Question 19.28

(a) The management accountant should consider the following factors when deciding whether or not to investigate variances:

(i) *The size of the variances:* This may be expressed in terms of percentage variation from standard or budget. Alternatively, statistical techniques can be used to determine the probability of the variance occurring when it is under control. The size of the variance indicates the likelihood that the variance is due to an assignable cause.

(ii) *Costs and benefits of investigation:* The management accountant should assess whether the costs of investigation are less than the benefits that are expected to result from the investigation.

(iii) *Nature of the standard:* Are expected or ideal standards used? If ideal standards are used then investigation of the variances is unlikely to result in the variances being eliminated.

(iv) *Cumulative variances:* A variance showing an increase in size over time may justify an investigation even when the variance for the particular period is not significant. Alternatively, a variance that is significant for a particular period but that is decreasing over time may be under control.

(v) *Validity of standard or budget:* The validity of the standard will help the accountant to gauge the significance of the variance. A price variance in times of rapidly rising prices is unlikely to be due to an assignable cause.

(b) The management accountant can take the following action to improve the chances of achieving positive results from investigating variances:

(i) *Speedy identification and reporting of variances:* Significant delays between the occurrence of a variance and its notification to managers will limit the degree of control that managers can achieve. The sooner a variance is identified, the sooner it can be investigated and acted upon.

(ii) *Analysis of variances:* The accountant should provide clues as to the possible reasons for the variances by pinpointing where the variances have arisen. For example, the accountant might identify the reason for a direct material variance as being due to excessive usage of a certain material in a particular process. This should assist the responsibility manager in quickly identifying the cause of the excessive usage.

(iii) *Statistical procedures:* Statistical procedures and quality control charts should be used so as to determine the probability that variances are due to an assignable cause. If managers are frequently required to investigate variances that are due to random variations then it is unlikely that they will give detailed attention to the investigation process. However, if the majority of variances reported are significant then managers will attach greater importance to the investigation process.

(iv) *Develop a team effort approach:* The accountant should be seen by managers as supportive within the control process. If a team effort approach is developed then it is likely that managers will be more actively involved in the investigation process.
The following problems might occur during periods of rapid inflation:

(i) The standards will presumably include some assumptions about inflation. If this assumption is not clearly stated then it is difficult to determine how much of a price variance is due to inflation and how much is due to buying efficiency.

(ii) Price indices tend to reflect average price changes. Consequently, it is difficult for a company to predict future costs and interpret variances if the specific rate of inflation for its inputs is considerably different from the general rate of inflation.

(iii) Inflation may result in relative changes in the prices of inputs. Therefore standard mixes requiring different inputs may no longer be the most efficient mix.

(iv) If standard prices are not adjusted then the efficiency variances will be understated.

(v) The impact of inflation will have an immediate effect on cash flows, but some delay will occur before the full extent of the variances is ascertained. Therefore management may not respond quickly enough to pricing, output and sourcing decisions in order to effectively control cash flows.

(vi) Sharp rises in prices will raise questions as to whether unadjusted standards can be used in the decision-making process (e.g. pricing decisions).

(vii) Administrative work in maintaining up-to-date standards when prices are constantly changing.

When establishing standards, the inflation factor that has been assumed should be clearly stated so that variances can be analysed by price and efficiency changes.

(iii) Variances should be analysed by their forecasting and operational elements as indicated in Chapter 19.

(iv) Standard mixes should be established for a range of prices for the material inputs, and management should be prepared to implement changes in the mix immediately price changes dictate that a change is necessary.

The sales volume variance is the difference between budgeted sales volume and actual sales volume. It can be valued at the sales revenue per unit sold, contribution margin per unit sold or the profit margin per unit sold. For an explanation of the weaknesses arising from valuing the variance using sales revenues see ‘Sales variances’ in Chapter 18. It is preferable to value variances at the unit contribution margin. This is because deviations from budgeted sales will result in profit changing by the amount of the unit contribution multiplied by sales volume, assuming all other factors remain unchanged. Profit margins are derived after deducting unit fixed overheads from the contribution per unit. However, in the short term, fixed overheads will remain unchanged, so changes in sales volume will not result in profit changing by the change sales volume multiplied by the profit margin per unit. As indicated above, profit will be a function of sales volume multiplied by the contribution per unit.

