

Lanen 3e, Chapter 17

Additional Topics in Variance Analysis

Learning Objectives

1. Explain how to prorate variances to inventories and cost of goods sold.
2. Use market share variances to evaluate marketing performance.
3. Use sales mix and quantity variances to evaluate marketing performance.
4. Evaluate production performance using production mix and yield variances
5. Apply the variance analysis model to nonmanufacturing costs.
6. Determine which variances to investigate.

Chapter Outline

- I. PROFIT VARIANCE ANALYSIS WHEN UNITS PRODUCED DO NOT EQUAL UNITS SOLD
 - ◆ Reconciling variable costing budgets and full-absorption income statements
- II. MATERIALS PURCHASES DO NOT EQUAL MATERIALS USED
- III. MARKET SHARE VARIANCE AND INDUSTRY VOLUME VARIANCE
- IV. SALES ACTIVITY VARIANCES WITH MULTIPLE PRODUCTS
 - A. Evaluating product mix
 - B. Evaluating sales mix and sales quantity
 - Sources of the sales mix variance
- V. PRODUCTION MIX AND YIELD VARIANCES
 - ◆ Mix and yield variances in manufacturing
- VI. VARIANCE ANALYSIS IN NONMANUFACTURING SETTINGS
 - A. Using the profit variance analysis in service and merchandise organizations
 - B. Efficiency measures
 - C. Mix and yield variances in service organizations
- VII. KEEPING AN EYE ON VARIANCES AND STANDARDS
 - A. How many variances to calculate
 - B. When to investigate variances
 - C. Updating standards
- VIII. SUMMARY

Key Concepts

LO1 Explain how to prorate variances to inventories and cost of goods sold.

♦ The analysis of variances becomes more complicated when the units sold do not equal the units produced (i.e., when inventory is present).

- The assumption that production was greater than sales has no effect on the sales activity variance because the master budget and flexible budget are based on sales volume. So are the sales price variance, and marketing and administrative variances in general.

- In the time period in which units are produced, the variable production cost variance is calculated as follows:

Variance = (Actual variable cost – Estimated variable cost) × Units produced.

- The actual variable production costs are really a hybrid.

Actual variable production costs = Flexible budget variable production costs + (or -) Variable production cost variances.

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Demonstration Problem 1

The accountant at EZ Toys, Inc. is analyzing the production and cost data for its Trucks Division. For October, the actual results and the master budget data are presented below.

Actual results		Budget data	
12,000 trucks produced		12,000 trucks planned	
10,000 trucks sold			
Unit selling price	\$15	Unit selling price	\$14
Unit variable costs: ^a		Unit variable cost:	
Direct materials	\$5.28	Direct materials	\$5
Direct labor	5.10	Direct labor	4
Variable overhead	2.30	Variable overhead	2
Total variable costs	<u>\$12.68</u>	Total unit variable costs	<u>\$11</u>
Fixed overhead	\$9,000	Fixed overhead	\$9,600

^a These are average costs.

Required:

Prepare a profit variance analysis.

Solution:

	Actual (based on activity of 10,000 units sold)	Manufacturing variances	Sales price variance	Flexible budget (based on actual activity of 10,000 units sold)	Sales activity variance	Master budget (based on 12,000 units planned)
Sales revenue	\$150,000		\$10,000 F	\$140,000	\$28,000 U	\$168,000
Less: Costs						
Variable costs						
Direct materials	\$53,360	\$3,360 U ^a		\$50,000	\$10,000 F	\$60,000
Direct labor	53,200	13,200 U ^b		40,000	8,000 F	48,000
Variable overhead	23,600	3,600 U ^c		20,000	4,000 F	24,000
Total variable costs	\$130,160			\$110,000	\$22,000 F	\$132,000
Contribution margin	\$19,840			\$30,000	\$6,000 U	\$36,000
Fixed overhead	9,000	600 F		9,600	0	9,600
Operating profit	\$10,840	\$19,560 U	\$10,000 F	\$20,400	\$6,000 U	\$26,400

F = Favorable variance.

U = Unfavorable variance.

