3

The Analysis of Overhead

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3

Learning Outcomes

After completing this chapter, you should be able to:

- prepare cost statements for allocation and apportionment of overheads, including between reciprocal service departments;
- calculate direct, variable and full costs of products, services and activities using overhead absorption rates to trace indirect costs to cost units;
- explain the use of cost information in pricing decisions, including marginal cost pricing and the calculation of 'full cost'-based prices to generate a specified return on sales or investment.

3.1 Introduction

In this chapter you will learn about the analysis of indirect costs or overheads. We will be looking at the three-stage process of attributing overheads to individual cost units: allocation, apportionment and absorption.

You will need a thorough understanding of the contents of this chapter for your studies of the *Fundamentals of Management Accounting* syllabus and for many of the syllabuses at later stages in the CIMA examinations.

3.2 What is an overhead cost?

3.2.1 Definition

An overhead cost is defined in the CIMA *Terminology* as 'expenditure on labour, materials or services that cannot be economically identified with a specific saleable cost unit'.

Overhead costs are also referred to as *indirect costs* which we discussed in Chapter 1. Therefore, overhead cost comprises indirect material, indirect labour and indirect expenses. The indirect nature of overheads means that they need to be 'shared out' among the cost units as fairly and as accurately as possible.

In this chapter, you will be learning how this 'sharing out', or *attribution*, is accomplished for production overheads, using a costing method known as *absorption costing*.

One of the main reasons for absorbing overheads into the cost of units is for inventory valuation purposes. Accounting standards recommend that inventory valuations should include an element of fixed production overheads incurred in the normal course of business. We therefore have to find a fair way of sharing out the fixed production overhead costs among the units produced.

3.2.2 Functional analysis of overhead costs

Overhead costs may be classified according to the function of the organisation responsible for incurring the cost. Examples of overhead cost classifications include production overhead, selling and distribution overhead, and administration overhead. It is usually possible to classify the majority of overhead cost in this way, but some overhead costs relate to the organisation generally and may be referred to as general overhead.

In this chapter we shall focus mainly on production overhead. Production is that function of the business which converts raw materials into the organisation's finished product. The production department is usually divided into a number of departments or cost centres. Some of these cost centres are directly involved with the production process. These are called *production cost centres* and might include, for example, the cutting department and the finishing department.

Other cost centres in the production department are not directly involved with the production process but provide support services for the production cost centres. These are called *service cost centres*, and examples include the maintenance department and the stores.

3.3 Overhead allocation and apportionment

The first stage in the analysis of production overheads is the selection of appropriate cost centres. The selection will depend on a number of factors, including the level of control required and the availability of information.

Having selected suitable cost centres, the next stage in the analysis is to determine the overhead cost for each cost centre. This is achieved through the process of allocation and apportionment.

Cost allocation is possible when we can identify a cost as specifically attributable to a particular cost centre. For example, the salary of the manager of the packing department can be allocated to the packing department cost centre. It is not necessary to share the salary cost over several different cost centres.

Cost apportionment is necessary when it is not possible to allocate a cost to a specific cost centre. In this case, the cost is shared out over two or more cost centres according to the estimated benefit received by each cost centre. As far as possible the basis of apportionment is selected to reflect this benefit received. For example, the cost of rent and rates might be apportioned according to the floor space occupied by each cost centre.

The following example illustrates the allocation and apportionment of production overhead costs.

Example

The information given below relates to a four-week accounting period of WHW Ltd.

	Machining	*Assembly*	*Finishing*	*Stores*
Area occupied (square metres)	24,000	36,000	16,000	4,000
Plant and equipment at cost (£000)	1,400	200	60	10
Number of employees	400	800	200	20
Direct labour hours	16,000	32,000	4,000	
Direct wages (£)	32,600	67,200	7,200	
Machine hours	32,000	4,000	200	
Number of requisitions on stores	310	1,112	100	
Allocated costs	£	£	£	£
Indirect wages	9,000	15,000	4,000	6,000
Indirect materials	394	1,400	600	
Maintenance	1,400	600	100	
Power	1,600	400	200	
Other costs (in total)				
Rent	2,000			
Business rates	600			
Insurance on building	200			
Lighting and heating	400			
Depreciation on plant and equipment	16,700			
Wage-related costs	28,200			
Factory administration and personnel	7,100			
Insurance on plant and equipment	1,670			
Cleaning of factory premises	800			
	57,670			

The data above distinguishes between those costs which can and those which cannot be allocated to a cost centre. The first step is to construct an overhead analysis sheet having separate columns for each cost centre, together with a column for the total costs, a description of the cost item and the basis upon which the cost has been apportioned between the cost centres if applicable.

An explanation of the apportionment method is given beneath the analysis.

Item	*Basis of apportionment*	*Machining*	*Assembly*	*Finishing*	*Stores*	*Total*
		£	£	£	£	£
Indirect wages	Allocation	9,000	15,000	4,000	6,000	34,000
Indirect materials	Allocation	394	1,400	600	–	2,394
Maintenance	Allocation	1,400	600	100	–	2,100
Power	Allocation	1,600	400	200	–	2,200
Rent	Area occupied	600	900	400	100	2,000
Business rates	Area occupied	180	270	120	30	600
Building insurance	Area occupied	60	90	40	10	200
Lighting/heating	Area occupied	120	180	80	20	400
Depreciation on plant/equipment	Plant/equipment at cost	14,000	2,000	600	100	16,700
Wage-related costs	Total wages	8,320	16,440	2,240	1,200	28,200
Factory administration and personnel	No. of employees	2,000	4,000	1,000	100	7,100
Insurance on plant/equipment	Plant/equipment at cost	1,400	200	60	10	1,670
Factory cleaning	Area occupied	240	360	160	40	800
		39,314	41,840	9,600	7,610	98,364

You should note that the direct wages costs are not included in the analysis because they are not overhead costs. Also notice that the apportionment of wage-related costs is based on total wages – that is, the sum of the direct and indirect wages for each cost centre.

