STANDARD COSTS AND VARIANCE ANALYSIS

Key Terms and Concepts to Know

Static or Planning Budgets

- Used for planning purposes
- Prepared at the beginning of the period
- Based on one projected level of activity

Standards:

- Standards are benchmarks or "norms" for measuring performance. Standards relate to the quantity and costs of inputs used in manufacturing goods or providing services.
- Price Standards specify how much should be paid for each unit of the input.
- Quantity Standards specify how much of an input such as raw material should be used to make a product or provide service.

Standard Costing:

- Standard costing allows companies to compare the actual results to expected or standard results and to analyze the differences or variances between them.
- If there is a significant variance between the standard and actual results, managers may investigate the discrepancy to find the underlying cause of the variance.
- Standard costs are used to value raw materials inventory, work-in-process inventory, finished goods inventory and cost of goods sold.

All Variances:

- Variances are computed for each manufacturing cost: direct materials, direct labor, variable overhead and fixed overhead.
- The total variance for each manufacturing cost is the difference between the actual costs incurred and the flexible budget costs (the standard costs that should have been incurred for the actual level of production).
    - Actual cost incurred is actual price x the actual quantity for the good unit produced.
    - Flexible budget amount is standard price x standard quantity allowed.

  - Standard quantity allowed is good units produced x standard quantity per unit.
- The total variance is divided into price and quantity variances for each manufacturing cost.
- All variances are favorable or unfavorable.
  - Favorable if actual price or quantity is less than standard price or quantity.
  - Unfavorable if actual price or quantity is greater than standard price or quantity.
- The general variance model is:

Actual Quantity X Actual Price	Actual Quantity X Standard Price	Standard Quantity X Standard Price

Price Variances SP (AQ - SQ)	**Quantity Variances AQ (AP – SP)**
DM Price	DM Quantity
DL Rate	DL Efficiency or Time
VOH Spending	VOH Efficiency
FOH Budget or Spending	FOH Volume

- Overhead variances may also be grouped into Controllable and Volume Variances.
- Controllable variances, those that can be affected by management's decision regarding spending levels, are:

Controllable variance	=	Variable overhead spending variance	+	Variable overhead efficiency variance	+	Fixed overhead budget variance

- The fixed overhead budget or spending variance is the difference between actual fixed overhead costs incurred and the budgeted fixed overhead costs. This difference is due to spending controllable by management and not to a difference in plant activity. For example, this variance could be caused by giving a factory supervisor a salary increase greater than budgeted, but not by the factory working more hours than budgeted.
- The non-controllable variance is the Fixed Overhead Volume Variance. It measures the difference in plant capacity utilization between the standard hours used for actual good units produced and the standard hours at normal capacity.
- Standard hours at normal capacity is also the denominator activity used to calculate the predetermined or standard variable and fixed overhead rates.

Key Topics to Know

Direct Materials Variances

- Material Price Variance
  - The difference between the actual unit price paid and the standard price per unit of direct materials, multiplied by the quantity purchased.
  - May result from many factors such as receiving more cash or quantity discounts than expected, price reductions or increases from the supplier or purchasing a different quality of materials.
  - Identified at time of purchase; formula is AQ (AP - SP)

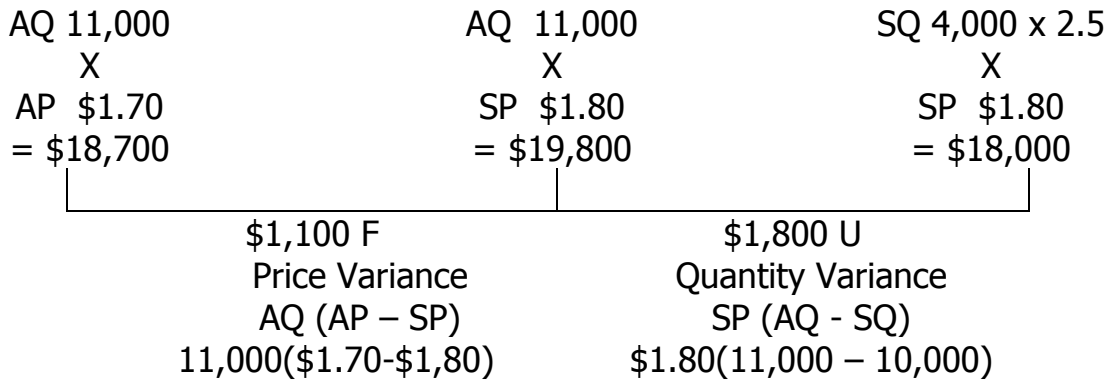
- Material Quantity Variance
  - The difference between the actual quantity of materials used in production and the standard quantity allowed for the actual output, multiplied by the standard price per unit of materials.
  - May result from many factors such as shortchanging the actual amount of material used, fewer rejects or spoilage than expected, faulty machines, inferior materials quality, untrained workers, and poor supervision.
  - Identified at time of usage; formula is SP (AQ - SQ)