The principle of separating variances into the planning and operational variances is explained in the section on ex post variance analysis in Chapter 19. Note that in this section the terms ‘efficiency’ or ‘controllable variances’ are used to describe operational variances. The principles described in this section can be applied to sales price variances. For example, if the original budgeted selling price was £100 and the actual price was £110 the conventional method would report a price variance of £10 per unit sold. However, if the ex post efficient market price for the product is £115, it should represent the revised standard and the price variance can be separated into a favourable planning variance of £15 (£115 – £100) and an unfavourable operational price efficiency variance of £5 (£110 – £115). Future planning should be based on using the £115 standard since it reflects the most up to date standard, and investigations should be made as to why the actual selling price was less than the ex post expected market price.
Question 19.31
(a) Because standard costs represent future target costs based on the elimination of avoidable inefficiencies they are preferable for decision-making to estimates based on an adjustment of past costs which may incorporate inefficiencies. For example, where cost-plus pricing is used as an input to pricing decisions, standard costs provide more appropriate information because efficient competitors will also base any price bids on costs where efficiencies have been eliminated. Alternatively, where competitive market prices exist for a firm’s products so that they are price takers, it will be necessary for such firms to periodically review the profitability of their products to identify possible loss making activities. In such circumstances product costs for input into the profitability analysis should be extracted from a database of standard costs reviewed periodically. A periodic cost audit should be undertaken to provide a strategic review of the standard costs and profitability of a firm’s products. The review provides attention-directing information for signalling the need for more detailed studies to make cost reduction, discontinuation, redesign and outsourcing decisions. Standard costs thus provide the basis for such decisions and avoid the need for the detailed tracking of costs.

Standard costing can also be used with target costing for decision-making. Target costs can be compared with costs derived from the standard costing system to identify the estimated cost. If the estimated/standard cost exceeds the target cost, ways are investigated of driving down the estimated cost to the target cost. You should refer to Chapter 22 for a detailed explanation of target costing.

Finally, trends in variances can be monitored to identify the need for actions for improvement and changes in product design, production methods, etc. Situations where there has been a lack of improvement in the variances can be investigated with a view to introducing alternative designs and improvements in production methods.

(b) See ‘The effect of the level of budget difficulty on motivation and performance’ in Chapter 16 for the answer to this question. In addition, the following points should be included in the answer.
1. An over-emphasis on achieving standards and reporting variances can have dysfunctional effects. For example, purchasing officers might strive to achieve favourable price variances by purchasing inferior materials or focusing on prices at the expense of reliable and on-time deliveries and generally not fostering long-term supplier relationships.
2. Excessive focus on labour efficiency variances may encourage large production batches to reduce idle and set-up time but such savings may be outweighed by the increased costs associated with the higher stocks and work in progress. Also favourable volume variances may be achieved by producing in excess of demand and maintaining excessive stocks.
3. If overheads are absorbed on the basis of direct labour this can result in an over-emphasis on direct labour efficiency. However, improvements in direct labour will not cause overheads to reduce where there is only a weak cause-and-effect relationship between direct labour hours and overhead spending.

For a more detailed discussion of the above points you should refer to ‘Criticisms of standard costing’ in Chapter 19.

Question 19.32
(a) Variance analysis
Material price = (standard price – actual price) × actual purchases
X = (£20 – £20.50) × 9000
   = £4500A
Y = (£6 – £5.50) × 5000
   = £2500F

Material usage = (standard usage – actual usage) × standard price
X = (800 × 10 kg – 7800 kg) × £20
   = £4000F
\[
Y = (800 \times 5 \text{ litres} - 4300 \text{ litres}) \times £6
= £1800\text{A}
\]

Wage rate = \[
[\text{standard rate (£6) - actual rate (£24 150/4200)}]
\times \text{actual hours (4200)}
= £1050\text{F}
\]

Labour efficiency = \[
[\text{standard hours (800 \times 5 hrs) - actual hours (4200)}]
\times \text{standard rate (£6)}
= £1200\text{A}
\]

Fixed overhead expenditure = \[
\text{budgeted cost (10 800/12 \times £50)}
- \text{actual cost (£47 000)}
= £2000\text{A}
\]

Volume efficiency = \[
[\text{standard hours (800 \times 5 hrs) - actual hours (4200)}]
\times (\£50/5 \text{ hours})
= £1200\text{A}
\]

Volume capacity\(^a\) = \[
[\text{actual hours (4200) - budgeted hours\(^b\) (4500)}]
\times \text{FOAR (£50/5 \text{ hours})}
= £3000\text{A}
\]

Notes
\(^a\) Note that the CIMA Terminology (at the time of setting the examination) described the volume variance as being equivalent to the volume capacity variance.
\(^b\) Budgeted hours = monthly budgeted output (10 800/12) \times 5 \text{ hrs}

