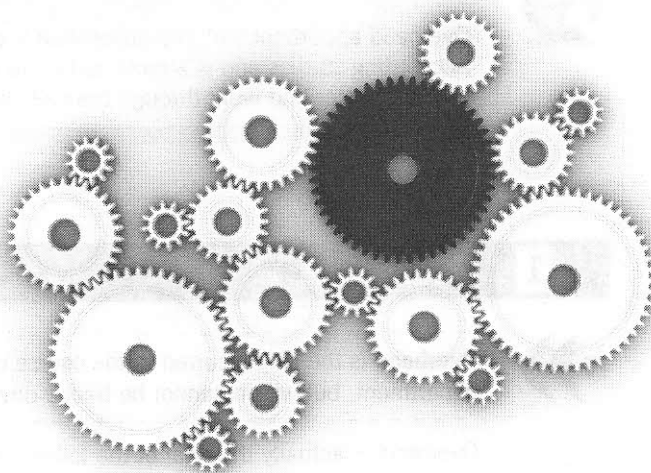


**Absorption costing** is a method of accounting for overheads. It is basically a method of sharing out overheads incurred amongst units produced.

This chapter begins by explaining why absorption costing might be necessary and then provides an overview of how the cost of a unit of product is built up under a system of absorption costing. A detailed analysis of this costing method is then provided, covering the three stages of absorption costing: **allocation**, **apportionment** and **absorption**.

## Accounting for overheads



### TOPIC LIST

- 1 Overheads
- 2 Absorption costing: an introduction
- 3 Overhead allocation
- 4 Overhead apportionment
- 5 Overhead absorption
- 6 Blanket absorption rates and departmental absorption rates
- 7 Over and under absorption of overheads
- 8 Ledger entries relating to overheads

### SYLLABUS REFERENCE

- B1(c)(i)  
B1(c)(i)(ii)  
B1(c)(iii)  
B1(c)(iii)(iv)  
B1(c)(v)  
B1(c)(v)  
B1(c)(vi)  
B1(c)(vi)

**Study Guide****Intellectual level****B1(c) Accounting for overheads**

(i) Explain the different treatment of direct and indirect expenses	K
(ii) Describe the procedures involved in determining production overhead absorption rates	K
(iii) Allocate and apportion production overheads to cost centres using an appropriate basis	S
(iv) Reapportion service cost centre costs to production cost centres (using the reciprocal method where service cost centres work for each other)	S
(v) Select, apply and discuss appropriate bases for absorption rates	S
(vi) Prepare journal and ledger entries for manufacturing overheads incurred and absorbed	S
(vii) Calculate and explain the under- and over-absorption of overheads	S

**EXAM FOCUS POINT**

Overhead apportionment and absorption is one of the most important topics in your Management Accounting studies and is almost certain to appear in the exam. Make sure that you study the contents of this chapter and work through the calculations very carefully.

**1 Overheads**

**Overhead** is the cost incurred in the course of making a product, providing a service or running a department, but which cannot be traced directly and in full to the product, service or department.

Overhead is actually the total of the following.

- Indirect materials
- Indirect labour
- Indirect expenses

The total of these indirect costs is usually split into the following categories.

- **Production**
- **Administration**
- **Selling and distribution**

In cost accounting there are two schools of thought as to the correct method of dealing with overheads.

- Absorption costing
- Marginal costing

## 2 Absorption costing: an introduction

**The objective of absorption costing** is to include in the total cost of a product an appropriate share of the organisation's total overhead. An appropriate share is generally taken to mean an amount which reflects the amount of time and effort that has gone into producing a unit or completing a job.

An organisation with one production department that produces identical units will divide the total overheads among the total units produced. **Absorption costing is a method for sharing overheads between different products on a fair basis.**

### 2.1 Is absorption costing necessary?

Suppose that a company makes and sells 100 units of a product each week. The prime cost per unit is \$6 and the unit sales price is \$10. Production overhead costs \$200 per week and administration, selling and distribution overhead costs \$150 per week. The weekly profit could be calculated as follows.

	\$	\$
Sales (100 units × \$10)		1,000
Prime costs (100 × \$6)	600	
Production overheads	200	
Administration, selling and distribution costs	<u>150</u>	
		<u>950</u>
Profit		<u>50</u>

**In absorption costing, overhead costs will be added to each unit of product manufactured and sold.**

	\$ per unit
Prime cost per unit	6
Production overhead (\$200 per week for 100 units)	<u>2</u>
Full factory cost	<u>8</u>

The weekly profit would be calculated as follows.

	\$
Sales	1,000
Less factory cost of sales	<u>800</u>
Gross profit	<u>200</u>
Less administration, selling and distribution costs	<u>150</u>
Net profit	<u>50</u>

Sometimes, but not always, the overhead costs of administration, selling and distribution are also added to unit costs, to obtain a full cost of sales.

	\$ per unit
Prime cost per unit	6.00
Factory overhead cost per unit	2.00
Administration etc costs per unit	<u>1.50</u>
Full cost of sales	<u>9.50</u>

The weekly profit would be calculated as follows.

	\$
Sales	1,000
Less full cost of sales	<u>950</u>
Profit	<u>50</u>

It may already be apparent that the weekly profit is \$50 no matter how the figures have been presented. So, how does absorption costing serve any useful purpose in accounting?

The **theoretical justification** for using absorption costing is that all production overheads are incurred in the production of the organisation's output and so each unit of the product receives some benefit from these costs. Each unit of output should therefore be charged with some of the overhead costs.

## 2.2 Practical reasons for using absorption costing



The main reasons for using absorption costing are for inventory valuations, pricing decisions, and establishing the profitability of different products.

(a) **Inventory valuations.** Inventory in hand must be valued for two reasons.

- (i) For the closing inventory figure in the statement of financial position
- (ii) For the cost of sales figure in the statement of comprehensive income

The valuation of inventory will affect profitability during a period because of the way in which the cost of sales is calculated.