^a $12,000 \times (\$5.28 - \$5) = \$3,360 \text{ U.}$

^b $12,000 \times (\$5.10 - \$4) = \$13,200 \text{ U.}$

^c $12,000 \times (\$2.30 - \$2) = \$3,600 \text{ U.}$

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- The entire variable production cost variance for units produced can be treated as a period cost and expensed in the period incurred, or it can be prorated between units sold and units still in inventory.

<i>Cost of goods sold</i>	XX	
<i>Fixed overhead price variance</i>		XX
<i>Fixed overhead production volume variance</i>		XX
<i>Variable production cost variances</i>		XX

(To close production cost variances to Cost of goods sold; the debits and credits are assumed)

<i>Cost of goods sold</i>	XX	
<i>Finished goods inventory</i>	XX	
<i>Fixed overhead price variance</i>		XX
<i>Fixed overhead production volume variance</i>		XX
<i>Variable production cost variances</i>		XX

(To close production cost variances to Cost of goods sold and Finished goods inventory; the debits and credits are assumed)

- Using variable costing, the entire fixed production cost is expensed when incurred.
- When standard, full-absorption costing is used and production and sales volumes are not the same, the profit reported will be different from that reported under variable costing (due to the accounting system, not managerial efficiency). Care must be taken to identify the cause of such profit differences.
- Exhibit 17.2 reconciles the reported income statement under full absorption with that under variable costing.

Demonstration Problem 2

Required:

Reconcile reported income using standard, full-absorption costing with that using standard, variable costing for the Trucks Division of EZ Toys in October.

Solution:

	Actual (using standard, full-absorption costing)	Inventory adjustment	Actual (using standard, variable costing)
Sales revenue	\$150,000		\$150,000
Less:			
Variable costs			
Direct materials (at standard)	\$50,000		\$50,000
Direct labor (at standard)	40,000		40,000
Variable overhead (at standard)	20,000		20,000
Variable production cost variances (net)	20,160 ^a		20,160
Less:			
Fixed overhead	8,000	\$(1,600)	9,600
Fixed overhead variance (net)	(600)		(600)
Operating profit	\$12,440	\$(1,600)	\$10,840

^a \$3,360 U + \$13,200 U + \$3,600 U = \$20,160 U.

Using variable costing, the entire fixed production cost of \$9,000 is expensed in October. Under standard, absorption costing, each truck is allocated fixed production cost of \$0.8 (= \$9,600 ÷ 12,000 units). A portion of the fixed production cost is allocated to the 2,000 units in ending inventory:

$$\$0.8 \times 2,000 = \$1,600.$$

Thus, only \$7,400 (= \$9,000 - \$1,600) of the actual fixed production cost are expensed in October under standard, full-absorption costing. This includes \$8,000 (= \$0.8 × 10,000 units) of fixed production cost in standard cost of goods sold plus a favorable budget variance of \$600.

In this case, full-absorption operating profit would be \$12,440, or \$1,600 higher than variable costing operating profit. The \$1,600 difference in profits is due to the accounting system, not because of operating activities.

♦ When the quantities of materials purchased and used are not the same, a **purchase price variance** based on the quantity of materials purchased can be calculated.

Purchase price variance = (Actual price – Standard price) × Actual quantity purchased.

- The materials efficiency variance remains the same because it is based on materials used.
- One advantage of using a standard costing system is that managers receive information that is useful in making decisions to improve performance.
 - The sooner the information is received (such as information about the purchase price variance shortly after the acquisition of materials), the sooner it can be used for decision making purposes.
 - If materials are stored, recording the purchase at standard cost provides information on price variances earlier than if the firm waits until the materials are used.

