



Workbook activities

This section contains activities which are suitable for use with the first four chapters of *Managing Performance & Resources Tutorial* from Osborne Books.

1 MANAGEMENT INFORMATION

1.1 All kinds of information, and management information in particular, must satisfy certain criteria in order to be useful.

List and explain briefly five criteria which should be satisfied by information if it is to be useful.

1.2 Fino Ltd provides a spray-painting service for manufacturers of various products. The work of Fino Ltd consists of three activities: preparation, painting and storage. The following budgeted information is available for Fino Ltd for the next year:

Activity	Cost Driver	Budgeted Cost Pool	Budgeted Demand
Preparation	Minutes	£375,000	750,000 minutes
Painting	Minutes	£960,000	384,000 minutes
Storage	Cubic metres	£510,000	255,000 cubic metres

Required:

- (a) Calculate the cost driver rates for each of the three activities of Fino Ltd.
- (b) Calculate the budgeted cost per unit of products X and Y, which require the following:

	X	Y
Preparation	8 minutes	12 minutes
Painting	10 minutes	6 minutes
Storage	0.25 cubic m	0.5 cubic m

1.3 Delta Ltd is an engineering firm which manufactures three products, A, B and C. Product C is produced in smaller quantities for one specific customer. The following planned and budgeted information is available for the coming year:

Overheads:	£
Production set-up costs	246,000
Raw materials inwards department	66,300
Raw materials stores	99,000
Total	<u>411,300</u>

Product:	A	B	C
Budgeted production (units)	40,000	30,000	15,000
Batch size (units)	2,500	3,000	1,000
Direct material cost per unit	£25	£30	£16
Direct labour cost per unit	£4	£2	£1
Direct labour hours per unit	0.5	0.25	0.125
Expected number of raw materials deliveries in year	10	6	10
Expected number of materials requisitions	16	20	30

Required: giving your answers in £ correct to 2 decimal places:

- Calculate a single overhead absorption rate for the total overheads of £411,300 on a direct labour hour basis. (Hint: you will first need to calculate the total labour hours required for the budgeted production of the products.)
- Calculate the direct cost per unit and the total cost per unit of each of the products A, B and C, using absorption costing. Use your answer to (a) to calculate the absorbed overheads.
- In order to apply the Activity Based Costing method to Delta Ltd, a cost driver rate must be calculated for each activity using:

$$\text{Cost driver rate} = \frac{\text{Budgeted cost pool}}{\text{Total budgeted demand for cost driver}}$$

Using this method, calculate the cost driver rates to be charged for the three activities as follows:

- Production set-up costs to be charged on the basis of number of batches.
 - Raw materials inwards to be charged on the basis of number of deliveries.
 - Raw materials stores to be charged on the basis of number of requisitions.
- Using your answers to (c) and Activity Based Costing, calculate the overheads to be included in the total cost of production for each of the products A, B and C.
 - Using your answers to (d), calculate the total cost per unit of each of the products A, B and C, using Activity Based Costing. Show the direct cost as a subtotal before adding the overheads in each case.

- 1.4** Abmar Ltd manufactures one product of the same name, the Abmar. The variable costs of producing 10,000 Abmars during the year ended 30 June 2004 were:

Direct Materials	£70,000
Direct Labour	£40,000
Variable Production Overheads	£30,000

The fixed costs incurred by Abmar Ltd in the year ended 30 June 2004 were:

Fixed production overheads	£50,000
Other fixed overheads	£60,000

The selling price was £30 per Abmar.

Of the 10,000 Abmars produced, only 8,000 were sold during the year.

The opening stock of finished Abmars was zero and there was no opening or closing work-in-progress.

Required:

- Calculate the cost of one Abmar using Marginal Costing.
- Set out a marginal costing statement for Abmar Ltd for the year ended 30 June 2004, showing the contribution (in total) and the total reported profit.
- Given that Fixed Production Overheads are to be absorbed on a per unit basis, but Other Fixed Overheads are not absorbed, calculate the absorption cost of one Abmar.
- Set out an absorption costing statement for Abmar Ltd for the year ended 30 June 2004, showing the total reported profit.
- Calculate the difference in reported profit between your answer in (b) and your answer in (d). What is the reason for this difference?

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1.5 The standard cost per unit of a product is as follows:

	£
Direct Materials: 5kg at £5 per kg	25
Direct Labour: 5hrs at £8 per hour	40
Variable production overhead:	
5hrs at £3 per direct labour hour	15
Fixed production overhead:	
5hrs at £4 per direct labour hour	20

Budgeted production totals 1,500 units of the product in a given period.