	The cost of goods produced
+	the value of opening inventories
–	the value of closing inventories
=	the cost of goods sold.

In our example, closing inventories might be valued at prime cost (\$6), but in absorption costing, they would be valued at a fully absorbed factory cost, \$8 per unit. (They would not be valued at \$9.50, the full cost of sales, because the only costs incurred in producing goods for finished inventory are factory costs.)

- (b) **Pricing decisions.** Many companies attempt to fix selling prices by calculating the full cost of production or sales of each product, and then adding a margin for profit. In our example, the company might have fixed a gross profit margin at 25% on factory cost, or 20% of the sales price, in order to establish the unit sales price of \$10. 'Full cost plus pricing' can be particularly useful for companies which do jobbing or contract work, where each job or contract is different, so that a standard unit sales price cannot be fixed. Without using absorption costing, a full cost is difficult to ascertain.
- (c) **Establishing the profitability of different products.** This argument in favour of absorption costing is more contentious, but is worthy of mention here. If a company sells more than one product, it will be difficult to judge how profitable each individual product is, unless overhead costs are shared on a fair basis and charged to the cost of sales of each product.

## 2.3 International Accounting Standard 2 (IAS 2)

**Absorption costing is recommended in financial accounting** by IAS 2 *Inventories*. IAS 2 deals with **financial accounting systems**. The cost accountant is (in theory) free to value inventories by whatever method seems best, but where companies integrate their financial accounting and cost accounting systems into a single system of accounting records, the valuation of closing inventories will be determined by IAS 2.

IAS 2 states that costs of all inventories should comprise those costs which have been incurred in the normal course of business in **bringing the inventories to their 'present location and condition'**. These costs incurred will include all related production overheads, even though these overheads may accrue on a time basis. In other words, in financial accounting, closing inventories should be valued at full factory cost, and it may therefore be convenient and appropriate to value inventories by the same method in the cost accounting system.

## 2.4 Absorption costing stages



The three stages of absorption costing are:

- Allocation
- Apportionment
- Absorption

We shall now begin our study of absorption costing by looking at the process of **overhead allocation**.



### 3 Overhead allocation

#### 3.1 Introduction

**Allocation** is the process by which whole cost items are charged direct to a cost unit or cost centre.

Cost centres may be one of the following types.

- A **production department**, to which production overheads are charged
- A **production area service department**, to which production overheads are charged
- An **administrative department**, to which administration overheads are charged
- A **selling** or a **distribution department**, to which sales and distribution overheads are charged
- An **overhead cost centre**, to which items of expense which are shared by a number of departments, such as rent and rates, heat and light and the canteen, are charged

The following costs would therefore be charged to the following cost centres via the process of allocation.

- Direct labour will be charged to a production cost centre.
- The cost of a warehouse security guard will be charged to the warehouse cost centre.
- Paper (recording computer output) will be charged to the computer department.
- Costs such as the canteen are charged direct to various overhead cost centres.

#### 3.2 Example: Overhead allocation

Consider the following costs of a company.

Wages of the foreman of department A	\$200
Wages of the foreman of department B	\$150
Indirect materials consumed in department A	\$50
Rent of the premises shared by departments A and B	\$300

The cost accounting system might include three overhead cost centres.

Cost centre:	101	Department A
	102	Department B
	201	Rent

Overhead costs would be allocated directly to each cost centre, ie \$200 + \$50 to cost centre 101, \$150 to cost centre 102 and \$300 to cost centre 201. The rent of the factory will be subsequently shared between the two production departments, but for the purpose of day to day cost recording, the rent will first of all be charged in full to a separate cost centre.

### 4 Overhead apportionment

**Apportionment** is a procedure whereby indirect costs are spread fairly between cost centres. Service cost centre costs may be apportioned to production cost centres by using the reciprocal method.

The following question will be used to illustrate the overhead apportionment process.

#### 4.1 Example: Overhead apportionment - Swotathon

Swotathon Inc has two production departments (A and B) and two service departments (maintenance and stores). Details of next year's budgeted overheads are shown below.

	Total (\$)
Heat and light	19,200
Repair costs	9,600
Machinery Depreciation	54,000

Rent and rates	38,400
Canteen	9,000
Machinery insurance	25,000

Details of each department are as follows.

	A	B	Maintenance	Stores	Total
Floor area (m <sup>2</sup> )	6,000	4,000	3,000	2,000	15,000
Machinery book value (\$000)	48	20	8	4	80
Number of employees	50	40	20	10	120
Allocated overheads (\$000)	15	20	12	5	50

Service departments' services were used as follows.

	A	B	Maintenance	Stores	Total
Maintenance hours worked	5,000	4,000	---	1,000	10,000
Number of stores requisitions	3,000	1,000	---	---	4,000

## 4.2 Stage 1: Apportioning general overheads

**Overhead apportionment** follows on from overhead allocation. The first stage of overhead apportionment is to identify all overhead costs as production department, production service department, administration or selling and distribution overhead. The costs for heat and light, rent and rates, the canteen and so on (ie costs allocated to general overhead cost centres) must therefore be shared out between the other cost centres.

### 4.2.1 Bases of apportionment

It is considered important that overhead costs should be shared out on a **fair basis**. You will appreciate that because of the complexity of items of cost it is rarely possible to use only one method of apportioning costs to the various departments of an organisation. The bases of apportionment for the most usual cases are given below.

Overhead to which the basis applies	Basis
Rent, rates, heating and light, repairs and depreciation of buildings	Floor area occupied by each cost centre
Depreciation, insurance of equipment	Cost or book value of equipment
Personnel office, canteen, welfare, wages and cost offices, first aid	Number of employees, or labour hours worked in each cost centre

Note that heating and lighting may also be apportioned using volume of space occupied by each cost centre.

### 4.2.2 Example: Swotathon

Using the Swotathon question above, show how overheads should be apportioned between the four departments.

