

(b) Income Statements

		January		*February*
Sales	(9,000 × $35)	315,000	(11,500 × $35)	402,500
Less: Cost of sales:				
Opening inventory		–	(2,000 × $25)	50,000
Materials	(11,000 × $12)	132,000	(9,500 ×$12)	114,000
Labour	(11,000 × $8)	88,000	(9,500 × $8)	76,000
Variable o/h	(11,000 × $5)	55,000	(9,500 × $5)	47,500
		275,000		287,500
Less: Closing inventory	(2,000 × $25)	(50,000)		–
		225,000		287,500
		90,000		115,000
Less: Variable selling costs	(9,000 × $1)	(9,000)	(11,500 × $1)	(11,500)
Contribution		81,000		103,500
Less: Fixed costs				
Production		(20,000)		(20,000)
Selling		(2,000)		(2,000)
Actual Net Profit		$59,000		$81,500

Example 2

	January	*February*
Absorption costing	63,000	77,500
Marginal costing	59,000	81,500
Difference	4,000	(4,000)
Fixed overheads in inventory value:		
Opening inventory (2,000 × $2)	–	(4,000)
Closing inventory (2,000 × $2)	4,000	–
	4,000	(4,000)

Chapter 11

Example 1

Materials	20,000
Labour	10,000
Overheads	8,000
	$38,000

Cost per unit $\frac{\$38,000}{2,000\ u} = \$19$

Example 2

Process Account

	Units	$		Units	$
Materials	2,000	20,000	Transfer out	2,000	38,000
Labour		10,000	(2,000 u × $19)		
Overheads		8,000			
	2,000	38,000		2,000	38,000

Chapter 12

Example 1

	kg	*$*
Materials	1,000	12,000
Labour		7,000
Overheads		8,000
	1,000	27,000
Normal loss (10%)	(100)	
	900	$27,000

Cost per kg $\frac{\$27,000}{900\ kg} = \mathbf{\$30}$

Process Account

	kg	$		kg	$
Materials	1,000	12,000	Normal loss	100	–
Labour		7,000	Transfer out	900	27,000
Overheads		8,000	(at $30)		
	1,000	27,000		1,000	27,000

Example 2

	kg		*$*
Materials	3,000		30,000
Labour			12,000
Overheads			10,800
	3,000		52,800
Normal loss (10%)	(300)	×$5	(1,500)
	2,700		$51,300

Cost per kg $\frac{\$51,300}{2,700 \text{ kg}}$ = **$19**

Process Account

	kg	$		kg	$
Materials	3,000	30,000	Normal loss	300	1,500
Labour		12,000	(at $5)		
Overheads		10,800			
			Transfer out	2,700	51,300
			(at $19)		
	3,000	52,800		3,000	52,800

Loss Account

	kg	$		kg	$
Normal loss	300	1,500	Cash	300	1,500
	3,000	1,500		3,000	1,500

Example 3

	kg	*$*
Materials	1,000	9,000
Labour		18,000
Overheads		13,500
	1,000	40,500
Normal loss (10%)	(100)	(900)
	900	$39,600

Cost per kg $\frac{\$39,600}{900\ kg} = \$44$

Process Account

	kg	$		kg	$
Materials	1,000	9,000	Normal loss	100	900
Labour		18,000	Transfer out	850	37,400
Overheads		13,500			
			Abnormal loss (at $44)	50	2,200
	1,000	40,500		1,000	40,500

Loss Account

	kg	$		kg	$
Normal loss	100	900	Cash	150	1,350
Abnormal loss	50	2,200	I/S a/c		1,750
	150	3,100		150	3,100

Example 4

	kg	*$*
Materials	2,000	18,000
Labour		36,000
Overheads		27,000
	2,000	81,000
Normal loss (10%)	(200)	(1,800)
	1,800	$79,200

Cost per kg $\frac{\$79,200}{1,800\ kg} = \$44$

Process Account

	kg	$		kg	$
Materials	2,000	18,000	Normal loss	200	1,800
Labour		36,000	Transfer out	1,840	80,960
Overheads		27,000			
Abnormal Gain	40	1,760			
	2,040	82,760		2,040	82,760