The apportioned costs are all calculated using the general formula:

$$\frac{\text{Total overhead cost}}{\text{Total value of apportionment base}} \times \text{Value of apportionment base of the cost centre being calculated}$$

For example, in the case of depreciation apportioned to the machining cost centre:

$$\frac{£16{,}700}{£1{,}670{,}000} = £1{,}400{,}000 = £14{,}000$$

The result of the initial allocation and apportionment is that the organisation's production overhead costs have been identified with cost centres associated with production. However, the service cost centre (stores) is not directly involved in the manufacture of the saleable cost unit. Nevertheless, it is part of the production function and the total cost of operating the stores should be attributed to the saleable cost units. The total cost of the stores must be shared or apportioned between those production cost centres which derive benefit from the stores service.

If we now return to our example, the next step is to apportion the cost of the stores department to the production cost centres.

Item	*Basis of apportionment*	*M/c*	*Ass'y*	*Finish*	*Stores*	*Total*
		£	£	£	£	£
B/fwd		39,314	41,840	9,600	7,610	98,364
Stores costs	No. of requisitions on stores	1,550	5,560	500	(7,610)	–
		40,864	47,400	10,100	–	98,364

We have now achieved the objective of allocating and apportioning all of the production overhead costs to the departments directly involved in the manufacture of the saleable cost unit.

3.4 Absorption of overheads into saleable cost units

3.4.1 General principles

The last stage in the analysis of overheads is their absorption into the cost units produced in the production cost centres. This is sometimes referred to as *overhead recovery*.

To begin with, we need to measure the level of production achieved. There are many measures which may be used, but the most common are:

- physical units produced;
- labour hours worked;
- machine hours operated.

It is quite likely that different production departments will measure their production in different ways. The objective is to use a measure which reflects the nature of the work involved. The physical unit measure is in theory the simplest but it is only valid if all of the items produced require the same amount of resources.

The overhead costs of each production cost centre are then divided by the quantity of production achieved to calculate the amount of overhead cost to be attributed to each unit.

This is the technique of overhead absorption and we shall illustrate it by extending our example on allocation and apportionment.

The output of the machining department is to be measured using the number of machine hours produced, while the output of the assembly and finishing departments is to be measured using the number of direct labour hours produced. The reasons for this can be seen from the number of machine and direct labour hours for each department shown in the original data for the example. The machining department is clearly machine-intensive, whereas the other departments are labour-intensive.

The absorption rates are calculated by dividing the costs attributed to the department by its appropriate measure of output.

	Machining	*Assembly*	*Finishing*
Production overhead costs obtained by allocation and apportionment	£40,864	£47,400	£10,100
Number of:			
machine hours	32,000		
direct labour hours		32,000	4,000
Absorption rates:			
per machine hour	£1.277		
per direct labour hour		£1.48125	£2.525

3.4.2 Applying the overhead absorption rate

When using an absorption method based either on direct labour hours or on machine hours the cost attributed to each unit is obtained by multiplying the time taken per unit by the absorption rate per hour.

For example, if a particular cost unit took three machine hours in the machining department, and five direct labour hours in each of the assembly and finishing departments, the overhead cost absorbed by the cost unit would be as follows:

	£
Machining: 3 hours × £1.277	3.83
Assembly: 5 hours × £1.48125	7.41
Finishing: 5 hours × £2.525	12.63
Overhead absorbed by cost unit	23.87

3.4.3 Other absorption bases

In addition to the three bases of absorption mentioned above, a percentage rate based on any of the following may be used:

- direct material cost;
- direct labour cost;
- prime cost.

For example, if a direct labour cost percentage is used the absorption rates would be as follows:

	Machining	*Assembly*	*Finishing*
	£	£	£
Production overhead costs	40,864	47,400	10,100
Direct wages cost	32,600	67,200	7,200
Direct labour cost percentage	125%	71%	140%

If our cost unit had a labour cost of £12 in the machining department, and £20 in each of the assembly and finishing departments, the overhead cost absorbed by the cost unit using this method would be as follows:

	£
Machining: 125% × £12=	15.00
Assembly: 71% × £20=	14.20
Finishing: 140% × £20=	28.00
Overhead absorbed by cost unit	57.20

The direct material cost and the prime cost methods work in a similar way.

3.4.4 Selecting the most appropriate absorption rate

The data in the last example demonstrate how the calculated total production cost of a particular cost unit can be dramatically different, depending on the overhead absorption method selected. It is important that the selected method results in the most realistic charge for overhead, reflecting the incidence of overheads in the cost centre as closely as possible within the limits of available data.

You must not make the common mistake of thinking that the best absorption method in this example would be the one which results in the lowest overhead charge to our cost unit. Remember that the same total cost centre overhead is being shared out over the cost units produced, whichever absorption method is selected. If this unit is given a lower charge for overhead, then other cost units will be charged with a higher amount so that the total overhead is absorbed overall.

A major factor in selecting the absorption rate to be used is a consideration of the practical applicability of the rate. This will depend on the ease of collecting the data required to use the selected rate.

It is generally accepted that a time-based method should be used wherever possible, that is, the machine hour rate or the labour hour rate. This is because many overhead costs increase with time, for example indirect wages, rent and rates. Therefore, it makes sense to attempt to absorb overheads according to how long a cost unit takes to produce. The longer it takes, the more overhead will have been incurred in the cost centre during that time.

In addition to these general considerations, each absorption method has its own advantages and disadvantages:

(a) *Rate per unit*. This is the easiest method to apply but it is only suitable when all cost units produced in the period are identical. Since this does not often happen in practice this method is rarely used.

(b) *Direct labour hour rate*. This is a favoured method because it is time-based. It is most appropriate in labour-intensive cost centres, which are becoming rarer nowadays and so the method is less widely used than it has been in the past.
(c) *Machine hour rate*. This is also a favoured method because it is time-based. It is most appropriate in cost centres where machine activity predominates and is therefore more widely used than the direct labour hour rate. As well as absorbing the time-based overheads mentioned earlier, it is more appropriate for absorbing the overheads related to machine activity, such as power, maintenance, repairs and depreciation.
(d) *Direct wages cost percentage*. This method may be acceptable because it is to some extent time-based. A higher direct wages cost may indicate a longer time taken and therefore a greater incidence of overheads during this time. However, the method will not produce equitable overhead charges if different wage rates are paid to individual employees in the cost centre. If this is the case, then there may not be a direct relationship between the wages paid and the time taken to complete a cost unit.
(e) *Direct materials cost percentage*. This is not a very logical method because there is no reason why a higher material cost should lead to a cost unit apparently incurring more production overhead cost. The method can be used if it would be too costly and inconvenient to use a more suitable method.
(f) *Prime cost percentage*. This method is not recommended because it combines methods (d) and (e) and therefore suffers from the combined disadvantages of both.

