

# RESPONSIBILITY AND SEGMENT ACCOUNTING

## Key Terms and Concepts to Know

### **Organizations:**

- Centralized and decentralized organizations
- Business segments include cost centers, profit centers and investment centers.

### **Decentralization:**

- The delegation of decision-making to lower levels of management. It is not possible for all decisions to be made by top management, especially in large and medium sized organizations.
- Responsibility accounting systems link decision-making authority with accountability for the outcomes of those decisions.
- Large and medium sized organizations are often divided into three types of responsibility centers: cost centers, profit centers and/or investment centers:
  - Cost Centers which may be evaluated through variance analysis
  - Profit Centers which may be evaluated by comparing actual income to budgeted income
  - Investment Centers which may be evaluated using Return on Investment or Residual Income

### **Fixed Costs:**

- Traceable fixed costs are incurred for the benefit of one business segment and are controllable by the segment
- Common fixed costs are incurred for the benefit of more than one segment and are not traceable to or controllable by any one segment.
- There are numerous approaches to the allocation of common fixed expenses to business segments
- Problems caused by arbitrarily dividing common costs among segments

### **Segment Performance Evaluation:**

- Information from the Segment Income Statement is an input for two methods:
  - Return on Investment (ROI) method
  - Residual Income method

## Key Topics to Know

### Evaluation of Management Performance

- Managers of the cost centers, profit centers and/or investment centers are held responsible for the results of their particular segment. This is referred to as responsibility accounting.
- Each segment may prepare a Segment Income Statement income statement that reports the revenue, variable expenses, contribution margin and traceable fixed expenses controllable by segment management. The highlight of the segment income statement is the Segment Margin, computed as segment contribution margin less the segment's traceable fixed costs. It represents the segment's income after all the traceable fixed costs have been covered. Some companies then deduct the segment's share of common or allocated fixed expenses to calculate the segment's operating income.
- In addition to the segment income statement, segment performance may be evaluated using either **Return on Investment** or **Residual Income**.

### Return on Investment

- ROI measures the segments ability to utilize its operating assets to generate income. ROI focuses on how efficiently the assets are used since it expressed as a percent of the assets used. The ability to generate income by utilizing operating assets varies widely by industry and by company within an industry.
- Return on Investment (ROI) has three interrelated formulas:

$$\text{ROI} = \frac{\text{Net operating income}}{\text{Average operating assets}}$$

$$\text{ROI} = \text{Margin} \quad \times \quad \text{Turnover}$$

$$\text{ROI} = \frac{\text{Net operating income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Average operating assets}}$$

- Margin = Net Operating Income / Sales or the ability to keep a portion of sales dollars in the business as income
- Turnover = Sales / Average Operating Assets or the ability to use operating assets to generate sales

- ROI may be improved in several ways:
  - Reduce expenses which increases operating income
  - Increase sales which increases operating income
  - Reduce operating assets
  - Increase operating assets to increase sales which increases operating income
- Net Operating Income, NOT Net Income, is used in the ROI formula.
- Net Operating Income is income before interest and taxes.
- Operating assets include cash, accounts receivable, inventory, plant and equipment and all other assets held for operating purposes. It does NOT include investments in other companies, land held for future use, or a building that may be rented to others as opposed to being used in the business.

**Example #1**

Montana Company has reported the following results for last year's operations:

Sales	\$50,000,000
Net operating income	6,000,000
Average operating assets	20,000,000

- Required:
- a) Compute Montana's margin, turnover, and ROI
  - b) Management has set a minimum required rate of return on average operating assets of 25%. What is the residual income?

**Solution #1**

a)

$$\text{Margin} = \frac{\text{Net operating income}}{\text{Sales}} = \frac{\$6,000,000}{\$50,000,000} = 12\%$$

$$\text{Turnover} = \frac{\text{Sales}}{\text{Average operating assets}} = \frac{\$50,000,000}{\$20,000,000} = 2.5$$

$$\text{ROI} = \text{Margin} \times \text{Turnover} = 12\% \times 2.5 = 30\%$$

b)

Average operating assets	\$20,000,000
Minimum rate of return	<u>25%</u>
Minimum required income	\$5,000,000
Net operating income	<u>\$6,000,000</u>
Residual Income	\$1,000,000

**Example #2**

Omaha Company provides the following information:

Sales	\$4,000,000
Net operating income	400,000
Average operating assets	1,600,000

- Required:
- Compute the company's return on investment.
  - The owner is convinced that sales will increase next year by 150% and that net operating income will increase by 100%, with no increase in average operating assets. What would be the company's ROI?
  - The chief financial officer of the company believes a more realistic scenario would be a \$1,000,000 increase in sales, requiring a \$400,000 increase in average operating assets, with a resulting \$250,000 increase in net operating income. What would be the company's ROI in this situation?