#### Solution

Item of cost	Basis of apportionment	Department			
		A	B	Maintenance	Stores
		\$	\$	\$	\$
Heat and light	Floor area	7,680	5,120	3,840	2,560
Repair costs	Floor area	3,840	2,560	1,920	1,280
Machine dep <sup>n</sup>	Machinery value	32,400	13,500	5,400	2,700
Rent and rates	Floor area	15,360	10,240	7,680	5,120
Canteen	No of employees	3,750	3,000	1,500	750
Machine insurance	Machinery value	15,000	6,250	2,500	1,250
Total		<u>78,030</u>	<u>40,670</u>	<u>22,840</u>	<u>13,660</u>

*Workings**Overhead apportioned by floor area*

$$\text{Overhead apportioned to department} = \frac{\text{Floor area occupied by department}}{\text{Total floor area}} \times \text{total overhead}$$

For example:

$$\text{Heat and light apportioned to Dept A} = \frac{6,000}{15,000} \times 19,200 = \$7,680$$

*Overheads apportioned by machinery value*

$$\text{Overheads apportioned to department} = \frac{\text{Value of department's machinery}}{\text{Total value of machinery}} \times \text{total overhead}$$

*Overheads apportioned by number of employees*

$$\text{Overheads apportioned to department} = \frac{\text{No of employees in department}}{\text{Total no of employees}} \times \text{total overhead}$$

### 4.3 Stage 2 – Apportion service department costs

Only production departments produce goods that will ultimately be sold. In order to calculate a correct price for these goods, we must determine the **total cost** of producing each unit – that is, not just the cost of the labour and materials that are directly used in production, but also the **indirect** costs of services provided by such departments as maintenance, stores and canteen.

Our aim is to apportion all the **service** department costs to the **production** departments, in one of three ways.

- The **direct** method, where the service centre costs are apportioned to production departments only.
- The **step-down** method, where each service centre's costs are not only apportioned to production departments but to some (but not all) of the other service centres that make use of the services provided.
- The **repeated distribution** (or **reciprocal**) method, where service centre costs are apportioned to both the production departments and service departments that use the services. The service centre costs are then gradually apportioned to the production departments. This method is used only when service departments work for each other – that is, **service departments use each other's services** (for example, the maintenance department will use the canteen, whilst the canteen may rely on the maintenance department to ensure its equipment is functioning properly or to replace bulbs, plugs, etc).

The **direct** and **step-down** methods are **not examinable**.



#### EXAM FOCUS POINT

Remember that **all** service department costs must be allocated – that is, both **general overheads** that were apportioned and those overheads that are **specific** to the individual departments.

#### 4.3.1 Basis of apportionment

Whichever method is used to apportion service cost centre costs, **the basis of apportionment must be fair**. A different apportionment basis may be applied for each service cost centre. This is demonstrated in the following table.

Service cost centre	Possible basis of apportionment
Stores	Number or cost value of material requisitions
Maintenance	Hours of maintenance work done for each cost centre
Production planning	Direct labour hours worked in each production cost centre

Although both the **direct** and **step-down** methods are **not in your syllabus**, the following illustration will give you an idea of how to carry out simple apportionments before we move onto the more complex reciprocal method.

#### 4.3.2 Example: Swotathon with simple apportionment

Using the information contained in the Swotathon question and the results of the calculations in Section 4.2.2 above, apportion the Maintenance and Stores departments' overheads to production departments A and B and calculate the total overheads for each of these production departments.

#### Solution

- (1) Decide how the **service departments'** overheads will be apportioned. The table above tells us that maintenance overheads can be apportioned according to the **hours of maintenance work done**, whilst we can use the number or cost value of stores/material requisitions for apportioning stores.

The question gives us information about maintenance hours worked and the number of stores requisitions.

- (2) **Apportion the overheads** of the **service** department whose services are also used by another service department (in this case, maintenance). This allows us to obtain a total overhead cost for stores.

Total overheads for maintenance department

	\$	
General overheads	22,840	(see Section 4.2.2 above)
Allocated overheads	12,000	(from information given in Section 4.1)
	<u>34,840</u>	

Apportioned as follows:

$$\frac{\text{Maintenance hours worked in department}}{\text{Total maintenance hours worked}} \times \$34,840$$

$$\text{Production department A} = \frac{5,000}{10,000} \times \$34,840 = \$17,420$$

$$\text{Production department B} = \frac{4,000}{10,000} \times \$34,840 = \$13,936$$

$$\text{Stores department} = \frac{1,000}{10,000} \times \$34,840 = \$3,484$$

- (3) Apportion **Stores department's** overheads.

Total overheads for stores

	\$	
General overheads	13,660	(see Section 4.2.2 above)
Allocated overheads	5,000	(from information given in Section 4.1)
Apportioned from maintenance	3,484	(see above)
	<u>22,144</u>	

Apportioned as follows:



$$\frac{\text{Number of stores requisitions for department}}{\text{Total number of stores requisitions}} \times \$22,144$$

$$\text{Production department A} = \frac{3,000}{4,000} \times \$22,144 = \$16,608$$

$$\text{Production department B} = \frac{1,000}{4,000} \times \$22,144 = \$5,536$$

(4) **Total overheads** for each production department

	A	B	
	\$	\$	
General overheads	78,030	40,670	(see Section 4.2.2)
Allocated overheads	15,000	20,000	(from information in Section 4.1)
Maintenance	17,420	13,936	
Stores	16,608	5,536	
	<u>127,058</u>	<u>80,142</u>	

## 4.4 The reciprocal (repeated distribution) method of apportionment

Now that we have looked at the 'simple' scenario of only one service department making use of the other service department's services, we can move onto the more complicated situation of '**reciprocal**' servicing. This is where each service department makes use of the other service department (in the Swotathon example, stores would use maintenance and maintenance would use stores).

### 4.4.1 Example: Swotathon using repeated distribution method

Suppose the usage of Swotathon's service departments' services were amended to be as follows:

	A	B	Maintenance	Stores	Total
Maintenance hours used	5,000	4,000	—	1,000	10,000
Number of stores requisitions	3,000	1,000	1,000	—	5,000

Show how the Maintenance and Stores departments' overheads would be apportioned to the two production departments and calculate total overheads for each of the production departments.