3.5 Predetermined overhead absorption rates

Overhead absorption rates are usually predetermined, that is, they are calculated in advance of the period over which they will be used.

The main reason for this is that overhead costs are not incurred evenly throughout the period. In some months the actual expenditure may be very high and in others it may be relatively low. The actual overhead rate per hour or per unit will therefore be subject to wide fluctuations. If the actual rate was used in product costing, then product costs would also fluctuate wildly. Such product costs would be very difficult to use for planning and control purposes.

Fluctuations in the actual level of production would also cause the same problem of fluctuating product costs.

To overcome this problem the absorption rate is determined in advance of the period, using estimated or budget figures for overhead and for the number of units of the absorption base (labour hours or machine hours, etc.).

A further advantage of using predetermined rates is that managers have an overhead rate permanently available which they can use in product costing, price quotations and so on. The actual overhead costs and activity levels are not known until the end of the period. It would not be desirable for managers to have to wait until after the end of the period before they had a rate of overhead that they could use on a day-to-day basis.

3.5.1 Under- or over-absorption of overheads

The problem with using predetermined overhead absorption rates is that the actual figures for overhead and for the absorption base are likely to be different from the estimates used in calculating the absorption rate. It is this difference which causes an under-/over-absorption

of production overhead. We will now return to our example in Section 3.4 to see how this is calculated, assuming that machine/labour hour rates have been used to absorb the overheads.

We will assume that all of the values used in the calculations in our example are estimates based on WHW Limited's budgets.

The *actual* costs for the same four-week period have now been allocated and apportioned using the same techniques and bases as shown in our earlier example, with the following total actual costs being attributed to each cost centre:

	Machining	*Assembly*	*Finishing*
	£	£	£
Actual costs	43,528	49,575	9,240

Actual labour and machine hours recorded against each cost centre were:

	Machining	*Assembly*	*Finishing*
Number of:			
machine hours	32,650		
labour hours		31,040	3,925

The amount of overhead cost absorbed into each department's total number of saleable cost units will be calculated by multiplying the absorption rate calculated in Section 3.4 (using the budget data) by the actual number of hours. The amounts absorbed are thus:

	Machining	*Assembly*	*Finishing*
Amount absorbed:	£	£	£
32,650 hours × £1.277	41,694		
31,040 hours × £1.48125		45,978	
3,925 hours × £2.525			9,911

This is compared with the actual cost incurred and the difference is the under-/over-absorption of production overhead:

	Machining	*Assembly*	*Finishing*
	£	£	£
Amount absorbed	41,694	45,978	9,911
Actual cost incurred	43,528	49,575	9,240
Over-absorption			671
Under-absorption	1,834	3,597	

If the amount absorbed exceeds the amount incurred, then an over-absorption arises; the opposite is referred to as an under-absorption. The terms *under-recovery* and *over-recovery* are sometimes used.

3.5.2 The reasons for under- or over-absorption

The under- or over-absorption has arisen because the actual overhead incurred per hour was different from the predetermined rate per hour. There are two possible causes of this:

1) The actual number of hours (machine or direct labour) was different from the number contained in the budget data. If this happens, then we would expect the variable element of the overhead to vary in direct proportion to the change in hours, so this part of the absorption rate would still be accurate. However, the fixed overhead would not alter with the hours worked and this means that the actual overhead cost per hour would be different from the predetermined rate.
2) The actual production overhead incurred may be different from the estimate contained in the predetermined rate. Apart from the expected change in variable overhead referred to in (1), this would also cause an under- or over-absorption of overhead.

We will return in a later chapter to learn how any under- or over-absorption is accounted for in the bookkeeping records.

3.5.3 The problems caused by under- or over-absorption of overheads

If overheads are under-absorbed then managers have been working with unit rates for overheads which are too low. Prices may have been set too low and other similar decisions may have been taken based on inaccurate information. If the amount of under-absorption is significant, then this can have a dramatic effect on reported profit.

Do not make the common mistake of thinking that over-absorption is not such a bad thing because it leads to a boost in profits at the period end. If overhead rates have been unnecessarily high, then managers may have set selling prices unnecessarily high, leading to lost sales. Other decisions would also have been based on inaccurate information.

Although it is almost impossible to avoid under- and over-absorption altogether, it is possible to minimise the amount of adjustment necessary at the year end. This is achieved by conducting regular reviews of the actual expenditure and activity levels which are arising. The overhead absorption rate can thus be reviewed to check that it is still appropriate to absorb the overheads sufficiently accurately by the year end. If necessary the overhead absorption rate can be adjusted to reflect more recent estimates of activity and expenditure levels.

3.6 Illustrative example

You can use the following short example to practise the techniques which we have covered so far in this chapter.

The information given below relates to the forthcoming period for a manufacturer's operation. There are four cost centres of which two are involved in production and two are service cost centres.

		Production depts		*Service depts*	
	Total	*A*	*B*	*Canteen*	*Stores*
	£	£	£	£	£
Allocated costs	70,022	21,328	29,928	8,437	10,329
Other costs:					
Rent and rates	4,641				
Buildings insurance	3,713				
Electricity and gas	6,800				
Plant depreciation	28,390				
Plant insurance	8,517				
	122,083				
Area occupied (square metres)		7,735	6,188	1,547	3,094
Plant at cost (£000)		1,845	852	–	142
Number of employees		600	300	30	70
Machine hours		27,200	800	–	–
Direct labour hours		6,800	18,000	–	–
Number of stores requisitions		27,400	3,400	–	–

Use this information to calculate a production overhead absorption rate for departments A and B.

3.6.1 Solution

The first step is to prepare an overhead analysis sheet which shows the apportionment of the overheads, using the most appropriate basis for each.