(b) Stores control

\[
\begin{array}{lccc}
\text{K Ltd: X (AQ \times SP)} & 180 000 & \text{WIP: (SQ \times SP)} & 160 000 \\
\text{C Ltd: Y (AQ \times SP)} & 30 000 & \text{WIP: (SQ \times SP)} & 24 000 \\
\text{Material usage variance (X)} & 4 000 & \text{Material usage variance (Y)} & 1 800 \\
\text{Balance} & & \text{Balance} & 28 200 \\
\hline
\text{£214 000} & & \text{£214 000} & \\
\end{array}
\]

Wages control account

\[
\begin{array}{lccc}
\text{Cash} & 20 150 & \text{Wages owing b/fwd} & 6 000 \\
\text{PAYE and NI} & 5 000 & \text{Labour efficiency} & 1 200 \\
\text{Accrued wages} & 5 000 & \text{WIP (SQ \times SP)} & 24 000 \\
\text{Wage rate variance} & 1 050 & & \\
\hline
\text{£31 200} & & \text{£31 200} & \\
\end{array}
\]

WIP control account

\[
\begin{array}{lccc}
\text{Stores control: X} & 160 000 & \text{Finished goods control a/c} & 248 000 \\
\text{Y} & 24 000 & & \\
\text{Wages control} & 24 000 & & \\
\text{Fixed overhead} & 40 000 & & \\
\hline
\text{£248 000} & & \text{£248 000} & \\
\end{array}
\]
### Fixed overhead control

<table>
<thead>
<tr>
<th>Description</th>
<th>(£)</th>
<th>(£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expense creditors</td>
<td>33 000</td>
<td>WIP (SQ × SP)</td>
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<tr>
<td>Depreciation provision</td>
<td>14 000</td>
<td>Expenditure variance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Efficiency variance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Capacity variance</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>£47 000</strong></td>
<td><strong>£47 000</strong></td>
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### Finished goods control

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<tbody>
<tr>
<td>WIP control</td>
<td>£248 000</td>
<td>Cost of sales</td>
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</table>

### Cost of sales

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<th>Description</th>
<th>(£)</th>
<th>(£)</th>
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</thead>
<tbody>
<tr>
<td>Finished goods control</td>
<td>£248 000</td>
<td>Profit and loss (P/L)</td>
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</tbody>
</table>

### Material price variance

<table>
<thead>
<tr>
<th>Description</th>
<th>(£)</th>
<th>(£)</th>
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</thead>
<tbody>
<tr>
<td>K Ltd: X</td>
<td>4500</td>
<td>C Ltd: Y</td>
</tr>
<tr>
<td>P/L</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>£4500</strong></td>
<td><strong>£4500</strong></td>
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</table>

### Material usage variance

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<thead>
<tr>
<th>Description</th>
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<th>(£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stores control: Y</td>
<td>1800</td>
<td>Stores control: X</td>
</tr>
<tr>
<td>P/L</td>
<td>2200</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>£4000</strong></td>
<td><strong>£4000</strong></td>
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</table>

### Labour rate variance

<table>
<thead>
<tr>
<th>Description</th>
<th>(£)</th>
<th>(£)</th>
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</thead>
<tbody>
<tr>
<td>P/L</td>
<td>£1050</td>
<td>Wages control</td>
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</tbody>
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### Labour efficiency variance

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<thead>
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<th>(£)</th>
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</thead>
<tbody>
<tr>
<td>Wages control</td>
<td>1200</td>
<td>P/L</td>
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</table>

### Fixed overhead expenditure variance

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<tr>
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<th>(£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overhead control</td>
<td>2000</td>
<td>P/L</td>
</tr>
</tbody>
</table>
Fixed overhead efficiency variance

Overhead control £2000 P/L £2000

Fixed overhead capacity variance

Overhead control £3000 P/L £3000

Sales

P/L £320 000 Debtors £320 000

K Limited

STORES CONTROL 180 000

Price variance account £4 500

C plc

Price variance account £2 500 Stores control £30 000

Expense creditors

Fixed overhead control £33 000

K Limited

Provision for depreciation

Fixed overhead control £14 000

Profit and loss account

Sales £320 000

Cost of sales £248 000

Variances

F (A)

Material price — 2 000

usage 2200 —

Labour rate 1050 —

efficiency — 1 200

Overhead expenditure — 2 000

efficiency — 2 000

volume — 3 000

3250 10 200 6 950

Gross profit 65 050
(c) The difference of £250 in the accounts is due to the fact that the material price variance has been calculated on purchases (instead of usage) and written off as a period cost. In the question the raw material stocks are recorded at actual cost, and therefore the £250 is included in the stock valuation and will be recorded as an expense next period.