### Solution

Remember to apportion both the general and allocated overheads (see section 4.2.2). The bases of apportionment for Maintenance and Stores are the same as for the example in section 4.2.2 (that is, maintenance hours worked and number of stores requisitions).

	A	B	Maintenance	Stores
	\$	\$	\$	\$
Total overheads (general and allocated)	93,030	60,670	34,840	18,660
Apportion maintenance (note (a))	17,420	13,936	(34,840)	3,484
			NIL	22,144
Apportion stores (note (b))	13,286	4,429	4,429	(22,144)
			4,429	NIL
Apportion maintenance	2,215	1,772	(4,429)	442
			NIL	442
Apportion stores (note (c))	332	110	NIL	(442)
Total overheads	<u>126,283</u>	<u>80,917</u>	<u>NIL</u>	<u>NIL</u>

### Notes

- It does not matter which department you choose to apportion first. Maintenance overheads were apportioned using the calculations illustrated in section 4.3.2.
- Stores overheads are apportioned using the same formula as used in section 4.3.2 but with the amended number of stores requisitions given above.

- (c) The problem with the repeated distribution method is that you can keep performing the same calculations many times. When you are dealing with a small number (such as \$442 above) you can take the decision to apportion the figure between the production departments only. In this case, we ignore the stores requisitions for Maintenance and base the apportionment on the total stores requisitions for the production departments (that is, 4,000). The amount apportioned to production department A was calculated as follows.

$$\frac{\text{Stores requisitions for A}}{\text{Total stores requisitions (A+B)}} \times \text{Stores overheads} = \frac{3,000}{4,000} \times \$442 = £332$$

## 4.5 The reciprocal (algebraic) method of apportionment



The results of the reciprocal method of apportionment may also be obtained using **algebra** and **simultaneous equations**.

### 4.5.1 Example: Swotathon using the algebraic method of apportionment

Whenever you are using equations you must define each variable.

Let  $M$  = total overheads for the Maintenance department  
 $S$  = total overheads for the Stores department

Remember that total overheads for the Maintenance department consist of general overheads apportioned, allocated overheads and the share of Stores overheads (20%).

Similarly, total overheads for Stores will be the total of general overheads apportioned, allocated overheads and the 10% share of Maintenance overheads.

$$M = 0.2S + \$34,840 \quad (1) \quad (\$34,840 \text{ was calculated in section 4.3.2})$$

$$S = 0.1M + \$18,660 \quad (2) \quad (\$18,660 \text{ was calculated in section 4.3.2})$$

We now solve the equations.

Multiply equation (1) by 5 to give us

$$5M = S + 174,200 \quad (3), \text{ which can be rearranged as}$$

$$S = 5M - 174,200 \quad (4)$$

Subtract equation (2) from equation (4)

$$S = 5M - 174,200 \quad (4)$$

$$S = 0.1M + 18,660 \quad (2)$$

$$0 = 4.9M - 192,860$$

$$4.9M = 192,860$$

$$M = \frac{192,860}{4.9} = \$39,359$$

Substitute  $M = 39,359$  into equation (2)

$$S = 0.1 \times 39,359 + 18,660$$

$$S = 3,936 + 18,660 = 22,596$$

These overheads can now be apportioned to the production departments using the proportions in section 4.3.1 above.

	A	B	Maintenance	Stores
	\$	\$	\$	\$
Overhead costs	93,030	60,670	34,840	18,660
Apportion maintenance	19,680	15,743	(39,359)	3,936
Apportion stores	13,558	4,519	4,519	(22,596)
Total	<u>126,268</u>	<u>80,932</u>	<u>Nil</u>	<u>Nil</u>

You will notice that the total overheads for production departments A and B are the same regardless of the method used (difference is due to rounding).

**EXAM FOCUS POINT**

You must never ignore the existence of reciprocal services unless a question specifically instructs you to do so.

**4.6 A full example for you to try**

Now that we have worked through the various stages of overhead apportionment, you should try this question to ensure you understand the techniques.

**QUESTION****Reapportionment**

Sandstorm is a jobbing engineering concern which has three production departments (forming, machines and assembly) and two service departments (maintenance and general).

The following analysis of overhead costs has been made for the year just ended.

	\$	\$
Rent and rates		8,000
Power		750
Light, heat		5,000
Repairs, maintenance:		
Forming	800	
Machines	1,800	
Assembly	300	
Maintenance	200	
General	100	
		3,200
Departmental expenses:		
Forming	1,500	
Machines	2,300	
Assembly	1,100	
Maintenance	900	
General	1,500	
		7,300
Depreciation:		
Plant		10,000
Fixtures and fittings		250
Insurance:		
Plant		2,000
Buildings		500
Indirect labour:		
Forming	3,000	
Machines	5,000	
Assembly	1,500	
Maintenance	4,000	
General	2,000	
		15,500
		<u>52,500</u>

Other available data are as follows.

	Floor area sq. ft	Plant value \$	Fixtures & fittings \$	Effective horse- power	Direct cost for year \$	Labour hours worked	Machine hours worked
Forming	2,000	25,000	1,000	40	20,500	14,400	12,000
Machines	4,000	60,000	500	90	30,300	20,500	21,600
Assembly	3,000	7,500	2,000	15	24,200	20,200	2,000
Maintenance	500	7,500	1,000	5			
General	500	—	500	—	—	—	—
	<u>10,000</u>	<u>100,000</u>	<u>5,000</u>	<u>150</u>	<u>75,000</u>	<u>55,100</u>	<u>35,600</u>

Service department costs are apportioned as follows.

	Maintenance	General
	%	%
Forming	20	20
Machines	50	60
Assembly	20	10
General	10	—
Maintenance	—	10
	<u>100</u>	<u>100</u>

*Required*

Using the data provided prepare an analysis showing the distribution of overhead costs to departments. Reapportion service cost centre costs using the reciprocal method.