Demonstration Problem 3

Information about the use of direct materials at EZ Toys' Trucks Division for October is as follows:

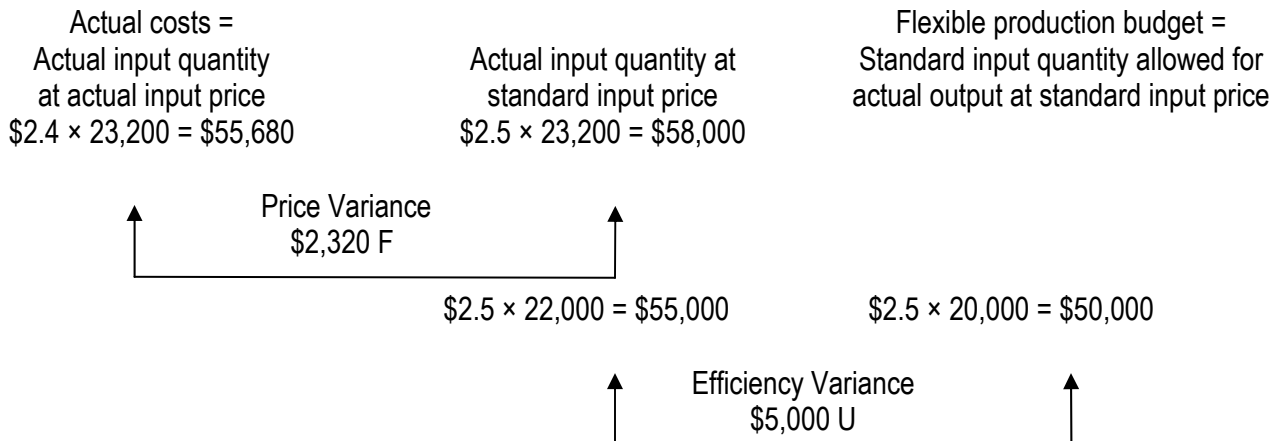
Standard costs		
2 units per truck @ \$2.5 per unit	=	\$5 per truck
Trucks produced in October	=	10,000
Actual materials purchased		
23,200 units @ \$2.4 per unit	=	\$55,680
Actual materials used		
22,000 units @ \$2.4 per unit	=	\$52,800

There was no beginning inventory on October 1.

Required:

Prepare Truck Division's direct materials variances for October.

Solution:



The price variance is based on the quantities purchased (23,200 units), while the efficiency variance is based on the quantities used (22,000 units vs. 20,000 units allowed under the flexible budget).

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- The relevant journal entries are

<i>Materials inventory</i>	XX	
<i>Material price variance</i>	XX	
<i>Accounts payable</i>		XX

(To record materials purchase and material price variance; Unfavorable variance is assumed)

<i>Work in process inventory</i>	XX	
<i>Material efficiency variance</i>		
<i>Materials inventory</i>		XX

(To record the use of materials and material efficiency variance; Unfavorable variance is assumed)

LO2 Use market share variances to evaluate marketing performance.

- ◆ The general approach in variance analysis is to separate the variance into components based on a budgeting formula.
 - The same idea is applicable to variances in sales activities.
- ◆ Many companies base an initial sales forecast on an estimate of sales activity in the industry as a whole and on an estimate of the company's market share.
 - There are two reasons why actual sales activity is different from budgeted sales activity:
 - (1) Actual industry volume was different from budgeted industry volume, and/or
 - (2) Actual market share was different from budgeted market share.
 - **Industry volume variance** represents the portion of the sales activity variance attributable to changes in industry volume.
 - **Market share variance** represents the portion of the sales activity variance due to change in the company's proportion of sales in the markets in which the company operates.
 - By decomposing sales activity variance into an industry volume and a market share variance, management has additional information that can be used to make operational improvements next period.
 - Multiplying each figure (one from the industry effect, the other from the market share effect) by the standard contribution margin gives the impact of these variances on operating profit. That is,

$$\text{Industry volume variance} = \text{Standard contribution margin per unit} \times (\text{Actual industry volume} - \text{Budgeted industry volume}) \times \text{Budgeted market share.}$$

$$\text{Market share variance} = \text{Standard contribution margin per unit} \times \text{Actual industry volume} \times (\text{Actual market share} - \text{Budgeted market share}).$$

Example: Pioneer Uniform, Inc. serves two groups of the customers in the market, Retail and Commercial. The following budget information is available for June.

Customers	Unit contribution margin	Sales volume	Sales mix
Commercial	\$5	40,000	80%
Retail	8	10,000	20%
		<u>50,000</u>	

Since two "products" are offered in the same industry, a composite (weighted-average) standard contribution margin per unit needs to be calculated to determine the industry volume and market share variances later. The weights are based on the standard sales mix.