**Question 19.33**

(a) **Cost variance calculations**

Material price:

\[(SP - AP) \times AQ\]

\[
\begin{array}{ll}
\text{A (} £0.30 - £0.20\text{)} \times 8000 & 800 \text{ F} \\
\text{B (} £0.70 - £0.80\text{)} \times 5000 & 500 \text{ A}
\end{array}
\]

Material mix:

\[(\text{actual wage in standard proportions} - \text{actual wage in actual proportions}) \times SP\]

\[
\begin{array}{ll}
\text{A (} 6500 - 8000\text{)} \times £0.30 & 450 \text{ A} \\
\text{B (} 6500 - 5000\text{)} \times £0.70 & 1050 \text{ F} 600 \text{ F}
\end{array}
\]

Material yield:

\[(\text{actual yield} - \text{standard yield}) \times SC \text{ per unit of output}\]

\[(12000 - 13000) \times £0.50\]

\[500 \text{ A}\]

Wage rate:

\[(SR - AR) \times AH\]

\[
\begin{array}{ll}
\text{Skilled (} £3 - £2.95\text{)} \times 6000 & 300 \text{ F} \\
\text{Semi-skilled (} £2.50 - £2.60\text{)} \times 3150 & 315 \text{ A}
\end{array}
\]

Labour mix:

\[(\text{AQ in standard and proportions} - \text{AQ in actual proportions}) \times SR\]

\[
\begin{array}{ll}
\text{Skilled (} 5799 - 6000\text{)} \times £3 & 603 \text{ A} \\
\text{Semi-skilled (} 3351 - 3150\text{)} \times £2.50 & 503 \text{ F} 100 \text{ A}
\end{array}
\]

Labour productivity:

\[(\text{SQ in standard and proportions} - \text{AQ in standard proportions}) \times SR\]

\[
\begin{array}{ll}
\text{Skilled (} 5400 - 5799\text{)} \times £3 & 1197 \text{ A} \\
\text{Semi-skilled (} 3120 - 3351\text{)} \times £2.50 & 578 \text{ A} 1775 \text{ A}
\end{array}
\]

Fixed overhead spending:

\[BC - AC\]

\[£10000 - £9010\]

\[990 \text{ F}\]

Variable overhead spending:

\[\text{flexed budgeted} - AC\]

\[12000 \times £0.50 = 6000 - £7500\]

\[1500 \text{ A}\]

Fixed overhead volume:

\[(\text{actual production} - \text{budgeted production}) \times FOAR\]

\[12000 - 10000 \times £1\]

\[2000 \text{ F}\]

Total cost variances

\[\text{Nil}\]
Sales margin variance calculations
Sales volume variance: (\(£\))
\[
\text{(actual sales volume} - \text{budgeted volume}) \\
\times \text{standard margin} \\
(11000 - 10000) \times £1
\]
1000F

Sales margin price variance:
\[
\text{(actual selling price} - \text{budgeted selling price}) \\
\times \text{actual sales volume} \\
(\£5 - \£5) \times 7000 = 0 \\
(\£4.75 - \£5) \times 4000 = 1000A
\]
Total sales variances 1000A nil

The question requires the calculation of the material usage variance and the labour efficiency variance. These variances are calculated as follows:

\[
\text{direct material usage variance} = \text{mix variance} + \text{yield variance} \\
= £600F + £500A = £100F
\]

\[
\text{labour efficiency variance} = \text{mix variance} + \text{productivity variance}
\]

\[
\text{Skilled} = 603A + 1197A = 1800A \\
\text{Unskilled} = 503F + 578A = 75A \\
\]

Reconciliation of actual and budgeted profit
The total of the cost variances and the sales variances are zero. Therefore actual profit equals budgeted profit.

Notes

a Budgeted usage is 1 kg of materials for 1 unit of output. The standard yield for an input of 13 000 kg is therefore 13 000 units.

The standard material cost per unit of output is:

\[
\begin{align*}
\text{A} (0.5 \times £0.30) &= 0.15 \\
\text{B} (0.5 \times £0.70) &= 0.35 \\
\text{total} &= 0.50
\end{align*}
\]

b

\[
\text{Skilled} = 9150 \text{hrs} \times 4500/7100 = 5799 \text{hrs} \\
\text{Semi-skilled} = 9150 \text{hrs} \times 2600/7100 = 3351 \text{hrs}
\]

c The standard labour quantity is 0.45 skilled hours and 0.26 unskilled hours for each unit of output. For an output of 12 000 units the standard labour hours are:

\[
\begin{align*}
\text{skilled} &= 5400 (12000 \times 0.45 \text{ hrs}) \\
\text{semi-skilled} &= 3120 (12000 \times 0.26 \text{ hrs})
\end{align*}
\]

(b) The sales volume variance shows the effect on profit from sales volume being in excess of budget (assuming standard costs remain unchanged). The adverse sales price variance of £1000 indicates the lost profits from selling below the
standard price. However, the reduction in the selling price will be partly accounted for by the increase in sales volume. An ex-post budget comparison should be used. For example, a revised target for sales that could have been obtained at the actual selling prices should be used to calculate the volume variance.