## ANSWER

Analysis of distribution of actual overhead costs

	Basis	Forming \$	Machines \$	Assembly \$	Maint. \$	General \$	Total \$
Directly allocated overheads:							
Repairs, maintenance		800	1,800	300	200	100	3,200
Departmental expenses		1,500	2,300	1,100	900	1,500	7,300
Indirect labour		3,000	5,000	1,500	4,000	2,000	15,500
Apportionment of other overheads:							
Rent, rates	1	1,600	3,200	2,400	400	400	8,000
Power	2	200	450	75	25	0	750
Light, heat	1	1,000	2,000	1,500	250	250	5,000
Depreciation of plant	3	2,500	6,000	750	750	0	10,000
Depreciation of F and F	4	50	25	100	50	25	250
Insurance of plant	3	500	1,200	150	150	0	2,000
Insurance of buildings	1	100	200	150	25	25	500
		<u>11,250</u>	<u>22,175</u>	<u>8,025</u>	<u>6,750</u>	<u>4,300</u>	<u>52,500</u>

Basis of apportionment:

1	floor area	3	plant value
2	effective horsepower	4	fixtures and fittings value

Apportionment of service department overheads to production departments, using the reciprocal method.

	Forming \$	Machines \$	Assembly \$	Maintenance \$	General \$	Total \$
Overheads	11,250	22,175	8,025	6,750	4,300	52,500
	1,350	3,375	1,350	(6,750)	675	
	995	2,985	498	497	(4,975)	
	99	249	99	(497)	50	
	10	30	5	5	(50)	
	1	3	1	(5)		
	<u>13,705</u>	<u>28,817</u>	<u>9,978</u>	<u>0</u>	<u>0</u>	<u>52,500</u>



### EXAM FOCUS POINT

Remember that you will never be asked a question of this length in the real exam. However, exam questions may, for example, give you the total general and allocated overheads, and ask you to apportion service department overheads to production departments.



## QUESTION

### Apportioning service department overheads

Spaced Out Co has two production departments (F and G) and two service departments (Canteen and Maintenance). Total allocated and apportioned general overheads for each department are as follows.

<i>F</i>	<i>G</i>	<i>Canteen</i>	<i>Maintenance</i>
\$125,000	\$80,000	\$20,000	\$40,000

Canteen and Maintenance perform services for both production departments and Canteen also provides services for Maintenance in the following proportions.

	<i>F</i>	<i>G</i>	<i>Canteen</i>	<i>Maintenance</i>
% of Canteen to	60	25	-	15
% of Maintenance to	65	35	-	-

What would be the total overheads for production department G once the service department costs have been apportioned?

- A \$90,763                      B \$100,500                      C \$99,000                      D \$100,050

## ANSWER

The correct answer is D.

$$\begin{aligned}
 \text{Total Maintenance overheads} &= \$40,000 + 15\% \text{ of Canteen overheads} \\
 &= \$40,000 + 15\% \text{ of } \$20,000 \\
 &= \$43,000
 \end{aligned}$$

Of which 35% are apportioned to G = \$15,050

Canteen costs apportioned to G = 25% of \$20,000 = \$5,000

Total overheads for G = \$80,000 + 15,050 + 5,000 = \$100,050

## 5 Overhead absorption

### 5.1 Introduction



**Overhead absorption** is the process whereby overhead costs allocated and apportioned to production cost centres are added to unit, job or batch costs. Overhead absorption is sometimes called **overhead recovery**.

Having allocated and/or apportioned all overheads, the next stage in the costing treatment of overheads is to add them to, or **absorb them into, cost units**.

Overheads are usually added to cost units using a **predetermined overhead absorption rate**, which is calculated using figures from the budget.

### 5.2 Calculation of overhead absorption rates

**Step 1** Estimate the overhead likely to be incurred during the coming period.

**Step 2** Estimate the activity level for the period. This could be total hours, units, or direct costs or whatever it is upon which the overhead absorption rates are to be based.

**Step 3** Divide the estimated overhead by the budgeted activity level. This produces the overhead absorption rate.



**Step 4** Absorb the overhead into the cost unit by applying the calculated absorption rate.

### 5.3 Example: The basics of absorption costing

Athena Co makes two products, the Greek and the Roman. Greeks take 2 labour hours each to make and Romans take 5 labour hours. What is the overhead cost per unit for Greeks and Romans respectively if overheads are absorbed on the basis of labour hours?

#### Solution

**Step 1** Estimate the overhead likely to be incurred during the coming period  
Athena Co estimates that the total overhead will be \$50,000

**Step 2** Estimate the activity level for the period  
Athena Co estimates that a total of 100,000 direct labour hours will be worked

**Step 3** Divide the estimated overhead by the budgeted activity level  

$$\text{Absorption rate} = \frac{\$50,000}{100,000 \text{ hrs}} = \$0.50 \text{ per direct labour hour}$$

**Step 4** Absorb the overhead into the cost unit by applying the calculated absorption rate

	<i>Greek</i>	<i>Roman</i>
Labour hours per unit	2	5
Absorption rate per labour hour	\$0.50	\$0.50
Overhead absorbed per unit	\$1	\$2.50

It should be obvious to you that, even if a company is trying to be 'fair', there is a great lack of precision about the way an absorption base is chosen.

This arbitrariness is one of the main criticisms of absorption costing, and if absorption costing is to be used (because of its other virtues) then it is important that **the methods used are kept under regular review**. Changes in working conditions should, if necessary, lead to changes in the way in which work is accounted for.

For example, a labour intensive department may become mechanised. If a direct labour hour rate of absorption had been used previous to the mechanisation, it would probably now be more appropriate to change to the use of a machine hour rate.

### 5.4 Choosing the appropriate absorption base

The different **bases of absorption** (or 'overhead recovery rates') are as follows.

