

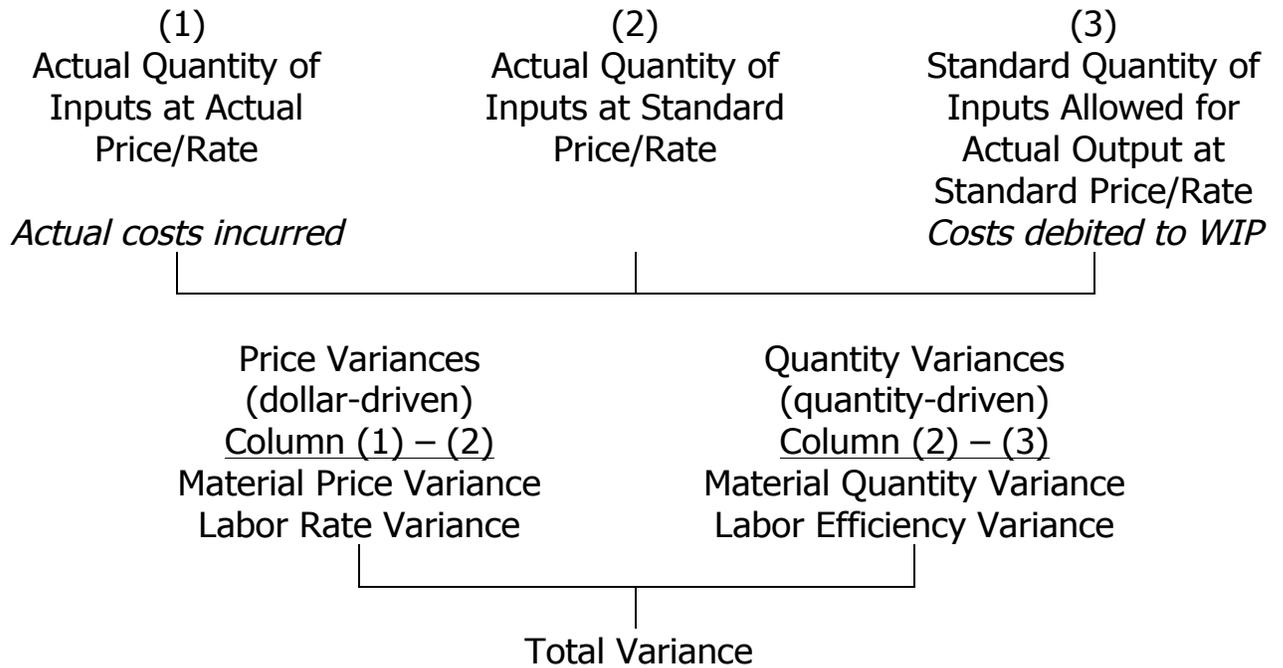
# STANDARD COSTS AND VARIANCE ANALYSIS

## Key Topics to Know

- The nature of standards: what they are, how they are developed, why they are important and the different types of standards used
- The nature of variances: what they are, how they arise, how they are calculated and why they are important.
- Prepare journal entries to record actual and standard costs and the related variances.
- Relationship between under and over-applied overhead in Job Costing and overhead variances in Standard Costs.
- Be able to compute the following variances:
  - Direct materials price and quantity variances
  - Direct labor rate and efficiency variances
  - Variable manufacturing overhead controllable variance
  - Fixed overhead volume variance
- Remember that the direct materials price variance is based on the quantity of materials purchased and the direct materials quantity variance is based on the quantity of materials used. This is the only variance where this situation occurs. If the direct materials inventory is different at the beginning and end of the variance period, then the quantity purchased and the quantity used are not equal.
- Variances are based on the actual number of good units produced and sold
- Variances ignore the number of good units expected or budgeted for the period
- The standard quantity of inputs allowed is calculated as follows:  
Actual good output in units \* Standard quantity of inputs per unit of output
- Use denominator activity in computing a predetermined fixed overhead rate
- Predetermined overhead rate from Job Costing chapter is based on the total budgeted overhead cost. The predetermined overhead rate may be divided into variable overhead and fixed overhead components. These are the standard costs or rates used in the variance analyses.

