Chapter

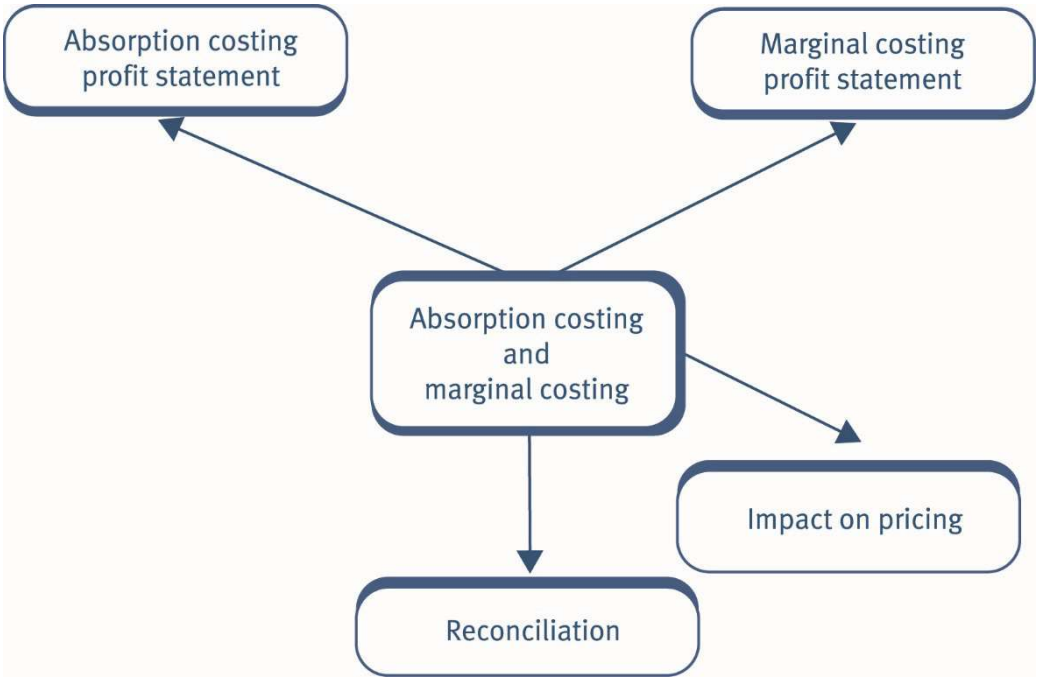
2

Traditional costing

Chapter learning objectives

Lead outcome	Component outcome
A3. Apply costing methods to determine the costs for different purposes	(a) Cost accumulation, allocation, apportionment and absorption
C1. Describe the main types of short-term decisions made by organisations	(a) Describe pricing and revenue maximisation decisions

1 Chapter overview diagram

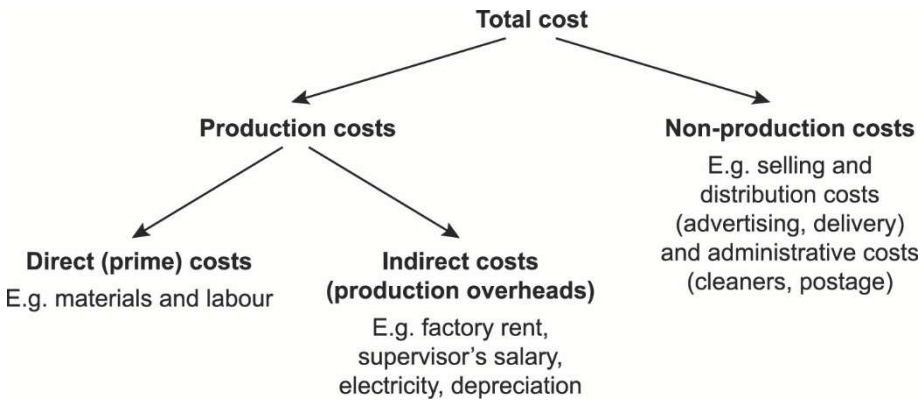


Having understood why it's so important for the business to determine the cost of its products or services, we now need to consider how we can calculate this cost.

The first two ways of doing this are examined in this chapter.

2 Absorption costing

The aim of traditional absorption costing is to determine the full production cost per unit.



When we use absorption costing to determine the cost per unit, we focus on the production costs only.

We can summarise these costs into a cost card:

	$
Direct materials per unit	X
Direct labour per unit	X
Production overhead per unit (Note 1)	X
Full production cost per unit	X

Note 1:

All production overheads must be absorbed into units of production, using a suitable basis, e.g. units produced, labour hours or machine hours. The assumption underlying this method of absorption is that overhead expenditure is connected to the volume produced.

If, for example, units produced are used as the basis, the absorption rate is calculated as:

$$\frac{\text{Total budgeted overhead cost (allocated and apportioned)}}{\text{Budgeted production volume}}$$

Example 1

A company accountant has gathered together some cost information for her company's product as follows:

	Cost
Direct materials	$4 per kilogram (kg) used
Direct labour	$22 per hour worked
Variable overheads	$6 for each hour that direct labour work

She has also determined that fixed production overheads will be $400,000 in total. Overheads are absorbed on a per unit basis.

Investigation has shown that each unit of the product uses 3 kilograms of material and needs 2 hours of direct labour work.

Sales and production were budgeted at 20,000 units, but only 16,000 were actually produced and 14,000 actually sold.

There was no opening inventory.

Required:

Produce a standard cost card using absorption costing and value the company's closing inventory on that basis.

More on calculating absorption rates

It is relatively easy to estimate the cost per unit for direct materials and labour. In doing so we can complete the first two lines of the cost card. However, it is much more difficult to estimate the production overhead per unit. This is an indirect cost and so, by its very nature, we do not know how much is contained in each unit. Therefore, we need a method of attributing the production overheads to each unit.

Review of overhead absorption procedure

Accounting for overhead costs in an absorption costing system can be quite complex, and production overhead costs are first allocated, then apportioned and finally absorbed into product costs (or service costs).