- A percentage of direct materials cost
- A percentage of direct labour cost
- A percentage of prime cost
- A rate per machine hour
- A rate per direct labour hour
- A rate per unit
- A percentage of factory cost (for administration overhead)
- A percentage of sales or factory cost (for selling and distribution overhead)

The choice of an absorption basis is a matter of judgement and common sense, what is required is an **absorption basis** which realistically reflects the characteristics of a given cost centre and which avoids undue anomalies.

Many factories use a **direct labour hour rate** or **machine hour rate** in preference to a rate based on a percentage of direct materials cost, wages or prime cost.

- (a) A **direct labour** hour basis is most appropriate in a **labour intensive** environment.
- (b) A **machine hour** rate would be used in departments where production is controlled or dictated by machines.
- (c) A **rate per unit** would be effective only if all units were identical.

## 5.5 Example: Overhead absorption

The budgeted production overheads and other budget data of Bridge Cottage Co are as follows.

Budget	Production dept A	Production dept B
Overhead cost	\$36,000	\$5,000
Direct materials cost	\$32,000	
Direct labour cost	\$40,000	
Machine hours	10,000	
Direct labour hours	18,000	
Units of production		1,000

### Required

Calculate the absorption rate using the various bases of apportionment.

### Solution

#### Department A

- (i) Percentage of direct materials cost  $\frac{\$36,000}{\$32,000} \times 100\% = 112.5\%$
- (ii) Percentage of direct labour cost  $\frac{\$36,000}{\$40,000} \times 100\% = 90\%$
- (iii) Percentage of prime cost  $\frac{\$36,000}{\$72,000} \times 100\% = 50\%$
- (iv) Rate per machine hour  $\frac{\$36,000}{10,000 \text{ hrs}} = \$3.60 \text{ per machine hour}$
- (v) Rate per direct labour hour  $\frac{\$36,000}{18,000 \text{ hrs}} = \$2 \text{ per direct labour hour}$

The department B absorption rate will be based on units of output.

$$\frac{\$5,000}{1,000 \text{ units}} = \$5 \text{ per unit produced}$$

## 5.6 Bases of absorption

The choice of the basis of absorption is significant in determining the cost of individual units, or jobs, produced. Using the previous example, suppose that an individual product has a material cost of \$80, a labour cost of \$85, and requires 36 labour hours and 23 machine hours to complete. The overhead cost of the product would vary, depending on the basis of absorption used by the company for overhead recovery.

- (a) As a percentage of direct material cost, the overhead cost would be  
 $112.5\% \times \$80 = \$90.00$

- (b) As a percentage of direct labour cost, the overhead cost would be  
 $90\% \times \$85 = \$76.50$
- (c) As a percentage of prime cost, the overhead cost would be  $50\% \times \$165 = \$82.50$
- (d) Using a machine hour basis of absorption, the overhead cost would be  
 $23 \text{ hrs} \times \$3.60 = \$82.80$
- (e) Using a labour hour basis, the overhead cost would be  $36 \text{ hrs} \times \$2 = \$72.00$

In theory, each basis of absorption would be possible, but the company should choose a basis for its own costs which seems to be 'fairest'.

## 6 Blanket absorption rates and departmental absorption rates

### 6.1 Introduction



A **blanket overhead absorption rate** is an absorption rate used throughout a factory and for all jobs and units of output irrespective of the department in which they were produced.

For example, if total overheads were \$500,000 and there were 250,000 direct machine hours during the period, the **blanket overhead rate** would be \$2 per direct machine hour and all jobs passing through the factory would be charged at that rate.

**Blanket overhead rates** are not appropriate in the following circumstances.

- There is more than one department.
- Jobs do not spend an equal amount of time in each department.

If a single factory overhead absorption rate is used, some products will receive a higher overhead charge than they ought 'fairly' to bear, whereas other products will be under-charged.

If a **separate absorption rate** is used for each department, charging of overheads will be fair and the full cost of production of items will represent the amount of the effort and resources put into making them.

### 6.2 Example: Separate absorption rates

The Old Grammar School has two production departments, for which the following budgeted information is available.

	Department A	Department B	Total
Budgeted overheads	\$360,000	\$200,000	\$560,000
Budgeted direct labour hours	200,000 hrs	40,000 hrs	240,000 hrs

If a single factory overhead absorption rate is applied, the rate of overhead recovery would be:

$$\frac{\$560,000}{240,000 \text{ hours}} = \$2.33 \text{ per direct labour hour}$$

If separate departmental rates are applied, these would be:

$$\text{Department A} = \frac{\$360,000}{200,000 \text{ hours}} = \$1.80 \text{ per direct labour hour}$$

$$\text{Department B} = \frac{\$200,000}{40,000 \text{ hours}} = \$5 \text{ per direct labour hour}$$

Department B has a higher overhead rate of cost per hour worked than department A.

Now let us consider two separate jobs.

Job X has a prime cost of \$100, takes 30 hours in department B and does not involve any work in department A.

Job Y has a prime cost of \$100, takes 28 hours in department A and 2 hours in department B.

What would be the factory cost of each job, using the following rates of overhead recovery?

- (a) A single factory rate of overhead recovery
- (b) Separate departmental rates of overhead recovery

### Solution

	Job X	Job Y
(a) <b>Single factory rate</b>	\$	\$
Prime cost	100	100
Factory overhead (30 × \$2.33)	70	70
Factory cost	<u>170</u>	<u>170</u>
(b) <b>Separate departmental rates</b>	\$	\$
Prime cost	100	100.00
Factory overhead: department A	0	(28 × \$1.80) 50.40
department B (30 × \$5)	150	(2 × \$5) 10.00
Factory cost	<u>250</u>	<u>160.40</u>

Using a single factory overhead absorption rate, both jobs would cost the same. However, since job X is done entirely within department B where overhead costs are relatively higher, whereas job Y is done mostly within department A, where overhead costs are relatively lower, it is arguable that job X should cost more than job Y. This will occur if separate departmental overhead recovery rates are used to reflect the work done on each job in each department separately.