$$\frac{\text{Estimated VARIABLE Overhead Cost}}{\text{Estimated Activity}} + \frac{\text{Estimated FIXED Overhead Cost}}{\text{Estimated Activity}} = \frac{\text{Estimated TOTAL Overhead Cost}}{\text{Estimated Activity}}$$

- Calculate the material and labor variances using either the three-column method or the equation method:

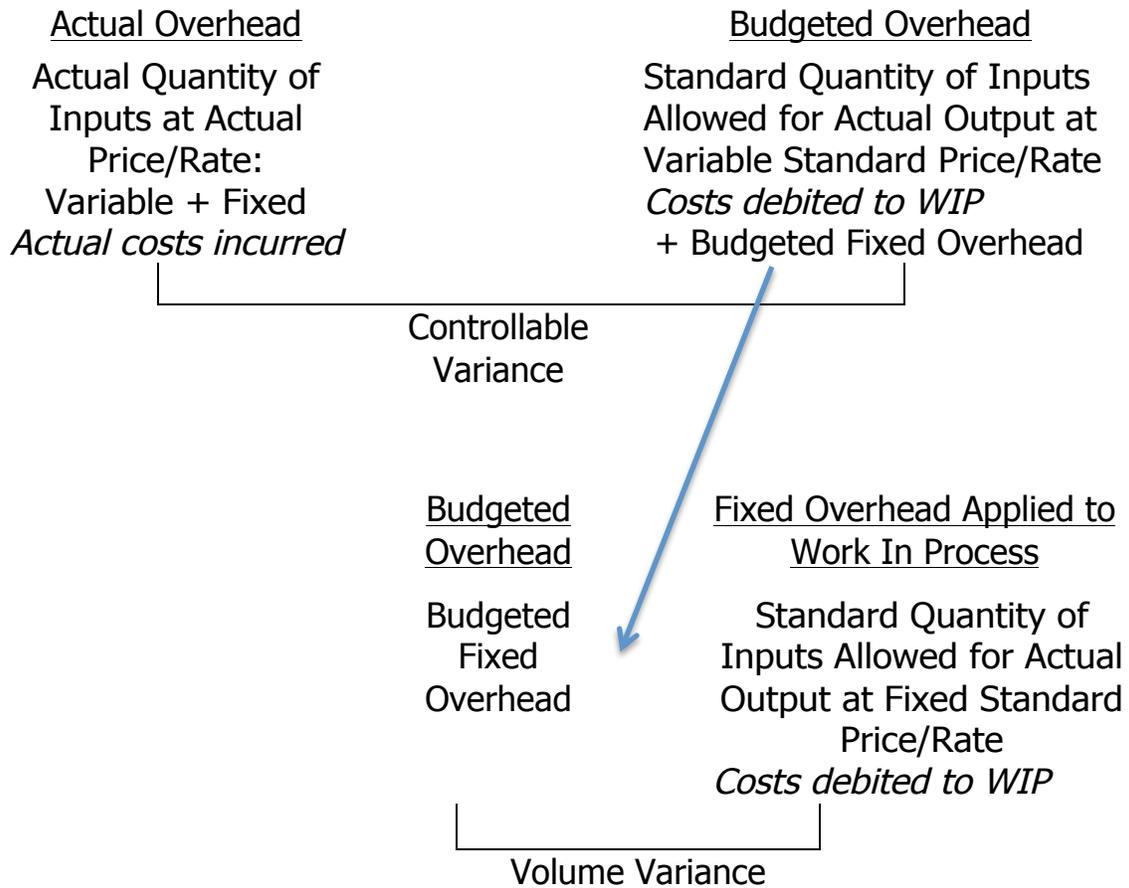


Equations:

Price/Rate/Spending Variance  
 $AQ * (AP - SP)$

Quantity/Efficiency Variances  
 $SP * (AQ - SQ)$

- Calculate the overhead variances using the following method:



## Problems

### Problem #1

M Company is a manufacturer of men's hunting clothing. During May, the company produced 4,800 units of product.

