

Cost assignment

Solutions to Chapter 3 questions

- (a) For the answer to this question see 'Budgeted overhead rates' in Chapter 3.
- (b) A lower production overhead rate does not necessarily indicate that factory X is more efficient than factory Y. The reasons for this are:
- Factory Y's operations might be highly mechanized, resulting in large depreciation costs, whereas factory X's operations might be labour-intensive. Consequently, products produced in factory Y will incur higher overhead and lower labour costs, whereas products produced in factory X will incur lower overhead and higher labour costs.
 - Factory Y may have invested in plant with a larger operating capacity in order to meet future output. This will result in larger fixed costs and a higher overhead rate.
 - Both factories may use different denominators in calculating the overhead rates. For example, if factory Y uses normal capacity and factory X uses maximum practical capacity then factory Y will have a higher overhead rate.
 - Current budgeted activity might be used by both firms to calculate the overhead rate. The level of budgeted sales will determine budgeted activity. The lower overhead rate of factory X might be due to a higher sales volume rather than efficient factory operations.
 - Different cost classification might result in different overhead rates. Factory X might treat all expenditure as a direct cost wherever possible. For example, employers' costs might be charged out by means of an inflated hourly wage rate. Factory Y may treat such items as overhead costs.

Solution IM 3.1

See answer to Question 3.23 in the text for the answer to this question.

Solution IM 3.2

- (a) For the answer to this question see 'Blanket overhead rates' in Chapter 3.
- (b) For the answer to this question see Learning Note 3.1 on the open access website.

Solution IM 3.3

(a)	<u>Production department</u>			<u>Service department</u>	<u>Total</u>
	A (£)	B (£)	C (£)	(£)	(£)
Direct	261,745	226,120	93,890	53,305	635,060
Indirect	135,400 (40%)	118,475 (35%)	67,700 (20%)	16,925 (5%)	338,500
Service dept appointment	23,410 $(\frac{1}{3})$	23,410 $(\frac{1}{3})$	23,410 $(\frac{1}{3})$	(70,230)	
	420,555	368,005	185,000	—	973,560
Allocation base (1)	17,760 = £23.68 per direct labour hour	5,760 = £63.89 per m/c hour	148,000 = £1.25 per hour		

Solution IM 3.4

Note

1. Dept. A direct labour hours
 $= 10 \times 37 \times 48$
 $= 17,760$
 Dept. B machine hours
 $= 5 \times 24 \times 48$
 $= 5,760$
 Dept. C units
 $= 148,000$

(b) Dept A	£
9 direct labour hours at £23.68	213.12
Dept B	
3 m/c hours at £63.89	191.67
Dept C	
100 units at £1.25	125.00
	<u>529.79</u>

Cost per unit = £5.30 (£529.79/100)

Solution IM 3.5

(a) *Overhead analysis sheet*

	Total (£)	Production			Service		
		Cutting (£)	Formal (£)	Casual (£)	Stores (£)	Canteen (£)	Maintenance (£)
Indirect wages	147,200	6,400	19,500	20,100	41,200	15,000	45,000
Consumable materials	54,600	5,300	4,100	2,300	—	18,700	24,200
Plant depreciation	84,200	31,200	17,500	24,600	2,500	3,400	5,000
Power ^a	31,700	5,389	12,046	10,144	951	2,536	634
Heat and light ^b	13,800	11,280	14,100	9,870	2,115	3,525	1,410
Rent and rates ^b	15,000						
Building insurance ^b	<u>13,500</u>						
	360,000	59,569	67,246	67,014	46,766	43,161	76,244
Reapportionment:							
Stores ^c	—	29,228	5,846	5,846	(46,766)	—	5,846
Canteen ^d	—	2,697	18,497	21,967		(43,161)	—
Maintenance ^e	—	1,888	37,742	42,460			(82,090)
	<u>360,000</u>	<u>93,382</u>	<u>129,331</u>	<u>137,287</u>			
Machine hours	87,000	2,000	40,000	45,000			
Labour hours	112,000	7,000	48,000	57,000			
Machine hour rate		£46.69	£3.23	£3.05			
Overheads per labour hour		£13.34	£2.69	£2.41			

Notes

Bases of apportionment: ^a estimated power usage; ^b area; ^c value of issues; ^d direct labour hours; ^e machine hours. Actual basis for other costs.