There are other fixed overheads of £50,000 in total for the period.

The selling price of the product is £170 per unit.

Required:

For each of the following two periods, prepare marginal costing and absorption costing operating statements for this product. In each case, reconcile the reported profit figures for the two costing methods.

- (a) In a given period, 1,500 units of the product are made, but only 1,200 are sold. There is no opening stock of finished goods.
- (b) In the next period, with an opening stock of 300 units, 1,000 units are made and 1,200 are sold.

1.6 Arnold Ltd makes a single product, the Arno. On completion of production, 2% of the Arnos are found to be faulty and have to be scrapped. Production workers work independently of each other in making Arnos, and the production manager wants to establish whether certain workers are responsible for most of the faulty Arnos.

Required:

- (a) Identify two advantages of sampling for establishing the reasons for the faulty Arnos.
- (b) Explain briefly what is meant by
 - true (or simple) random sampling
 - systematic sampling
 - stratified sampling
- (c) State which form of sampling would be most appropriate for Arnold Ltd.

1.7 A moving average trend in Sales Volume has been calculated as follows:

Time period:	3	4	5	6	7	8
Moving average trend (000s units)	931.0	942.4	953.3	964.6	975.7	987.0

Required:

- (a) Calculate the average change in the trend per period.
- (b) Forecast the trend in sales volume for each of the time periods 9, 10, 11 and 12, assuming the trend continues.

1.8 (a) Calculate a *three-point* moving average trend for the data:

902	890	940	900	905	950
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(b) Calculate a *five-point* moving average trend for the data:

74	77	70	75	80	79	82	74	85	90
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1.9 Toto Toys has the following quarterly turnover figures for the three years starting 1 July 2004.

Toto Toys: Turnover in £000s

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
2004			482	560
2005	493	528	520	604
2006	530	571	558	642
2007	570	609		

Required:

- (a) Set out the Toto Toys turnover data in a column and calculate a centred four-point moving average trend.
- (b) Using your answer to (a), calculate average additive (absolute) seasonal variations in turnover.
- (c) Assuming that the trend and the pattern of additive seasonal variations continue, calculate forecast turnover figures for Toto Toys for each of quarters 3 and 4 of 2007.

1.10 Spring Ltd sells a range of outdoor clothing, including lightweight showerproof jackets, for which the quarterly sales volumes over a period of three years are shown below.

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
2003	2,530	2,700	2,610	2,480
2004	2,730	2,940	2,850	2,620
2005	2,950	3,100	3,050	2,820

Required:

- (a) Set out the Spring Ltd data in a column and calculate centred four-point moving average sales volumes for the showerproof jackets. (Use 1 decimal place in workings.)
- (b) Using your answer to (a), calculate average *percentage* seasonal variations (to the nearest whole number) in the sales of Spring Ltd's showerproof jackets.

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- (c) Assuming that the trend and the pattern of percentage seasonal variations will continue, forecast the sales volume of Spring Ltd's showerproof jackets for each of the four quarters of 2006.

- 1.11** An assistant management accountant in Snap Ltd is testing computer software for the analysis of trends and seasonal variations. After inputting several years' historical sales data relating to Snap Ltd's photographic film, the following output has been obtained:

Analysis of sales of photographic film (sales volume in numbers of films)

Regression line trend: $y = 8,000x + 150,000$

This may be written: Trend value = (8,000 x Quarter Number) + 150,000

Quarter of the year	Seasonal Variations	
	Absolute	Percentage
First	-100,000	-30%
Second	+50,000	+15%
Third	+170,000	+60%
Fourth	-120,000	-45%

Actual numbers of films sold in quarters 17 to 20 are shown below. Quarter 17 was a 'first' quarter of a year, quarter 18 a 'second' quarter, and so on.

Quarter	Number of films sold
17	185,000
18	345,500
19	471,600
20	189,000

Required:

- Using the regression line formula, calculate the trend for the sales of films in quarters 17, 18, 19 and 20.
- Using your answer to (a) and the absolute seasonal variations, calculate the resulting forecasts for the film sales in quarters 17 to 20 inclusive.
- Using your answer to (a) and the percentage seasonal variations, calculate the resulting forecasts for the film sales in quarters 17 to 20 inclusive.
- By comparing the two sets of forecasts with the actual film sales given for quarters 17 to 20, identify which method of calculating the seasonal variations gives the best estimates of actual sales of films.
- Using the method which you have identified as best in (d), calculate the forecast sales numbers of films for Snap Ltd for Quarters 21 to 24 inclusive.