Overhead item	*Basis of apportionment*	*Total*	*Dept A*	*Dept B*	*Canteen*	*Stores*
		£	£	£	£	£
Allocated costs	–	70,022	21,328	29,928	8,437	10,329
Rent and rates[1]	Area	4,641	1,934	1,547	387	773
Buildings insurance	Area	3,713	1,547	1,238	309	619
Electricity and gas	Area	6,800	2,833	2,267	567	1,133
Depreciation	Plant cost	28,390	18,450	8,520	–	1,420
Insurance	Plant cost	8,517	5,535	2,556	–	426
		122,083	51,627	46,056	9,700	14,700
Canteen[2]	Employees	–	6,000	3,000	(9,700)	700
Stores[3]	Requisitions	–	13,700	1,700	–	(15,400)
		122,083	71,327	50,756	–	–

Notes

1. The rent and rates cost is apportioned as follows. Total area occupied is 18,564 square metres. Therefore, rent and rates cost £4,641/18,564 =£0.25 per square metre.
   All of the other apportionments are calculated in the same way.
2. Since the canteen serves all other departments, its costs must be apportioned first, over the 970 employees in the other departments.

3. Once the stores have received a charge from the canteen, the total stores costs can be apportioned to the production departments.

Looking at the data for machine hours and direct labour hours in each of the departments, it appears that the most appropriate absorption base for department A is machine hours and for department B is direct labour hours. The absorption rates can now be calculated.

Production department A = £71,327/27,200 = £2.62 per machine hour

Production department B = £50,756/18,000 = £2.82 per direct labour hour

We can now extend the example a little further to practise using the calculated absorption rates. What is the total production cost of the following job?

	Job 847
Direct material cost	£487
Direct labour cost	£317
Machine hours in department A	195
Direct labour hours in department B	102

The overhead absorption rates can be applied as follows:

	Job 847
	£
Direct material cost*	487.00
Direct labour cost*	317.00
Prime cost	804.00
Production overhead:	
Department A 195 hours × £2.62	510.90
Department B 102 hours × £2.82	287.64
Total production cost	1602.54

*Remember that direct costs are not affected by the overhead absorption rate selected.

See if you can calculate the under- or over-absorbed overhead in each of the departments using the following data. The actual overhead incurred would have been determined by the allocation and apportionment of the actual overhead costs.

	Department A	*Department B*
Actual results		
Overhead incurred	£70,483	£52,874
Direct labour hours	6,740	18,300
Machine hours	27,900	850

The first step is to calculate how much overhead would have been absorbed, based on the actual hours and the predetermined overhead absorption rate for each department. This total can then be compared with the actual overhead incurred.

	Department A £	*Department B* £
Overhead absorbed		
27,900 × £2.62	73,098	
18,300 × £2.82		51,606
Overhead incurred	70,483	52,874
(Under-)/over-absorption	2,615	(1,268)

3.7 Reciprocal servicing

3.7.1 Taking account of reciprocal servicing

In the previous example there were two service cost centres: the canteen and the stores. The stores personnel made use of the canteen and it was therefore equitable to charge some of the canteen costs to the stores cost centre. It was not necessary to charge any of the stores costs to the canteen because there was no indication that the canteen made use of the stores facilities.

If the canteen had used the stores facilities, then we would say that reciprocal servicing was taking place, that is, that the service cost centres each used the other's facilities.

This can lead to a complicated situation because we do not know the total of the stores costs until a proportion of the canteen costs has been charged to it. Similarly, we do not know the total of the canteen costs until the total of the stores costs has been apportioned.

There are two methods which can be used to solve this problem. Your *Fundamentals of Management Accounting* syllabus requires you to be able to use only the repeated distribution method. We will use the following example to illustrate this. The other method, using algebra, is outside the scope of your syllabus.

Example

A company reapportions the costs incurred by two service cost centres – materials handling and inspection – to three production cost centres – machining, finishing and assembly.

The following are the overhead costs which have been allocated and apportioned to the five cost centres:

	£000
Machining	400
Finishing	200
Assembly	100
Materials handling	100
Inspection	50

Estimates of the benefits received by each cost centre are as follows:

	Machining %	*Finishing* %	*Assembly* %	*Materials handling* %	*Inspection* %
Materials handling	30	25	35	–	10
Inspection	20	30	45	5	–

These percentages indicate the use which each of the cost centres makes of the materials handling and inspection facilities. Calculate the charge for overhead to each of the three production cost centres, including the amounts reapportioned from the two service centres.

Solution: repeated distribution method

The task of allocating and apportioning the overheads to all cost centres has already been done (the primary apportionment). The problem now is to reapportion the costs of the service centres (the secondary apportionment).

Using the repeated distribution method the service cost centre costs are apportioned backwards and forwards between the cost centres until the figures become very small. At this stage it might be necessary to round the last apportionments.

In the workings that follow we have chosen to begin the secondary apportionment by apportioning the inspection costs first. The £50,000 inspection cost is reapportioned according to the percentages provided, then the total of the materials handling department is reapportioned and so on. The final result would have been the same if we had chosen instead to begin by apportioning the materials handling costs first.

	Machining	*Finishing*	*Assembly*	*Materials handling*	*Inspection*
	£	£	£	£	£
Initial allocation	400,000	200,000	100,000	100,000	50,000
Apportion inspection	10,000	15,000	22,500	2,500	(50,000)
Apportion materials handling	30,750	25,625	35,875	(102,500)	10,250
Apportion inspection	2,050	3,075	4,612	513	(10,250)
Apportion materials handling	154	128	180	(513)	51
Apportion inspection*	11	16	24	–	(51)
Total charge for overhead	442,965	243,844	163,191	0	0

* When the service department cost reduces to a small amount the final apportionment is adjusted for roundings.

The objective has been achieved and all of the overheads have been apportioned to the production cost centres, using the percentages given. A spreadsheet or similar software package would obviously be helpful here!

3.7.2 The usefulness of reapportioned service centre costs

The task of accounting for reciprocal servicing can be fairly laborious, particularly if it must be performed manually. Managers must therefore ensure that the effort is worthwhile.

Generally, if the service centre costs are significant and they make considerable use of each other's services, then accounting for reciprocal servicing is probably worthwhile. In other cases the reciprocal servicing could be ignored, or alternatively the service centre which does the most work for the other service centres could be apportioned first. The other service centres could then be apportioned direct to the production cost centres.