- **Overhead allocation.** Indirect production costs are initially allocated to cost centres or departments. Allocation is the process of charging a cost directly and in full to the source of the expenditure. For example, the salary of a maintenance engineer would be allocated to the engineering maintenance department.
- **Overhead apportionment.** The overhead costs that have been allocated to cost centres and cost codes other than direct production departments must next be apportioned to direct production departments. Apportionment is the process of sharing on a fair basis. For example, factory rental costs might be apportioned between the production departments on the basis of the floor area occupied by each department. Similarly, the costs of the engineering maintenance department might be apportioned between production departments on the basis of the operating machine hours in each department. At the end of the apportionment process, all the production overheads have been allocated or apportioned to the direct production departments.
- **Overhead absorption**. An absorption rate is calculated for each production department. This is the rate at which production overheads will be added to the cost of production going through the department.

When the department produces a single product, production volume can be measured as the number of units produced, and the absorption rate would be a rate per unit produced.

More usually, organisations produce different products or carry out non-standard jobs for customers, and production volume is commonly measured as one of the following:

- direct labour hours worked in the department, and the absorption rate is a rate per direct labour hour worked
- machine hours worked in the department, and the absorption rate is a rate per machine hour operated
- sometimes the cost of direct labour might be used as a measure of production volume, and the absorption rate is then calculated as a percentage of direct labour cost.

This often results in a factory wide absorption rate. This is used when all products produced in the factory use the same type of labour or machines. Dividing total factory indirect costs by, say, total direct machine hours results in this absorption rate that can be charged to all products based on the number of machine hours used. So, for example, if all products are produced on the same machines and a factory wide absorption rate of $40 per machine hour has been determined, every product will be charged $40 worth of overheads for every machine hour that they use.

Predetermined absorption rates

Although it is possible to calculate absorption rates using actual overhead costs and actual production volume, this is not the usual practice. This is because:

- It is usually inconvenient to wait until the end of an accounting period to work out what the absorption rates should be. In absorption costing systems, overhead costs are added to the cost of production as it passes through each stage in the production process, and overhead costs are absorbed when the production happens.
- A predetermined rate is required to enable a price to be estimated.
- Overhead costs may vary throughout the year. The overhead absorption rate smooths variations in overheads by applying an average overhead cost to each unit of product throughout the year.

The normal practice is therefore to absorb production overhead costs at a predetermined rate, based on budgeted overhead expenditure and budgeted production volume.

This however can lead to an over-or under-absorption of the overheads when compared to the actual overheads incurred.

This **over-or under-absorption** can be calculated as follows:

= (Budgeted overhead rate per unit × actual units) – Actual overheads incurred

Absorption advantages/disadvantages

Advantages of absorption costing

The arguments used in favour of absorption costing are as follows:

- Fixed production costs can be a large proportion of the total production costs incurred. Unless production overheads are absorbed into product costs, a large proportion of cost would be excluded from the measurement of product costs.
- Absorption costing follows the matching concept (accruals concept) by carrying forward a proportion of the production cost in the inventory valuation to be matched against the sales value when the items are sold.

- It is necessary to include fixed production overhead in inventory values for financial statements; absorption costing produces inventory values which include a share of fixed production overhead.
- Analysis of under-/over-absorbed overhead may be useful for identifying inefficient utilisation of production resources.
- There is an argument that in the longer term, all costs are variable, and it is appropriate to try to identify overhead costs with the products or services that cause them. This argument is used as a reason for activity-based costing (ABC). ABC is a form of absorption costing, and is described in a later chapter.

Disadvantages of absorption costing

There are serious disadvantages with using absorption costing to measure costs and profits.

- **The apportionment and absorption of overhead costs is arbitrary**

  The way in which overhead costs are apportioned between cost centres and absorbed into production costs is subjective and many methods of cost allocation may be deemed appropriate. Although the process attempts to be 'fair', it is arbitrary.

  For example, suppose that a factory rental cost is apportioned between production departments on the basis of the floor area for each department. This might seem a fair way of sharing out the costs, but it is still subjective. Why not apportion the costs on the basis of the number of employees in each department? Or why not allow for the fact that some of the accommodation might be more pleasant to work in than others? In a manufacturing environment, production overheads might be absorbed on the basis of either direct labour hours or machine hours. However, choosing one instead of the other can have a significant effect on job costs or product costs, and yet it still relies on a subjective choice.

  It may be easier in some departments than others. If a department is labour intensive then allocations can be made on the basis of labour hours worked. Or if the department is machine intensive then allocations can be made on the basis of machine hours. But not every department will have this clear distinction.

- **Profits vary with changes in production volume**

  A second criticism of absorption costing is that profits can be increased or reduced by changes in inventory levels.

  For example, by increasing output, more fixed overhead is absorbed into production costs, and if the extra output is not sold, the fixed overhead costs are carried forward in the closing inventory value. This can encourage managers to over-produce in order to inflate profits.

3 Marginal costing

Marginal costing is a costing method which charges products or services with variable costs alone. The fixed costs are treated as period costs and are written off in total against the contribution of the period.

Marginal cost

Marginal cost is the extra cost arising as a result of producing one more unit, or the cost saved as a result of producing one less unit. It comprises:

- Direct material
- Direct labour
- Variable overheads

Example 2

Use the same data as that provided in Example 1.

Required:

Produce a standard cost card using marginal costing and value the company's closing inventory on that basis.

Marginal costing advantages/disadvantages

Advantages of marginal costing

- It is a simpler costing system, because there is no requirement to apportion and absorb overhead costs.
- Marginal costing reflects the behaviour of costs in relation to activity. When sales increase, the cost of sales rise only by the additional variable costs. Since most decision-making problems involve changes to activity, marginal costing information is more relevant and appropriate for short-run decision-making than absorption costing.
- Marginal costing avoids the disadvantages of absorption costing, described above.

Disadvantages of marginal costing

- When fixed costs are high relative to variable costs, and when overheads are high relative to direct costs, the marginal cost of production and sales is only a small proportion of total costs. A costing system that focuses on marginal cost and contribution might therefore provide insufficient and inadequate information about costs and product profitability. Marginal costing is useful for short-term decision-making, but not for measuring product costs and profitability over the longer term.
- It could also be argued that the treatment of direct labour costs as a variable cost item is often unrealistic. When direct labour employees are paid a fixed wage or salary, their cost is fixed, not variable.