- 1.12 Required:** answer the following questions using index numbers:

- In the base year of a suitable price index (ie when the index number was 100), product P cost £3. The price index is now 130. What would the cost of product P be in today's terms?

- (b) The market value of a house at the present time is £180,000. A suitable index for house prices is now at a level of 145. What would the price of this house be in terms of the prices 5 years ago, when this house price index was 116?
- (c) A group of workers has been awarded a 2% wage increase for the next year. If the retail prices index goes up from 124 to 128 for the next year, are the workers better or worse off in real terms?
- (d) Average salaries for staff in the head office of a company over 5 years are given below, together with an index of general prices for the same years.

<i>Year</i>	<i>Average Salary</i>	<i>Price Index</i>
1	£16,000	120
2	£16,300	122
3	£16,700	123
4	£17,000	126
5	£17,200	128

- Calculate the average salaries for each of the five years in terms of Year 5 prices. Give your answers to the nearest £.
 - Comment on the results of your calculations.
- (e) The price of a material is currently £24.00 per kg and a suitable price index is 120. The index is forecast to rise to 125 in a year's time. What would be the forecast price of the material at that time?

After a year, it was found that the index actually rose to 122. Calculate the error in the forecast of the material price.

2 STANDARD COSTING – DIRECT COSTS

- 2.1 (a) The standard cost per unit of product A includes:

Direct Material: 2 kg at £5.50 per kg.

In a given period, 10,500 units of product A were made, using 20,000 kg of Direct Material, at a total cost of £98,000.

Required:

Calculate the Direct Material Price and Usage Variances for Product A for this period.

- (b) The standard cost budget for 1,500 units of product B includes 4,500 metres of Direct Material at a total cost of £5,400.

In a given period, 1,700 units of product B were made, using 5,400 metres of Direct Material, at a total cost of £8,000.

Required:

Calculate the Direct Material Price and Usage Variances for Product B for this period.

- 2.2 (a) The standard cost per unit of product A includes:

Direct Labour: 0.5 hours at £6 per hour.

In a given period, 10,500 units of product A were made, taking 5,700 Direct Labour hours, at a total cost of £35,000.

Required:

Calculate the Direct Labour Rate and Efficiency Variances for Product A for this period.

- (b) The standard cost budget for 1,500 units of product B includes 3,000 hours of Direct Labour at a total cost of £24,000.

In a given period, 1,700 units of product B were made, taking 3,500 Direct Labour hours, at a total cost of £26,000.

Required:

Calculate the Direct Labour Rate and Efficiency Variances For Product B for this period.

- 2.3 The standard cost per unit of product C includes the following direct costs:

Direct Material: 1.5 kg at £16 per kg = £24 per product unit

Direct Labour: 4 hours at £7 per hour = £28 per product unit

In a given period, the actual results were as follows:

6,300 units of product C were made

10,000 kg of Direct Material were used, total cost £165,400

Direct Labour cost £180,000 for 25,200 hours

Required: for Product C for this period:

- (a) calculate the Direct Material Price and Usage Variances for this period.
- (b) calculate the Direct Labour Rate and Efficiency Variances for this period.
- (c) suggest possible reasons for the direct cost variances in this period.

2.4 State whether each of the following statements is true or false.

- (a) Normal amounts of wastage of direct materials are allowed for when the standard cost of a product is set.
- (b) If more product units are produced than planned, the direct materials usage variance will be adverse.
- (c) If the direct labour (total) variance is adverse, it means that the labour force worked more slowly than the standard.
- (d) Direct materials usage variances are based on the standard prices of the materials.
- (e) If forecasts under-estimate the rate of inflation when standards are set, all the direct cost variances will be adverse.
- (f) Purchasing a substitute for the normal direct material can affect both the price and usage variances.

2.5 The standard cost per unit of a product includes:

Direct material: 2.5 kg at £9.00 per kg

Direct Labour: 20 minutes at £6.00 per hour.

In a given period, the actual results were as follows:

7,620 product units were manufactured.

Direct material cost £8.80 per kg and 20,000 kg were used.

Direct labour rate was £6.60 per hour and the total cost was £16,500.