The actual and standard costs per unit for May were as follows:

		<u>Quantity</u>	<u>Price</u>
Direct materials	Standard	4.0 yds	\$3.60
	Actual	4.4 yds	3.35
Direct labor	Standard	1.6 hours	4.50
	Actual	1.4 hours	4.85
Variable overhead	Standard	1.6 hours	1.80
	Actual	1.4 hours	2.15
Fixed overhead	Standard	Per unit	9.00
	Actual	Per unit	9.10

Total costs for May were as follows:

	<u>Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Standard	4,800	\$24.48	\$117,504
Actual	4,800	24.54	<u>117,792</u>
Total variance			(288)

There was no inventory of materials on hand at the beginning of May. During the month, 21,120 yards of material were purchased at a cost of \$70,752, all of which were used during the month.

M Company reported the following information regarding fixed overhead during May:

	<u>Quantity</u>	<u>Units</u>	<u>Unit Cost</u>
Standard	1.6 hours	5,000	\$9.00
Actual	1.4 hours	4,800	9.10

- Required:
- a) Compute the material price and quantity variances
  - b) Compute the labor rate and efficiency variances.
  - c) Prepare the journal entries to record the direct materials and direct labor variances.
  - d) Compute the controllable variable overhead variance and the fixed overhead volume variance.

**Problem #2**

P Company produces a single product and uses a standard cost system. Overhead is applied to production based on machine hours.

According to the company's flexible budget, the following costs should have been incurred at an activity level of 18,000 machine hours (the denominator activity level):

Variable overhead	\$31,500
Fixed overhead	72,000
Total overhead	103,500

During the year, the following operating results were recorded:

Actual machine hours	15,000
Standard machine hours allowed	16,000
Actual variable overhead costs incurred	\$26,500
Actual fixed overhead costs incurred	70,000

At year-end, the Manufacturing Overhead account showed the following activity:

Manufacturing Overhead	
96,500	92,000
4,500	

Management would like to determine the cause of the \$4,500 under-applied overhead.

- Required:
- Compute the predetermined or standard rate for the year for variable, fixed and total overhead.
  - Show how the applied overhead cost was computed
  - Compute the controllable variable overhead variance and the fixed overhead volume variance.
  - Reconcile the \$4,500 underapplied balance in the overhead account to the variances calculated in c) above.

**Problem #3**

F Company makes a product with the following standard costs:

	Standard Quantity	Standard Cost	Standard Cost per Unit
Direct materials	7.1 pounds	\$5.00 per pound	\$35.50
Direct labor	.8 hours	\$17.00 per hour	13.60
Variable overhead	.8 hours	\$7.00 per hour	5.60
Fixed overhead	.8 hours	\$9.00 per hour	7.20

The company reported the following results concerning this product in July.

Originally budgeted output	4,700 units
Actual output	4,500 units
Raw materials used	34,150 pounds
Actual direct labor hours	3,610 hours
Purchases of raw materials	36,500 pounds
Actual price of raw materials	\$5.10 per pound
Actual direct labor rate	\$18.10 per hour
Actual variable overhead cost	\$25,187
Actual fixed overhead cost	\$33,333
Budgeted fixed overhead	\$33,840

The materials price variance is recognized when materials are purchased. Variable overhead is applied on the basis of direct labor-hours.

- Required:
- Compute the materials quantity variance.
  - Compute the materials price variance.
  - Compute the labor efficiency variance.
  - Compute the labor rate variance.
  - Compute the controllable overhead variance.
  - Compute the overhead volume variance.

## Multiple Choice Questions

1. L Company's direct labor costs for the month of January were as follows:

Actual total direct labor hours	20,000
Standard total direct labor hours allowed	21,000
Direct labor rate variance (unfavorable)	\$3,000
Total direct labor cost	\$126,000

What was the direct labor efficiency variance?

- a) \$6,000 F
- b) \$6,150 F
- c) \$6,300 F
- d) \$6,450 F

The next 7 questions refer to the following information.

