variances are computed by comparing the number of direct labor-hours actually worked to the standard hours allowed. That is, in each case the formula is:

$$\text{Efficiency variance} = SR(AH - SH)$$

Only the "SR" part of the formula, the standard rate, differs between the two variances.

**10-12** A statistical control chart is a graphical aid that helps identify variances that should be investigated. Upper and lower limits are set on the control chart. Any variances falling between those limits are considered to be normal. Any variances falling outside of those limits are considered abnormal and are investigated.

**10-13** If labor is a fixed cost and standards are tight, then the only way to generate favorable labor efficiency variances is for every workstation to produce at capacity. However, the output of the entire system is limited by the capacity of the bottleneck. If workstations before the bottleneck in the production process produce at capacity, the bottleneck will be unable to process all of the work in process. In general, if every workstation is attempting to produce at capacity, then work in process inventory will build up in front of the workstations with the least capacity.

## **Exercise 10-1** (20 minutes)

1.

| | |
|---|---|
| Number of chopping blocks | 4,000 |
| Number of board feet per chopping block | × 2.5 |
| Standard board feet allowed | 10,000 |
| Standard cost per board foot | × $1.80 |
| Total standard cost | $18,000 |
| Actual cost incurred | $18,700 |
| Standard cost above | 18,000 |
| Spending variance—unfavorable | $ 700 |

2.

| Standard Quantity Allowed for Actual Output, at Standard Price (SQ × SP) | Actual Quantity of Input, at Standard Price (AQ × SP) | Actual Quantity of Input, at Actual Price (AQ × AP) |
|---|---|---|
| 10,000 board feet × $1.80 per board foot = $18,000 | 11,000 board feet × $1.80 per board foot = $19,800 | $18,700 |
| Materials quantity variance = $1,800 U | Materials price variance = $1,100 F | |
| Spending variance = $700 U | | |

Alternatively, the variances can be computed using the formulas:

Materials quantity variance = SP (AQ – SQ)
= $1.80 per board foot (11,000 board feet – 10,000 board feet)
= $1,800 U

Materials price variance = AQ (AP – SP)
= 11,000 board feet ($1.70 per board foot* – $1.80 per board foot)
= $1,100 F
*$18,700 ÷ 11,000 board feet = $1.70 per board foot.

## **Exercise 10-2** (20 minutes)

1. 

| | | |
|---|---|---|
| Number of meals prepared ..... | 6,000 | |
| Standard direct labor-hours per meal..... | × 0.20 | |
| Total direct labor-hours allowed ..... | 1,200 | |
| Standard direct labor cost per hour ..... | × $9.50 | |
| Total standard direct labor cost..... | $11,400 | |
| Actual cost incurred ..... | $11,500 | |
| Total standard direct labor cost (above)... | 11,400 | |
| Spending variance ..... | $ 100 | Unfavorable |

2.

| Standard Hours Allowed for Actual Output, at Standard Rate (SH × SR) | Actual Hours of Input, at Standard Rate (AH × SR) | Actual Hours of Input, at Actual Rate (AH × AR) |
|---|---|---|
| 1,200 hours × $9.50 per hour = $11,400 | 1,150 hours × $9.50 per hour = $10,925 | 1,150 hours × $10.00 per hour = $11,500 |
| Labor efficiency variance = $475 F | | Labor rate variance = $575 U |
| Spending variance = $100 U | | |

Alternatively, the variances can be computed using the formulas:

Labor efficiency variance = SR(AH – SH)
= $9.50 per hour (1,150 hours – 1,200 hours)
= $475 F

Labor rate variance = AH(AR – SR)
= 1,150 hours ($10.00 per hour – $9.50 per hour)
= $575 U

## **Exercise 10-3** (20 minutes)

1. 

| | | |
|---|---|---|
| Number of items shipped..... | 140,000 | |
| Standard direct labor-hours per item ..... | × 0.04 | |
| Total direct labor-hours allowed..... | 5,600 | |
| Standard variable overhead cost per hour..... | × $2.80 | |
| Total standard variable overhead cost ..... | $15,680 | |
| Actual variable overhead cost incurred..... | $15,950 | |
| Total standard variable overhead cost (above) . | 15,680 | |
| Spending variance ..... | $ 270 | Unfavorable |

2.