Required:

- (a) Calculate the direct material price and usage variances for the given period.
- (b) Calculate the direct labour rate and efficiency variances for the given period.
- (c) Set out a reconciliation of the standard direct cost of the actual output with the total actual direct cost, showing the variances calculated in (a) and (b).

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2.6 Varan Ltd has the following budgeted and actual direct cost and production data for its single product for the last three months.

	<i>Budget</i>	<i>Budget</i>	<i>Actual</i>	<i>Actual</i>
Production units	12,000		12,300	
Direct materials	36,000 m	£223,200	37,000 m	£250,000
Direct labour	24,000 hrs	£115,200	25,000 hrs	£122,500
Total direct costs		£338,400		£372,500

Required: Calculate all the direct cost variances for Varan Ltd for the last three month period and use them to reconcile the standard direct cost for the actual production level with the actual costs.

2.7 Margan Ltd uses marginal costing and has the following budgeted and actual variable cost and production data for the month of November.

	<i>Budget</i>	<i>Budget</i>	<i>Actual</i>	<i>Actual</i>
Production units	8,500		8,200	
Variable materials	10,625 kg	£63,750	10,100 kg	£63,630
Variable labour:				
Grade I	4,250 hrs	£35,700	4,000 hrs	£34,000
Grade II	6,375 hrs	£51,000	6,300 hrs	£50,400
Total variable costs		£150,450		£148,030

Required: Calculate all the relevant variable cost variances (keeping Grade I and II labour separate) and use them to reconcile the standard marginal cost for the actual production level with the actual marginal cost.

2.8 Rust Ltd manufactures a single product, the Rek. The standard direct costs of one Rek are as follows:

Direct Material: 4 kg @ £0.80 per kg =	£3.20
Direct Labour: 1.5 hours @ £8.00 per hour =	£12.00
Total direct cost	<u>£15.20</u>

In October 2004, Rust Ltd produced 9,000 Reks, and the total actual direct costs of production were £30,000 for direct material and £105,000 for direct labour.

The direct material usage variance for October 2004 has been calculated as £800 Favourable, and the Direct Labour Efficiency Variance as £4,000 Adverse.

Required:

- Calculate the total standard direct cost of production for 9,000 Reks.
- Calculate the total actual cost of production for October 2004.
- Calculate the direct material (total) variance for October 2004 and hence calculate the direct material price variance.
- Calculate the direct labour (total) variance for October 2004 and hence calculate the direct labour rate variance.
- Prepare a direct cost reconciliation statement for Rust Ltd for October 2004, showing the total standard and actual costs and all the variances.
- Eight possible separate causes of variances are given below. For each one, state whether it appears to be a valid reason for the variances shown in (e), and if so, to which variances it may have contributed.

- Production was interrupted due to a machine breakdown.

- 2 The supplier has improved the specification of the material.
- 3 An employee's mistake caused materials to be wasted.
- 4 There was a national wage increase, applicable to Rust Ltd's employees, which came into force on 1 October 2004.
- 5 The direct workers included a considerable number of trainees, who started work this month.
- 6 A bonus was offered to direct workers to encourage greater efficiency.
- 7 The purchasing department ordered the material from a different supplier.
- 8 The employees were deliberately working slowly in October to highlight their claim for a pay increase.

- 2.9** Garth Ltd uses standard costing in the preparation of its budgets. The following information relates to the budgeted and actual results for a given year for product Zed, which is one of the products manufactured by Garth Ltd.

Budget information: Product Zed

Production volume	1,200 units of Zed
Direct material quantity	7,200 kg
Total cost of direct material	£36,000
Direct labour hours	8,400 hours
Total direct labour cost	£50,400

Actual results : Product Zed

Production volume	1,400 units of Zed
Direct material quantity	8,200 kg
Total cost of direct material	£42,640
Direct labour hours	9,400 hours
Total direct labour cost	£56,500

During this period, a customer put in an extra order for Product Zed at short notice, which meant that a batch of direct material had to be purchased from a local supplier. This material was slightly different from that normally used in Product Zed, and was more expensive. Some overtime was worked to complete the order on time and the premium paid to employees for this was included in the direct labour cost.

Required:

- (a) Calculate all the direct material and direct labour variances for Product Zed for the given year.
- (b) Prepare a statement reconciling the standard direct cost of actual output with the actual direct cost of Product Zed for the given year.
- (c) Write a Memo to the manager of Garth Ltd, suggesting reasons for the difference between the standard and actual costs.