Composite standard contribution margin per unit = $\$5 \times 80\% + \$8 \times 20\% = \$5.6$.

- The market share variance is usually more controllable by the marketing department and is a measure of its performance.
- The use of the industry volume and market share variances enables management to separate that portion of the activity variance that coincides with changes in the overall industry from that which is specific to the company.
- Exhibit 17.4 illustrates the relation between these two market-related variances.

Demonstration Problem 4

EZ Toys' marketing manager estimated the sales of 12,000 trucks in October for the Trucks Division based on an estimated industry volume of 80,000 trucks and on the Trucks Division's ability to maintain a market share of 15 percent in the past. That is,

80,000 trucks to be sold in the market $\times$ 15% of estimated market share = 12,000 trucks.

Due to unexpected shift in demand, the industry volume in toy truck sales dropped to 62,500 units in October while EZ Toys' Trucks Division managed to sell a total of 10,000 units.

The following information is also available.

Budget data

Unit selling price	\$14
Unit variable cost:	
Direct materials	\$5
Direct labor	4
Variable overhead	<u>2</u>
Total unit variable costs	<u>\$11</u>

Required:

Prepare October's industry volume and market share activity variances for the Trucks Division of EZ Toys.

Solution:

The Trucks Division's actual market share for October was 16% ($= 10,000 \text{ units} \div 62,500 \text{ units}$).

Industry volume variance	$(\$14 - \$11) \times (62,500 \text{ units} - 80,000 \text{ units}) \times 15\%$	=	\$7,875 U
Market share variance	$(\$14 - \$11) \times 62,500 \text{ units} \times (16\% - 15\%)$	=	<u>1,875 F</u>
Sales activity variance			<u><u>\$6,000 U</u></u>

L03 Use sales mix and quantity variances to evaluate marketing performance.

♦ The sales activity variance can be divided into two components: sales mix and sales quantity.

- **Sales mix variance** arises from the relative proportion of different products sold, holding constant the quantity effects.

$$\text{Sales mix variance} = \text{Standard contribution margin per unit} \times (\text{Actual quantity sold} - \text{Quantity that would have been sold at the standard mix}).$$

- A sales mix variance provides useful information for a company that sells multiple products when these products are (imperfect) substitutes for each other.
- The sales mix variance measures the impact of substitution.
- **Sales quantity variance** occurs in multiproduct companies from the change in volume of sales, independent of any change in sales mix.

$$\text{Sales quantity variance} = \text{Standard contribution margin per unit} \times (\text{Quantity that would have been sold at the standard mix} - \text{Budgeted sales quantity}).$$

- The sales quantity variance measures the variance in sales quantity, holding the sales mix constant.
- Although the variances can be calculated for each product sold to show the exact source, the total variance is most frequently used for analysis.
- See Exhibit 17.5 for an example.

Demonstration Problem 5

EZ Toys' Stuffed Animals Division has two products: Bear and Monkey. Data on the two products for October are as follows.

	Bear	Monkey	Total
Standard selling price	\$20	\$12	
Standard variable costs	12	8	
Standard unit contribution margin	<u>\$8</u>	<u>\$4</u>	
Budgeted sales quantity	2,500	7,500	10,000
Budgeted sales mix	25%	75%	
Budgeted contribution margin	\$20,000	\$30,000	<u>\$50,000</u>
Actual sales quantity	3,000	5,000	8,000
Actual sales mix	37.5%	62.5%	
Budgeted contribution margin at actual quantities	\$24,000 ^a	\$20,000	<u>\$44,000</u>
Sales activity variance			<u>\$6,000 U^b</u>

^a \$24,000 = \$8 × 3,000 units.