4 Absorption and marginal costing profit statements

Absorption costing format

	$	$
Sales		X
Less: Cost of sales		
Opening inventory	X	
+ Production costs	X	
	X	
Less: Closing inventory	(X)	
		(X)
		X
(Under) / over absorption		+X
Gross profit		X
Less: Selling, distribution and administration costs,		
Variable	X	
Fixed	X	
		(X)
Net profit/(loss)		X

Marginal costing format

	$	$
Sales		X
Less: ***Variable*** *cost of sales*		
Opening inventory	X	
+ ***Variable*** production costs	X	
	X	
Less: Closing inventory	(X)	
		(X)
		X
Less: **Variable** selling, distribution and administration costs		(X)
Contribution		X

Contribution		X
Less: Fixed costs		
Production	X	
Selling, distribution and admin.	X	
		(X)
Net profit/(loss)		X

Example 3

Perry Ltd makes and sells a single product with the following information:

	$/unit
Selling price	50
Direct material	15
Direct labour	10
Variable overhead	5

Fixed overheads are $5,000. Budgeted and actual output and sales are 1,000 units.

(a) Using absorption costing:
  (i) calculate the profit for the period
  (ii) calculate the profit per unit.

(b) Using marginal costing:
  (i) calculate the contribution per unit
  (ii) calculate the total contribution
  (iii) calculate the profit for the period.

5 Reconciling the profits

The differences between the two profits can be reconciled as follows:

	$
Absorption costing profit	X
(Increase)/decrease in inventory × fixed overheads per unit	(X)X
Marginal costing profit	X

Justification

The profit differences are caused by the different valuations given to the closing inventories in each period. With absorption costing, an amount of fixed production overhead is carried forward in inventory to be charged against sales of later periods.

If inventories increase, then absorption costing profits will be higher than marginal costing profits. This is because some of the fixed overhead is carried forward in inventory instead of being written off against sales for the period.

If inventories reduce, then marginal costing profits will be higher than absorption costing profits. This is because the fixed overhead which had been carried forward in inventory with absorption costing is now being released to be charged against the sales for the period.

Marginal costing and absorption costing systems give the same profit when there is no change in inventories.

Profit differences in the long term

In the long term the total reported profit will be the same whichever method is used. This is because all of the costs incurred will eventually be charged against sales; it is merely the timing of the sales that causes the profit differences from period to period.

Example 4

The details are exactly the same as for Example 3, but output and sales are now 3,000 units instead of 1,000.

Calculate the profit for the period using both absorption and marginal costing? Answer the question in any way that you want.

Example 5

Z Limited manufactures a single product, the budgeted selling price and variable cost details of which are as follows

	$
Selling price	15.00
Variable costs per unit:	
Direct materials	3.50
Direct labour	4.00
Variable overhead	2.00

Budgeted fixed overhead costs are $60,000 per annum charged at a constant rate each month.

Budgeted production is 30,000 units per annum.

In a month when actual production was 2,400 units and exceeded sales by 180 units, identify the profit reported under absorption costing:

A $6,660
B $7,570
C $7,770
D $8,200

Profits from one period to the next can be reconciled in a similar way. For example, the difference between periods can be explained as the change in unit sales multiplied by the contribution per unit if using marginal costing.

Further explanation on reconciling profits between periods

Just like reconciling profits between the two accounting systems can be achieved via a proforma, similar proformas can be used for reconciling profits between one period and the next using the same accounting system as follows:

Marginal costing reconciliation

	$
Profit for period 1	X
Increase/(decrease) in sales × contribution per unit	(X)X
Profit for period 2	X

Absorption costing reconciliation

This is a little trickier as the reconciliation needs to be adjusted for any over/under-absorptions that may have occurred of fixed overheads.

	$
Profit for period 1	X
Increase/(decrease) in sales × profit per unit	X(X)
(Over–)/under-absorption in period 1	(X)/X
Over– /(under)-absorption in period 2	X/(X)
Profit for period 2	X

Note:

You must be careful with the direction of the absorption. For example, an over-absorption in period 1 makes profit for that month higher, therefore it must be deducted to arrive at period 2's profit. On the other hand, an over-absorption in period 2 makes period 2's profit higher than period 1's, therefore it must be added in the reconciliation.

6 Pricing strategies based on cost

Pricing decisions is an element of the decision making part of the syllabus which will be explored again in a later chapter when we look at how pricing should be set for one-off or short-term decisions. In any pricing decision there are four key factors to consider:

- Costs – the organisation needs to ensure that the price is sufficient to cover the cost of producing the product or providing the service.
- Competitors – organisations will often monitor the prices of competing products/services to ensure that the price set for their own product/service is in line with the organisation's competitive goals.
- Customers – the value placed on the product by customers will often determine how the product/service is priced. Organisations will consider how much the customer is willing to pay for the product/service.
- Corporate objectives – pricing will often have a link to the organisation's overall strategic objectives. If, for example, an organisation is trying to break into a market and gain market share it might set an initially low price in order to attract customers to the product/service. On the other hand, if the organisation wants to project an image of quality and difference then it might set a high price in order to do this.

The **cost** of the product or service is therefore one of the elements that can impact on the selling price of a product or service. For many organisations it will be **the key determinant of the selling price**. Often referred to as 'cost-plus pricing', this involves adding a mark-up to the cost of the product or service in order to arrive at the selling price.

Choosing the mark up percentage

A standard mark-up is used by some organisations, such as government contractors and some job costing companies, but the majority of companies vary the percentage to reflect differing market conditions for their products or services.

This mark-up may be influenced by factors such as:

- The amount that customers are willing to pay. For example, the product may have a high perceived value (if, say, it is in short supply) which would therefore encourage the organisation to use a higher mark up.
- The level of competition that the product will experience. If the product has many close competitors and substitutes then the organisation may be forced to use a lower mark up.
- The organisation's objectives. For example, when first trying to break into a market and gain market awareness and market share an organisation might use a lower mark-up percentage.
- Alternatively, the profit mark-up may be fixed so that the company makes a specific return on capital based on a particular capacity utilisation.

Under different circumstances there may be different interpretations of what gets included in the 'cost' element of cost plus pricing. In some circumstances full cost may be used (including absorbed overheads), in other circumstances it might be more appropriate to use marginal cost.

Full cost plus pricing

Using this method, the selling price for the product is determined as follows:

Selling price = Full cost per unit × (1 + mark-up percentage)

So that, for example, if the full cost was $40 and the organisation was using a 15% mark-up percentage then the selling price would be set at $46 (i.e. $40 × 1.15).

Full cost can be interpreted in different ways. It will always include the full production cost, including all absorbed overheads. But some organisations may also interpret it to include sales, distribution and administration costs.