Loss Account

	kg	$		kg	$
Normal loss	200	1,800	Abnormal Gain	40	1,760
I.S.		1,400	Cash	160	1,440
	200	3,200		200	3,200

Chapter 13

Example 1

(a)

		Materials		*Labour*		*Overheads*
Cost		$5,000		$2,760		$3,440
Equivalent costs:						
Finished		800		800		800
W.I.P.	(100%)	200	(60%)	120	(30%)	60
		1,000		920		860
Cost per unit		$\frac{5,000}{1,000} = \$5$		$\frac{2,760}{920} = \$3$		$\frac{3,440}{860} = \$4$

Total cost per unit = 5 + 3 + 4 = $12

(b) Finished output: 800 × $12 = $9,600

W.I.P.:

Materials:	200 u × 100% × $5	= 1,000
Labour:	200 u × 60% × $3	= 360
Overheads:	200 u × 30% × $4	= 240
		$1,600

(c)

Process Account

	u	$		u	$
Materials	1,000	5,000	Finished	800	9,600
Labour		2,760	WIP c/f	200	1,600
Overheads		3,440			
	1,000	11,200		1,000	11,200

Example 2

(a)

Units

	u		u
W.I.P. b/f	15,000	Finished (balancing figure)	40,000
Started	30,000		
		WIP c/f	5,000
	45,000		45,000

(b) Units started and finished in July
= units finished – W.I.P b/f
= 40,000 – 15,000 = 25,000 units

		Materials		*Lab & o/h's*
Cost in July		$24,900		$20,075
Equivalent units:				
Finished W.I.P b/f (15,000u)	(0%)	–	(60%)	9,000
Started and finished (25,000u)		25,000		25,000
Start W.I.P. c/f (5,000u)	(100%)	5,000	(50%)	2,500
		30,000		36,500
Cost per unit		24,900 / 30,000 = **$0.83**		20,075 / 36,500 = **$0.55**

Total cost p.u. = $0.83 + $0.55 = $1.38

(c) **Finished units** (40,000)

W.I.P b/f (15,000 units)	
Cost b/f (9,000 + 1,250)	10,250
Cost of finishing:	
Labour & o/h (15,000 × 60% × $0.55)	4,950
	15,200
Started and finished in July (25,000 × $ 1.38)	
	$49,700
W.I.P c/f (5,000 units)	
Materials (5,000 × 100% × $0.83)	4,150
Labour o/h (5,000 × 50% × $0.55)	1,375
	$5,525

(d)

Process Account

	u	$		u	$
W.I.P. b/f	15,000	10,250	Transferred out	40,000	49,700
Materials	30,000	24,900	WIP c/f	5,000	5,525
Labour & o/h		20,075			
	45,000	55,225		45,000	55,225

Example 3

(a)

Units

	u		u
W.I.P. b/f	15,000	Finished	40,000
Started	30,000	WIP c/f	5,000
	45,000		45,000

(b)

		Materials		*Lab & o/h's*
Costs				
W.I.P b/f		9,000		1,250
In July		24,900		20,075
		$33,900		$21,325
Equivalent units:				
W.I.P b/f (15,000u)		15,000		15,000
Started & finished (25,000u)		25,000		25,000
Finished in July		40,000		40,000
Start W.I.P. c/f (5,000u)	(100%)	5,000	(50%)	2,500
		45,000		42,500
Cost per unit		33,900 / 45,000 = **$0.75**		21,325 / 42,500 = **$0.50**

Total cost p.u. = $0.75 + $0.50 = $1.25

(c)

Finished units (40,000 × $1.25)	$50,000
W.I.P c/f (5,000 units)	
Materials (5,000 × 100% × $0.75)	3,750
Labour o/h (5,000 × 50% × $0.50)	1,250
	$5,000

(d)