3 STANDARD COSTING – FIXED OVERHEADS

- 3.1** The budget for product A for a given period includes £48,000 of fixed overheads, to be absorbed on direct labour hours at a rate of £8 per direct labour hour. The planned production of product A is 12,000 units, the standard direct labour hours being 0.5 hours per unit of product A.

The actual results for the period were as follows:

10,500 units of product A were made, taking 5,700 direct labour hours.

Total actual fixed overheads amounted to £50,000.

Required:

Calculate for product A for the given period:

- the total fixed overhead variance
- the fixed overhead expenditure variance
- the fixed overhead volume variance
- the fixed overhead capacity variance
- the fixed overhead efficiency variance

- 3.2** The planned production of product B for a given period is 1,500 units. The standard cost per unit of B includes fixed overheads absorbed at a rate of £30 per direct labour hour. Each unit of B should take 2 hours of direct labour according to the standard.

In the given period, 1,700 units of product B were actually made, taking 3,500 direct labour hours. The actual fixed overheads were £85,000.

Required:

Calculate for product B for the given period:

- the total fixed overhead variance
- the fixed overhead expenditure variance
- the fixed overhead volume variance
- the fixed overhead capacity variance
- the fixed overhead efficiency variance

- 3.3** Margan Ltd uses marginal costing and has the following budgeted and actual fixed cost data for the month of November.

	<i>Budget</i>	<i>Actual</i>
Production units	8,500	8,200
Fixed costs	£90,100	£85,000

Required:

- (a) Calculate the fixed cost (expenditure) variance for Margan Ltd for November.
- (b) Explain briefly why there is no further analysis of fixed cost variances when marginal costing is being used.

3.4 The standard direct labour time per unit of a product is 20 minutes. Fixed overheads are to be absorbed on direct labour hours at an overhead absorption rate of £12.60 per hour, based on budgeted production of 7,800 units.

In a given period, the actual results were as follows:

7,620 product units were manufactured.

Direct labour hours used were 2,500 hours.

Actual fixed production overhead amounted to £33,000.

Required:

- (a) Calculate the following fixed overhead variances for this product for the given period:
 - total fixed overhead variance
 - fixed overhead expenditure variance
 - fixed overhead capacity variance
 - fixed overhead efficiency variance
 - fixed overhead volume variance
- (b) Which of the following statements is true for this case?
 - 1 Production output was more than planned, resulting in a favourable efficiency variance.
 - 2 Direct labour hours were less than planned, resulting in an adverse capacity variance.
 - 3 Fixed overheads were over-absorbed.
 - 4 Output was produced using less hours than the standard for the actual number of units.
 - 5 Spending on fixed overheads was less than expected.

3.5 Varan Ltd has the following budgeted and actual direct cost and production data for its single product for the last three months.

	<i>Budget</i>	<i>Budget</i>	<i>Actual</i>	<i>Actual</i>
Production units	12,000		12,300	
Direct materials	36,000 m	£223,200	37,000 m	£250,000
Direct labour	24,000 hrs	£115,200	25,000 hrs	£122,500
Fixed production overhead		£14,400		£16,000
Machine hours	18,000 hrs		18,500 hrs	

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Required:

- (a) Calculate the fixed production overhead absorption rate for Varan Ltd, based on machine hours.
- (b) Calculate the budgeted amount of fixed production overhead per unit of the product, using your answer to (a).
- (c) Calculate all the direct cost variances for Varan Ltd for the last three month period. (You may have already calculated these in Activity 2.6.)
- (d) Calculate all the fixed overhead variances for Varan Ltd for the last three month period.
- (e) Prepare a reconciliation statement for Varan Ltd's actual output for the last three months, showing the total standard and actual costs and all the variances calculated in (c) and (d) above.
- (f) Seven possible separate causes of variances are given below. For each one, state whether it appears to be a valid reason for the variances shown in (e), and if so, to which variances it may have contributed.
 - 1 A customer increased his order for the product at short notice.
 - 2 Due to extra demand for the product, insufficient direct materials were in stock, and a slightly different substitute material had to be obtained at short notice from a different supplier.
 - 3 Production was interrupted due to a machine breakdown.
 - 4 There was a national wage increase, applicable to Varan Ltd's employees, which came into force during this period.
 - 5 A number of production staff were off sick and therefore additional overtime was worked by others.
 - 6 A bonus was offered to direct workers to encourage greater efficiency.
 - 7 There have been improvements in production methods since the standard was set.