(**Note**: typically, the more costs that are included in the full cost then the lower that the mark up percentage used is likely to be).

Illustration – Full cost-plus pricing

A company is replacing product A with an updated version, B, and must calculate a base cost, to which will be added a mark-up in order to arrive at a selling price. The following variable costs have been established by reference to the company's experience with product A, although they may be subject to an error margin of + or – 10 % under production conditions for B:

	$ per unit
Direct material	4
Direct labour (1/4 hr @ $16/hr)	4
Variable manufacturing overheads (1/4 hr of machine time @ $8/hr)	2
Total variable cost per unit	**10**

As the machine time for each B would be the same as for A, the company estimates that it will be able to produce the same total quantity of B as its current production of A, which is 20,000 units.

The production facilities currently use 50,000 hours of machine time for all of the company's products (including A) and this should be used as the basis for absorbing fixed costs. Current fixed costs are $240,000 for the production facilities, $200,000 for selling and distribution, and $180,000 for administration.

For costing purposes, the 20,000 units of B can be assumed to consume 10 per cent of the total selling, distribution and administration costs.

Alternative 1, using conventional absorption costing principles and building in the conservative error margin

	$
Variable production costs (as above)	10.0
Add: allowance for underestimate (10%)	1.0
Add: fixed manufacturing cost 1/4 hour of machine time @ $4.80/hour ($240,000/50,000 hours)	1.2
Full cost	**12.2**

Alternative 2, as 1 but including administrative costs

	$
Base cost as under 1 above	12.2
Add: fixed administrative costs ($180,000 × 10% = $18,000/20,000 units)	0.9
Full cost	**13.1**

Alternative 3, as 2 but including selling and distribution costs

	$
Base cost as under 2 above	13.1
Add: fixed selling and distribution costs ($200,000 × 10% = $20,000/20,000 units)	1.0
Full cost	**14.1**

Depending on the analysis adopted, the full cost varies from $12.20 to $14.10. The full cost rises with each alternative, as an increasing proportion of the total costs is recovered. The profit mark-up built into the pricing formula is therefore likely to fall with each alternative from 1 to 3

Advantages and disadvantages of full cost plus pricing

A number of advantages are claimed for full cost-plus pricing:

(1) The required profit will be made if budgeted sales volumes are achieved.

(2) It is a particularly useful method in contract costing industries such as building, where a few large individual contracts can consume the majority of the annual fixed costs and the fixed costs are low in relation to the variable costs.

(3) Assuming the organisation knows its cost structures, full cost-plus is quick and cheap to employ. Its routine nature lends itself to delegation, thus saving management time.

(4) Full cost-plus pricing can be useful in justifying selling prices to customers; if costs can be shown to have increased, this strengthens the case for an increase in the selling price.

However, there are a number of **problems** with full cost-plus pricing:

(1) There will always be problems associated with the selection of a 'suitable' basis on which to charge fixed costs to individual products or services. Selling prices can show great variation, depending on the apportionment basis chosen. This can lead to over-or under-pricing relative to competitors causing the firm to either lose business or make sales at an unintentional loss.

(2) If prices are set on the basis of normal volume, and actual volume turns out to be considerably lower, overheads will not be fully recovered from sales and predicted profits may not be attainable.

(3) The mark up can be very arbitrary and may not properly account for factors such as competition levels, how much customers are willing to pay etc

Marginal cost-plus pricing

Using this method, the selling price for the product is determined as follows:

Selling price = Marginal cost per unit × (1 + mark-up percentage)

To the accountant, marginal cost is the same as variable cost. In setting the selling price using this method a larger mark-up percentage is added because both fixed costs and profit must be covered.

It is a particularly useful method when determining a minimum acceptable selling price (for example, for a one-off product order) and this is examined in more detail in a later chapter.

Benefits and problems when using marginal cost pricing

Some of the reasons for using marginal cost in preference to full cost are as follows:

(1) It is just as accurate as total cost-plus pricing. A larger mark-up percentage is added because both fixed costs and profit must be covered, but the uncertainty over the fixed costs per unit remains in both pricing methods.

(2) Knowledge of marginal cost gives management the option of pricing below total cost when times are bad, in order to fill capacity.

(3) It is particularly useful in pricing specific one-off contracts because it only accounts for costs which are likely to change because of the new contract. This pricing decision is covered in more detail in a later chapter.

(4) It also recognises the existence of scarce or limiting resources. Where these are used by competing products and services it must be reflected in the selling price if profit is to be maximised. If there is a scarce or bottleneck resource the aim must be to maximise the total contribution from the limiting factor. The contribution that each alternative product or service makes from each unit of the scarce resource must be calculated and a suitable profit margin added.

The main criticisms of marginal cost pricing are:

(1) Like any cost based pricing method, it ignores other factors such as levels of competition, customer attitudes etc.

(2) The mark-up becomes even more arbitrary than that used in full cost plus as now it must also include a subjective element which allows for the selling price to cover fixed costs. For this reason, many accountants argue that marginal cost plus pricing should only be used for marginal (short-term or one-off) decisions.

Target return on capital

As well as determining the selling price by adding a mark-up on cost, an organisation may also set the mark-up at a level that provides a target return on the investment that has been made in the product.

The mark-up is calculated as:

Profit mark-up = Targeted return on investment in the product/budgeted level of production

The targeted return on investment is calculated as:

Targeted return on investment in the product = Total investment in the product × targeted rate of return

Example 6

This method involves determining the amount of capital invested to support a product. For example, some fixed or non-current assets and certain elements of working capital such as inventory and trade receivables can be attributed to individual products.

The selling price is then set to achieve a specified return on the capital invested on behalf of the product. The following example will demonstrate how the method works.

LG Ltd manufactures product B. Data for product B are as follows

Direct material cost per unit	$62
Direct labour cost per unit	$14
Direct labour hours per unit	4 hours
Production overhead absorption rate	$16 per direct machine hour
Mark-up for non-production overhead costs	8% of total production cost

LG Ltd sells 1,000 units of product B each year. Product B requires an investment of $400,000 and the target rate of return on investment is 12% per annum.

Calculate the selling price for one unit of product B, to the nearest cent.

Target return on sales

An organisation can use a similar technique to determine a selling price which provides a target return on sales. This pricing method involves determining the full cost of a cost unit and then adding a mark-up that represents a specified percentage of the final selling price.