Process Account

	u	$		u	$
W.I.P. b/f	15,000	10,250	Transferred out	40,000	50,000
Materials	30,000	24,900	WIP c/f	5,000	5,000
Labour & o/h		20,075			
	45,000	55,225		45,000	55,000

(Note: The difference of $225 is due to rounding the costs p.u. to 2 decimal places)

Chapter 14

Example 1

Total joint costs:	$
Materials	5,000
Labour & o/h	2,300
	7,300
Less: proceeds of by-product	
(500 kg × $0.20)	(100)
Started & finished (25,000 u)	$7,200

Production of joint products:	kg
A	1,000
B	2,000
	3,000 kg

Cost per kg $\frac{7,200}{3,000}$ = **$2.40**

(for A and B)

Example 2

Total joint costs:	$
Materials	5,000
Labour o/h	2,300
	7,300
Less: Proceeds of by-product	
(500 kg × $0.20)	(100)
	$7,200

Sales value of production of joint products:

	$
A (1,000kg × $5)	5,000
B (2,000kg × $2)	4,000
	$9,000

Allocation of joint costs to production:

		$	
A	$\left(\frac{5,000}{9,000}\times 7,200\right)$	4,000	for 1,000 kg
B	$\left(\frac{4,000}{9,000}\times 7,200\right)$	3,200	for 2,000 kg

Cost per kg:

A $\left(\frac{4,000}{1,000}\right)$ = **$4.00** per kg

B $\left(\frac{3,200}{2,000}\right)$ = **$1.60** per kg

Example 3

Total joint costs:	$
Materials	5,000
Labour o/h	2,300
	7,300
Less: Proceeds of by-product (500 kg × $0.20)	(100)
	$7,200

Net realisable value of production

		$
A	1,000 kg × ($8.40 – $4.80) =	3,600
B	2,000 kg × ($4.50 – $2.20) =	4,600
		$8,200

Allocation of joint costs to production:

		$
A	$\left(\frac{3,600}{8,200}\times 7,200\right)$	3,161
B	$\left(\frac{4,600}{8,200}\times 7,200\right)$	4,039
		$7,200

Cost per kg:

A $\left(\frac{3,161}{1,000}\right)$ = **$3.16** per kg

B $\left(\frac{4,039}{2,000}\right)$ = **$2.02** per kg

Chapter 15

Example 1

Materials	100
Labour	50
Var. o/h's	20
Fix. prod o/h's	40
Non. prod o/h's	100
Total job cost	$310

Example 2

Direct materials	1,250
Direct labour	500
Variable overheads	600
Fixed production o/h's	1,000
Non-production o/h's	200
Total batch cost	$3,550

Cost per unit = 3,550 / 1,000 = $3.55

Example 3

Total kg/km = 150,000 x 6,000 = 900,000,000.
Total cost = $27,000,000

So cost per kg/lm = $27,000,000 / 900,000,000 = $0.03

Chapter 16

No Answers

Chapter 17

No Answers

Chapter 18

No Answers

Chapter 19

Example 1

	units	*$*
High	420	2,400
Low	300	2,160
Difference	120	$240

Variable cost = $\frac{\$240}{120}$ = $2 per unit

In 'high'

	$
Total cost	2,400
Variable cost (420u × $2)	840
Fixed cost	$1,560

y = 1,560 + 2x

Examples 2 & 3

×	*y*	*xy*	x^2	y^2
1	40	40	1	1,600
4	65	260	16	4,225
2	45	90	4	2,025
7	80	560	49	6,400
6	70	420	36	4,900
5	70	350	25	4,900
3	50	150	9	2,500
28	420	1,870	140	26,550

$$b = \frac{n\Sigma xy - \Sigma x\Sigma y}{n\Sigma x^2 - (\Sigma x)^2} = \frac{(7 \times 1{,}870) - (28 \times 420)}{(7 \times 140) - (28 \times 28)} = \frac{1{,}330}{196} = 6.7857$$

$$a = \frac{\Sigma y}{n} - \frac{b\Sigma x}{n} = \frac{420}{7} - \frac{6.7857 \times 28}{7} = 60 - 27.1428 = 32.8572$$

y = 32.86 + 6.79x

or: y = 32,857 + 67.9x

(if × and y are actual units and $'s)

