

Problem 10-25 (45 minutes)

1. Total rate: $(£31,500 + £72,000)/18,000 \text{ MHs} = £5.75 \text{ per MH}$

Variable rate: $£31,500/18,000 \text{ MHs} = £1.75 \text{ per MH}$

Fixed rate: $£72,000/18,000 \text{ MHs} = £4.00 \text{ per MH}$

2. $16,000 \text{ standard MHs} \times £5.75 \text{ per MH} = £92,000$

3. Variable manufacturing overhead variances:

Actual Hours of Input, at the Actual Rate (AH × AR)	Actual Hours of Input, at the Standard Rate (AH × SR)	Standard Hours Allowed for Output, at the Standard Rate (SH × SR)
<hr/> £26,500	<hr/> 15,000 MHs × £1.75 per MH = £26,250	<hr/> 16,000 MHs × £1.75 per MH = £28,000
↑	↑	↑
Spending Variance, £250 U		Efficiency Variance, £1,750 F

Alternative solution:

Variable Overhead Spending Variance = $(\text{AH} \times \text{AR}) - (\text{AH} \times \text{SR})$
 $(£26,500) - (15,000 \text{ MHs} \times £1.75 \text{ per MH}) = £250 \text{ U}$

Variable Overhead Efficiency Variance = $\text{SR} (\text{AH} - \text{SH})$
 $£1.75 \text{ per MH} (15,000 \text{ MHs} - 16,000 \text{ MHs}) = £1,750 \text{ F}$

Problem 10-25 (continued)

Fixed overhead variances:

Actual Fixed Overhead Cost	Budgeted Fixed Overhead Cost	Fixed Overhead Cost Applied to Work in Process
<u>£70,000</u>	<u>£72,000</u>	<u>16,000 MHs × £4 per MH = £64,000</u>
<div style="display: flex; justify-content: space-around; align-items: center;"><div style="text-align: center;">↑ Budget Variance, £2,000 F</div><div style="text-align: center;">↑ Volume Variance, £8,000 U</div><div style="text-align: center;">↑</div></div>		

Alternative approach to the budget variance:

Budget variance = Actual fixed overhead – Flexible budget fixed overhead

$$£70,000 - £72,000 = £2,000 \text{ F}$$

Alternative approach to the volume variance:

Volume variance = Fixed Overhead Rate (Denominator hours – standard hours allowed)

$$£4 \text{ per MH } (18,000 \text{ MHs} - 16,000 \text{ MHs}) = £8,000 \text{ U}$$

Verification of variances:

Variable overhead spending variance.....	£ 250 U
Variable overhead efficiency variance	1,750 F
Fixed overhead budget variance.....	2,000 F
Fixed overhead volume variance	<u>8,000 U</u>
Underapplied overhead	<u>£4,500</u>

Problem 10-25 (continued)

4. Variable overhead

Spending variance: This variance includes both price and quantity elements. The overhead spending variance reflects differences between actual and standard prices for variable overhead items. It also reflects differences between the amounts of variable overhead inputs that were actually used and the amounts that should have been used for the actual output of the period. Since the variable overhead spending variance is unfavourable, either too much was paid for variable overhead items or too many of them were used.

Efficiency variance: The term "variable overhead efficiency variance" is a misnomer, since the variance does not measure efficiency in the use of overhead items. It measures the indirect effect on variable overhead of the efficiency or inefficiency with which the activity base is utilized. In this company, machine-hours is the activity base. If variable overhead is really proportional to machine-hours, then more effective use of machine-hours has the indirect effect of reducing variable overhead. Since 1,000 fewer machine-hours were required than indicated by the standards, the indirect effect was presumably to reduce variable overhead spending by about £1,750 (£1.75 per machine-hour × 1,000 machine-hours).

Fixed overhead

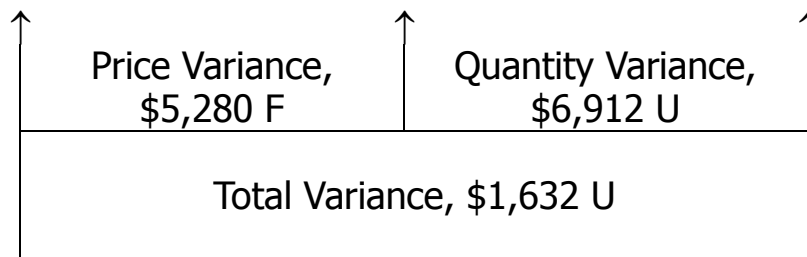
Budget variance: This variance is simply the difference between the budgeted fixed cost and the actual fixed cost. In this case, the variance is favourable, which indicates that actual fixed costs were lower than anticipated in the budget.