WP Ltd manufactures product A. Data for product A are as follows:

Direct material cost per unit	$7
Direct labour cost per unit	$18
Direct labour hours per unit	2 hours
Production overhead absorption rate	$6 per direct labour hour
Mark-up for non-production overhead costs	5% of total production cost

WP Ltd requires a 15% return on sales revenue from all products.

Calculate the selling price for product A, to the nearest cent.

Solution

	$ per unit
Direct material cost	7.00
Direct labour cost	18.00
Total direct cost	25.00
Production overhead absorbed (2 hours × $6)	12.00
Total production cost	37.00
Mark-up for non-production costs (5% × $37.00)	1.85
Full cost	38.85
Profit mark-up (15/85* × $38.85)	6.86
Selling price	45.71

*Always read the question data carefully. The 15% required return is expressed as a percentage of the sales revenue, not as a percentage of the cost.

Profit margin

As an alternative calculation, the examiner may provide a profit margin rather than a mark-up on cost. The selling price using a profit margin can be calculated as follows:

Selling price = Total cost ÷ (1 – required margin)

The decision as to what gets included in the total cost (for example, whether that is the absorption or marginal cost) and the associated calculations required to get to the total cost will be the same as when using a mark-up on cost.

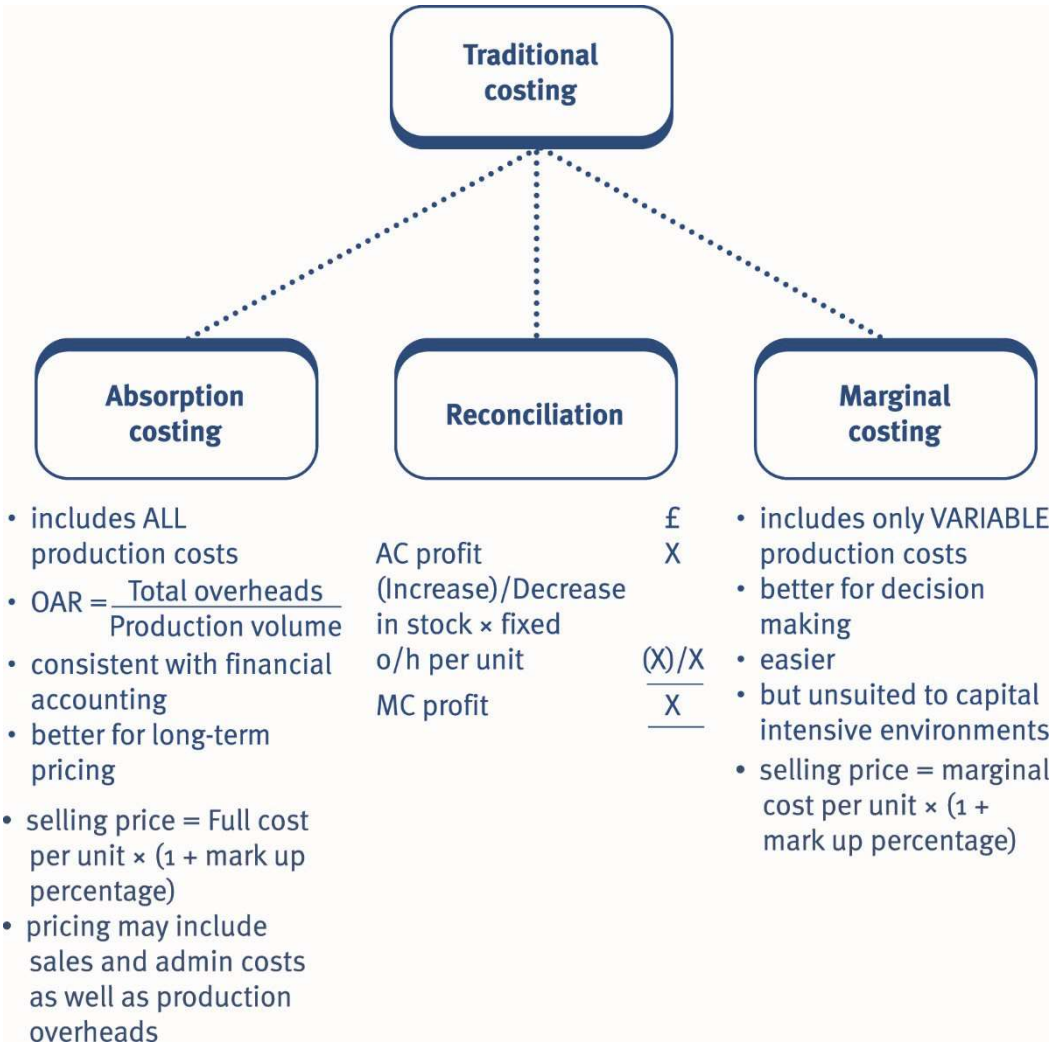
Example 7

A product has a total production cost of $60. Determine the selling price for the product if the company wants to achieve:

(a) a 20% mark-up on total production cost

(b) a 20% margin on total production cost

7 Chapter summary



8 Practice questions

Test your understanding 1

Scenario

Saturn, a chocolate manufacturer, produces three products:

- The Sky Bar, a bar of solid milk chocolate.
- The Moon Egg, a fondant filled milk chocolate egg.
- The Sun Bar, a biscuit and nougat based chocolate bar.

Information relating to each of the products is as follows:

	Sky Bar	Moon Egg	Sun Bar
Direct labour cost per unit ($)	0.07	0.14	0.12
Direct material cost per unit ($)	0.17	0.19	0.16
Actual production/sales (units)	500,000	150,000	250,000
Direct labour hours per unit	0.001	0.01	0.005
Direct machine hours per unit	0.01	0.04	0.02
Selling price per unit ($)	0.50	0.45	0.43

Annual production overhead = $80,000

Tasks

Using traditional absorption costing, calculate the full production cost per unit and the profit per unit for each product. Explain the implications of the figures calculated. **(Time allowed: 20 minutes)**

Test your understanding 2

E plc operates a marginal costing system. For the forthcoming year, variable costs are budgeted to be 60% of sales value and fixed costs are budgeted to be 10% of sales value.