- 3.6** Island Holidays Ltd specialises in arranging holidays to a small island. The company uses its own 105-seat aircraft to transfer tourists to and from the island. The following report was presented to the manager of Island Holidays Ltd:

Island Holidays Ltd Operating Statement for Quarter 3, 2004

	<i>Budget</i>	<i>Actual</i>
Number of holidays	6,000	7,800
	£	£
Turnover	1,800,000	2,262,000
Accommodation	840,000	1,048,944
Air transport	720,000	792,000
Operating profit	240,000	421,056

The manager considers this report unhelpful and requests a standard costing report, reconciling the standard and actual costs for the actual holidays sold in the quarter. You are given the following additional information:

The accommodation cost is a variable cost and the usage variance is zero.

Air transport is a fixed cost.

The budget for a volume of 6,000 holidays was based on air transport capacity of 80 return flights in the quarter, with an average of 75 tourists per flight. These standards were used to calculate the fixed overhead absorption rate when costing individual holidays.

Due to weather conditions, there were only 78 flights in this quarter, carrying a total of 7,800 tourists.

Required:

- (a) Using the budgeted data, calculate the standard absorption cost per holiday
- (b) Using your answer to (a), calculate the standard absorption cost of 7,800 holidays
- (c) Calculate the following variances:
 - material price variance for accommodation
 - fixed overhead expenditure variance for air transport
 - fixed overhead volume variance for air transport
 - fixed overhead capacity variance for air transport
 - fixed overhead efficiency variance for air transport
- (d) Prepare a statement reconciling the standard absorption cost of 7,800 holidays to the actual total cost of 7,800 holidays
- (e) Calculate the actual total cost per holiday and identify the most important reason why this was lower than the standard absorption cost per holiday.

3.7 Image Dry Cleaners run four shops, each of which is equipped with a dry cleaning machine. Whenever possible, each machine is run with a full load, which is on average 20 items. The shops are open six days a week, and each machine can be used to dry clean a maximum of 5 loads per day, but Image's budget is set on the basis of 4 loads per machine per weekday, and 2 loads per machine on Saturdays. Image Dry Cleaners' budgeted fixed overheads are £6,160 per week and are absorbed on a machine run basis, with the standard set at an average load of 15 items per machine run.

During the week commencing 10 September 2004, the actual fixed overheads amounted to £6,010. Results from the Image shops showed:

	<i>Number of machine runs</i>	<i>Items cleaned</i>
North shop	18	288
South shop	24	384
East shop	20	300
West shop	20	288
Total	<u>82</u>	<u>1,260</u>

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Required:

- (a) Identify the output of Image Dry Cleaners and how it is measured in standard form. Calculate the fixed overhead absorption rate per machine run.
- (b) Calculate all the fixed overhead variances for Image Dry Cleaners for the week commencing 10 September 2004.
- (c) Write a short report to the manager of Image Dry Cleaners, summarising the subdivision of the fixed overhead variance into expenditure, volume, capacity and efficiency variances. Include brief comments on the meaning of these variances in relation to the actual results and the usefulness of the analysis.

- 3.8** The Village Museum is a small private museum, which is open each day except Monday, throughout the year. The costs of running the museum are all costs which relate to time periods and do not depend on the number of visitors. Visitors are charged for entry and can stay as long as they wish in the museum on that day. The fixed costs for the first six months of the current year were budgeted as £8,400 and the total number of visitors expected was 2,400.

The actual fixed costs for the first six months of the current year were £8,670 and the actual total number of visitors was 2,550.

Required:

- (a) Calculate a fixed cost absorption rate for the museum, based on the number of visitors.
- (b) Calculate the fixed cost variance for the first six months of the current year, and analyse it into expenditure and volume variances. State why each of these variances has arisen.
- (c) Explain briefly why analysis of the volume variance into capacity and efficiency variances would not be relevant in this case.

- 3.9** The Riviera Swimming Pool is open for 1,200 hours per quarter. There should be five staff on duty throughout opening hours. The cost budget for the second quarter of 2004 is shown below, together with the actual costs for the quarter.