Volume variance: This variance occurs as a result of actual activity being different from the denominator activity that was used in the predetermined overhead rate. In this case, the variance is unfavourable, so actual activity was less than the denominator activity. It is difficult to place much of a meaningful economic interpretation on this variance. It tends to be large, so it often swamps the other, more meaningful variances if they are simply netted against each other.

Problem 10-26 (60 minutes)

1. a.

Actual Quantity of Inputs, at Actual Price (AQ × AP)	Actual Quantity of Inputs, at Standard Price (AQ × SP)	Standard Quantity Allowed for Output, at Standard Price (SQ × SP)
21,120 metres × \$3.35 per metre = \$70,752	21,120 metres × \$3.60 per metre = \$76,032	19,200 metres* × \$3.60 per metre = \$69,120



*4,800 units × 4.0 metres per unit = 19,200 metres

Alternatively:

Materials Price Variance = AQ (AP – SP)

21,120 metres (\$3.35 per metre – \$3.60 per metre) = \$5,280 F

Materials Quantity Variance = SP (AQ – SQ)

\$3.60 per metre (21,120 metres – 19,200 metres) = \$6,912 U

b. Raw Materials (21,120 metres @ \$3.60 per metre) ..	76,032
Materials Price Variance	
(21,120 metres @ \$0.25 per metre F)	5,280
Accounts Payable	
(21,120 metres @ \$3.35 per metre)	70,752
Work in Process (19,200 metres @ \$3.60 per metre)	69,120
Materials Quantity Variance	
(1,920 metres U @ \$3.60 per metre)	6,912
Raw Materials (21,120 metres @ \$3.60 per metre)	76,032

Problem 10-26 (continued)

2. a.

Actual Hours of Input, at the Actual Rate (AH × AR)	Actual Hours of Input, at the Standard Rate (AH × SR)	Standard Hours Allowed for Output, at the Standard Rate (SH × SR)
6,720 hours* × \$4.85 per hour = \$32,592	6,720 hours × \$4.50 per hour = \$30,240	7,680 hours** × \$4.50 per hour = \$34,560

↑	Rate Variance, \$2,352 U	↑	Efficiency Variance, \$4,320 F	↑
Total Variance, \$1,968 F				

*4,800 units × 1.4 hours per unit = 6,720 hours

**4,800 units × 1.6 hours per unit = 7,680 hours

Alternatively:

Labour Rate Variance = AH (AR – SR)

6,720 hours (\$4.85 per hour – \$4.50 per hour) = \$2,352 U

Labour Efficiency Variance = SR (AH – SH)

\$4.50 per hour (6,720 hours – 7,680 hours) = \$4,320 F

b. Work in Process (7,680 hours @ \$4.50 per hour).....	34,560
Labour Rate Variance	
(6,720 hours @ \$0.35 per hour U)	2,352
Labour Efficiency Variance	
(960 hours F @ \$4.50 per hour)	4,320
Wages Payable (6,720 hours @ \$4.85 per hour) ..	32,592

Problem 10-26 (continued)

3.	Actual Hours of Input, at the Actual Rate (AH × AR)	Actual Hours of Input, at the Standard Rate (AH × SR)	Standard Hours Allowed for Output, at the Standard Rate (SH × SR)
	<hr/>	<hr/>	<hr/>
	6,720 hours × \$2.15 per hour = \$14,448	6,720 hours × \$1.80 per hour = \$12,096	7,680 hours × \$1.80 per hour = \$13,824

↑	Spending Variance, \$2,352 U	↑	Efficiency Variance, \$1,728 F	↑
<hr/>				
Total Variance, \$624 U				

Alternatively:

Variable Overhead Spending Variance = AH (AR – SR)
6,720 hours (\$2.15 per hour – \$1.80 per hour) = \$2,352 U

Variable Overhead Efficiency Variance = SR (AH – SH)
\$1.80 per hour (6,720 hours – 7,680 hours) = \$1,728 F

Problem 10-26 (continued)

4. Fixed overhead variances:

<u>Actual Fixed Overhead Cost</u>	<u>Budgeted Fixed Overhead Cost</u>	<u>Fixed Overhead Cost Applied to Work in Process</u>
6,720 hours × \$3.05 per hour = \$20,496	6,860 hours × \$3.00 per hour = \$20,580	7,680 × \$3 per hour = \$23,040
↑	↑	↑
Budget Variance, \$84 F		Volume Variance, \$2,460 F