If E plc increases its selling prices by 10%, but if fixed costs, variable costs per unit and sales volume remain unchanged, identify the effect on E plc's contribution:

A a decrease of 2%

B an increase of 5%

C an increase of 10%

D an increase of 25%

Test your understanding 3

When comparing the profits reported under marginal and absorption costing during a period when the level of inventories increased, identify which of the following statements would be true:

A absorption costing profits will be higher and closing inventory valuations lower than those under marginal costing

B absorption costing profits will be higher and closing inventory valuations higher than those under marginal costing

C marginal costing profits will be higher and closing inventory valuations lower than those under absorption costing

D marginal costing profits will be lower and closing inventory valuations higher than those under absorption costing

Test your understanding 4

Exe Limited makes a single product whose total cost per unit is budgeted to be $45. This includes fixed cost of $8 per unit based on a volume of 10,000 units per period. In a period, sales volume was 9,000 units, and production volume was 11,500 units. The actual profit for the same period, calculated using absorption costing, was $42,000.

If the profit statement were prepared using marginal costing, identify the profit for the period:

A $10,000

B $22,000

C $50,000

D $62,000

Test your understanding 5

Scenario

Keats plc commenced business on 1 March making one product only, the standard cost of which is as follows:

	$
Direct labour	5
Direct material	8
Variable production overhead	2
Fixed production overhead	5
Standard production cost	20

The fixed production overhead figure has been calculated on the basis of a budgeted normal output of 36,000 units per annum.

You are to assume that actual fixed overheads were as expected and that all the budgeted fixed expenses are incurred evenly over the year. March and April are to be taken as equal period months.

Selling, distribution and administration expenses are:

Fixed $120,000 per annum

Variable 15% of the sales value

The selling price per unit is $35 and the number of units produced and sold were:

	March (units)	**April** (units)
Production	2,000	3,200
Sales	1,500	3,000

Tasks

(a) prepare profit statements for each of the months of March and April using:

(i) absorption costing, and

(ii) marginal costing

(b) prepare a reconciliation of the profit or loss figures given in your answers to (a)(i) and (a)(ii) accompanied by a brief explanation.

(Time allowed: 20 minutes)

Test your understanding 6

If inventory levels have increased during the period, the profit calculated using marginal costing would be _____ (choose between 'higher' and 'lower') than the profit when compared with that calculated using absorption costing.

Test your understanding 7

Identify which of the following statements would be true: fixed production overheads will always be under-absorbed when:

A actual output is lower than budgeted output

B actual overheads incurred are lower than budgeted overheads

C overheads absorbed are lower than those budgeted

D overheads absorbed are lower than those incurred

Test your understanding 8

A company uses a standard absorption costing system. The fixed overhead absorption rate is based on labour hours.

Extracts from the company's records for last year were as follows:

	Budget	Actual
Fixed production overhead	$450,000	$475,000
Output	50,000 units	60,000 units
Labour hours	900,000	930,000

The _____ (choose between 'over' and 'under') -absorbed fixed production overheads for the year were $_____ (fill in the value).

Test your understanding 9

GY Ltd budgets to produce and sell 3,800 units of product R in the forthcoming year. The amount of capital investment attributable to product R will be $600,000 and GY Ltd requires a rate of return of 15% on all capital invested.

Further details concerning product R are as follows:

Direct material cost per unit	$14
Direct labour cost per unit	$19
Variable overhead cost per unit	$3
Machine hours per unit	8

Fixed overhead is absorbed at a rate of $11 per machine hour.

Required:

Calculate all answers to the nearest cent.

(a) The variable cost of product R is $ _____per unit.

(b) The total (full) cost of product R is $ _____per unit.

(c) The selling price of product R which will achieve the specified return on investment is $ _____per unit.

Test your understanding 10

A company manufactures a range of products one of which, product Y, incurs a total cost of $20 per unit. The company incurs a total cost of $600,000 each period and the directors wish to achieve a return of 18% on the total capital of $800,000 invested in the company.

Required:

Based on this information the cost-plus selling price of one unit of product Y should be $_____

Test your understanding 11

Scenario

ML is an engineering company that specialises in providing engineering facilities to businesses that cannot justify operating their own facilities in-house. ML employs a number of engineers who are skilled in different engineering techniques that enable ML to provide a full range of engineering facilities to its customers.

Most of the work undertaken by ML is unique to each of its customers, often requiring the manufacture of spare parts for its customers' equipment, or the building of new equipment from customer drawings. As a result most of ML's work is short-term, with some jobs being completed within hours while others may take a few days.

To date, ML has adopted a cost plus approach to setting its prices. This is based upon an absorption costing system that uses machine hours as the basis of absorbing overhead costs into individual job costs. The Managing Director is concerned that, over recent months, ML has been unsuccessful when quoting for work with the consequence that there has been an increase in the level of unused capacity. It has been suggested that ML should adopt an alternative approach to its pricing based on marginal costing since 'any price that exceeds variable costs is better than no work'.

Tasks

With reference to the above scenario:

(a) briefly explain absorption and marginal cost approaches to pricing

(b) discuss the validity of the comment 'any price that exceeds variable costs is better than no work'.

(Time allowed: 20 minutes)

Example and test your understanding answers

Example 1

Standard cost card

		$
Direct materials per unit	3 kgs × $4/kg	12
Direct labour per unit	2 hrs × $22/hr	44
Variable overheads	2 hrs × $6/hr	12
Production overhead per unit (note)		20
Full/absorption cost per unit		88

Note:

Production overhead per unit in the standard cost card should be based on budgeted production. Therefore in this example they will be ($400,000/20,000 units =) $20 per unit.

Inventory valuation

If 16,000 units were produced and 14,000 units sold then there will be 2,000 units in closing inventory.

Valuing that inventory at the absorption cost will give a value of

= 2,000 × $88

= $176,000

Example 2

Standard cost card

		$
Direct materials per unit	3 kgs × $4/kg	12
Direct labour per unit	2 hrs × $22/hr	44
Variable overheads	2 hrs × $6/hr	12
Marginal cost per unit		68

Note:

Fixed production overhead is not included in a marginal costing standard cost card.

Inventory valuation

Valuing that inventory at the marginal cost will give a value of

= 2,000 × $68

= $136,000

Example 3

(a) (i)

		$	$
Sales	1,000 units × $50		50,000
Direct materials	1,000 units × $15	15,000	
Direct labour	1,000 units × $10	10,000	
Variable overheads	1,000 units × $5	5,000	
Fixed overheads		5,000	
			35,000
Profit			15,000

(ii)

$$\text{Profit per unit} = \frac{\$15000}{1{,}000 \text{ units}} = \$15/\text{unit}$$

(b) (i) Contribution per unit = $50 – ($15 + $10 + $5) = $20

(ii) Total contribution = $20/unit × 1,000 units = $20,000

(iii)

	$
Contribution	
$20/unit × 1,000 units	20,000
Fixed cost	5,000
Profit	15,000

The two systems give the same profit provided there is no change in inventory.