The price paid for material A is less than standard and the price paid for B is above standard. This might explain why the company has substituted material A for B during the period. The usage variance is £100 favourable, but £600 of this is due to the change in the materials mix. The difference of £500 represents the excess wage when the mix variance is not taken into account. The analysis does not indicate whether the excess usage is due to using a non-standard mix or to inefficient usage.

The wage rate variances arise because the skilled rate is below standard but the semi-skilled rate is above the standard. There is a significant adverse labour efficiency variance, which should be investigated. The mix and productivity variances are unlikely to provide any helpful clues in explaining the adverse efficiency variance.

The fixed overhead volume variance arises because output is in excess of budget but this variance is not particularly useful (see 'Volume variance' in Chapter 18 for an explanation). The variable overhead expenditure variance is partly a spending variance and a usage variance, and on its own is not very meaningful. Any meaningful analysis of this variance requires a comparison of the actual expenditure with budget for each variable cost item.

**Question 19.34**

(a) It is assumed that the actual selling price for the period was the same as the budgeted selling price.

**Sale volume variance**

\[
\text{Sale volume variance} = (\text{Actual sales volume} - \text{Budgeted sales volume}) \times \text{Standard contribution} \\
= (2850 - 2500) \times £78 \\
= £27,300 \text{F}
\]

**Material price variance**

\[
\text{Material price variance} = (\text{Standard price} - \text{Actual price}) \times \text{Actual quantity} \\
= (£20 - £18) \times 12,450 \\
= £24,900 \text{F}
\]

**Material usage variance**

\[
\text{Material usage variance} = (\text{Actual quantity} - \text{Standard quantity}) \times \text{Standard price} \\
= (2850 \times 4 \text{ kg} = 11,400 - 12,450) \times £20 \\
= £21,000 \text{A}
\]

**Wage rate variance**

\[
\text{Wage rate variance} = (\text{Standard rate} - \text{Actual rate}) \times \text{Actual hours} \\
= (£7 - £8) \times 18,800 \\
= £18,800 \text{A}
\]

**Labour efficiency variance**

\[
\text{Labour efficiency variance} = (\text{Actual hours} - \text{Standard hours}) \times \text{Standard rate} \\
= (2850 \times 6 \text{ hrs} = 17,100 \text{ hrs} - 18,800 \text{ hrs}) \times £7 \\
= £11,900 \text{A}
\]

**Reconciliation statement**

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<thead>
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<th></th>
<th>(£)</th>
<th>(£)</th>
</tr>
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<tbody>
<tr>
<td>Budget contribution</td>
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<td>195,000</td>
</tr>
<tr>
<td>Sales volume variance</td>
<td>27,300</td>
<td>27,300F</td>
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<tr>
<td>Sales price variance</td>
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<td></td>
</tr>
<tr>
<td>Material usage variance</td>
<td>21,000A</td>
<td>21,000A</td>
</tr>
<tr>
<td>Material price variance</td>
<td>24,900F</td>
<td>3,900F</td>
</tr>
</tbody>
</table>
Wage rate variance 18 800A  
Labour efficiency variance 11 900A 30 700A  
Actual contribution 195 500

(b) (i) **Original standard**

<table>
<thead>
<tr>
<th>Item</th>
<th>Original standard ((\£))</th>
<th>Revised ex post standard ((\£))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials</td>
<td>2500 (\times) 4 kg (\times) (\£)20 = 200 000</td>
<td>2500 (\times) 4.5 kg (\times) (\£)16.50 = 185 625</td>
</tr>
<tr>
<td>Labour</td>
<td>2500 (\times) 6 hrs (\times) (\£)7 = 105 000</td>
<td>2500 (\times) 6 hrs (\times) (\£)6.50 = 97 500</td>
</tr>
<tr>
<td>Sales</td>
<td>2500 (\times) (\£)200 = 500 000</td>
<td>2500 (\times) (\£)200 = 500 000</td>
</tr>
<tr>
<td>Contribution</td>
<td>195 500</td>
<td>216 875</td>
</tr>
</tbody>
</table>