Example #1

Harmon Household, Inc. manufactures a number of consumer items for general household use. During the recent month, the company manufactured 4,000 chopping blocks using 11,000 feet of hardwood. The hardwood cost the company $18,700 when purchased. According to the standard cost card, each chopping block requires 2.5 board feet of hardwood, at a cost of $1.80 per board feet.

Required: Compute the material quantity variance and material price variance.

Solution #1



Direct Labor Variances

- Labor Rate Variance
  - The difference between the actual hourly labor rate and the standard rate per hour, multiplied by the actual number of hours worked during the period.
  - May result from many factors such as using workers with different wage rates than expected, different benefits costs per hour, annual wage rate increases more or less than expected, or a different number of overtime hours than expected.
  - Identified when direct labor hours are worked; formula is AH (AR - SR)

- Labor Efficiency or Time Variance
  - The difference between the actual hours worked and the standard hours allowed for the actual output, multiplied by the standard hourly labor rate.
  - May result from many factors such as poorly trained or motivated workers, materials of a different quality than standard, faulty equipment causing breakdowns and work interruptions, fewer equipment breakdowns than expected, poor supervision of workers, or using workers with different level of skills than expected.
  - Identified when direct labor hours are worked; formula is SR (AH - SH).

Example #2

China Inc. produces custom-painted cake plates for a number of major department stores. During the most recent week, the company prepared 6,000 plates using 1,150 direct labor-hours. The company paid its direct labor workers at an average pay rate of $10.00 per hour. According to the standard cost card, each plate should require .20 direct-hours at a cost of $9.50 per hour.

Required: Compute the labor efficiency variance and a labor rate variance.

Solution #2

AH 1,150 X AR $10.00 = $11,500	AH 1,150 X SR $9.50 = $10,925	SH 6,000 x .20 X SR $9.50 = $11,400
	$575 U Rate Variance AH (AR – SR) 1,150($10.00-$9.50)	$475 F Efficiency or Time Variance SR (AH - SH) $9.50(1,150-1,200)

Overhead Variances

- Overhead variances have a somewhat different meaning than direct materials and direct labor variances for two reasons:
  - overhead is an indirect cost whereas materials and labor are direct costs
  - overhead includes both variable and fixed costs
- Overhead variances may be separated into Variable Overhead Controllable and Fixed Overhead Volume Variances.
- For overhead variance analysis, the standard or pre-determined overhead rate based on total overhead costs is divided into variable and fixed rates, which are calculated by dividing budgeted variable or budgeted fixed overhead by the budgeted allocation base (now referred to as the denominator activity).
- The controllable variances may result from many factors such as a difference in price for the overhead items purchased and a difference in the quantity of overhead items purchased. In other words, they contain the same information as the price and quantity variances for direct materials and direct labor.

- The FOH volume variance measures the difference between the budgeted and allowed denominator activity (fixed overhead) valued at the fixed standard (pre-determined) overhead rate. It does not measure the difference between how much fixed overhead was incurred vs. how much fixed overhead should have been incurred.
- In a standard cost system overhead is applied based on the standard hours allowed for actual output.