Example 4

Either marginal costing or absorption costing principles can be used. The two systems will give the same profit as there is no change in inventory (production = sales). Marginal costing will be simpler and is illustrated first.

	$
Contribution	
$20/unit × 3,000 units	60,000
Fixed cost	5,000
Profit	55,000

Alternatively:

		$	$
Sales	3,000 units × $50		150,000
Direct materials	3,000 units × $15	45,000	
Direct labour	3,000 units × $10	30,000	
Variable overheads	3,000 units × $5	15,000	
Fixed overheads	3,000 units × $5	15,000	
			(105,000)
Over-absorption of fixed overheads	($15,000 – $5,000)		10,000
			55,000

Notice that we did not use the $15 per unit profit figure. Unlike contribution per unit, profit per unit is not constant.

Example 5

B

A common short-cut in multiple choice questions is to calculate the marginal costing profit and then use the reconciliation of profits to get to the absorption costing profit.

First of all – the profit under marginal costing:

Contribution per unit = $15 – (3.50 + 4.00 + 2.00) = $5.50

No of units sold = 2,400 – 180 = 2,220

	$
Contribution	
$5.50/unit × 2,220 units	12,210
Fixed cost	
$60,000 p.a./12 months	5,000
	7,210

As production is greater than sales, absorption costing will show the higher profit.

Difference in profit = change in inventory × fixed production overhead per unit.

Difference in profit = 180 units × $2/unit = $360.

Therefore, profit reported under absorption costing = $7,210 + 360 = $7,570.

The FOAR was worked out as $= \frac{\text{Budgeted overheads}}{\text{Budgeted level of activity}} = \frac{\$60{,}000}{30{,}000 \text{ units}} = \$2 \text{ per unit}$

Example 6

The selling price is calculated as follows:

	$ per unit
Direct material cost	62.00
Direct labour cost	14.00
Total direct cost	76.00
Production overhead absorbed (4 hours × $16)	64.00
Total production cost	140.00
Mark-up for non-production costs (8% × $140)	11.20
Full cost	151.20
Profit mark-up (see working)	48.00
Selling price	199.20

Working:

Target return on investment in product B = $400,000 × 12% = $48,000

Target return per unit of product B = $48,000/1,000 units = $48

Example 7

(a) a 20% mark-up on total production cost

Selling price = $60 × 1.20 = $72

Note:	Mark up = % of cost	Margin = % of sales
The profit is $12	20%	17%

(b) a 20% margin on total production cost

Selling price = $60 / (1 – 0.2) = $75

Note:	Mark up = % of cost	Margin = % of sales
The profit is $15	25%	20%

Test your understanding 1

As mentioned, it is relatively easy to complete the first two lines of the cost card. The difficult part is calculating the production overhead per unit, so let's start by considering this. We need to absorb the overheads into units of production. To do this, we will first need to calculate an overhead absorption rate (OAR):

$$\text{OAR} = \frac{\text{Production overhead}}{\text{Activity level}} = \frac{\text{(this is \$80,000, as per the question}}{\text{(this must be chosen)}}$$

The activity level must be appropriate for the business. Saturn must choose between three activity levels:

- Units of production – This would not be appropriate since Saturn produces more than one type of product. It would not be fair to absorb the same amount of overhead into each product.
- Machine hours or labour hours – It is fair to absorb production overheads into the products based on the labour or machine hours taken to produce each unit. We must decide if the most appropriate activity level is machine or labour hours. To do this we can look at the nature of the process. Production appears to be more machine intensive than labour intensive because each unit takes more machine hours to produce than it does labour hours. Therefore, the most appropriate activity level is machine hours.

Working – OAR

$$\text{OAR} = \frac{\text{\$80,000 production overhead}}{\text{(0.01 × 500k) + (0.04 × 150k) + (0.02 × 250k) hours}}$$

$$= \frac{\text{\$80,000}}{\text{16,000 hours}}$$

= $5 per machine hour

We can now absorb these into the units of production:

	Sky Bar	Moon Egg	Sun Bar
Production overheads ($) = machine hours per unit × $5	0.5	0.20	0.10

This is the difficult part done.

We can now quickly complete the cost card and answer the question:

	Sky Bar	Moon Egg	Sun Bar
Direct labour cost per unit	0.7	0.14	0.12
Direct material cost per unit	0.17	0.19	0.16
Production overhead per unit	0.05	0.20	0.10
Full production cost per unit	**0.29**	**0.53**	**0.38**
Selling price per unit	0.50	0.45	0.43
Profit/(loss) per unit	**0.21**	**(0.08)**	**0.05**

Outcome of absorption costing

Based on absorption costing, the Sky Bar and the Sun Bar are both profitable. However, the Moon Egg is loss making. Managers would need to consider the future of the Moon Egg. They may look at the possibility of increasing the selling price and/or reducing costs. If this is not possible, they may make the decision to stop selling the product. However, this may prove to be the wrong decision because absorption costing does not always result in an accurate calculation of the full production cost per unit. ABC can be a more accurate method of calculating the full production cost per unit and as a result should lead to better decisions. ABC is explored in the next chapter.

Test your understanding 2

D

The easiest way to answer this question is to make up a number for sales, say $1,000, then the relationships will be much easier to visualise.

If sales = $1,000, then:

Variable cost = 60% × $1,000 = $600

Current situation

	$
Sales	1,000
Variable cost	600
Contribution	400

New situation

	$
Sales (10% higher)	1,100
Variable cost	600
Contribution	500

Contribution increases by $100, which is an increase of 25% on its original value.

Fixed cost should be ignored as it does not affect contribution.

Test your understanding 3

B

Test your understanding 4

B

Production is greater than sales, so absorption costing will have the higher profit.

Difference in profit = change in inventory × fixed production overhead per unit.

Difference in profit = 2,500 units × $8/unit = $20,000.

Therefore, profit reported under marginal costing = $42,000 – 20,000 = $22,000.