The overriding consideration must be the usefulness to managers of the resulting information. If the improved accuracy of the overhead absorption rates is deemed to be worthwhile, then reciprocal servicing should be taken into account in service cost reapportionment.

In the assessment, you must never ignore the existence of reciprocal servicing unless you are specifically instructed to do so.

3.8 Activity-based costing (ABC)

Activity-based costing (ABC) is a more recent development in cost analysis. It is based on the idea that to use a single absorption base of either labour or machine hours does not accurately reflect the cause of the overhead costs being incurred.

Supporters of ABC argue that overhead costs are only loosely related to time and are not often related to the volume of production. They argue that overheads in a modern manufacturing environment are related to the complexity of production. The more complex the production process for a product, the higher are the overheads incurred on its behalf. For example, a product might require a number of complicated machine set-ups, or quality control activity might be more intense for some products than for others. An ABC approach attempts to ensure that overheads are traced to products in a way which more adequately reflects the overhead cost which has been incurred on their behalf.

Using an ABC approach, overhead costs are accumulated initially in activity *cost pools*. These might include, for example, order placing or material handling. Costs would then be collected and analysed for each activity cost pool and a *cost driver* would be identified for each activity. Cost drivers are the factors which cause the cost of an activity to increase.

Using estimates of the costs attributed to each activity cost pool and the number of cost drivers associated with it, a cost driver rate is calculated. This is similar in principle to the calculation of absorption rates. For example, if the total cost of the activity of setting up a machine is £5,000 for a period and the number of machine set-ups for the period is 250, the cost per set-up is £20 (£5,000/250). Each product that requires the use of this machine is regarded as having incurred £20 of overhead cost each time the machine is set up for the product.

This analysis of overhead costs into activities, and their absorption using a variety of cost drivers, is believed to produce more accurate product costs. The ABC technique can also be applied to non-production costs as well as to the determination of the costs of services provided.

3.9 The use of cost information in pricing decisions

3.9.1 Marginal cost pricing

In Chapter 1, we saw how knowledge of the extra or *marginal* cost of making and selling a hairdryer provided a manager with important information when deciding what selling price should be charged for a special order.

If the price charged is higher than the marginal or incremental cost of making and selling a cost unit then some contribution is earned towards the costs which are being incurred anyway. These include costs such as certain production and administration overheads.

The problem with marginal cost pricing is that it is difficult to decide on the mark-up that must be added to the marginal cost in order to ensure that the other costs such as administration overheads are covered and that the organisation makes a profit.

Marginal cost pricing is useful in a one-off special price decision such as that discussed concerning the hairdryer in Chapter 1, but it does not help us to decide on the price to be charged in routine product pricing decisions, in order to cover all costs and earn a profit.

3.9.2 Full cost-plus pricing

We have seen how the overhead absorption rate can be used to trace indirect costs to cost units in order to obtain the unit's full cost.

Full cost-plus pricing involves adding a mark-up to the total cost of a cost unit in order to arrive at the selling price. Your syllabus requires you to know how to calculate full cost-based prices to generate a specified return on sales or on investment.

3.9.3 Example: full-cost pricing to achieve a specified 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. The following example will demonstrate how the method works.

WP Limited 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 Limited requires a 15 per cent return on sales revenue from all products.

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

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 per cent required return is expressed as a percentage of the sales revenue, not as a percentage of the cost.

3.9.4 Example: full-cost pricing to achieve a specified return on investment

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 Limited 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 Limited 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 penny.

Solution

	£ 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% × £140.00	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

3.9.5 Second example: full-cost pricing to achieve a specified return on investment

This example demonstrates how the profit mark-up can be determined as a percentage of the total budgeted cost for a period.

The following data relate to a company which produces a range of products.

Capital invested in company	£800,000
Required return on investment each period	15%
Budgeted total cost for next period	£1,500,000

One of the company's products, R, incurs a total cost of £35 per unit.

Calculate the cost-plus selling price of one unit of product R.

Solution

Required profit in period = £800,000 × 15% = £120,000
Profit as a percentage of budgeted total cost = (£120,000/£1,500,000) × 100%
= 8%

This percentage is applied to calculate the mark up for all products produced.

Profit mark-up for one unit of product R = £35 × 8% = £2.80
Selling price for one unit of product R = £35 + £2.80 = £37.80

3.10 Summary

Having read this chapter the main points you should understand are as follows:

1. The three stages in attributing overheads to cost units are allocation, apportionment and absorption. Allocation involves allotting whole items of cost to a single cost centre. Apportionment is necessary when it is not possible to allot the whole cost to a single cost centre. The cost must then be apportioned between cost centres using a suitable basis.
2. The primary apportionment of production overheads involves apportioning the overhead costs to all cost centres. The secondary apportionment is then necessary to reapportion the service cost centre costs to the production cost centres.
3. The final totals of the production cost centre overheads are absorbed into product costs using a predetermined production overhead absorption rate. The absorption basis should reflect the type of activity undertaken within each production cost centre.
4. The production overhead absorption rate is calculated by dividing the budgeted cost centre overheads by the budgeted number of units of the absorption base (machine hours, direct labour hours, etc.).
5. Under- or over-absorption arises at the end of a period when the amount of production overhead absorbed into cost units is lower than or higher than the actual production overhead incurred during the period.
6. Reciprocal servicing occurs where service cost centres each do work for the other. In this situation the service cost centre overheads are reapportioned using the repeated distribution method.
7. Activity-based costing uses a variety of cost drivers to trace overhead costs to products and services.
8. The full cost of a cost unit can be used as a basis for determining its selling price. The required return from each cost unit can be calculated to achieve a specified return on sales or return on investment.

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Revision Questions 3

Question 1 Multiple choice

1.1 A method of dealing with overheads involves spreading common costs over cost centres on the basis of benefit received. This is known as:

(A) overhead absorption.
(B) overhead apportionment.
(C) overhead allocation.
(D) overhead analysis.

1.2 An overhead absorption rate is used to:

(A) share out common costs over benefiting cost centres.
(B) find the total overheads for a cost centre.
(C) charge overheads to products.
(D) control overheads.

1.3 Over-absorbed overheads occur when:

(A) absorbed overheads exceed actual overheads.
(B) absorbed overheads exceed budgeted overheads.
(C) actual overheads exceed budgeted overheads.
(D) budgeted overheads exceed absorbed overheads.