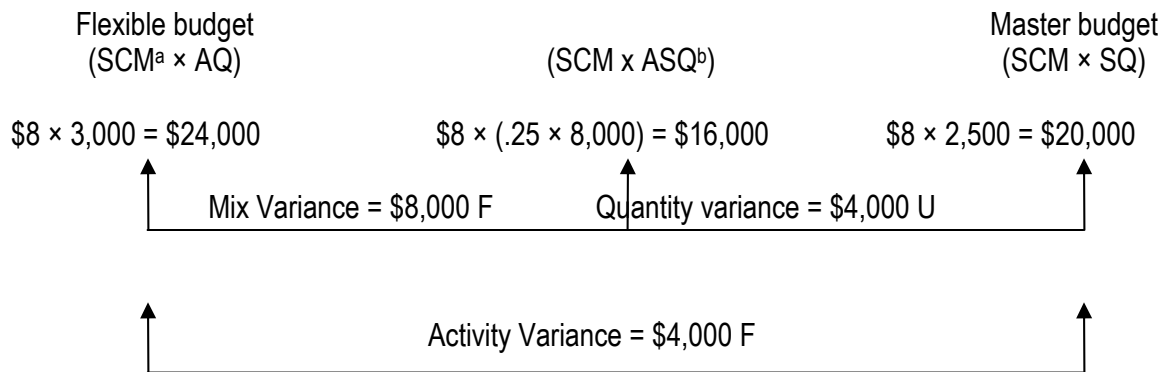
^b \$6,000 U = \$44,000 - \$50,000.

Required:

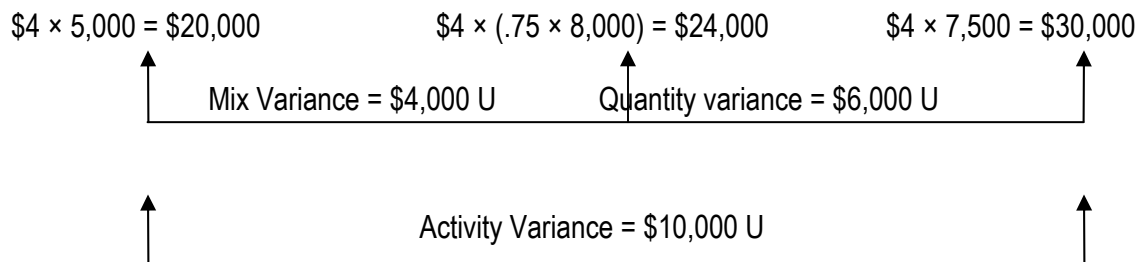
Determine the Stuffed Animals Division's sales mix and sales quantity variances for October.

Solution:

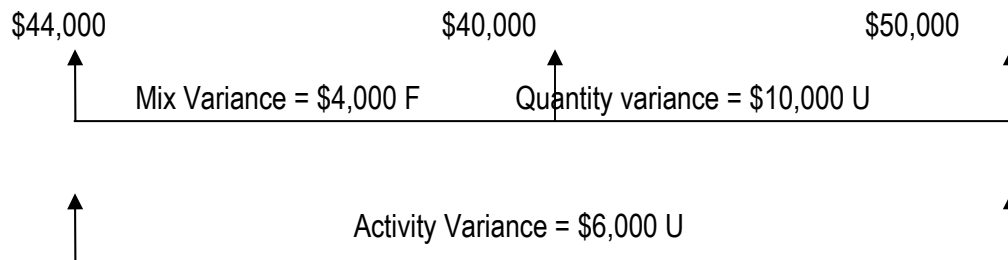
For Bear,



For Monkey,



For the Stuffed Animals Division as a whole,



^a SCM = Standard unit contribution margin.

^b ASQ = Quantity that would have been sold at the standard mix.

LO4 Evaluate production performance using production mix and yield variances.

- ♦ The analysis of mix and quantity variances for sales can be applied to production as well.
 - The direct materials efficiency variance can be divided into two components: mix and yield.
 - **Production mix variance** arises from a change in the relative proportion of inputs (a materials or labor mix variance).

Production mix variance	Standard input price	(Actual quantity – Actual input used at the standard mix).
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- The production mix variance measures the impact of substitution.
- **Production yield variance** measures the difference between expected output from a given level of inputs and the actual output obtained from those inputs.