Test your understanding 5

(a) (i)

	March		April	
	$	$	$	$
Sales		52,000		105,000
Cost of sales				
Opening stock (W1)	0		10,000	
Production costs (@$20/unit)	40,000		64,000	
	40,000		74,000	
Less closing inventory (@$20/unit) (W2)	10,000		14,000	
		30,000		60,000
		22,500		45,000
(Under)/over-absorption (W3)		(5,000)		1,000
Gross profit		17,500		46,000
Selling and other costs				
Fixed (W4)	10,000		10,000	
Variable	7,875		15,750	
		17,875		25,750
Net Profit/Loss		(375)		20,250

(ii)

	March		April	
	$	$	$	$
Sales		52,500		105,000
Variable cost of sales				
Opening inventory (W1)	0		7,500	
Variable production costs (@$15/unit)	30,000		48,000	
	30,000		55,500	
Less: closing inventory (@$15/unit) (W2)	7,500		10,500	
		22,500		45,000
		30,000		45,000
Variable selling and other costs		7,875		15,750
Contribution		22,125		44,250
Fixed costs				
Production	15,000		15,000	
Selling etc.	10,000		10,000	
		25,000		25,000
Profit/Loss		(2,875)		19,250

Workings

(W1) The closing inventory for March becomes the opening stock for April.

(W2)

	March	April
	Units	Units
Opening inventory	0	500
Production	2,000	3,200
	2,000	3,700
Less sales	1,500	3,000
Closing inventory	500	700

(W3) Under-/over-absorption is the difference between overheads incurred and overheads absorbed.

"Overheads incurred" means actual overheads and we are told that the actual fixed overheads were as expected. Therefore the actual overheads incurred are the same as the budgeted fixed overheads.

Budgeted fixed overhead
= $5 per unit × 36,000 units = $180,000 per annum

This works out as = $15,000 per month

March		
Overheads incurred		15,000
Overheads absorbed	$5/unit × 2,000 units	10,000
Under-absorption		(5,000)
April		
Overheads incurred		15,000
Overheads absorbed	$5/unit × 3,200 units	16,000
Over-absorption		1,000

(W4) Selling and other costs fixed overhead = $120,000/12 = $10,000 per month.

(b) If there is no change in inventory, the 2 systems give the same profit. If production is greater than sales then absorption costing shows the higher profit.

Difference in profit = change in inventory × fixed production overhead cost per unit

In both March and April, production is greater than sales and thus absorption costing will show the higher profit (the smaller loss in March).

	March	**April**
Marginal costing profit/loss	(2,875)	19,250
Difference in profit		
(2,000 – 1,500) × $5 per unit	2,500	
(3,200 – 3,000) × $5 per unit		1,000
Absorption costing profit/loss	(357)	20,250

This difference occurs because marginal costing writes off the entire fixed overhead in the period incurred, whereas absorption costing carries forward some fixed production overhead into the next period in the valuation of closing inventory.

Test your understanding 6

Missing word: lower

Marginal costing values inventory at a lower amount because it does not include fixed overheads in the valuation. Therefore as inventory levels increase the value of closing inventory under marginal costing will be lower. This will give a higher cost of sales and a lower profit.

Test your understanding 7

D

Under-absorption occurs when the amount absorbed is less than the actual overheads incurred.

Test your understanding 8

The **over**-absorbed fixed production overheads for the year were **$65,000**

$$\text{Absorption rate} = \frac{\$450{,}000}{900{,}000} = \$0.50/\text{hour}$$

Absorbed overheads	60,000 units × 18 hrs/unit × $0.50/hour	= $540,000
Actual overheads	=	$475,000
Over-absorption	=	$65,000

Test your understanding 9

(a) The variable cost per unit of product R is $36.00 per unit.

Direct material $14 + direct labour $19 + variable overhead $3 = **$36.**

(b) The total (full) cost of product R is $124.00 per unit.

Variable cost $36 + fixed overhead (8 hours × $11) = **$124.**

(c) The selling price of product R which will achieve the specified return on investment is $147.68 per unit.

Working:

Required return from investment in product R
= $600,000 × 15% = $90,000

Required return per unit sold = $90,000/3,800 units = $23.68

Required selling price = $124.00 full cost + $23.68 = **$147.68**

Test your understanding 10

The cost-plus selling price of one unit of product Y should be **$24.80.**

Required annual return = $800,000 × 18% = $144,000

Return as a percentage of total cost = 144,000/$600,000 = 24%

Required cost-plus selling price = $20 + (24% + $20) = **$24.80**

Test your understanding 11

[Make sure that you focus your answer on absorption and marginal cost approaches to pricing (not costing). A main issue is therefore how the level of mark-up is determined. Your answer should take a balanced view of the comment in the short and long term. While it may be true in the short term, under certain circumstances a price which does not generate a profit in the long term could not be acceptable.]

(a) An absorption cost approach to pricing involves adding a profit margin to the full cost of the product. The full cost is calculated by taking prime cost and adding a share of overhead which, in ML's case, is absorbed using machine hours.

A marginal cost approach to pricing takes the variable cost of the product and adds a mark-up to cover fixed cost and profit. Fixed overheads are not absorbed to product but are treated as a period cost in the accounts.

The mark-up added using a marginal costing approach would have to be greater than that under an absorption costing approach to ensure that the same profit level is achieved. Mark-ups may be varied depending on the market conditions. ML's work is unique to each of its customers and it may therefore be difficult to estimate a suitable mark-up.

(b) The comment 'any price that exceeds variable costs is better than no work' may have some validity in the short term. In the case of a company like ML, which has unused capacity, fixed costs will be incurred in the short term irrespective of workload, i.e. the fixed costs will not change as no extra capacity is required (for example, premises will not have to be expanded in order to accommodate the extra production), and they can therefore be ignored for decision making purposes. Any price that exceeds variable cost will provide some contribution and will reduce losses.

Care must be taken that special prices based on variable cost do not become the normal expectation or upset existing customers who are paying a price which generates a profit.

In the long run fixed cost must be covered and a profit made in accordance with company objectives. An absorption costing approach may not provide an accurate total product costs and an activity-based approach may improve the accuracy of total costs and enable ML to identify those products or customers which generate most profit.

If resources are scarce (i.e. they cannot easily be obtained at the prices or rates contained in the standard cost card) then this statement is not true, even in the short term, as scarce resources typically cost a premium and the marginal cost will increase. This concept will be explored in the decision making chapter later in the text.