| Standard Hours Allowed for Actual Output, at Standard Rate (SH × SR) | Actual Hours of Input, at Standard Rate (AH × SR) | Actual Hours of Input, at Actual Rate (AH × AR) |
|---|---|---|
| 5,600 hours × $2.80 per hour = $15,680 | 5,800 hours × $2.80 per hour = $16,240 | 5,800 hours × $2.75 per hour* = $15,950 |
| Variable overhead efficiency variance = $560 U | Variable overhead rate variance = $290 F | |
| Spending variance = $270 U | | |

*$15,950 ÷ 5,800 hours = $2.75 per hour

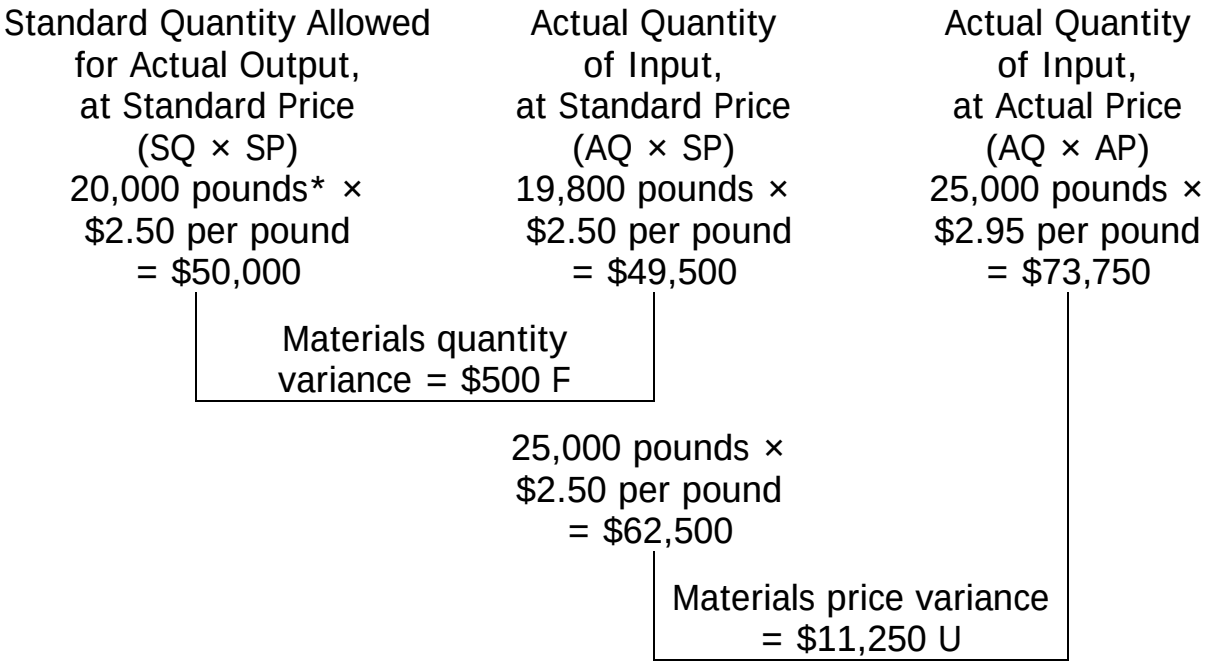
Alternatively, the variances can be computed using the formulas:

Variable overhead efficiency variance = SR(AH – SH)
= $2.80 per hour (5,800 hours – 5,600 hours)
= $560 U

Variable overhead rate variance = AH(AR – SR)
= 5,800 hours ($2.75 per hour – $2.80 per hour)
= $290 F

**Problem 10-9** (45 minutes)

1. a.




*5,000 ingots × 4.0 pounds per ingot = 20,000 pounds

Alternatively, the variances can be computed using the formulas:

Materials quantity variance = SP (AQ – SQ)
= $2.50 per pound (19,800 pounds – 20,000 pounds)
= $500 F

Materials price variance = AQ (AP – SP)
= 25,000 pounds ($2.95 per pound – $2.50 per pound)
= $11,250 U

**Problem 10-9** (continued)

1. b.

| Standard Hours Allowed for Actual Output, at Standard Rate (SH × SR) | Actual Hours of Input, at Standard Rate (AH × SR) | Actual Hours of Input, at Actual Rate (AH × AR) |
|---|---|---|
| 3,000 hours* × $9.00 per hour = $27,000 | 3,600 hours × $9.00 per hour = $32,400 | 3,600 hours × $8.70 per hour = $31,320 |
| Labor efficiency variance = $5,400 U | | Labor rate variance = $1,080 F |
| Spending variance = $4,320 U | | |