Production yield variance	Standard input price	(Actual input used at the standard mix – Standard input allowed).
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- The production yield variance measures the input-output relationship holding the standard mix inputs constant.
- By separating the efficiency variance into its mix and yield components, the pure mix effect is isolated by holding constant the yield effect, and the pure yield effect is isolated by holding constant the mix effect.
- See Exhibit 17.6 for an example.

Demonstration Problem 6

Beautiful Paints Company makes different paints. Its semi-gloss paint product requires two chemical ingredients, X and Y. The standard cost and quantity data follow.

Direct materials	Standard price per gallon	Standard quantity (gallon) of input per gallon of semi-gloss paint	Standard cost per gallon of semi-gloss paint
Chemical X	\$8	.5	\$4
Chemical Y	2	.5	1

During October, Beautiful Paints Company had the following results:

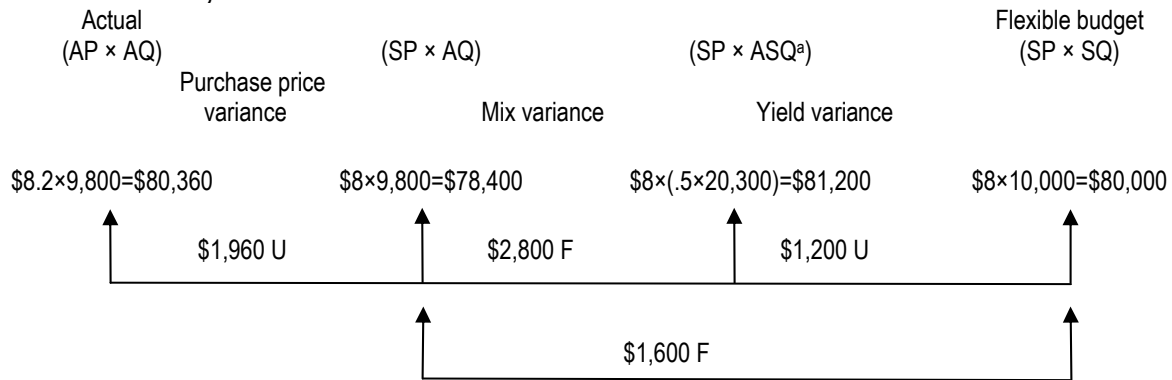
Units produced	20,000 gallons of semi-gloss paint
Materials purchased and used	
Chemical X	9,800 gallons at \$8.2 per gallon
Chemical Y	10,500 gallons at \$2.1 per gallon

Required:

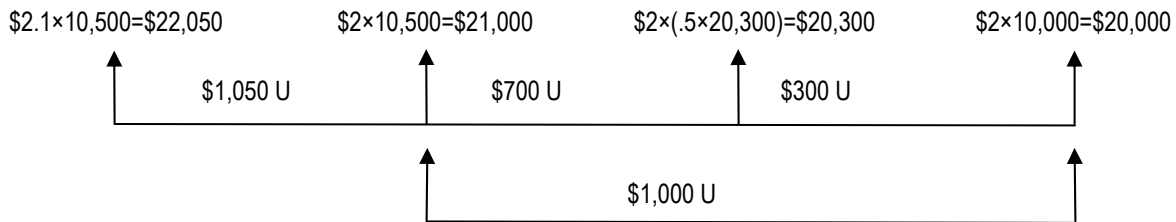
Determine the price, mix, and yield variances for Beautiful Paints Company's semi-gloss paint in October.

Solution:

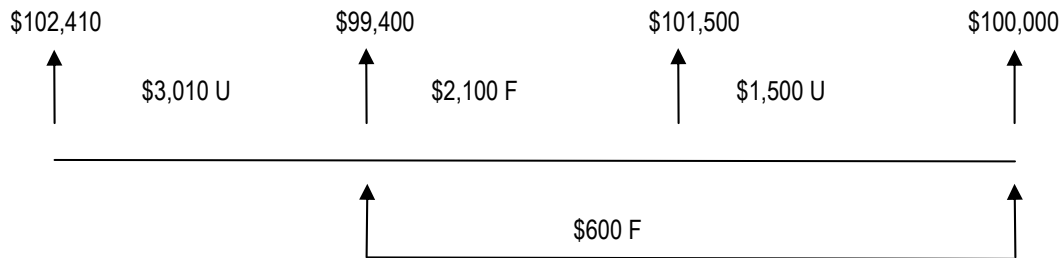
For Chemical X,



For Chemical Y,



For the semi-gloss paint,



^a ASQ = Quantity that would have been sold at the standard mix.