Controllable Overhead Variances

- Variances controllable by management are total actual overhead costs vs. budgeted overhead costs for the period (variable overhead allowed for the period + fixed budgeted overhead for the period).
- There are three sources of the Variable Overhead Controllable Variance:
  - The difference between the actual variable overhead cost incurred during a period and the standard cost that should have been incurred based on the actual activity of the period, multiplied by the standard variable overhead rate. It is identified when variable overhead costs are incurred
  - The difference between the actual activity and the standard activity allowed for the actual output, multiplied by the standard variable overhead rate. It is identified when variable overhead costs are incurred.
  - The difference between the Actual Fixed Overhead and the Budgeted Fixed Overhead. It is identified when fixed overhead costs are incurred.

Example #3

Order Up, Inc. provides order fulfillment services for e-commerce merchants. The company maintains warehouses that stock items carried by its clients. In the most recent month, 140,000 items were shipped to customers using 5,800 direct labor-hours. According to the company's standards, 0.04 direct labor-hours are required to fulfill an order for one item. It applies overhead to products based on direct labor hours. Data for the year are as follows:

MONTH:	
Actual variable overhead costs incurred	$15,950
Actual direct labor hours	5,800
Actual fixed overhead costs incurred	$27,000
YEAR:	
Total budgeted variable overhead	$168,000
Total budgeted fixed overhead	$300,000

Total budgeted (denominator) direct labor hours	60,000
Standard machine-hours allowed for the actual output	52,000

Required: Compute variable overhead controllable variance.

Solution #3

$$\text{Pre-determined overhead rate} = \frac{\text{Estimated variable overhead cost}}{\text{Estimated amount of the allocation base (denominator activity)}}$$

$$\text{Pre-determined overhead rate} = \$7.80 \text{ per DLH} = \frac{\$168,000 + \$300,000}{60,000 \text{ DLH}}$$

$$\text{Pre-determined overhead rate (variable portion)} = \frac{\text{Estimated variable overhead cost}}{\text{Estimated amount of the allocation base (denominator activity)}}$$

$$\text{Pre-determined overhead rate (variable portion)} = \$2.80 \text{ per DLH} = \frac{\$168,000}{60,000 \text{ DLH}}$$

$$\text{Pre-determined overhead rate (fixed portion)} = \frac{\text{Estimated fixed overhead cost}}{\text{Estimated amount of the allocation base (denominator activity)}}$$

$$\text{Pre-determined overhead rate (fixed portion)} = \$5.00 \text{ per DLH} = \frac{\$300,000}{60,000 \text{ DLH}}$$

Actual fixed overhead		Budgeted fixed overhead
= $15,950	Variable	140,000 x 0.04 = 5,600 X $2.80
+		
$27,000	Fixed	= $15,680
		+ $300,000/12 = $25,000
$42,950		$ 40,680

$2,270 U
Controllable Variance

Overhead Volume Variance

- Fixed Overhead Volume Variance is the difference between the Budgeted Fixed Overhead and the Fixed Overhead Applied to Work in Process. It is identified when fixed overhead costs are incurred.
- Formula is Fixed Component of the Predetermined Overhead Rate x (Denominator hours – Standard Hours allowed for Actual Output)

Example #4

Order Up, Inc. provides order fulfillment services for e-commerce merchants. The company maintains warehouses that stock items carried by its clients. In the most recent month, 140,000 items were shipped to customers using 5,800 direct labor-hours. According to the company's standards, 0.04 direct labor-hours are required to fulfill an order for one item. It applies overhead to products based on direct labor hours. Data for the year are as follows:

MONTH:	Actual for Month	Budget for Year
Variable overhead costs incurred	$15,950	$168,000
Fixed overhead costs incurred	$27,000	$300,000
Direct labor hours	5,800	60,000
Standard machine-hours allowed for the actual output		52,000

Required: Compute the fixed overhead volume variance.