Alternative approach to the budget variance:

Budget variance = Actual fixed overhead – Flexible budget fixed overhead

$$\$20,496 - \$20,580 = \$84 \text{ F}$$

Alternative approach to the volume variance:

Volume variance = Fixed Overhead Rate (Denominator hours – standard hours allowed)

$$\$3 \text{ per hour } (6,860 \text{ hours} - 7,680 \text{ hours}) = \$2,460 \text{ F}$$

Problem 10-26 (continued)

5. No. This total variance is made up of several quite large individual variances, some of which may warrant investigation. A summary of variances is given below:

Materials:

Price variance	\$5,280 F	
Quantity variance	<u>6,912</u> U	\$1,632 U

Labour:

Rate variance	2,352 U	
Efficiency variance	<u>4,320</u> F	1,968 F

Variable overhead:

Spending variance	2,352 U	
Efficiency variance	<u>1,728</u> F	624 U

Fixed overhead

Budget variance	84 F	
Volume variance	<u>2,460</u> F	<u>2,544</u> F

Net favourable variance		<u>\$ 2,256</u> F
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Problem 10-26 (continued)

6. The variances have many possible causes. Some of the more likely causes include:

Materials variances:

Favourable price variance: Good price, inaccurate standards, inferior quality materials, unusual discount due to quantity purchased, drop in market price.

Unfavourable quantity variance: Carelessness, poorly adjusted machines, unskilled workers, inferior quality materials, and inaccurate standards.

Labour variances:

Unfavourable rate variance: Use of highly skilled workers, change in wage rates, inaccurate standards, and overtime.

Favourable efficiency variance: Use of highly skilled workers, high-quality materials, new equipment, and inaccurate standards.

Variable overhead variances:

Unfavourable spending variance: Increase in costs, inaccurate standards, waste, theft, spillage, and purchases in uneconomical lots.

Favourable efficiency variance: Same as for labour efficiency variance.

Fixed overhead variances:

Favourable budget variance: Decreases in costs such as insurance, taxes, salaries, and maintenance that were not anticipated when the budget was set for fixed overhead.

Favourable volume variance: greater use of available capacity than planned.

Problem 10-36 (75 minutes)

1. a.

Actual Quantity of Inputs, at Actual Price (AQ × AP)	Actual Quantity of Inputs, at Standard Price (AQ × SP)	Standard Quantity Allowed for Output, at Standard Price (SQ × SP)
20,000 metres × \$2.85 per metre = \$57,000	20,000 metres × \$3.00 per metre = \$60,000	12,000 metres* × \$3.00 per metre = \$36,000
<p style="text-align: center;"> Price Variance, \$3,000 F 12,650 metres × \$3.00 per metre = \$37,950 Quantity Variance, \$1,950 U </p>		

*6,000 units × 2.0 metres per unit = 12,000 metres

Alternative approach:

Materials Price Variance = AQ (AP – SP)

20,000 metres (\$2.85 per metre – \$3.00 per metre) = \$3,000 F

Materials Quantity Variance = SP (AQ – SQ)

\$3.00 per metre (12,650 metres – 12,000 metres) = \$1,950 U

b. Raw Materials (20,000 metres @ \$3.00 per metre)	60,000
Materials Price Variance	
(20,000 metres @ \$0.15 per metre F).....	3,000
Accounts Payable	
(20,000 metres @ \$2.85 per metre)	57,000
Work in Process (12,000 metres @ \$3.00 per metre)	36,000
Materials Quantity Variance	
(650 metres U @ \$3.00 per metre)	1,950
Raw Materials (12,650 metres @ \$3.00 per metre)	37,950

Problem 10-36 (continued)

2. a.

Actual Hours of Input, at the Actual Rate (AH × AR)	Actual Hours of Input, at the Standard Rate (AH × SR)	Standard Hours Allowed for Output, at the Standard Rate (SH × SR)
<hr/> \$27,950	<hr/> 6,500 hours* × \$4.50 per hour = \$29,250	<hr/> 6,000 hours** × \$4.50 per hour = \$27,000

↑	Rate Variance, \$1,300 F	↑	Efficiency Variance, \$2,250 U	↑
Total Variance, \$950 U				