Riviera Swimming Pool: Quarter 2, 2004

	<i>Budget</i>	<i>Actual</i>
Opening hours	1,200	1,200
Direct material for water treatment: quantity (litres)	4,500	4,620
Direct material cost (£)	8,100	8,300
Direct labour hours	6,000	5,900
Direct labour cost (£)	32,400	32,450
Fixed overheads (£)	28,000	30,000
Number of customer visits	20,000	18,600

Required:

- (a) Calculate:
- the standard cost per litre of direct material
 - the standard cost per direct labour hour
 - the fixed overhead absorption rate, based on the number of customer visits
- (b) Calculate, for quarter 2, 2004:
- the direct material price variance
 - the direct labour rate variance
 - the fixed overhead expenditure variance
 - the fixed overhead volume variance, based on the budgeted and actual numbers of customer visits
- (c) Explain briefly why it is not appropriate to split the fixed overhead volume variance into capacity and efficiency variances in this case.

4 STANDARD COSTING – FURTHER ANALYSIS

- 4.1 (a) Explain briefly the meaning and implications of each of the following, in relation to standard costing:
- ideal standard
 - attainable standard
 - basic standard
- Which of these is most appropriate for the purposes of variance analysis and why?
- (b) Explain briefly what is meant by the following terms in relation to variance analysis:
- control limits
 - management by exception
- (c) Give one example of how methods of costing and the setting of standards may affect the behaviour of a manager who is held responsible for particular variances.

- 4.2 The standard cost per litre of a material is £3.20, based on its expected average price over the coming year. Time series analysis of the cost of this item over the last 5 years indicates that the following additive seasonal variations in the price can be expected.

Quarter 1	January to March	– £0.10
2	April to June	+ £0.05
3	July to September	+ £0.10
4	October to December	– £0.05

Required:

Using the given data for each of the following months, calculate the Material Price Variance for this material, and analyse it into the part expected to be due to the seasonality of the price and the part due to other influences.

- (a) In January, 18,000 litres were used, at a total cost of £54,000.
- (b) In May, 18,000 litres were used, at a total cost of £58,140.
- 4.3 The standard cost per metre of a material is £20, based on its expected average price over the coming year. Time series analysis of the cost of this item over the last 5 years indicates that the following proportional (multiplicative) seasonal variations in the price can be expected.

Quarter 1	January to March	+15%
2	April to June	+5%
3	July to September	– 20%
4	October to December	zero

Required:

Using the given data for each of the following months, calculate the Material Price Variance for this material, and analyse it into the part expected to be due to the seasonality of the price and the part due to other influences.

- (a) In May, 6,400 metres were used, at a total cost of £124,800.
- (b) In September, 7,000 metres were used, at a total cost of £105,000.

- 4.4** A business set its standard price for a certain material when the appropriate price index was 148. The assumption was made that the index would rise to 150 by the time the standard was in use, and therefore the standard decided upon was £60 per unit of material, to take this into account. By the time the standard was in use, the index had actually risen to 152 and in a given month 5,800 units of material actually cost £350,900.

Required:

Calculate the Material Price Variance for this material, and analyse it into the part due to the actual change in the price index and the part due to other factors.

- 4.5** When standards were being decided upon, the appropriate wage rate index was expected to rise from 180 to 189, and the standard wage rate was set as £7.35 per hour to take account of this. In fact, by the time the standard was in use, an increase of 4% had been brought in for the relevant employees. In a given period, £79,056 was paid for a total of 10,800 hours.

Required:

Calculate the Labour Rate Variance for this period, and analyse it into the part due to the actual pay award and the part due to other factors.

- 4.6** A company imports a direct material from Beta Island and pays in Beta Dollars (B\$). The standard price per unit of the material was set in B\$, equivalent to £36, when the exchange rate was B\$5 to the £. The exchange rate is subject to fluctuations, however, due to instability in the Beta Island economy.

Required:

For each of the following months, calculate the Material Price Variance, and analyse it into the part due to exchange rate changes and the part due to other factors.

- (a) In June the exchange rate was B\$4.50 = £1. In June 7,500 units of material cost £307,500 in total.
- (b) In September the exchange rate was B\$6 = £1. In September 8,000 units of material cost £256,000 in total.

- 4.7** A company imports a direct material from Gamma Island and pays in Gamma Dollars (G\$). The standard price per unit of the material was set in G\$, equivalent to £40, when the exchange rate was G\$30 to the £. The exchange rate is subject to fluctuations, however, due to instability in the Gamma Island economy.

Required:

For each of the following months, calculate the Material Price Variance, and analyse it into the part due to exchange rate changes and the part due to other factors.

- (a) In July the exchange rate was G\$32 = £1. In July 4,800 units of material cost £168,000 in total.
- (b) In November the exchange rate was G\$25 = £1. In November 5,200 units of material cost £260,000 in total.