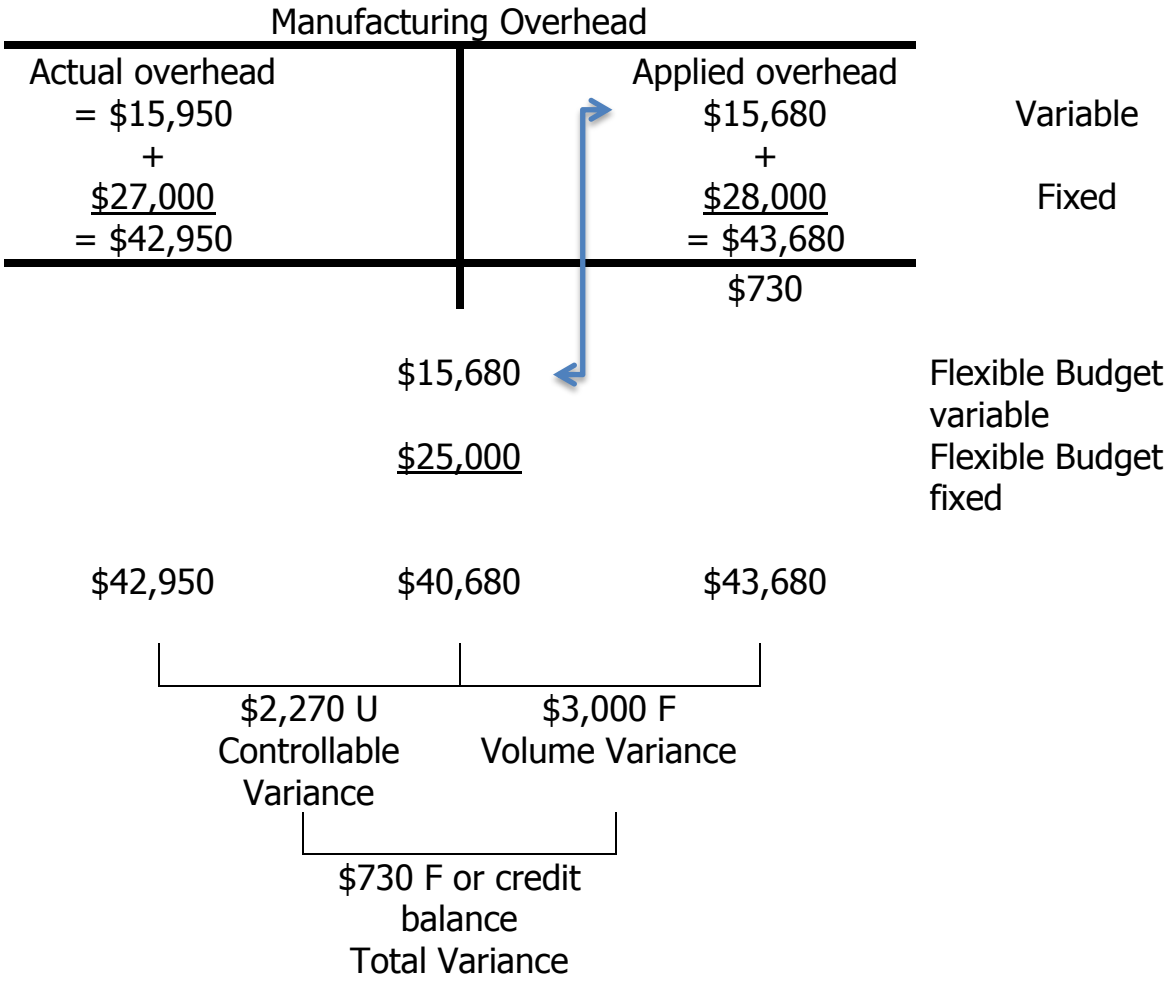
Solution #4

Budgeted fixed overhead for the month	Fixed overhead applied to work in process
$300,000 / 12 mo.	SH 140,000 x .04 X SR $5.00
= $25,000	= $28,000

$3,000 F
Volume Variance

Overhead Variances and the Overhead Account

- **Example #3** and **Example #4** and the Manufacturing Overhead account are combined in the chart shown below.
- The overhead account has a credit balance $730, which indicated that overhead has been overapplied and that the total overhead variance is Favorable.
- Below the overhead account, the $730 credit/Favorable balance has been broken down into the controllable variance of $2,270 Unfavorable and the volume variance of $3,000 Favorable.



Practice Problems

Practice Problem #1

Conway manufactures a number of consumer items for general household use. During the recent month, the company manufactured 5,000 units using 12,000 pounds of material. The 14,000 pounds purchased cost the company $21,000. According to the standard cost card, each unit requires 2.2 pounds, at a cost of $1.40 per pound.