(ii) **Revised ex post standard**

<table>
<thead>
<tr>
<th>Item</th>
<th>Original standard ((\£))</th>
<th>Revised ex post standard ((\£))</th>
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<tbody>
<tr>
<td>Materials</td>
<td>2500 (\times) 4.5 kg (\times) (\£)16.50 = 185 625</td>
<td>2500 (\times) 4 kg (\times) (\£)20 = 200 000</td>
</tr>
<tr>
<td>Labour</td>
<td>2500 (\times) 6 hrs (\times) (\£)6.50 = 97 500</td>
<td>2500 (\times) 6 hrs (\times) (\£)7 = 105 000</td>
</tr>
<tr>
<td>Sales</td>
<td>2500 (\times) (\£)200 = 500 000</td>
<td>2500 (\times) (\£)200 = 500 000</td>
</tr>
<tr>
<td>Contribution</td>
<td>195 500</td>
<td>216 875</td>
</tr>
</tbody>
</table>

(iii) **Actual**

<table>
<thead>
<tr>
<th>Item</th>
<th>Actual ((\£))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials</td>
<td>12 450 kg (\times) (\£)18 = 224 100</td>
</tr>
<tr>
<td>Labour</td>
<td>18 800 hrs (\times) (\£)8 = 374 500</td>
</tr>
<tr>
<td>Sales</td>
<td>2850 (\times) (\£)200 = 570 000</td>
</tr>
<tr>
<td>Contribution</td>
<td>195 500</td>
</tr>
</tbody>
</table>

The total variances consist of a favourable planning variance of \(\£\)21 875 (\(\£\)216 875 \(\text{–} \) \(\£\)195 000) and an adverse operational variance of \(\£\)21 375 (\(\£\)216 875 \(\text{–} \) \(\£\)195 500). The analysis of these variances is shown below.

**Planning variances**

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<thead>
<tr>
<th>Item</th>
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<th>(\£)</th>
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</thead>
<tbody>
<tr>
<td>Material usage(^a) ((2500 \times 0.5 \text{ kg} \times \£20))</td>
<td>25 000A</td>
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</tr>
<tr>
<td>Material price(^a) ((\£20 \text{–} \£16.50) \times (2500 \times 4 \text{ kg}))</td>
<td>35 000F</td>
<td></td>
</tr>
<tr>
<td>Joint price/quantity variance ((2500 \times 0.50 \text{ kg}) \times (\£20 \text{–} \£16.50))</td>
<td>4 375F</td>
<td></td>
</tr>
<tr>
<td>Wage rate ((2500 \times 6 \text{ hrs} \times \£0.50))</td>
<td>7 500F</td>
<td>21 875F</td>
</tr>
</tbody>
</table>

**Operational variances**

<table>
<thead>
<tr>
<th>Item</th>
<th>(\£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material usage ((2850 \times 4.5 \text{ kg} = 12 825 \text{ kg} \text{–} 12 450) \times \£16.50)</td>
<td>6 187.50F</td>
</tr>
<tr>
<td>Material price ((\£16.50 \text{–} \£18) \times 12 450 \text{ kg})</td>
<td>18 675.00A</td>
</tr>
<tr>
<td>Labour efficiency ((2850 \times 6 \text{ hrs} = 17 100 \text{ hrs} \text{–} 18 800) \times \£6.50)</td>
<td>11 050.00A</td>
</tr>
<tr>
<td>Wage rate ((\£6.50 \text{–} \£8) \times 18 800 \text{ hrs})</td>
<td>28 200.00A</td>
</tr>
<tr>
<td>Sales volume ((350 \text{ units at £86.75 revised unit contribution(^b)}))</td>
<td>39 250.00A</td>
</tr>
<tr>
<td>Sales volume ((350 \text{ units at £86.75 revised unit contribution(^c)}))</td>
<td>30 362.50F</td>
</tr>
<tr>
<td>Sales volume ((350 \text{ units at £86.75 revised unit contribution(^d)}))</td>
<td>21 375.00A</td>
</tr>
</tbody>
</table>
Notes
4 It is questionable whether it is meaningful to analyse the materials planning
variance into its price and quantity elements because of the joint price/
quantity variance. An alternative answer would be to present only the total
materials planning variance of £14,375 (£200,000 − £185,625).
5 Operational variances should be valued at the ex-post standard. The ex
post unit contribution is £200 selling price − (6 hrs × £6.50 labour) − 4.5 kg
× £16.50 materials) = £86.75.