T Company makes a single product which has the following standards:

Direct materials	2 kilograms	\$4.30 per kilogram
Direct labor	3 hours	\$6.00 per hour
Variable overhead	3 hours	\$6.50 per hour
Fixed overhead	3 hours	\$9.00 per hour

The following data pertain to June's operations:

- Direct labor was \$820,500 for 147,000 hours worked
- Direct material purchases were 110,000 kilograms for \$485,000
- Variable manufacturing overhead incurred was \$986,000
- Fixed manufacturing overhead incurred was \$1,154,500
- 93,000 kilograms of direct materials were used
- The company sold 42,000 units at \$130 each
- Variable manufacturing overhead is applied based on direct labor hours
- 46,000 units were produced during the year
- Budgeted production was 45,000 units
- At the beginning of June there were no inventories.

2. The material price variance is:

- a) \$89,400 F
- b) \$89,400 U
- c) \$12,000 F
- d) \$12,000 U

3. The material quantity variance is:
  - a) \$77,400 U
  - b) \$77,400 F
  - c) \$4,300 F
  - d) \$4,300 U
  
4. The labor rate variance is:
  - a) \$61,500 U
  - b) \$61,500 F
  - c) \$54,000 U
  - d) \$54,000 F
  
5. The labor efficiency variance is:
  - a) \$61,500 U
  - b) \$61,500 F
  - c) \$54,000 U
  - d) \$54,000 F
  
6. The controllable overhead variance was:
  - a) \$28,500 U
  - b) \$89,000 U
  - c) \$28,500 F
  - d) \$89,000 F
  
7. The fixed overhead volume variance was:
  - a) \$28,500 U
  - b) \$27,000 U
  - c) \$27,000 F
  - d) \$28,500 F
  
8. The total variance for T Company was:
  - a) \$10,800 U
  - b) \$37,800 U
  - c) \$11,200 F
  - d) \$99,800 U

9. Information on D Company's manufacturing overhead costs for last period is given below:

Actual direct labor hours worked	40,000 hours
Standard hours allowed	38,000 hours
Denominator hours	35,000 hours
Predetermined overhead rate	\$4 per DLH
Actual overhead costs incurred	\$150,000

D Company uses a standard cost system and applies manufacturing overhead cost to units of product on the basis of direct labor hours. The under- or overapplied overhead cost for the period would be:

- \$10,000 overapplied
- \$2,000 overapplied
- \$10,000 underapplied
- \$2,000 underapplied

The next 2 questions refer to the following information.

E Company uses standard costing and applied manufacturing overhead cost to units of product on the basis of direct labor hours (DLHs). Budgeted and actual data relating to manufacturing overhead for last year appear below:

Applied fixed overhead cost	\$38,900
Denominator activity	20,000 DLH
Standard hours allowed for one unit	1.2 DLH
Units produced	17,000
Fixed overhead volume variance	\$1,300 U

10. The budgeted fixed factory overhead cost was:
- \$24,000
  - \$38,900
  - \$40,200
  - \$37,600
11. The standard direct labor hours allowed for the output was:
- 14,167 hrs
  - 19,600 hrs
  - 20,000 hrs
  - 20,400 hrs

The next 2 questions refer to the following information.

H Company uses standard costing. Last period, it spent \$145,000 for labor. The direct labor rate variance was \$5,000 favorable, and the direct labor efficiency variance was \$6,000 unfavorable.

Standards for Product W require 2 pounds of materials at \$13 per pound and 3 hours of labor at \$10 per hour. Budgeted production last period was 5,000 units, and actual production was 4,800 units. Last period, M Company purchased and used 9,800 pounds of materials for \$135,000, and used 15,000 labor hours costing \$145,000.

12. What is the journal entry to record the use of materials?

A.	Work in Process	135,000	
	Raw materials inventory		135,000
B.	Work in Process	124,800	
	Materials quantity variance	2,600	
	Raw materials inventory		127,400
C.	Cost of goods sold	127,400	
	Materials quantity variance		2,600
	Raw materials inventory		124,800
D.	Cost of goods sold	124,800	
	Raw materials inventory		124,800

- a) A
- b) B
- c) C
- d) D

13. What is the journal entry to record direct labor costs?

A.	Work in process	144,000	
	Labor rate variance	6,000	
	Labor efficiency variance		5,000
	Wages payable		145,000
B.	Work in process	144,000	
	Wages payable		144,000
C.	Work in process	144,000	
	Labor efficiency variance	6,000	
	Labor rate variance		5,000
	Wages payable		145,000
D.	Cost of goods sold	145,000	
	Wages payable		145,000

- a) A
- b) B
- c) C
- d) D

The next 2 questions refer to the following information.