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4.8 The standard cost per unit of product UV includes:

Direct material: 4 kg at £2.50 per kg, ie £10.00 per unit of UV

Direct Labour: 1.5 hours at £6.20 per hour, ie £9.30 per unit of UV

In a given period, the actual results were that 4,500 units of UV were produced, using 20,000 kg of direct material and taking 6,400 direct labour hours. The total cost of direct material was £48,000 and the total cost of direct labour was £40,000.

Required: for Product UV for the given period:

- (a) calculate the direct material total variance and split it into price and usage variances.
- (b) calculate the direct labour total variance and split it into rate and efficiency variances.
- (c) After calculating the variances as above, additional information becomes available:

The standard for direct material usage should have been changed to 4.2 kg per unit of UV for this period, due to a change in its specification.

The standard for direct labour time was set at 90% level of efficiency for a previous period, when staff were being trained. For the given period, 100% level of efficiency was expected and the standard had not been updated.

- (i) Calculate the part of the direct material usage variance due to the incorrect standard and the part due to other reasons.
- (ii) Calculate the part of the direct labour efficiency variance due to the out of date level of efficiency in the standard and the part due to other reasons.

4.9 The standard cost per unit of product W includes:

Direct material: 7 kg at £8.00 per kg, ie £56.00 per unit of W

Direct Labour: 4 hours at £5.00 per hour, ie £20.00 per unit of W

In a given period, the actual results were that 16,000 units of W were produced, using 113,600 kg of direct material and taking 68,640 direct labour hours. The total cost of direct material was £920,160 and the total cost of direct labour was £336,336.

Required: for Product W for the given period:

- (a) calculate the direct material total variance and split it into price and usage variances.
- (b) calculate the direct labour total variance and split it into rate and efficiency variances.
- (c) After calculating the variances as above, additional information becomes available:

The standard for the price of direct material should have been increased by 1.25% for this period, due to a change in supplier.

Production workers are new to this work and are currently taking 10% longer to make a unit of W than they will when fully trained.

- (i) Calculate the part of the direct material price variance due to the incorrect standard and the part due to other reasons.
- (ii) Calculate the part of the direct labour efficiency variance due to the production workers not yet being fully trained and the part due to other reasons.

- 4.10** Brighter Chemicals makes a single product, XZ, which is sold in 5-litre tins. Fixed overheads are absorbed on the basis of direct labour hours. Budgeted production is 1,750 tins per month and the standard cost per tin is as follows:

Direct material: 5 litres at £40 per litre = £200 per tin of XZ

Direct labour: 10 hours at £6 per hour = £60 per tin of XZ

Fixed overheads: 10 hours at £24 per hour = £240 per tin of XZ

During the month of May 2004, actual production was 1,700 tins of XZ and the actual total costs were as follows:

Direct material £338,283

Direct labour £110,330

Fixed overheads £410,000

The actual cost of direct material was £40.20 per litre and the actual direct labour rate was £5.90 per hour.

Required:

- (a) Calculate for the month of May 2004:
- (i) actual litres of material used
 - (ii) actual hours worked
 - (iii) standard quantity of material for the actual output of 1,700 tins of XZ
 - (iv) standard direct labour hours for the actual output of 1,700 tins of XZ
 - (v) the total budgeted fixed overheads
- (b) Calculate the following variances for the month of May 2004:
- (i) direct material price variance
 - (ii) direct material usage variance
 - (iii) direct labour rate variance
 - (iv) direct labour efficiency variance
 - (v) fixed overhead expenditure variance
 - (vi) fixed overhead volume variance
 - (vii) fixed overhead capacity variance
 - (viii) fixed overhead efficiency variance
- (c) Prepare a statement for the month of May 2004, reconciling the standard cost of the actual output of XZ to the actual cost, detailing the variances

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- (d) You are given the following additional information after preparing the statement in part (c):
- the direct material used is purchased in drums, each of which has a guaranteed minimum content
 - the tins of output of XZ are filled by a machine and the amounts put into the tins may vary very slightly
 - an appropriate index of raw material prices was 124.00 when the direct material standard price was set, but by May 2004 it was actually 125.86

You are asked to write a short memo to the production director, explaining:

- (i) three factors which may have contributed to the favourable direct material usage variance, but which do not represent efficient usage of the material
- (ii) why it is important to investigate favourable variances as well as adverse variances
- (iii) how the material price variance has arisen partly due to the change in the standard cost as measured by the material price index and partly due to other reasons, showing your calculation of these two parts.