Required: Compute the material price variance and material quantity variance.

Practice Problem #2

Czar Nicholas Chocolatier, Ltd. makes premium chocolate in Chicago. One of the company's products is the Bango Mint. Bango Mints are packed 24 per box. During June, 4,000 boxes were produced. The company paid its direct labor workers a total of $14,280 for their work or $11.90 per hour. According to the standard cost card for Bango Mints, each box should require 0.3 direct labor hours at a cost of $12.00 per hour.

Required: Compute the labor rate variance and a labor efficiency variance.

Practice Problem #3

Universal Parcel provides parcel delivery services to many merchants. The company maintains warehouses that store and distribute items carried by all the different merchants. In the most recent month, 12,000 orders were shipped to customers using $50,000 of direct labor and 2,500 direct labor hours. The company incurred a total of $20,000 in variable overhead costs and $6,000 in fixed overhead costs. For the year, Universal budgeted $84,000 of fixed overhead and 28,000 deliveries. According to the company's standards, 0.2 direct labor-hours are required to fulfill an order at a rate of $20.00 per hour. The variable overhead rate is 45% of the direct labor cost per hour.

Required:
a) Compute variable overhead controllable spending variance.
b) Compute the fixed overhead volume variance.

Practice Problem #4

Acme Fireworks maintains warehouses that store and distribute items carried by the company. In the most recent month, employees worked 28,500 direct labor hours. The company incurred a total of $463,100 in variable overhead costs and $240,000 in fixed overhead costs. For the month, the static budget at normal capacity included $489,000 of variable overhead and $240,000 of fixed overhead for 30,000 direct labor hours to be worked.

Required: Compute controllable overhead variance and the volume variance.

True / False Questions

1. A quantity standard allowed for actual output is the amount of input that should go into a single unit of the product.
   True False

2. A standard cost card shows what the company should spend to produce a single unit of product based on expected production for the coming period.
   True False

3. The direct material quantity variance is the difference between the actual quantity and the standard quantity of materials multiplied by the actual price.
   True False

4. The variable overhead rate variance is the difference between the actual variable overhead rate and the standard variable overhead rate multiplied by the actual value of the cost driver.
   True False

5. In calculating the material price variance, the actual quantity is equal to the quantity of material that the company used in production.
   True False

6. An unfavorable labor efficiency variance indicates that the actual number of direct labor hours worked was greater than the number of direct labor hours that should have been worked for the output attained.
   True False

7. Ideal standards are used more often than practical standards.
   True False

8. The volume variance measures the difference between the fixed overhead incurred and budgeted.
   True False

9. The controllable variance is calculated only for variable overhead.
   True False

10. The controllable variance means that the level of production controls the amount of overhead spending.
    True False

Multiple Choice Questions

1. A favorable variance occurs when
   a) actual costs are less than static costs
   b) standard costs are less than actual costs
   c) standard costs are less than static costs
   d) actual costs are less than standard costs

2. The difference between the actual price and the standard price, multiplied by the actual quantity of materials purchased is the
   a) direct materials spending variance
   b) direct materials volume variance
   c) direct materials price variance
   d) direct materials quantity variance

3. The difference between the actual quantity used in production and the standard quantity allowed for actual output multiplied by the standard price is:
   a) direct materials spending variance
   b) direct materials volume variance
   c) direct materials price variance
   d) direct materials quantity variance

4. Albertville has a material standard of 1 pound per unit of output. Each pound has a standard price of $25 per pound. During July, Albertville paid $127,250 for 4,950 pounds, which they used to produce 4,700 units. What is the direct material price variance?
   a) $3,500 unfavorable
   b) $2,600 favorable
   c) $12,600 unfavorable
   d) $10,000 unfavorable

5. Courtville has a material standard of 1 pound per unit of output. Each pound has a standard price of $25 per pound. During July, Albertville paid $118,800 for 4,950 pounds, which they used to produce 4,900 units. What is the direct materials quantity variance?
   a) $1,250 favorable
   b) $2,600 favorable
   c) $1,250 unfavorable
   d) $1,520 unfavorable

The next 4 questions refer to the following information.
Bridgetown Corporation produces a product that requires 2.5 pounds of materials per unit. The allowance for waste and spoilage per unit is .4 pounds and .1 pounds, respectively. The purchase price is $4 per pound, but a 2% discount is usually taken. Freight costs are $.10 per pound, and receiving and handling costs are $.15 per pound. The hourly wage rate is $9.00 per hour, but a raise that will average $.50 will go into effect soon. Fringe benefits average $2.00 per hour. Standard production time is 2 hours per unit, and the allowances for rest periods and setup are .1 hours and .2 hours.