*The actual hours worked during the period can be computed through the variable overhead efficiency variance, as follows:

$$\begin{aligned}
 \text{SR (AH - SH)} &= \text{Efficiency Variance} \\
 \$3 \text{ per hour (AH - 6,000 hours**)} &= \$1,500 \text{ U} \\
 \$3 \text{ per hour} \times \text{AH} - \$18,000 &= \$1,500^{***} \\
 \$3 \text{ per hour} \times \text{AH} &= \$19,500 \\
 \text{AH} &= 6,500 \text{ hours}
 \end{aligned}$$

**6,000 units × 1.0 hour per unit = 6,000 hours

***When used with the formula, unfavourable variances are positive and favourable variances are negative.

Alternative approach:

$$\begin{aligned}
 \text{Labour Rate Variance} &= \text{AH} \times (\text{AR} - \text{SR}) \\
 6,500 \text{ hours } (\$4.30 \text{ per hour}^* - \$4.50 \text{ per hour}) &= \$1,300 \text{ F}
 \end{aligned}$$

$$^* \$27,950 \div 6,500 \text{ hours} = \$4.30 \text{ per hour}$$

$$\begin{aligned}
 \text{Labour Efficiency Variance} &= \text{SR (AH - SH)} \\
 \$4.50 \text{ per hour (6,500 hours - 6,000 hours)} &= \$2,250 \text{ U}
 \end{aligned}$$

Problem 10-36 (continued)

b. Work in Process		
(6,000 hours @ \$4.50 per hour)	27,000	
Labour Efficiency Variance		
(500 hours U @ \$4.50 per hour)	2,250	
Labour Rate Variance		
(6,500 hours @ \$0.20 per hour F)		1,300
Wages Payable		
(6,500 hours @ \$4.30 per hour)		27,950

3. a.

Actual Hours of Input, at the Actual Rate (AH × AR)	Actual Hours of Input, at the Standard Rate (AH × SR)	Standard Hours Allowed for Output, at the Standard Rate (SH × SR)
<hr/> \$20,475	<hr/> 6,500 hours × \$3.00 per hour = \$19,500	<hr/> 6,000 hours × \$3.00 per hour = \$18,000

↑	Spending Variance, \$975 U	↑	Efficiency Variance, \$1,500 U	↑
<hr/>				
Total Variance, \$2,475 U				

Alternative approach:

Variable Overhead Spending Variance = AH × (AR – SR)
6,500 hours (\$3.15 per hour* – \$3.00 per hour) = \$975 U

*\$20,475 ÷ 6,500 hours = \$3.15 per hour

Variable Overhead Efficiency Variance = SR (AH – SH)
\$3.00 per hour (6,500 hours – 6,000 hours) = \$1,500 U

Problem 10-36 (continued)

- b. No. When variable manufacturing overhead is applied on the basis of direct labour-hours, it is impossible to have an unfavourable variable manufacturing overhead efficiency variance when the direct labour efficiency variance is favourable. The variable manufacturing overhead efficiency variance is the same as the direct labour efficiency variance except that the difference between actual hours and the standard hours allowed for the output is multiplied by a different rate. If the direct labour efficiency variance is favourable, the variable manufacturing overhead efficiency variance must also be favourable.

4. a. The volume variance for fixed overhead is calculated as follows:

Fixed Overhead Rate (Denominator hours – standard hours allowed)

$$\$5(6,200 - 6,000) = \$1,000 \text{ U}$$

- b. The budget variance for fixed overhead is calculated as follows:

Budget variance = Actual fixed overhead – Flexible budget fixed overhead

$$\$1,000 \text{ U} = \text{Actual fixed overhead} - \$31,000^*$$

$$\text{Therefore actual fixed overhead} = \$32,000$$

*Fixed overhead rate = Budgeted Fixed Overhead ÷ denominator hours

$$\$5 = \text{Budgeted Fixed Overhead} \div 6,200 \text{ hours}$$

$$\text{Therefore budgeted fixed overhead} = \$31,000$$

5. *For materials:*

Favourable price variance: Decrease in outside purchase prices, fortunate buy, inferior quality materials, unusual discounts due to quantity purchased, inaccurate standards.

Unfavourable quantity variance: Inferior quality materials, carelessness, poorly adjusted machines, unskilled workers, and inaccurate standards.

For labour:

Favourable rate variance: Unskilled workers (paid lower rates), piece work, and inaccurate standards.

Unfavourable efficiency variance: Poorly trained workers, poor quality materials, faulty equipment, work interruptions, fixed labour with insufficient demand to keep them all busy, inaccurate standards.

For variable overhead:

Unfavourable spending variance: Increase in supplier prices, inaccurate standards, waste, and theft of supplies.