Coefficient of correlation:

$$r = \frac{n\Sigma xy - \Sigma x\Sigma y}{\sqrt{\left(n\Sigma x^2 - (\Sigma x)^2\right)\left(n\Sigma y^2 - (\Sigma y)^2\right)}} = \frac{7 \times 1{,}870 - 28 \times 420}{\sqrt{(7 \times 140 - 28^2)(7 \times 26{,}550 - 420^2)}}$$

$$= \frac{+1330}{\sqrt{196 \times 9{,}450}} = \mathbf{+0.98}$$

Chapter 20

Example 1

		Actual sales	*4 ¼ average*	*TREND (centered average)*	*Seasonal variation*
2000	1	80			
	2	87			
			84.75		
	3	82		86.00	–4.00
			87.25		
	4	90		88.25	+1.75
			89.25		
2001	1	90		90.63	–0.63
			92.00		
	2	95		93.50	+1.50
			95.00		
	3	93		96.88	–3.88
			98.75		
	4	102		100.88	+1.12
			103.00		
2002	1	105		104.25	+0.75
			105.50		
	2	112		107.25	+4.75
			109.00		
	3	103			
	4	116			

	1	*2*	*3*	*4*
2000			–4.00	+1.75
2001	–0.63	+1.50	–3.88	+1.12
2002	+0.75	+4.75		
	+0.12	+6.25	–7.88	+2.87
average	+0.06	+3.13	–3.94	+1.44

Example 2

		Actual sales	*TREND*	*Seasonal variation*
2000	1	80		
	2	87		
	3	82	86.00	95.3%
	4	90	88.25	102.0%
2001	1	90	90.63	99.3%
	2	95	93.50	101.6%
	3	93	96.88	96.0%
	4	102	100.88	101.1%
2002	1	105	104.25	100.7%
	2	112	107.25	104.4%
	3	103		
	4	116		

	1	*2*	*3*	*4*
2000			95.3	102.0
2001	99.3	101.6	96.0	101.1
2002	100.7	104.4		
average	100%	103%	95.7%	101.6%

Chapter 21

Example 1

2007: $\frac{2.50}{2.40} \times 100 = \mathbf{104.2}$

2008: $\frac{2.60}{2.40} \times 100 = \mathbf{108.3}$

Example 2

2009: $\frac{9{,}000}{8{,}200} \times 100 = \mathbf{109.8}$

2010: $\frac{9{,}400}{8{,}200} \times 100 = \mathbf{114.6}$

(a) Laspeyre
2009 index

	q_0	p_0	p_1	p_0q_0	p_1q_0
Coffee	20	$4.00	$4.50	80.00	90.00
Sugar	15	$0.60	$0.70	9.00	10.50
Bread	30	$0.80	$1.00	24.00	30.00
				113.00	130.50

2009 index = $\frac{130.50}{113.00} \times 100 = \mathbf{115.5}$

2010 index

	q_0	p_0	p_1	p_0q_0	p_1q_0
Coffee	20	$4.00	$4.80	80.00	96.00
Sugar	15	$0.60	$1.00	9.00	15.00
Bread	30	$0.80	$1.10	24.00	33.00
				113.00	144.00

2010 index = $\frac{144.00}{113.00} \times 100 = \mathbf{127.4}$

(b) Paasche
2009 index

	q_1	p_0	p_1	p_0q_1	p_1q_1
Coffee	15	$4.00	$4.50	60.00	67.50
Sugar	18	$0.60	$0.70	10.80	12.60
Bread	35	$0.80	$1.00	28.00	35.00
				98.80	115.10