6. The standard direct materials price per pound is
   a) $3.92
   b) $4.00
   c) $4.17
   d) $4.25

7. The standard direct materials quantity per unit is
   a) 2.6 pounds
   b) 2.7 pounds
   c) 2.9 pounds
   d) 3.0 pounds

8. The standard direct labor rate per hour is
   a) $ 9.00
   b) $ 9.50
   c) $11.00
   d) $11.50

9. The standard direct labor hours per unit is
   a) 2 hour
   b) 2.1 hours
   c) 2.3 hours
   d) 3.2 hours

The next 3 questions refer to the following information.
A Company has a standard of 1 direct labor hour per unit at $12 per hour. 3,850 labor hours costing $46,970 were used to produce 4,000 units.

10. Company's labor rate variance is
    a) $770 F
    b) $770 U
    c) $1,030 F
    d) $1,930 F

11. Company's labor efficiency variance is
    a) $770 U
    b) $1,030 F
    c) $1,800 F
    d) $1,930 F

12. Company's total labor variance is
    a) $770 U
    b) $800 U
    c) $1,030 F
    d) $1,930 F

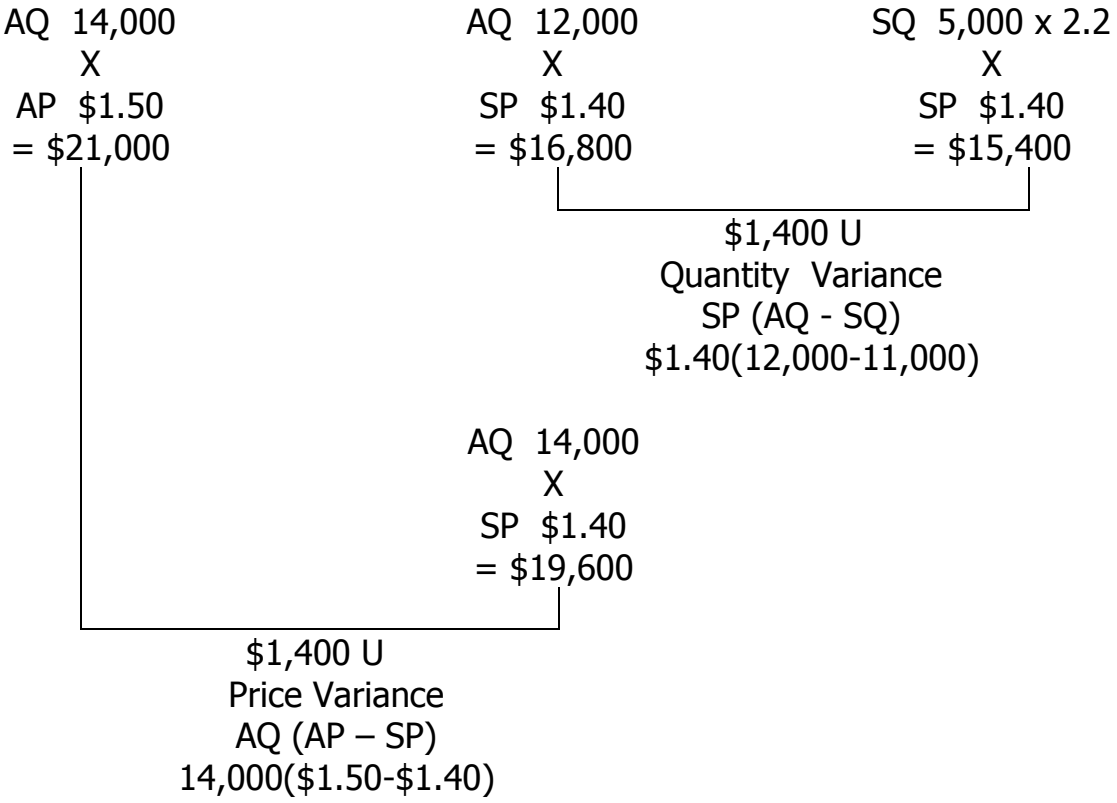
The next 2 questions refer to the following information.
The actual and standard direct labor rates were $8.50 and $8.00, respectively. 4,500 direct labor-hours were worked. The standard quantity of hours allowed was 5,000. The standard variable overhead per direct labor-hour is $5.00 and the fixed overhead rate is $6.00. Budgeted fixed overhead was $32,400.