If all jobs do not spend approximately the same time in each department then, to ensure that all jobs are charged with their fair share of overheads, it is necessary to establish **separate overhead rates for each department**.

### QUESTION

Machine hour absorption rate

The following data relate to one year in department A.

Budgeted machine hours	25,000
Actual machine hours	21,875
Budgeted overheads	\$350,000
Actual overheads	\$350,000

Based on the data above, what is the machine hour absorption rate as conventionally calculated?

- A \$12                      B \$14                      C \$16                      D \$18

### ANSWER

Don't forget, if your calculations produce a solution which does not correspond with any of the options available, then eliminate the unlikely options and make a guess from the remainder. Never leave out a multiple choice question.

A common pitfall is to think 'we haven't had answer A for a while, so I'll guess that'. The examiner is *not* required to produce an even spread of A, B, C and D answers in the examination. There is no reason why the answer to every question cannot be D!

The correct answer in this case is B.

$$\text{Overhead absorption rate} = \frac{\text{Budgeted overheads}}{\text{Budgeted machine hours}} = \frac{\$350,000}{25,000} = \$14 \text{ per machine hour}$$

## 7 Over and under absorption of overheads

### 7.1 Introduction



**Over and under absorption** of overheads occurs because the predetermined overhead absorption rates are based on estimates.

**The rate of overhead absorption is based on estimates** (of both numerator and denominator) and it is quite likely that either one or both of the estimates will not agree with what actually occurs.

- (a) **Over absorption** means that the overheads charged to the cost of sales are greater than the overheads actually incurred.
- (b) **Under absorption** means that insufficient overheads have been included in the cost of sales.

It is almost inevitable that at the end of the accounting year there will have been an over absorption or under absorption of the overhead actually incurred.

### 7.2 Example: Over and under absorption

Suppose that the budgeted overhead in a production department is \$80,000 and the budgeted activity is 40,000 direct labour hours. The overhead recovery rate (using a direct labour hour basis) would be \$2 per direct labour hour.

Actual overheads in the period are, say \$84,000 and 45,000 direct labour hours are worked.

Overhead incurred (actual)	\$ 84,000
Overhead absorbed (45,000 × \$2)	90,000
Over absorption of overhead	<u>6,000</u>

In this example, the cost of produced units or jobs has been charged with \$6,000 more than was actually spent. An adjustment to reconcile the overheads charged to the actual overhead is necessary and the over-absorbed overhead will be credited to the profit and loss account at the end of the accounting period.

### 7.3 The reasons for under-/over-absorbed overhead

**The overhead absorption rate is predetermined from budget estimates of overhead cost and the expected volume of activity.** Under- or over-recovery of overhead will occur in the following circumstances.

- Actual overhead costs are different from budgeted overheads
- The actual activity level is different from the budgeted activity level
- Actual overhead costs *and* actual activity level differ from the budgeted costs and level

### 7.4 Example: Reasons for under-/over-absorbed overhead

Pembridge Co has a budgeted production overhead of \$50,000 and a budgeted activity of 25,000 direct labour hours and therefore a recovery rate of \$2 per direct labour hour.

*Required*

Calculate the under-/over-absorbed overhead, and the reasons for the under-/over-absorption, in the following circumstances.

- (a) Actual overheads cost \$47,000 and 25,000 direct labour hours are worked.
- (b) Actual overheads cost \$50,000 and 21,500 direct labour hours are worked.
- (c) Actual overheads cost \$47,000 and 21,500 direct labour hours are worked.



**Solution**

(a)		\$
	Actual overhead	47,000
	Absorbed overhead (25,000 × \$2)	50,000
	Over-absorbed overhead	<u>3,000</u>

The reason for the over absorption is that although the actual and budgeted direct labour hours are the same, actual overheads cost less than expected.

(b)		\$
	Actual overhead	50,000
	Absorbed overhead (21,500 × \$2)	43,000
	Under-absorbed overhead	<u>7,000</u>

The reason for the under absorption is that although budgeted and actual overhead costs were the same, fewer direct labour hours were worked than expected.

(c)		\$
	Actual overhead	47,000
	Absorbed overhead (21,500 × \$2)	43,000
	Under-absorbed overhead	<u>4,000</u>

The reason for the under absorption is a combination of the reasons in (a) and (b).

The distinction between **overheads incurred** (actual overheads) and **overheads absorbed** is an important one which you must learn and understand. The difference between them is known as under- or over-absorbed overheads.

**QUESTION****Under-/over-absorbed overhead**

The budgeted and actual data for River Arrow Products Co for the year to 31 March 20X5 are as follows.

	<i>Budgeted</i>	<i>Actual</i>
Direct labour hours	9,000	9,900
Direct wages	\$34,000	\$35,500
Machine hours	10,100	9,750
Direct materials	\$55,000	\$53,900
Units produced	120,000	122,970
Overheads	\$63,000	\$61,500

The cost accountant of River Arrow Products Co has decided that overheads should be absorbed on the basis of labour hours.

**Required**

Calculate the amount of under- or over-absorbed overheads for River Arrow Products Co for the year to 31 March 20X5.

**ANSWER**

$$\text{Overhead absorption rate} = \frac{\$63,000}{9,000} = \$7 \text{ per hour}$$

$$\text{Overheads absorbed by production} = 9,900 \times \$7 = \$69,300$$

	\$
Actual overheads	61,500
Overheads absorbed	69,300
Over-absorbed overheads	<u>7,800</u>



### EXAM FOCUS POINT

You can always work out whether overheads are under- or over-absorbed by using the following rule.

- If Actual overhead incurred – Absorbed overhead = NEGATIVE (N), then overheads are over-absorbed (O) (NO)
- If Actual overhead incurred – Absorbed overhead = POSITIVE (P), then overheads are under-absorbed (U) (PU)

So, remember the NOPU rule when you go into your examination and you won't have any trouble in deciding whether overheads are under- or over-absorbed!