2009 index = $\frac{115.00}{98.80} \times 100 = \mathbf{116.5}$

2010 index

	q_1	p_0	p_1	p_0q_1	p_1q_1
Coffee	15	$4.00	$4.80	60.00	72.00
Sugar	20	$0.60	$1.00	12.00	20.00
Bread	40	$0.80	$1.10	32.00	44.00
				104.00	136.00

$$\text{2010 index} = \frac{136.00}{104.00} \times 100 = \mathbf{130.8}$$

Chapter 22

Example 1

			Capital Account	*Interest Account*
Payment	–	1 Jan year 1	200	
Interest	–	31 Dec year 1		30
Payment	–	1 Jan year 2	200	
			400	
Interest	–	31 Dec year 2		60
Payment	–	1 Jan year 3	200	
			600	
Interest	–	31 Dec year 3		90
Payment	–	1 Jan year 4	200	
			800	
Interest	–	31 Dec year 4		120
			800	300

Total **$1,100**

Example 2

	$
Now payment	500
Year 1 interest	50
	550
Year 2 interest	55
	605
Year 3 interest	60.5
	$665.50

(or $500 × (1.1)3 =$665.50)

Example 3

A = P (1 + r)n
= 800 × (1.06)5
= $1070.58

Example 4

Amount owed after 12 months = P (1 + r)n
= 100 (1.02)12
= $126.82

$$\text{APR} = \text{actual interest over the year} = \frac{26.82 \times 10\%}{100} \times 100\% = \mathbf{26.82\%}$$

Example 5

$x now will become $x(1.10)4 in 4 years

Therefore $x (1.10)^4 = 800$

$$x = \frac{800}{(1.10)^4}$$

$$= \mathbf{£546.41}$$

Example 6

$$\text{P.V.} = 2{,}500 \times \frac{1}{(1.13)^{12}} = \mathbf{£577}$$

or using tables,
P.V. = 2,500 × 0.231 = $577

Example 7

Present value = 500 ×4·968 = $2,484

Example 8

	Discount factor at 8%
1-12	7·536
less: 1-3	(2·577)
4-12	4·959

Present value = 1,000 × 4·959 = $4,959

Example 9

$$\text{Present value} = \frac{A}{r}$$

$$= \frac{5{,}000}{0.12}$$

$$= \mathbf{\$41{,}667}$$

Chapter 23

Example 1

		d.f. @ 10%	*P.V.*
0	(80,000)	1.000	(80,000)
1	20,000	0.909	18,180
2	30,000	0.826	24,780
3	40,000	0.751	30,040
4	20,000	0.683	13,660
		N.P.V.	6,660

The net present value is positive and therefore we should invest in the project.

Example 2

		d.f. @ 15%	*P.V.*
0	(80,000)	1.000	(80,000)
1	20,000	0.870	17,400
2	30,000	0.756	22,680
3	40,000	0.658	26,320
4	20,000	0.572	11,440
		N.P.V.	(2,160)

$$\text{I.R.R.} = 10\% + \frac{6{,}660}{6{,}660 + 2{,}160} \times 5\% = \mathbf{13.78\%}$$

Example 3

	Cash inflow	*Cumulative Cash inflow*	*Discounted cash inflow*	*Cumulative discounted cash inflow*
1	20,000	20,000	18,180	18,180
2	30,000	50,000	24,780	42,960
3	40,000	90,000	30,040	73,000
4	20,000	140,000	34,150	107,150
5	30,000	170,000	18,630	125,780

$$\text{Payback period} = 3 + \frac{10{,}000}{50{,}000} = 3.2 \text{ years} \quad \text{(or within 4)}$$

$$\text{Discounted payback period} = 3 + \frac{27{,}000}{34{,}150} = 3.79 \text{ years} \quad \text{(or within 4)}$$

Chapter 24

Example 1

	Original Fixed Budget	*Flexed Budget*	*Actual*	*Variances*	
	$	*$*	*$*		
Sales (units)	8,000	8,400	8,400		
Production (units)	8,700	8,900	8,900		
Sales	600,000	630,000	613,200	16,800	(A)
Materials	156,000	160,200	163,455	3,255	(A)
Labour	217,500	222,500	224,515	2,015	(A)
Variable o/h	87,000	89,000	87,348	1,652	(F)
Fixed o/h	130,500	133,500	134,074	574	(A)
	591,600	605,200	609,392		
Closing inventory	(47,600)	(34,000)	(34,000)		
	544,000	571,200	575,392		
Profit	$56,000	$58,800	$37,808	20,992	(A)