J Company uses a standard cost system in which direct materials inventory is carried at standard cost. Jackson has established the following standards for one unit of product.

	<u>Standard</u> <u>Quantity</u>	<u>Standard Price or</u> <u>Rate</u>	<u>Standard</u> <u>Cost</u>
Direct materials	5 pounds	\$3.60 per pound	\$18.00
Direct labor	1.25 hours	\$12.00 per hour	\$15.00

During May, J Company purchased 125,000 pounds of direct material at a total cost of \$475,000. The total factory wages for May were \$364,000, 90 percent of which were for direct labor. J Company manufactured 22,000 units of product during May using 108,000 pounds of direct material and 28,000 direct labor-hours.

14. The materials quantity variance for May is:

- a) \$7,200 U
- b) \$7,600 F
- c) \$5,850 U
- d) \$7,200 F

15. The materials price variance for May is:

- a) \$25,000 U
- b) \$21,600 U
- c) \$25,000 F
- d) \$21,600 F

16. W Company standard cost card for its product follows:

Direct materials (4 yards \$5 per yard)	\$20
Direct labor (1.5 hours \$10 per hour)	\$15
Variable manufacturing overhead (1.5 hrs \$4 per hour)	\$6

During a recent period the company produced 1,200 units of product. Various costs associated with the production of these units are given below:

Direct materials purchased (6,000 yards)	\$28,500
Direct materials used in production	5,000 yards
Direct labor cost incurred (2,100 hours)	\$17,850
Variable manufacturing overhead cost incurred	\$10,080

All variances are recorded at the earliest possible point in time. Variable manufacturing overhead costs are applied to products on the basis of standard direct labor-hours. The labor rate variance for the period is:

- a) \$3,150 U
- b) \$2,700 F
- c) \$2,700 U
- d) \$3,150 F

The next 2 questions refer to the following information.

Y Company produced 100,000 units of product during the year. Actual overhead costs incurred were \$262,000 of variable and \$90,000 of fixed. At the productive capacity of 15,000 direct labor hours, the total overhead rate was \$25 per dlh and the variable overhead rate was \$19 per dlh. For the year, both the actual hours worked and the standard hours allowed were 14,000.

17. The overhead controllable variance for the year was:

- a) \$4,000 U
- b) \$6,000 U
- c) \$6,000 F
- d) \$4,000 F

18. The fixed overhead volume variance for the year was:

- a) \$4,000 U
- b) \$6,000 U
- c) \$6,000 F
- d) \$4,000 F

The next 2 questions refer to the following information.

K Company's budgeted and actual overhead costs for the year were:

	<u>Budget</u>	<u>Actual</u>
Variable	\$540,000	\$524,000
Fixed	<u>240,000</u>	<u>230,000</u>
Total	\$780,000	\$754,000

The budget was based on productive capacity of 100,000 machine hours. 94,000 standard hours were allowed for the actual units produced, but only 93,000 actual hours were used.

19. The overhead controllable variance for the year was:
- a) \$20,800 U
  - b) \$5,400 F
  - c) \$10,000 F
  - d) \$6,400 U
20. The fixed overhead volume variance for the year was:
- a) \$14,400 U
  - b) \$14,400 F
  - c) \$10,000 F
  - d) \$20,800 U

# Solutions to Problems

## Problem #1

a) Direct Materials Variances:

$\frac{AQ}{21,120 \text{ yds}} \times \frac{AP}{\$3.35}$	$\frac{AQ}{21,120 \text{ yds}} \times \frac{SP}{\$3.60}$	$\frac{SQ}{4,800 \text{ units}} \times \frac{SP}{\$3.60}$
$\$70,752$	$\$76,032$	$\$70,752$
Rate Variance \$5,280 F		Efficiency Variance \$6,912 U
Total Variance \$1,632 U		

b) Direct Labor Variances

$\frac{AQ}{6,720 \text{ hrs}} \times \frac{AP}{\$4.85}$	$\frac{AQ}{6,720 \text{ hrs}} \times \frac{SP}{\$4.50}$	$\frac{SQ}{7,680 \text{ hrs}} \times \frac{SP}{\$4.50}$
$\$32,592$	$\$30,240$	$\$32,592$
Rate Variance \$2,352 U		Efficiency Variance \$4,320 F
Total Variance \$1,968 F		

Actual hours: 4,800 units X 1.4 hours per unit = 6,720 hours

Standard hours: 4,800 units X 1.6 hours per unit = 7,680 hours

c) Journal Entries

Raw Materials (21,120 yards @ \$3.60)	76,032	
Materials Price Variance (21,120 yards @ .25 F)	5,280	
Accounts Payable (21,120 yards @ \$3.35)		70,752
Work in Process (19,200 yards @ \$3.60)	69,120	
Materials Quantity Variances (1,920 yards U @ \$3.60)	6,912	
Raw Materials (21,120 yards @ \$3.60)		76,032
Work in Process (7,680 hrs @ \$4.50)	34,560	
Labor Rate Variance (6,720 hrs @ \$.35 U)	2,352	
Labor Efficiency Variance (960 hrs F @ \$4.50)		4,320
Wages Payable (6,720 hrs @ \$4.85)		32,592

d) Overhead Variances:

<u>Actual Overhead</u>		<u>Budgeted Overhead</u>
\$2.15 x 6,720 hrs = \$14,448	Variable	\$1.80 x 7,680 hrs = \$13,824
+		+
\$9.10 x 4,800 units = \$43,680	Fixed	\$9.00 x 5,000 units = \$45,000
\$696 F		
Controllable Variance		

<u>Budgeted Overhead</u>	<u>Fixed Overhead Applied to Work In Process</u>
\$45,000	\$9.00 x 4,800 units = \$43,200
\$1,800 U	
Volume Variance	

Summary of Variances

Direct Materials	Price Variance	\$5,280 F	
	Quantity Variance	<u>6,912 U</u>	\$1,632 U
Direct Labor	Rate Variance	2,352 U	
	Efficiency Variance	<u>4,320 F</u>	1,968 F
Overhead	Controllable Variance	696 F	
	Volume variance	<u>1,800 U</u>	<u>1,104 U</u>
Total Variance – Unfavorable			\$ 768 U

**Problem #2**

a) Predetermined overhead rate:

Variable overhead rate:  $\$31,500 / 18,000 \text{ hours} = \$1.75 \text{ per machine hour}$   
 Fixed overhead rate:  $\underline{\$72,000} / 18,000 \text{ hours} = \underline{\$4.00} \text{ per machine hour}$   
 Total overhead rate:  $\$103,500 / 18,000 \text{ hours} = \$5.75 \text{ per machine hour}$

b) Applied cost = 16,000 standard hours allowed X \$5.75 = \$92,000

<u>Actual Overhead</u>	<u>Budgeted Overhead</u>
Variable + Fixed	$\$1.75 \times 16,000 \text{ dlh} =$
\$26,500	\$28,000
+	+
\$70,000	72,000
\$96,500	\$100,000
<div style="display: flex; justify-content: space-between; width: 80%; margin: 0 auto;"> <span style="border-top: 1px solid black; width: 40%;"></span> <span style="border-top: 1px solid black; width: 40%;"></span> </div> <p style="text-align: center;">\$3,500 F Controllable Variance</p>	

<u>Budgeted Overhead</u>	<u>Fixed Overhead Applied to Work In Process</u>
\$72,000	$\$4.00 \times 16,000 \text{ dlh} =$
	\$64,000
<div style="display: flex; justify-content: center; width: 60%; margin: 0 auto;"> <span style="border: 1px solid black; padding: 2px 10px;">\$8,000 U</span> </div> <p style="text-align: center;">Volume Variance</p>	

Summary of Overhead Variances:

Controllable Variable overhead variance	\$3,500 F
Fixed Overhead Volume variance	<u>8,000 U</u>
Total underapplied overhead	\$4,500 U