- (b) See section on budgeted overhead rates in Chapter 3 for the answer to this question. In addition, the following points should be made:
 - (i) It draws attention to the under-/over-recovery of overheads arising from changes in production levels.
 - (ii) There is difficulty in determining estimated overheads and an appropriate level of activity when calculating predetermined overhead rates.

Solution IM 3.6

(a) Percentage of direct labour cost method = $(£600,000/£200,000) \times 100$
 = 300% of direct labour cost

Direct labour hour method = $(£600,000/40,000 \text{ direct labour hours})$
 = £15 per direct labour hour

Machine hour method = $(£600,000/50,000 \text{ machinehour})$
 = £12 per machine hour

(b) See Chapter 3 for the answer to this question.

(c) The question states that the company has become machine-intensive and implies that in the long term there is a closer association between overhead expenditure and machine hours than the other two methods. Therefore, the best measure of overhead resources consumed by jobs or products is machine hours.

(d) <i>Job AX</i>	(£)
Direct material	3,788
Direct labour	1,100
Direct expenses	<u>422</u>
Prime cost	5,310
Production overhead (120 machine hours × £12)	<u>1,440</u>
Factory cost	6,750
Administrative overheads (20% × £6,750)	<u>1,350</u>
Total cost	8,100
Profit (£8,100/0.90 – £8,100)	<u>900</u>
Selling price	<u>9,000</u>

Workings

Administration overhead absorption rate = Total admin. overheads/total factory cost
 = £328,000/£1,640,000
 = 20% of factory cost

(e) The general characteristics of incentive schemes should ensure that:

- (i) the scheme is simple to understand and administer;
- (ii) payment should be made as quickly as possible after production;
- (iii) there should be no limit on earnings and employees must be safe-guarded from earning lower wages than time rate wages arising from problems which are outside their control.

The advantages of incentive schemes are:

- (i) increased production and lower average unit costs;
- (ii) increased morale of the workforce;
- (iii) attraction of more efficient workers to the company.

Solution IM 3.7

$$(a) \text{ Predetermined machine hour rate} = \frac{\text{Machine department overheads (£1,080,000)}}{\text{Machine hours (80,000)}}$$

Machining department = £13.50 per machine hour
 Hand finishing department = £760,000/120,000 labour hours
 = £6.33 per labour hour

	Machine department (£)	Hand finishing department (£)
Overhead incurred	84,500	67,100
Overhead absorbed	<u>81,000</u> (6,000 × £13.50)	<u>60,800</u> (9,600 × £6.33)
Under recovery of overheads	<u>3,500</u>	<u>6,300</u>

- (ii) Overheads that are apportioned to cost centres tend to be on an arbitrary basis and are unlikely to be controllable by the cost centre manager. Managers should be held accountable for only those overheads that they can control. See 'Guidelines for applying the controllability principle' in Chapter 16 for a more detailed discussion of controllable and non-controllable costs.
- (c) Absorption costing is used by companies to ensure that all products/services bear an equitable share of company overheads. Statement of Standard Accounting Practice 9 (Replaced by Financial Reporting Standard 102) requires that stocks should be valued at full production cost. Therefore, absorption costing is required to allocate overheads to products in order to meet financial accounting requirements.