Example 2

Materials

Expense variance

Actual purchases 35,464kg	at actual cost	163,455
	at standard cost ($4.50)	159,588
		$3,867 (A)

Usage variance

	kg
Actual usage	35,464
Standard usage for actual production (8,900 u × 4kg)	35,600
	136kg

at a standard cost ($4.50) = **$612** (F)

Labour

Rate of Pay variance

Actual hours paid at actual cost	224,515
45,400 hours at standard cost ($5)	227,000
	$2,485 (F)

Idle Time Variance

Actual hours paid	45,400
Actual hours worked	44,100
	1,300 hrs

at a standard cost ($5) = **$6,500** (A)

Efficiency variance

Actual hours worked	44,100
Standard hours for actual production (8,900 u × 5hrs)	44,500
	400 hrs

at a standard cost ($5) = **$2,000** (F)

Variable overheads ***Expenditure variance***

Actual hours worked	at actual cost	87,348
44,100	at standard cost	88,200
		$852 (F)

Efficiency variance

Actual hours worked	44,100
Standard hours for actual production (8,900u × 5hrs)	44,500
	400 hrs

at a standard cost ($2) = $800 (F)

Fixed overheads

Expenditure variance

Actual total	134,074
Original budget total	130,500
	$3,574 (A)

Capacity variance

Actual hours worked	44,100
Budget hours (8,700u × 5hrs)	43,500
	600 hrs

at a standard cost ($3) = **$1,800** (F)

Efficiency variance

Actual hours worked	44,100
Standard hours for actual production (8,900u × 5hrs)	44,500
	400 hrs

at a standard cost ($3) = **$1,200** (F)

Example 3

Sales price variance

	$
Actual sales at actual selling price	613,200
Actual sales at standard selling price (8,400u × $75)	630,000
	$16,800(A)

Sales volume variance

	units	
actual sales	8,400	
budgeted sales	8,000	
	400 u × $7	= **$2,800** (F)
Profit	(Standard profit per unit)	

Example 4

Sales volume variance

	units	
actual sales	8,400	
budgeted sales	8,000	
	400 u × $22	= **$8,800**(F)
Profit	(Standard contribution per unit)	

Fixed overhead expenditure variance

	$
Actual total fixed overheads	134,074
Budgeted total fixed overheads (8,700u × $15)	130,500
	$3,574(A)

(This is the only fixed overhead variance if marginal costing is being used)

Chapter 25

No Examples

Chapter 26

Example 1

		2007	*2006*
Net profit margin	$(\frac{790}{7,180})$	11%	8.5%
Gross profit margin	$(\frac{1,795}{7,180})$	25%	22.5%
Return on capital	$(\frac{790}{2,690})$	29.4%	25.7%
Asset turnover	$(\frac{7,180}{2,690})$	2.67	3.02
Current ratio	$(\frac{2,314}{965})$	2.4	2.4
Quick ratio (or acid test)	$(\frac{1,308}{965})$	1.36	1.15
Inventory days	$(\frac{1,006}{5,385} \times 365)$	68.2 days	75.5 days
Receivables days	$(\frac{948}{7,180} \times 365)$	48.2 days	47.5 days
Payables days	$(\frac{965}{5,385} \times 365)$	65.4 days	61.0 days
Gearing ratio	$(\frac{500}{2,190})$	22.8%	28.6%

Chapter 27

No examples

Chapter 28

Example 1

$$\text{ROI} = \frac{50{,}000}{400{,}000} \times 11\% = 12.5\%$$

Example 2

Profit	50,000
Less: Notional interest (10% × $400,000)	(40,000)
R.I.	$10,000