Unfavourable efficiency variance: See comments under direct labour efficiency variance.

For fixed overhead:

Unfavourable budget variance: increases in the costs of insurance, taxes, maintenance, salaries, not anticipated in the budget.

Unfavourable volume variance: utilized less capacity than the denominator level (6,000 versus 6,200)

Case 10-44 (60 minutes)

1. The number of units produced can be computed by using the total standard cost applied for the period for *any* input (materials, labour, or overhead), or it can be computed by using the total standard cost applied for all inputs together. Using only the standard cost applied for materials, we have:

$$\frac{\text{Total standard cost applied for the period}}{\text{Standard cost per unit}}$$

$$= \$810,000/36 = 22,500 \text{ units}$$

The same answer can be obtained by using any other cost input.

2. 138,000 kilograms; see below for a detailed analysis.
3. \$5.90 per kilogram; see below for a detailed analysis.
4. 19,400 direct labour-hours; see below for a detailed analysis.
5. \$31.50 per direct labour-hour; see below for a detailed analysis.
6.

Standard variable overhead cost applied ..	\$108,000	
Add: Overhead efficiency variance.....	8,400	U (see below)
Deduct: Overhead spending variance.....	<u>2,600</u>	F
Actual variable overhead cost incurred.....	<u>\$113,800</u>	
7.

Standard fixed overhead cost applied	\$252,000	
Add: Unfavourable volume variance.....	<u>28,000</u>	U
Budgeted fixed overhead cost	<u>\$280,000</u>	
8.

<u>Budgeted fixed overhead cost</u>	= \$280,000/14
Fixed portion of the overhead rate	
	= 20,000 DLHs

Case 10-44 (continued)

Direct materials analysis:

Actual Quantity of Inputs, at Actual Price (AQ × AP)	Actual Quantity of Inputs, at Standard Price (AQ × SP)	Standard Quantity Allowed for Output, at Standard Price (SQ × SP)
138,000 kilograms × \$5.90 per kilogram*** = \$814,200	138,000 kilograms** × \$6 per kilogram = \$828,000	135,000 kilograms* × \$6 per kilogram = \$810,000
Price Variance, \$13,800 F		Quantity Variance, \$18,000 U
Total Variance, \$4,200 U		

* 22,500 units × 6 kilograms per unit
= 135,000 kilograms

** \$828,000 ÷ \$6 per kilogram = 138,000 kilograms

*** \$814,200 ÷ 138,000 kilograms = \$5.90 per kilogram

Direct labour analysis:

Actual Hours of Input, at the Actual Rate (AH × AR)	Actual Hours of Input, at the Standard Rate (AH × SR)	Standard Hours Allowed for Output, at the Standard Rate (SH × SR)
19,400 DLHs × \$31.50 per DLH*** = \$611,100	19,400 DLHs** × \$30 per DLH = \$582,000	18,000 DLHs* × \$30 per DLH = \$540,000
Rate Variance, \$29,100 U		Efficiency Variance, \$42,000 U
Total Variance, \$71,100 U		

* 22,500 units × 0.8 DLHs per unit = 18,000 DLHs

** \$582,000 ÷ \$30 per DLH = 19,400 DLHs

*** \$611,100 ÷ 19,400 DLHs = \$31.50 per DLH

Case 10-44 (continued)

Variable overhead analysis:

Actual Hours of Input, at the Actual Rate (AH × AR)	Actual Hours of Input, at the Standard Rate (AH × SR)	Standard Hours Allowed for Output, at the Standard Rate (SH × SR)
<u>\$113,800**</u>	<u>19,400 DLHs × \$6 per DLH = \$116,400</u>	<u>18,000 DLHs × \$6 per DLH = \$108,000</u>
	↑ Spending Variance, \$2,600 F	↑ Efficiency Variance, \$8,400 U*

* Computed using 19,400 actual DLHs at the \$6 per DLH standard rate.

** \$116,400 – \$2,600 = \$113,800.

Fixed overhead analysis:

Actual Fixed Overhead Cost	Budgeted Fixed Overhead Cost	Fixed Overhead Cost Applied to Work in Process
<u>\$279,000**</u>	<u>\$280,000*</u>	<u>18,000 hours × \$14 per hour = \$252,000</u>
	↑ Budget Variance, \$1,000 F	↑ Volume Variance, \$28,000 U

* \$252,000 + \$28,000 = \$280,000.

** \$280,000 – \$1,000 = \$279,000.