LO5 Apply the variance analysis model to nonmanufacturing costs.

♦ The comparison of the master budget, the flexible budget, and actual results can also be used in service and merchandising organizations.

- Output is usually defined as sales units in merchandising, but service organizations use other measures, such as professional staff hours (accounting firms), room nights or guests (hotels), seat miles or revenue miles (airlines), and patient days (hospitals).
- Merchandising and service organizations focus on marketing and administrative costs to measure efficiency and control costs.
- The key items to control are labor costs (for service organizations), and occupancy costs per sales dollar (for merchandising organizations).
- The computation of efficiency variance requires a reliable measure of output activity that is linked to input.
- In general, jobs with routine tasks lend themselves to efficiency measures, and jobs with non-routine tasks do not.
- By substituting different types of labor, service organizations need to calculate labor mix and yield variances.
- Two factors are important when considering mix variances.

(1) There is an assumed substitutability of inputs.

(2) The input costs must be different for a mix variance to exist.

Demonstration Problem 7

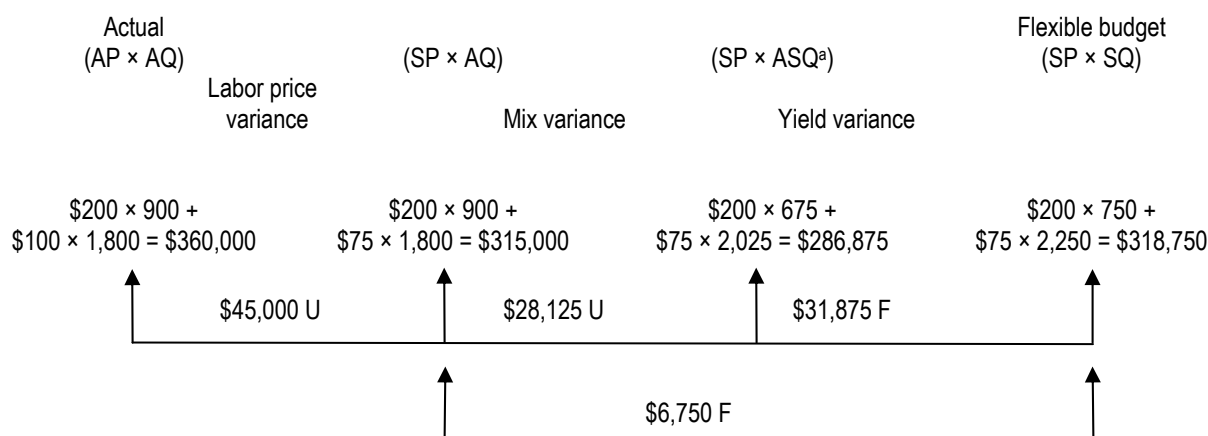
A CPA firm is to perform an audit job for a regular client. Based on past experiences working with the client, 750 partner hours (at a cost of \$200 per hour) and 2,250 staff hours (at a cost of \$75 per hour) are budgeted for the job.

Due to unforeseen events at the client's sites, a total of 2,700 hours are used consisting of 900 partner hours and 1,800 staff hours. The hourly rate for partner time is the same as budgeted but the hourly rate for staff time become \$100 per hour because more experienced staff members are put to work.

Required:

Determine all the variances for the CPA firm on the audit job.

Solution:



^a ASQ = Labor hours that would have been used at the standard mix.

$2,700 \times \frac{1}{4} = 675$; $2,700 \times \frac{3}{4} = 2,025$.

A total of 3,000 audit hours are budgeted for the job. The standard mix calls for three staff hours for each partner hour performed ($2,250 \div 750 = 3$). The actual audit takes 2,700 hours in which each partner hour is supported by only two staff hours due to staff members' seniority and experiences.