Solution IM 3.8

- (a) In order to ascertain the actual overhead traced to the production departments, it is necessary to allocate the service department overheads to the filling and sealing departments:

	Filling (£)	Sealing (£)	Maintenance (£)	Canteen (£)
Allocated	74,260	38,115	25,050	24,375
Reallocation of:				
Canteen	14,625 (60%)	7,800 (32%)	1,950 (8%)	(24,375)
Maintenance	18,900 (70%)	7,290 (27%)	(27,000)	810 (3%)
Canteen	486 (60%)	259 (32%)	65 (8%)	(810)
Maintenance	47 (70/97)	18 (27/97)	-	-
	<u>108,318</u>	<u>53,482</u>		

Predetermined overhead rates:

	Filling (£)	Sealing (£)
Budgeted overheads	110,040	53,300
Budgeted direct labour hours	13,100	10,250
Direct labour hour overhead rate	8.40	5.20
Overhead incurred	108,318	53,482
Overhead allocated	107,688 (12,820 × £8.40)	52,390 (10,075 × £5.20)
(Under-)/over-recovery	(630)	(1,092)

- (b) The objectives of overhead apportionment and absorption are:
- (i) To meet the stock valuation and profit measurement requirements for financial accounting purposes. Financial accounting regulations in most countries require that all manufacturing overheads be traced to products for stock valuation purposes.
 - (ii) For various decisions, such as pricing decisions, management require estimates of the total product costs.
 - (iii) Overhead costs may be traced to different segments of the business, such as product groups or geographical regions, in order to assess the performance of each segment.

Overhead apportionment and absorption can be criticized on the following grounds:

- (i) The process includes many arbitrary apportionments and does not provide an accurate indication of the resources consumed by each product. In tracing overheads to products, the allocation procedure assumes that all overheads are related to volume. This is inappropriate for many fixed overheads, since they are fixed in the short term, and tend to be caused by factors other than volume, such as the diversity of the product range, number of set-ups and range of component parts which the firm stocks.
- (ii) Fixed overheads are sunk costs and will tend not to change in the short term. Hence they are unaffected in the short term, irrespective of which decisions are taken. Arbitrary overhead allocations should not be used for decision-making purposes.
- (iii) Overhead allocations are normally undertaken for stock valuation purposes. The procedures are not intended to meet other requirements, such as decision-making and performance evaluation.
- (iv) Individuals should not be held accountable for costs which they cannot control. Arbitrary apportionment of overheads is therefore inappropriate for cost control and performance measurement purposes.

- (a) (i) An over-absorption of overheads occurs because the actual overhead charged to products (or clients) exceeds the overheads incurred. Therefore £747,360 (£742,600 actual overheads + £4,760 over-absorption) were charged to clients during direct hours worked, the actual professional staff hours worked during the period were 99,648 (£747,360/£7.50 hourly overhead rate). Therefore, budgeted professional staff hours = 98,288 (99,648 – 1,360).
- (ii) Budgeted overhead expenditure

$$= \text{Budgeted hours (98,288)} \times \text{Overhead rate (£7.50)}$$

$$= £737,160$$

- (b) To determine the overhead rate the senior staff hours should be weighted by a factor of 1.4 and the junior staff hours by a factor of 1.0:

$$\text{Senior staff} = 21,600 \times 1.4 = 30,240$$

$$\text{Junior staff} = 79,300 \times 1.0 = 79,300$$

$$\hline 109,540$$

Allocation of overheads:

$$\text{Senior staff} = 30,240/109,540 \times £784,000 = £216,434$$

$$\text{Junior staff} = 79,300/109,540 \times £784,000 = £567,566$$

$$\hline £784,000$$

Solution IM 3.9

Senior staff overhead allocation rate = £216,434/21,600
 = £10.020 per hour
 Junior staff overhead allocation rate = £567,566/79,300 hours
 = £7.157 per hour

- (c) Presumably, the senior staff consume a greater proportion of the overhead costs than the junior staff and the revised method is an attempt to reflect this difference in resource consumption. For example, senior staff are likely to require more office space and make greater demands on secretarial time, telephones, etc. The revised method creates two separate cost centres and overhead rates whereas the previous method used a single blanket rate for the whole organization.
- (d) See the section on under- and over-recovery of overheads in Chapter 3 for the answer to this question. Differences between overhead incurred and overhead absorbed may be due to:
- (1) differences between actual and budgeted expenditure;
 - (2) differences between actual and budgeted activity level.