13. What is the controllable overhead variance if the variable manufacturing overhead costs were $24,750 and the fixed overhead costs were $32,400?
    a) $2,250 U
    b) $250 F
    c) $4,750 F
    d) $1,350 F

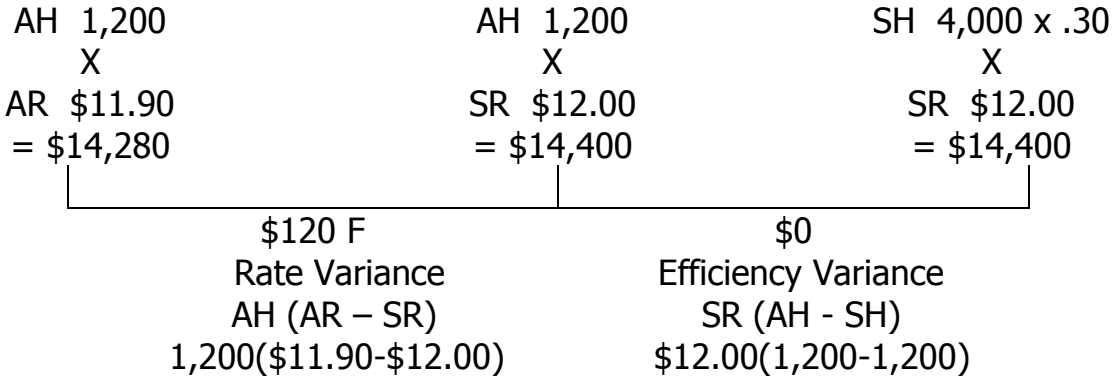
14. What is the volume variance?
    a) $1,300 U
    b) $1,100 F
    c) $2,400 U
    d) $2,500 F

Solutions to Practice Problems

Practice Problem #1



Practice Problem #2



Practice Problem #3

AH 2,500 X AR $8 = $20,000	Variable overhead	SH 12,000 x .2 X SR $20 x .45 = $21,600
$6,000 $26,000	Fixed overhead	$84,000 / 12 mo = $7,000 $28,600

$2,600 F
Controllable
variance

Budgeted fixed overhead for the month $84,000 / 12 mo = $7,000	Fixed overhead applied to work in process SH 12,000 x .2 X SR $3 = $7,200