### QUESTION

#### Budgeted overhead absorption rate

A management consultancy recovers overheads on chargeable consulting hours. Budgeted overheads were \$615,000 and actual consulting hours were 32,150. Overheads were under-recovered by \$35,000.

If actual overheads were \$694,075 what was the budgeted overhead absorption rate per hour?

A \$19.13

B \$20.50

C \$21.59

D \$22.68

### ANSWER

Actual overheads	\$ 694,075
Under-recoverable overheads	35,000
Overheads recovered for 32,150 hours at budgeted overhead absorption rate (x)	<u>659,075</u>

$$32,150 \times = 659,075$$

$$\times = \frac{659,075}{32,150} = \$20.50$$

The correct option is B.

## 8 Ledger entries relating to overheads

### 8.1 Introduction

The bookkeeping entries for overheads are not as straightforward as those for materials and labour. We shall now consider the way in which overheads are dealt with in a cost accounting system.

When an absorption costing system is in use we now know that the amount of overhead included in the cost of an item is absorbed at a predetermined rate. The entries made in the cash book and the nominal ledger, however, are the actual amounts.

You will remember that it is highly unlikely that the actual amount and the predetermined amount will be the same. The difference is called **under- or over-absorbed overhead**. To deal with this in the cost accounting books, therefore, we need to have an account to collect under- or over-absorbed amounts for each type of overhead.

### 8.2 Example: The under-/over-absorbed overhead account

Mariott's Motorcycles absorbs production overheads at the rate of \$0.50 per operating hour and administration overheads at 20% of the production cost of sales. Actual data for one month was as follows.

Administration overheads	\$32,000
Production overheads	\$46,500
Operating hours	90,000
Production cost of sales	\$180,000

What entries need to be made for overheads in the ledgers?

### Solution

#### PRODUCTION OVERHEADS

	DR		CR
	\$		\$
Cash	46,500	Absorbed into WIP ( $90,000 \times \$0.50$ )	45,000
		Under absorbed overhead	1,500
	<u>46,500</u>		<u>46,500</u>

#### ADMINISTRATION OVERHEADS

	DR		CR
	\$		\$
Cash	32,000	To cost of sales ( $180,000 \times 0.2$ )	36,000
Over-absorbed overhead	<u>4,000</u>		<u>36,000</u>
	<u>36,000</u>		

#### UNDER-/OVER-ABSORBED OVERHEADS

	DR		CR
	\$		\$
Production overhead	1,500	Administration overhead	4,000
Balance to profit and loss account	<u>2,500</u>		<u>4,000</u>
	<u>4,000</u>		

Less production overhead has been absorbed than has been spent so there is **under-absorbed overhead** of \$1,500. More administration overhead has been absorbed (into cost of sales, note, not into WIP) and so there is **over-absorbed overhead** of \$4,000. The net over-absorbed overhead of \$2,500 is a credit in the income statement.

## CHAPTER ROUNDUP

- ↻ **Overhead** is the cost incurred in the course of making a product, providing a service or running a department, but which cannot be traced directly and in full to the product, service or department.
- ↻ The **objective of absorption costing** is to include in the total cost of a product an appropriate share of the organisation's total overhead. An appropriate share is generally taken to mean an amount which reflects the amount of time and effort that has gone into producing a unit or completing a job.
- ↻ The main reasons for using absorption costing are for **stock valuations, pricing decisions** and **establishing the profitability of different products**.
- ↻ The three stages of absorption costing are:
  - Allocation
  - Apportionment
  - Absorption
- ↻ **Allocation** is the process by which whole cost items are charged direct to a cost unit or cost centre.
- ↻ **Apportionment** is a procedure whereby indirect costs are spread fairly between cost centres. Service cost centre costs may be apportioned to production cost centres by using the reciprocal method.
- ↻ The results of the reciprocal method of apportionment may also be obtained by using **algebra** and **simultaneous equations**.
- ↻ **Overhead absorption** is the process whereby overhead costs allocated and apportioned to production cost centres are added to unit, job or batch costs. Overhead absorption is sometimes called **overhead recovery**.
- ↻ A **blanket overhead absorption rate** is an absorption rate used throughout a factory and for all jobs and units of output irrespective of the department in which they were produced.
- ↻ **Over and under absorption of overheads** occurs because the predetermined overhead absorption rates are based on estimates.

**QUICK QUIZ**

- 1 What is allocation?
- 2 Name the three stages in charging overheads to units of output.
- 3 Match the following overheads with the most appropriate basis of apportionment.

**Overhead**

- (a) Depreciation of equipment
- (b) Heat and light costs
- (c) Canteen
- (d) Insurance of equipment

**Basis of apportionment**

- (1) Direct machine hours
- (2) Number of employees
- (3) Book value of equipment
- (4) Floor area

- 4 A direct labour hour basis is most appropriate in which of the following environments?
  - A Machine-intensive
  - B Labour-intensive
  - C When all units produced are identical
  - D None of the above
- 5 What is the problem with using a single factory overhead absorption rate?
- 6 How is under-/over-absorbed overhead accounted for?
- 7 Why does under- or over-absorbed overhead occur?



## ANSWERS TO QUICK QUIZ

- 1 The process whereby whole cost items are charged direct to a cost unit or cost centre.
- 2
  - Allocation
  - Apportionment
- 3
 

(a) (3)	(c) (2)
(b) (4)	(d) (3)
- 4 B
- 5 Because some products will receive a higher overhead charge than they ought 'fairly' to bear and other products will be undercharged.
- 6 Under-/over-absorbed overhead is written as an adjustment to the income statement at the end of an accounting period.
  - Over-absorbed overhead → credit in income statement
  - Under-absorbed overhead → debit in income statement
- 7
  - Actual overhead costs are different from budgeted overheads
  - The actual activity level is different from the budgeted activity level
  - Actual overhead costs *and* actual activity level differ from the budgeted costs and level

## Now try ...

Attempt the questions below from the **Exam Question Bank**

Number

Q35 – Q40