*5,000 ingots × 0.6 hour per ingot = 3,000 hours

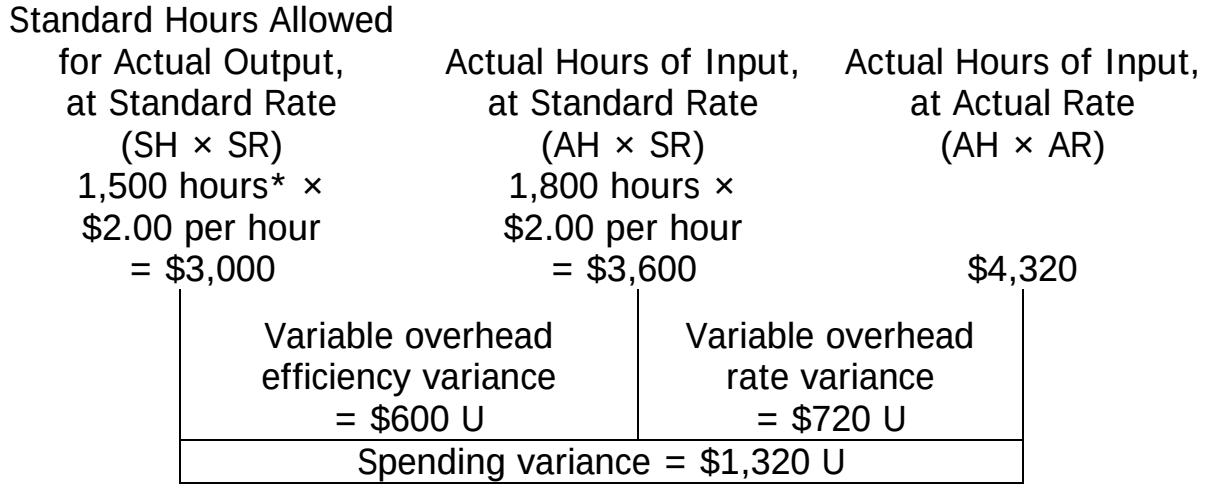
Alternatively, the variances can be computed using the formulas:

Labor efficiency variance = SR (AH – SH)
= $9.00 per hour (3,600 hours – 3,000 hours)
= $5,400 U

Labor rate variance = AH (AR – SR)
= 3,600 hours ($8.70 per hour – $9.00 per hour)
= $1,080 F

**Problem 10-9** (continued)

1. c.




*5,000 ingots × 0.3 hours per ingot = 1,500 hours

Alternatively, the variances can be computed using the formulas:

Variable overhead efficiency variance = SR (AH – SH)
= $2.00 per hour (1,800 hours – 1,500 hours)
= $600 U

Variable overhead rate variance = AH (AR – SR)
= 1,800 hours ($2.40 per hour* – $2.00 per hour)
= $720 U
*$4,320 ÷ 1,800 hours = $2.40 per hour

**Problem 10-9** (continued)

2. Summary of variances:

| | | |
|---|---|---|
| Material quantity variance | $ 500 | F |
| Material price variance | 11,250 | U |
| Labor efficiency variance | 5,400 | U |
| Labor rate variance | 1,080 | F |
| Variable overhead efficiency variance | 600 | U |
| Variable overhead rate variance | 720 | U |
| Net variance | $16,390 | U |

The net unfavorable variance of $16,390 for the month caused the plant's variable cost of goods sold to increase from the budgeted level of $80,000 to $96,390:

| | |
|---|---|
| Budgeted cost of goods sold at $16 per ingot | $80,000 |
| Add the net unfavorable variance (as above) | 16,390 |
| Actual cost of goods sold | $96,390 |

This $16,390 net unfavorable variance also accounts for the difference between the budgeted net operating income and the actual net loss for the month.

| | |
|---|---|
| Budgeted net operating income | $15,000 |
| Deduct the net unfavorable variance added to cost of goods sold for the month | 16,390 |
| Net operating loss | $(1,390) |

3. The two most significant variances are the materials price variance and the labor efficiency variance. Possible causes of the variances include:

| | |
|---|---|
| Materials price variance: | Outdated standards, uneconomical quantity purchased, higher quality materials, high-cost method of transport. |
| Labor efficiency variance: | Poorly trained workers, poor quality materials, faulty equipment, work interruptions, inaccurate standards, insufficient demand. |