Reconciliation statement

<table>
<thead>
<tr>
<th>(£)</th>
<th>(£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budgeted contribution</td>
<td>195,000</td>
</tr>
<tr>
<td>Planning variances:</td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td>14,375F</td>
</tr>
<tr>
<td>Wage rate</td>
<td>7,500F</td>
</tr>
<tr>
<td></td>
<td>21,875.00F</td>
</tr>
<tr>
<td>Operational variances</td>
<td></td>
</tr>
<tr>
<td>Materials usage</td>
<td>6,187.50F</td>
</tr>
<tr>
<td>Materials price</td>
<td>18,675.00A</td>
</tr>
<tr>
<td></td>
<td>12,487.50A</td>
</tr>
<tr>
<td>Labour efficiency</td>
<td>11,050A</td>
</tr>
<tr>
<td>Wage rate</td>
<td>28,200A</td>
</tr>
<tr>
<td></td>
<td>39,250.00A</td>
</tr>
<tr>
<td>Sales volume</td>
<td>30,362.50F</td>
</tr>
<tr>
<td>Actual contribution</td>
<td>195,500.00</td>
</tr>
</tbody>
</table>

(c) The answer to this question should explain the meaning of planning and
operational variances and why it is preferable to analyse the variances into their
planning and operational elements. In particular, the answer should explain why
the conventional approach reports an adverse material usage variance and a
favourable price variance whereas the ex-post approach highlights a favourable
usage and an adverse price variance.

Question 19.35

(a) The question relates to the role of standard costing in a modern manufacturing
environment. For the answer to this question see ‘The future role of standard
costing’ and ‘The role of standard costing when ABC has been implemented’ in
Chapter 19.

(b) The expenditure variance is the difference between the budgeted fixed overheads
(£100,000) and the actual fixed overheads (£102,300). For more detailed cost
control the variance should be disaggregated by the individual categories of fixed
overheads.

The budgeted capacity measured in direct labour hours of input were 10,000
but actual hours were 11,000. The extra hours of input should have enabled an
extra 1000 hours of overheads to be absorbed at a budgeted rate of £10 per hour.
Therefore a favourable variance of £10,000 is reported.

Budgeted standard hours for each unit of output is 0.10 hours (10,000
hours/100,000 units). Therefore for an actual output of 105,000 units the target
hours are 10,500 (105,000 × 0.10 hours) but the actual hours were 11,000. This has
resulted in a failure to recover £5000 overheads (500 hours × £10).

For a more detailed discussion of the above variances and a discussion of their
usefulness you should refer to the sections in Chapter 18 on fixed overhead
expenditure, volume capacity and volume efficiency variances.

(c) (i) It is assumed that material handling expenditure fluctuates in the longer term
with the number of orders executed. The variance has been derived adopting
a flexible budgeting approach using the number of orders as the cost driver as
follows:
Budgeted materials handling overheads (5500 orders at a budgeted rate of £30 000/5 000) £33 000
Actual materials handling expenditure £30 800
Variance (favourable) £2 200

The variance therefore indicates that the actual expenditure is £2200 less than expected for the actual level of activity. The same approach is used to calculate the expenditure variance for set ups:
Budgeted set up overheads (2600 production runs at a budgeted rate of £70 000/2800) £65 000
Actual set up expenditure £71 500
Variance (adverse) £6 500

The variance indicates that the actual expenditure is £6500 more than expected for the actual level of activity.

The efficiency variances compare the standard/budgeted cost driver usage for the actual output with the actual usage valued at the standard cost driver rate. The material handling overhead efficiency variance is calculated as follows:
Standard usage for actual output (5000/100 000 × 105 000 units = 5250 orders)
Actual number of orders (5500)
Adverse variance = 250 orders at £30 000/5000 per order = £1500 A
The variance indicates that 250 orders more than expected were executed at £6 per order.
The calculation of the set up efficiency variance is as follows:
Standard usage for actual output (2800/100 000 × 105 000 units = 2940 set ups)
Actual number of set ups (2600)
Favourable variance = 340 set ups at £70 000/2800 = £8500
The variance indicates that 340 less set ups than expected were required at £25 per set up.

(c) (ii) Presumably the company has introduced ABC because there was no cause-and-effect relationship between the previous cost drivers used by the traditional cost system and the overhead expenditure. Hence there is a need for the standard costing system to support the decision-making and cost management applications which would have been instrumental in introducing ABC. Failure to change the standard costing system to be consistent with the ABC system would have undermined the ABC system. Where reported variances prompt actions such as decisions to change the production processes/methods it is important that decisions are based on cost driver rates that are the causes of the overheads being incurred.

For further discussion of aspects relating to (c) (i) and (c) (ii) you should refer to ‘The role of standard costing when ABC has been implemented’ in Chapter 19.