Data for questions 1.4 and 1.5

Budgeted labour hours	8,500
Budgeted overheads	£148,750
Actual labour hours	7,928
Actual overheads	£146,200

1.4 Based on the data given above, what is the labour hour overhead absorption rate?

(A) £17.50 per hour.
(B) £17.20 per hour.
(C) £18.44 per hour.
(D) £18.76 per hour.

1.5 Based on the data given above, what is the amount of overhead under-/over-absorbed?

(A) £2,550 under-absorbed.
(B) £2,529 over-absorbed.
(C) £2,550 over-absorbed.
(D) £7,460 under-absorbed.

1.6 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

1.7 P Ltd absorbs overheads on the basis of direct labour hours. The overhead absorption rate for the period has been based on budgeted overheads of £150,000 and 50,000 direct labour hours.

During the period, overheads of £180,000 were incurred and 60,000 direct labour hours were used.

Which of the following statements is correct?

(A) Overhead was £30,000 over-absorbed.
(B) Overhead was £30,000 under-absorbed.
(C) No under- or over-absorption occurred.
(D) None of the above.

? Question 2 Short objective-test questions

2.1 Match the overhead costs to the most appropriate basis of cost apportionment. Write the correct letter in the box provided beside each apportionment basis. An apportionment basis may be selected more than once.

Overhead cost

(a) Canteen costs
(b) Cleaning of factory premises
(c) Power
(d) Rent
(e) Insurance of plant and machinery

Apportionment bases

☐ Floor area
☐ Plant and equipment at cost
☐ Number of employees
☐ Machine running hours
☐ Direct labour hours

2.2 Maintenance costs are to be apportioned to production cost centres on the basis of the following number of maintenance hours worked in each cost centre.

	Machining	*Assembly*	*Finishing*
Maintenance hours worked	1,000	700	300

Complete the following extract from the overhead analysis sheet:

Overhead cost item	*Total* £	*Machining* £	*Assembly* £	*Finishing* £
Maintenance cost	38,000			

2.3 After the initial overhead allocation and apportionment has been completed, the overhead analysis sheet for a car repair workshop is as follows:

Total overhead cost £	*Vehicle servicing* £	*Crash repairs* £	*Tyre fitting* £	*Canteen and vending* £
233,000	82,000	74,000	61,000	16,000

The costs of the canteen and vending activity are to be reapportioned to the other activities on the basis of the number of personnel employed on each activity.

	Vehicle servicing	*Crash repairs*	*Tyre fitting*	*Canteen and vending*
Number of personnel	20	15	5	2

The canteen and vending cost to be apportioned to the crash repair activity is £ ☐

2.4 The budgeted fixed overhead absorption rate for last period was £5 per direct labour hour. Other data for the period are as follows:

Actual fixed overhead expenditure	£234,500
Actual direct labour hours	51,300
Budgeted fixed overhead expenditure	£212,900

The number of direct labour hours budgeted to be worked last period was ☐

2.5 *Tick the correct box.*
Activity in the packing department of a company manufacturing fine china involves operatives bubble-wrapping finished items and placing them in boxes which are then sealed and labelled. Most of the boxes are sealed and labelled by specialised machines, but about a quarter of them have to be sealed and labelled by hand. Budgeted activity levels for next period are 3,800 machine hours and 3,600 direct labour hours. The most appropriate production overhead absorption rate for the packing department would be a:

Machine hour rate ☐
Direct labour hour rate ☐

2.6 Data for the machining cost centre are as follows:

Budgeted cost centre overhead	£210,000
Actual cost centre overhead	£230,000
Budgeted machine hours	42,000
Actual machine hours	43,000

Complete the following calculation.

	£		
Overhead absorbed			
Actual overhead incurred			*Tick correct box:*
Overhead under-/over-absorbed		under-absorbed	☐
		over-absorbed	☐

2.7 The number of machine and labour hours budgeted for three production cost centres for the forthcoming period is as follows:

	Machining	*Assembly*	*Finishing*
Machine hours	50,000	4,000	5,000
Labour hours	10,000	30,000	20,000

The most appropriate production overhead absorption basis for each cost centre would be (tick the correct box):

	Machining	*Assembly*	*Finishing*
Rate per machine hour	☐	☐	☐
Rate per labour hour	☐	☐	☐

2.8 Production overhead in department A is absorbed using a predetermined rate per machine hour. Last period, the production overhead in department A was under-absorbed. Which of the following situations could have contributed to the under absorption? (tick all that apply)

☐ the actual production overhead incurred was lower than budgeted.
☐ the actual production overhead incurred was higher than budgeted.
☐ the actual machine hours were lower than budgeted.
☐ the actual machine hours were higher than budgeted.

2.9 The Crayfield Hotel has completed its initial allocation and apportionment of overhead costs and has established that the total budgeted annual overhead cost of its linen services activity is £836,000.

The cost unit used to plan and control costs in the hotel is an occupied room night. The hotel expects the occupancy rate of its 400 rooms, which are available for 365 nights each year, to be 85 per cent for the forthcoming year.

To the nearest penny, the overhead absorption rate for the linen services activity is £ ☐ per occupied room night.

2.10 GY Limited 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 Limited requires a rate of return of 15 per cent 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.

Calculate all answers to the nearest penny.

(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.

2.11 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.

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

? Question 3 Overhead analysis and absorption

The Utopian Hotel is developing a cost accounting system. Initially it has been decided to create four cost centres: Residential and Catering deal directly with customers, while Housekeeping and Maintenance are internal service cost centres.