**Problem #3**

Direct Materials Variances:

<u>AQ</u> X <u>AP</u>	<u>AQ</u> X <u>SP</u>	<u>SQ</u> X <u>SP</u>
36,500 lbs X \$5.10	36,500 lbs X \$5.00	
\$	\$76,032	
Rate Variance \$3,650 U		
	<u>AQ</u> X <u>SP</u>	<u>SQ</u> X <u>SP</u>
	34,150 lbs X \$5.00	4,500 x 7.1 X \$5.00
	\$	lbs \$
	Quantity Variance \$11,000 U	
	Total Variance \$14,650 U	

a)  
Direct Labor Variances

<u>AQ</u> X <u>AP</u>	<u>AQ</u> X <u>SP</u>	<u>SQ</u> X <u>SP</u>
3,610 hrs X \$18.10	3,610 hrs X \$17.00	4,500 x .8 hrs X \$17.00
\$65,341	\$61,370	\$61,200
Rate Variance \$3,971 U      Efficiency Variance \$170 U		
Total Variance \$4,141 U F		

- a)  $SQ = 4,500 \text{ units} \times 7.1 \text{ pounds per unit} = 31,950 \text{ pounds}$   
 Materials quantity variance =  $(AQ - SQ) \times SP$   
 $= (34,150 \text{ pounds} - 31,950 \text{ pounds}) \times \$5.00 \text{ per pound}$   
 $= (2,200 \text{ pounds}) \times \$5.00 \text{ per pound}$   
 $= \$11,000 \text{ U}$
- b) Materials price variance =  $AQ \times (AP - SP)$   
 $= 36,500 \text{ pounds} \times (\$5.10 \text{ per pound} - \$5.00 \text{ per pound})$   
 $= 36,500 \text{ pounds} \times (\$0.10 \text{ per pound})$   
 $= \$3,650 \text{ U}$
- c)  $SH = 4,500 \text{ units} \times 0.8 \text{ hours per unit} = 3,600 \text{ hours}$   
 Labor efficiency variance =  $(AH - SH) \times SR$   
 $= (3,610 \text{ hours} - 3,600 \text{ hours}) \times \$17.00 \text{ per hour}$   
 $= (10 \text{ hours}) \times \$17.00 \text{ per hour}$   
 $= \$170 \text{ U}$

$$\begin{aligned}
 \text{d) Labor rate variance} &= \text{AH} \times (\text{AR} - \text{SR}) \\
 &= 3,610 \text{ hours} \times (\$18.10 \text{ per hour} - \$17.00 \text{ per hour}) \\
 &= 3,610 \text{ hours} \times (\$1.10 \text{ per hour}) \\
 &= \$3,971 \text{ U}
 \end{aligned}$$

<u>Actual</u> <u>Overhead</u>	<u>Budgeted Overhead</u>
Variable + Fixed	$\$7.00 \times 4,500 \text{ units} \times .8 \text{ dlh} =$
\$25,187	\$25,200
+	+
\$33,333	33,840
\$58,520	\$59,040
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\$520 F	
Controllable Variance	

<u>Budgeted</u> <u>Overhead</u>	<u>Fixed Overhead Applied</u> <u>to Work In Process</u>
\$33,840	$\$9.00 \times 4,500 \text{ units} \times .8$
	dlh =
	\$32,400
<div style="display: flex; justify-content: space-between; width: 100%;"> <span style="border-top: 1px solid black; width: 40%;"></span> <span style="border-top: 1px solid black; width: 40%;"></span> </div>	
\$1,440 U	
Volume Variance	

## Solutions to Multiple Choice Questions

- |     |   |
|-----|---|
| 1.  | B |
| 2.  | D |
| 3.  | D |
| 4.  | B |
| 5.  | C |
| 6.  | A |
| 7.  | C |
| 8.  | A |
| 9.  | B |
| 10. | C |
| 11. | D |
| 12. | B |
| 13. | C |
| 14. | D |
| 15. | A |
| 16. | D |
| 17. | D |
| 18. | B |
| 19. | D |
| 20. | A |