(a) (i)
Material price variance:
(standard price – actual price) × actual quantity
[£0.05 – (£45/1000)] × 105 000
525F
Material usage variance:
(standard quantity – actual quantity) × standard price
(100 000 – 105 000) × £0.05
250A

Total variance 275F

Question 19.36
(ii) Dr Cr
(£) (£)
Dr Stores ledger control account (AQ × SP) 5250 Cr Creditors control account (AQ × AP) 4725
Cr Material price variance account 525 Dr Work in progress (SQ × SP) 5000
Dr Material usage variance account 250 Cr Stores ledger control account (AQ × SP) 5250

(iii) On the basis of the above calculations, the buyer would receive a bonus of £52.50 (10% × £525) and the production manager would not receive any bonus. It could be argued that the joint price/usage variance should be separated if the variances are to be used as the basis for calculating bonuses. (For a discussion of joint price/usage variances see Chapter 18.) The revised analysis would be as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure price variance:</td>
<td></td>
</tr>
<tr>
<td>(standard price − actual price) × standard quantity</td>
<td></td>
</tr>
<tr>
<td>(£0.05 − £0.045) × 100 000</td>
<td>500F</td>
</tr>
<tr>
<td>Joint price/usage variance:</td>
<td></td>
</tr>
<tr>
<td>(standard price − actual price) × excess usage</td>
<td></td>
</tr>
<tr>
<td>(£0.05 − £0.045) × 5000</td>
<td>25F</td>
</tr>
</tbody>
</table>

**Buyer’s viewpoint**
At the purchasing stage the buyer can influence both quality and price. Consequently, the buyer can obtain favourable price variances by purchasing inferior quality materials at less than standard price. The adverse effects in terms of excess usage, because of the purchase of inferior quality of materials, are passed on to the production manager and the buyer gains from the price reduction. Indeed, if the joint price/usage is not isolated (see above), the buyer gains if production uses materials in excess of standard. Therefore the bonus system might encourage the buyer to purchase inferior quality materials, which results in an overall adverse total material cost variance and inferior product quality. In summary, the bonus system appears to be biased in favour of the buyer at the expense of the production manager.

**Production manager’s viewpoint**
The isolation of the joint price/usage variance might encourage the buyer not to purchase inferior quality materials, and this will be to the production manager’s advantage. Nevertheless, the problem of the control of material quality still exists. The production manager would need to ensure that the quality of material purchased is in line with the quality built into the standard. Therefore some monitoring device is necessary. If variations do occur, the quantity standard should be adjusted for the purpose of performance reporting and bonus assessment.

**Company’s viewpoint**
The objective of the bonus system is to encourage goal congruence and increase motivation. Interdependencies exist between the two responsibility centres, and it is doubtful that the bonus system encourages goal congruence or improves motivation. If the quality of materials that can be purchased from the various suppliers does not vary then the adverse effects of the bonus system will be reduced. Nevertheless, interdependencies will still exist between the responsibility centres. One solution might be to base the bonuses of both managers on the total material cost variance. In addition, standards should be regularly reviewed and participation by both managers in setting the standards encouraged.
(b) (i) The minimum present value of expected savings that would have to be made in future months in order to justify making an investigation is where

\[ IC + (P \times CC) = Px \]

where \( IC \) = investigation costs, \( P \) = probability that process is out of control, \( CC \) = correction cost, \( x \) = present value of expected savings if process is out of control

Therefore \( £50 + (0.5 \times £100) = 0.5x \)
\[ 0.5x = £100 \]
\[ x = £200 \]

Therefore the minimum present value of expected savings that would have to be made is £200.

(ii) The standard cost will probably represent the mean value, and random variations around the mean value can be expected to occur even when the process is under control. Therefore it is unlikely that the £500 variance will be eliminated completely, because a proportion of the variance simply reflects the randomness of the variables affecting the standard. If the process is found to be out of control, the corrective action will only confine variances to the normal acceptable range of standard outcomes. If the £500 is an extreme deviation from the standard then it is likely that the potential savings from investigation will be insignificant.

(iii) Applying the notation used in (i), the firm will be indifferent about whether to conduct an investigation when the expected savings resulting from correction are equal to the expected cost of correction. That is, where

\[ IC + (P \times CC) = Px \]

if \( x = £600 \) then
\[ 50 + P \times 100 = P \times 600 \]
\[ 500P = 50 \]
\[ P = 10\% \]

if \( x = £250 \) then
\[ 50 + P \times 100 = P \times 250 \]
\[ 150P = 50 \]
\[ P = 33\frac{1}{3}\% \]