Solution IM 3.10

- (i) With the step-wise method the costs of the first service department (Department G specified in the question) are reapportioned to the second department but return allocations are not made from the second department back to the first department.

	Production depts			Internal services	
	1	2		G	H
	(£000)	(£000)		(£000)	(£000)
Overheads	870	690	Costs	160	82
G apportioned	96 (60%)	48 (30%)		<u>-160</u>	<u>16 (10%)</u>
					98
H apportioned	61 ($\frac{50}{80}$)	37 ($\frac{30}{80}$)			<u>-98</u>
	<u>1,027</u>	<u>775</u>			

- (ii) Let G = Service Department G overheads
 Let H = Service Department H overheads

$$G = 160 + 0.2H$$

$$H = 82 + 0.1G$$

Rearranging the above equations

$$-0.2H + G = 160 \quad (1)$$

$$1H - 0.1G = 82 \quad (2)$$

Multiply equation (1) by 1 and equation (2) by 10

$$-0.2H + G = 160$$

$$10H - G = 820$$

Add the above equations together:

$$9.8H = 980$$

$$H = 100$$

Substituting for the value of H in equation (1)

$$-0.2(100) + G = 160$$

$$G = 180$$

Internal Services	Total (£000)	Production depts	
		1 (£000)	2 (£000)
G (180 × 90%)	162	108	54
H (100 × 80%)	80	50	30
	<u>242</u>	<u>158</u>	<u>84</u>
Overheads (given)		<u>870</u>	<u>690</u>
		<u>1,028</u>	<u>774</u>

- (iii) The simultaneous equation method will yield more accurate allocations because it takes into account the fact that service departments serve each other whereas the step-wise method ignores such reciprocal usage. The step-wise method involves simpler computations and, in this question, does not give a significantly different answer. However, the step-wise method may yield inaccurate results where service costs are high and there are more than two service departments with significantly different usage ratios between the departments.

(a)

	Overhead analysis (ignoring reciprocal allocations)				
	General factory overhead	Service cost centres		Production cost centres	
		1	2	A	B
	(£)	(£)	(£)	(£)	(£)
Primary allocation	210,000	93,800	38,600	182,800	124,800
Apportionment of general factory overhead ^a	(210,000)	10,500	21,000	31,500	147,000
	<u>—</u>	<u>104,300</u>	<u>59,600</u>	<u>214,300</u>	<u>271,800</u>
Charges by service cost centre 1 ^b		(104,300)	—	91,262	13,038
		<u>—</u>	<u>59,600</u>	<u>305,562</u>	<u>284,838</u>
Charges by service cost centre 2 ^c			(59,600)	8,221	51,379
			<u>—</u>	<u>£313,783</u>	<u>£336,217</u>
Budgeted direct labour hours				<u>120,000</u>	<u>20,000</u>
Absorption rates				<u>£2.61</u>	<u>£16.81</u>

Solution IM 3.11

Notes

^a General factory overhead is apportioned to service cost centres before reallocation to production centres as indicated in Note (i) of the question.

^b Because reciprocal allocations are not made, the costs allocated to service cost centre 1 are reallocated as follows:

£91,262 (63/72 × £104,300) to production cost centre A

£13,038 (9/72 × £104,300) to production cost centre B

^c Reciprocal charges are not made. Therefore, the allocation is as follows:

4,000/29,000 × £59,600 = £8,221 to production cost centre A

25,000/29,000 × £59,600 = £51,379 to production cost centre B

- (b) The difference may be due to the following:
- (i) Changes occurred in projected overhead expenditure compared with expenditure which was used to determine the current year's overhead rate.
 - (ii) Current overhead rates do not include a proportion of the service cost centres overhead.
 - (iii) Budgeted activity for the next year is greater than the current year for production cost centre A. If this is not matched by a corresponding increase in overhead expenditure then the hourly overhead rate will decline. Budgeted activity for production cost centre B is lower than the current year, resulting in an increase in the overhead rate. Because fixed overheads do not change in relation to activity, the hourly overhead rate will fluctuate whenever changes in activity occur. (See Example 3.2 in Chapter 3 for an illustration.)
- (c) This question can be answered by using either the repeated distribution or simultaneous equation methods. Both methods are illustrated in Appendix 3.1 to Chapter 3. The simultaneous equation method is illustrated below:

Let X = total overhead of service cost centre 1

Y = total overhead of service cost centre 2

Then

$$X = 104,300 + \frac{1}{30} Y \text{ (i.e. 1,000/30,000 hrs of service cost centre 2 overheads)}$$

$$Y = 59,600 + \frac{1}{5} X \text{ (i.e. 18 per cent out of total of 90 per cent of service cost centre 1 overheads)}$$

Rearranging the above equations:

$$X - Y \frac{1}{30} = 104,300 \quad (1)$$

$$-X + Y \frac{1}{5} = 59,600 \quad (2)$$

Multiply equation (1) by 1 and equation (2) by 5:

$$X - Y \frac{1}{30} = 104,300$$

$$-X + 5Y = 298,000$$

Adding the above equations together:

$$\frac{149}{30} Y = 402,300$$

$$Y = \frac{402,300 \times 30}{149}$$

$$Y = 81,000$$

Substituting for Y in equation (1) results in the following equation:

$$X - \frac{1}{30} \times 81,000 = 104,300$$

$$X = 107,000$$

The service cost centre overheads of £107,000 (service cost centre 1) and £81,000 (service cost centre 2) are now apportioned to the production cost centres as follows:

	General factory overhead (£)	Service cost centre		Production cost centre	
		1 (£)	2 (£)	A (£)	B (£)
Primary allocation	210,000	93,800	38,600	182,800	124,800
Apportionment of general factory overhead	<u>(210,000)</u>	<u>10,500</u>	<u>21,000</u>	<u>31,500</u>	<u>147,000</u>
	—	104,300	59,600	214,300	271,800
Charges by service cost centre 1 ^a		(107,000)	21,400	74,900	10,700
Charges by service cost centre 2 ^b		<u>2,700</u>	<u>(81,000)</u>	<u>10,800</u>	<u>67,500</u>
		<u>—</u>	<u>—</u>	<u>£300,000</u>	<u>£350,000</u>
Budgeted direct labour hours				<u>120,000</u>	<u>20,000</u>
Absorption rates				<u>£ 2.50</u>	<u>£ 17.50</u>

Notes

^a $18/90 \times £107,000 = £21,400$ to service cost centre 2 (18% out of 90%)

$63/90 \times £107,000 = £74,900$ to production cost centre A

$9/90 \times £107,000 = £10,700$ to production cost centre B

^b $1,000/30,000 \times £81,000 = £2,700$ to service cost centre 1

$4,000/30,000 \times £81,000 = £10,800$ to production cost centre A

$25,000/30,000 \times £81,000 = £67,500$ to production cost centre B

(d) The answer should include the following points:

- (i) The overhead rate calculations do not distinguish between fixed and variable elements. Such an analysis is necessary for decision-making purposes.
- (ii) The majority of service cost centre 1 costs are variable. It is preferable to determine an activity measure which exerts most influence on the variable costs and apportion the costs on the basis of this measure. The present method of apportionment appears to be inappropriate.
- (iii) Service cost centre 2 is the maintenance department and the majority of costs are fixed, thus suggesting preventive maintenance be undertaken. The question does not make it clear which hourly base is used for allocating overheads (direct labour hours or machine hours). Machine hours should be used for allocating variable costs, since these costs are likely to vary with this activity base. Preventive maintenance should be apportioned on the basis of the planned hours which the maintenance staff intend to allocate to each department.
- (iv) Production cost centre B is highly mechanized, thus suggesting that a machine hour rate might be preferable to the present direct labour hour rate.