The management accountant is in the process of calculating overhead absorption rates for the next period. An extract from the overhead analysis sheet is as follows:

	Basis of apportionment	*Residential*	*Catering*	*Housekeeping*	*Maintenance*	*Total*
		£	£	£	£	£
Consumables	Allocated	14,000	23,000	27,000	9,000	73,000
Staff costs	Allocated	16,500	13,000	11,500	5,500	46,500
Rent and rates				A		37,500
Contents ins.	Value of equip.		B			14,000
Heat and light		C				18,500

Other information

The following information is also available:

	Residential	*Catering*	*Housekeeping*	*Maintenance*	*Total*
Floor area (sq. metres)	2,750	1,350	600	300	5,000
Value of equipment, etc.	£350,000	£250,000	£75,000	£75,000	£750,000

Requirements

(a) The entries on the overhead analysis sheet shown as A to C are:

A £ _____ (to the nearest £)

B £ _____ (to the nearest £)

C £ _____ (to the nearest £)

(b) The initial overhead allocation and apportionment has now been completed. The cost centre overhead totals are as follows:

	Residential	*Catering*	*Housekeeping*	*Maintenance*	*Total*
	£	£	£	£	£
Initial allocation and apportionment	85,333	68,287	50,370	23,010	227,000

Housekeeping works 70 per cent for Residential and 30 per cent for Catering, and Maintenance works 20 per cent for Housekeeping, 30 per cent for Catering and 50 per cent for Residential.

After the reapportionment of the Housekeeping and Maintenance cost centres, the total cost centre overheads for Residential and Catering will be, to the nearest £:

Residential £ ☐
Catering £ ☐

? Question 4 Overhead absorption rates

QRS Ltd has three main departments – Casting, Dressing and Assembly – and has prepared the following production overhead budgets for period 3.

Department	*Casting*	*Dressing*	*Assembly*
Production overheads	£225,000	£175,000	£93,000
Expected production hours	7,500	7,000	6,200

During period 3, actual results were as follows:

Department	*Casting*	*Dressing*	*Assembly*
Production overheads	£229,317	£182,875	£92,500
Production hours	7,950	7,280	6,696

Requirements

(a) The departmental overhead absorption rates per production hour for period 3 are:

Casting £ ☐
Dressing £ ☐
Assembly £ ☐

(b) (i) The overheads in the Casting department were (tick the correct box and insert the value of the over-/under-absorption):

under-absorbed ☐ over-absorbed ☐
by £ ☐

(ii) The overheads in the Dressing department were (tick the correct box and insert the value of the over-/under-absorption):

under-absorbed ☐ over-absorbed ☐
by £ ☐

(c) The overheads in the Assembly department were over-absorbed. Which of the following factors contributed to the over absorption?

☐ the actual overheads incurred were lower than budgeted.
☐ the actual production hours were higher than budgeted.

Question 5 Overhead analysis

DC Ltd is an engineering company which uses job costing to attribute costs to individual products and services provided to its customers. It has commenced the preparation of its fixed production overhead cost budget for year 2 and has identified the following costs:

	£000
Machining	600
Assembly	250
Finishing	150
Stores	100
Maintenance	80
	1,180

The stores and maintenance departments are production service departments. An analysis of the services they provide indicates that their costs should be apportioned as follows:

	Machining	*Assembly*	*Finishing*	*Stores*	*Maintenance*
Stores	40%	30%	20%	–	10%
Maintenance	55%	20%	20%	5%	–

Requirements

(a) After the apportionment of the service department costs, the total overheads of the production departments will be (*to the nearest £500*):

Machining £ ☐
Assembly £ ☐
Finishing £ ☐

(b) DC Ltd's overhead absorption rates for year 1 are as follows:

Machining	£13.83 per machine hour
Assembly	£9.98 per labour hour
Finishing	£9.45 per labour hour

Job no. XX34 is to be started and completed in year 1. Data for the job is as follows:

Direct materials cost £2,400
Direct labour cost £1,500

Machine hours and labour hours required for the job are:

	Machine hours	*Labour hours*
Machining department	45	10
Assembly department	5	15
Finishing department	4	12

DC Ltd adds 10 per cent to total production cost in order to absorb non-production overhead costs, and profit is calculated as 20 per cent of selling price.

Requirement

Complete the following statements (to the nearest penny):

(i) The total production overhead cost of job no. XX34 is £ _____

(ii) The total production cost of job no. XX34 is £ _____

(iii) The selling price of job no. XX34 is £ _____

Solutions to Revision Questions

3

Solution 1

- Always remember that production overhead absorption rates are predetermined, that is, they are based on budgeted production overhead and budgeted activity levels.
- Over- or under-absorbed overhead = overhead absorbed – actual overhead incurred. If actual overhead exceeds the amount absorbed, then there is an under-absorption. If actual overhead is less than the amount absorbed, there is an over-absorption.

1.1 Answer: (B)

Answer (A) describes the final stage of charging overheads to cost units. (C) describes the allotment of whole items of cost to a single cost unit or cost centre. (D) describes the whole process of overhead allocation, apportionment and absorption.

1.2 Answer: (C)

An overhead absorption rate is a means of attributing overhead to a product or service-based, for example, on direct labour hours.

1.3 Answer: (A)

Over- or under-absorption of overhead is the difference between absorbed overheads and actual overheads. Under-absorption occurs when actual overheads exceed absorbed overheads.

1.4 Answer: (A)

Labour hour overhead absorption rate = £148,750/£8,500 = £17.50 per hour.

1.5 Answer: (D)

	£
Overhead incurred	146,200
Overhead absorbed = £17.50 × 7,928 hours	138,740
Under-absorption	7,460

1.6 Answer: (B)

Let £x = budgeted overhead absorption rate per hour:

	£
Actual overheads	694,075
Less: absorbed overheads	32,150x
Difference = under-absorption	35,000

$$\therefore x = \frac{694{,}075 - 35{,}000}{32{,}150} = 20.5$$

1.7 Answer: (C)

	£
Absorbed: (£150,000/50,000) = £3/hour × 60,000	180,000
Actual incurred	180,000
Under-/over-absorption	–

Solution 2

2.1 (a) Number of employees
(b) Floor area
(c) Machine running hours
(d) Floor area
(e) Plant and equipment at cost

2.2 Overhead cost per maintenance hour $= \dfrac{£38{,}000}{1{,}000 + 700 + 300} = £19$

Overhead cost item	*Total*	*Machining*	*Assembly*	*Finishing*
	£	£	£	£
Maintenance cost	38,000	19,000	13,300	5,700

2.3 Canteen and vending cost per personal member in production activities* $= \dfrac{£16{,}000}{20 + 15 + 5} = £400$

*The canteen and vending personnel are not included because the canteen cannot give a charge to itself.

The canteen and vending cost apportioned to the crash repair activity is £400 × 15 = £6,000.