$200 F
Volume Variance

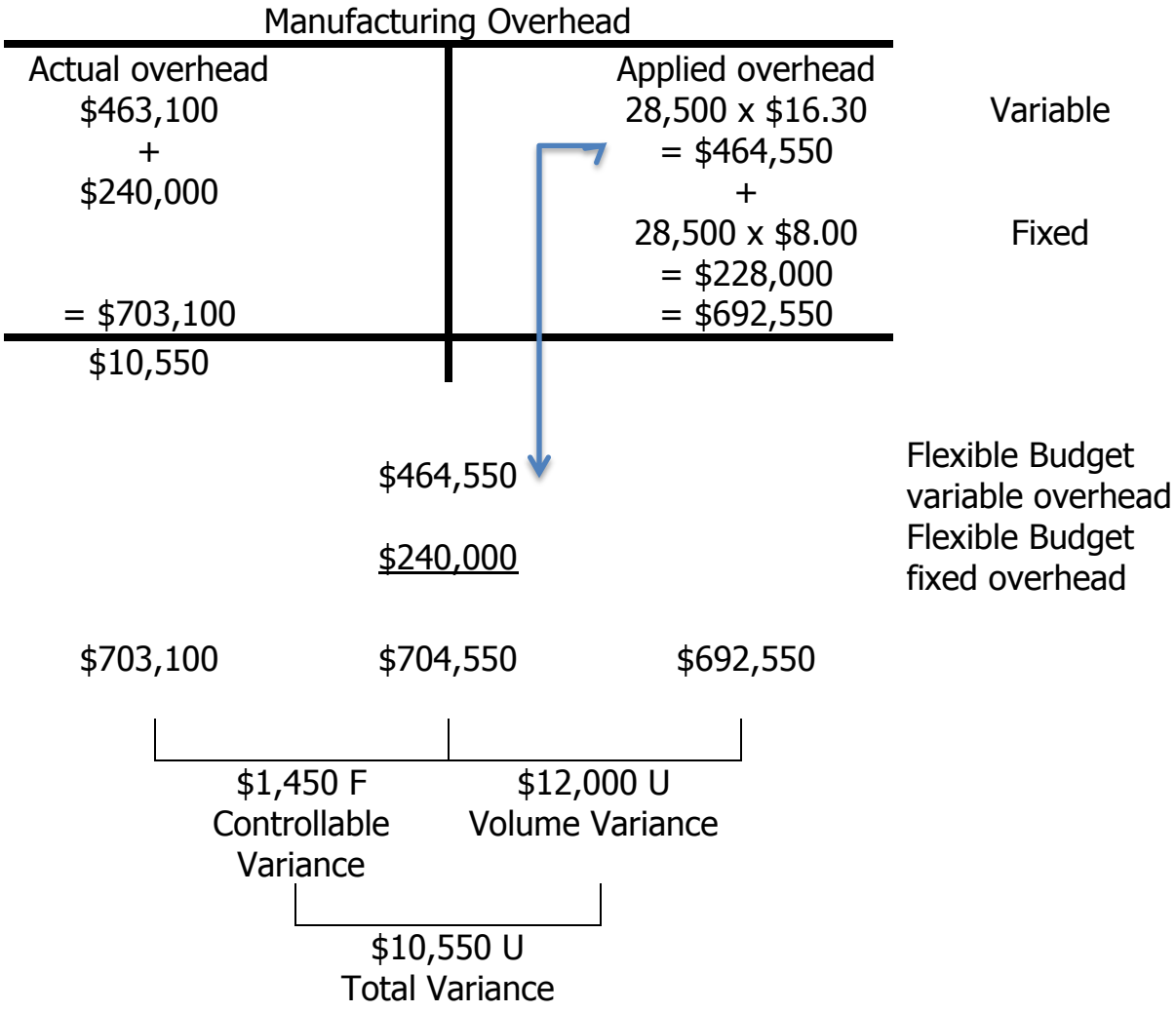
Actual variable overhead rate = $\frac{\text{Actual variable overhead cost}}{\text{Actual amount of the allocation base (denominator activity)}}$

Actual variable overhead rate = $\frac{\$20,000}{2,500 \text{ DLH}}$ = $8.00 per MHDLH

Pre-determined fixed overhead rate = $\frac{\text{Estimated fixed overhead cost}}{\text{Estimated amount of the allocation base (denominator activity)}}$

Pre-determined fixed overhead rate = $\frac{\$84,000}{28,000 \text{ deliveries}}$ = $3.00 per delivery

Practice Problem #4



Solutions to True / False Problems

1. False - The standard quantity allowed is the amount that should go into the actual number of good units produced.
2. True
3. False - The material quantity variance is calculated using the standard price per unit.
4. True
5. False - The material price variance is based on the quantity of material purchased.
6. True
7. False – practical standards are the most frequently used standards.
8. False – volume variance is driven by the difference between budgeted and allowed plant activity.
9. False – the controllable variance includes both variable and fixed overhead costs.
10. False – controllable means that management is able to control the variance by controlling spending on overhead.

Solutions to Multiple Choice Questions

1. D
2. C
3. D
4. A
5. C
6. C
7. D
8. D
9. C
10. B
11. C
12. C
13. B
14. C