2.4 Direct labour hours budgeted to be worked last period = 42,580.

$$\text{Budgeted overhead absorption rate} = \frac{\text{budgeted fixed overhead expenditure}}{\text{budgeted direct labour hours}}$$

$$£5 = \frac{£212{,}900}{\text{budgeted direct labour hours}}$$

Budgeted direct labour hours = £212,900/£5 = 42,580.

2.5 The most appropriate production overhead absorption rate for the packing department would be a *direct labour hour rate*.

Although the number of machine hours in the cost centre is significant, we are told that a quarter of the output is not placed on the machines. No machine hours would be recorded for this output and the use of a machine hour rate would mean that this part of the output received no charge for the overheads of the packing cost centre.

2.6 $$\text{Overhead absorption rate} = \frac{£210,000}{42,000} = £5 \text{ per machine hour}$$

	£
Overhead absorbed (£5 × 43,000)	215,000
Actual overhead incurred	230,000
Overhead under-absorbed	15,000

2.7 Looking at the number of machine and labour hours budgeted for each cost centre it is clear that the machining department is machine intensive. Therefore, a *rate per machine hour* would be most appropriate for this cost centre.

The assembly and finishing departments are labour intensive. Therefore, a *rate per labour hour* would be most appropriate for each of these cost centres.

2.8 Two of the stated factors could have contributed to the under absorption:

- *the actual production overhead incurred was higher than budgeted*; if this did happen then the predetermined absorption rate would be too low and there would be a potential under absorption;
- *the actual machine hours were lower than budgeted*; if this occurred then there would be fewer than expected hours to absorb the production overhead, potentially leading to under absorption.

2.9 Budgeted number of occupied room nights = 400 rooms × 365 nights × 85% = 124,100 occupied room nights.

Overhead absorption rate for linen services activity = £836,000/124,100 = £6.74 per occupied room night.

2.10 (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.

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

2.11 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

Solution 3

- This is an example of an application of absorption costing in a non-manufacturing situation. Do not be put off by this. In an assessment you must be prepared to deal with all sorts of unfamiliar situations. The principles of overhead analysis that you have learned in this chapter can be applied in the same way in this non-manufacturing environment. Residential and Catering are the equivalent of the production cost centres that you have learned about, whereas Housekeeping and Maintenance are internal service departments whose costs will need to be reapportioned.
- Maintenance does work for Housekeeping, but notice that Housekeeping does not provide any service to Maintenance. Therefore, in part (b), if you apportion the total of Maintenance first, including the appropriate charge to Housekeeping, you can then apportion the new total for Housekeeping straight to the departments which deal directly with customers, that is, Residential and Catering.

(a) A £4,500
B £4,667
C £10,175

Workings:

A: Using floor area as the apportionment basis, the rent and rates cost apportioned to Housekeeping = (600/5,000) × £37,500 = £4,500.
B: (250,000/750,000) × £14,000 = £4,667.
C: Using floor area as the apportionment basis, the heat and light cost apportioned to Residential = (2,750/5,000) × £18,500 = £10,175.

(b) Residential £135,318
Catering £91,682

Workings:

	Residential £	*Catering* £	*Housekeeping* £	*Maintenance* £	*Total* £
Initial allocation and appt.	85,333	68,287	50,370	23,010	227,000
Maintenance reapportioned					
50% to Residential	11,505				
30% to Catering		6,903			
20% to Housekeeping			4,602	(23,010)	
	96,838	75,190	54,972	–	
Housekeeping reapportioned					
70% to Residential	38,480				
30% to Catering		16,492	(54,972)		
	135,318	91,682	–		

Solution 4

- A common mistake in part (b) would be to compare the actual overheads with the budgeted overheads instead of with the absorbed overheads when calculating the under- or over-absorption.

(a) Predetermined departmental overhead absorption rates for period 3 (per production hour).

$$\textit{Casting}\quad \frac{£225{,}000}{7{,}500} = £30 \qquad \textit{Dressing}\quad \frac{£175{,}000}{7{,}000} = £25 \qquad \textit{Assembly}\quad \frac{£93{,}000}{6{,}200} = £15$$

(b) (i) The overheads in the Casting department were over-absorbed by £9,183
(ii) The overheads in the Dressing department were under-absorbed by £875.

Workings:

	Casting £	*Dressing* £
Overheads absorbed:		
£30/hour × 7,950	238,500	
£25/hour × 7,280		182,000
Actual overheads	(229,317)	(182,875)
Over/(under) absorption	9,183	(875)

(c) Both factors would have contributed to the over-absorption. The amount of overhead absorbed increased in line with the production hours, which would have led to over absorption even if the overhead expenditure had remained constant. The fact that the overhead expenditure was below budget would have increased the amount of over-absorption.

Solution 5

- You will need to use the repeated distribution method to deal with the reciprocal servicing in part (a).
- The question mentions job costing, which is the subject of Chapter 8. For now, all you need to know is that an individual job – in this case job XX34 – is simply treated as a cost unit for the purposes of overhead absorption.

(a) Machining: £691,500
Assembly: £299,500
Finishing: £189,000

Workings:

	Machining £000	*Assembly* £000	*Finishing* £000	*Stores* £000	*Maintenance* £000
Allocated costs	600.00	250.00	150.00	100.00	80.00
Stores apportionment	40.00	30.00	20.00	(100.00)	10.00
Maintenance apportionment	49.50	18.00	18.00	4.50	(90.00)
Stores apportionment	2.00	1.50	1.00	(4.50)	–
Total	691.50	299.50	189.00	–	–

(b) (i) £885.45
(ii) £4,785.45
(iii) £6,580.00

Workings:

	£	£
Direct material		2,400.00
Direct labour		1,500.00
Prime cost		3,900.00
Overhead cost:		
Machining (45 × £13.83)	622.35	
Assembly (15 × £9.98)	149.70	
Finishing (12 × £9.45)	113.40	
		885.45
Total production cost		4,785.45
Non-production overhead (10%)		478.55
Total cost		5,264.00
Profit mark-up (25%)*		1,316.00
Price for Job XX34		6,580.00

*A profit margin of 20 per cent of selling price is the same as a mark-up of 25 per cent of cost. Check for yourself that the calculated profit margin is in fact 20 per cent of the selling price.