**Solution #2**

$$\begin{aligned}
 \text{a) ROI} &= \frac{\text{Net operating income}}{\text{Average operating assets}} = \frac{\$400,000}{\$1,600,000} = 25\% \\
 \text{b) ROI} &= \frac{\text{Net operating income}}{\text{Average operating assets}} = \frac{\$400,000 + 400,000}{\$1,600,000} = 50\% \\
 \text{c) ROI} &= \frac{\text{Net operating income}}{\text{Average operating assets}} = \frac{\$400,000 + 250,000}{\$1,600,000 + 400,000} = 32.5\%
 \end{aligned}$$

**Example #3**

Snickers Company has two investment centers and has developed the following information:

	<u>Department A</u>	<u>Department B</u>
Net operating income	\$120,000	?
Average operating assets	?	\$400,000
Sales	800,000	250,000
ROI	10%	12%

- Required:
- What was the amount of Department A's average operating assets?
  - What was the amount of Department B's net operating income?
  - If Department B is able to reduce its operating assets by \$100,000, what would be Department B's new ROI?
  - If Department A is able to increase its net operating income by \$60,000 by reducing expenses, what would be Department A's new ROI?

**Solution #3**

a) $\frac{\text{Net operating assets}}{\text{ROI}}$	$\frac{\$120,000}{10\%}$	$= \$1,200,000$
b) Average operating assets X ROI	$\$400,000 \times 12\%$	$= \$48,000$
c) $\frac{\text{Net operating income}}{\text{Net operating assets}}$	$\frac{\$48,000}{\$400,000 - 100,000}$	$= 16\%$
d) $\frac{\text{Net operating income}}{\text{Net operating assets}}$	$\frac{\$120,000 + 60,000}{\$1,200,000}$	$= 15\%$

**Residual Income**

- An alternative measurement tool to ROI is Residual Income, which focuses on the ability of operating assets to generate dollars of income, not how efficiently the operating assets were used.
- Residual income is the amount by which actual operating income exceeds the minimum required income.
- Minimum Required Income = Required Rate of Return X Average Operating Assets
- Residual Income = Net Operating Income minus Minimum Required Income

- Residual income method has a natural bias in favor of segments with large operating asset bases since the more assets that are used, the easier it is to generate operating income and therefore residual income.
- Net Operating Income, NOT Net Income, is used in the residual income method.
- Net Operating Income is income before interest and taxes.
- Operating assets include cash, accounts receivable, inventory, plant and equipment and all other assets held for operating purposes. It does NOT include investments in other companies, land held for future use, or a building that may be rented to others as opposed to being used in the business.

**Example #4**

Snickers Company has two investment centers and has developed the following information. Snickers Company expects a minimum return on operating assets of 10%.

	<u>Department A</u>	<u>Department B</u>
Net operating income	\$120,000	\$48,000
Average operating assets	\$1,200,000	\$400,000
Sales	800,000	250,000

Required:           What was the amount of residual income for each department?

**Solution #4**

	<u>Department A</u>	<u>Department B</u>
Average operating assets	\$1,200,000	\$400,000
Minimum rate of return	<u>10%</u>	<u>10%</u>
Required operating income	\$120,000	\$40,000
Net operating income	<u>\$120,000</u>	<u>\$48,000</u>
Residual income	\$0	\$8,000

## Practice Problems

### **Practice Problem #1**

Stockholm Company produces and sells two packaged products, Product W and Product Z. Revenue and cost data relating to the two products is as follows: and in addition common fixed expenses not traceable in the company total \$44,000 per year. Last year the company produced and sold 18,000 units of Product W and 30,000 units of Product Z. The selling price of W is \$8 per unit and the selling price of Z is \$12 per unit. Variable expenses of W are \$5.50 per unit and Z \$8.75 per unit. Traceable fixed expenses per year are \$15,000 for W and \$65,000 for Z.

Required: Prepare a contribution format income statement segmented by product lines.

### **Practice Problem #2**

Madison Company Electronics Division provided the following annual data for 2009:

Sales	\$8,000,000
Net operating income	1,000,000
Average operating assets	4,000,000

Required: Compute the margin, turnover and return on investment.

### **Practice Problem #3**

For the year, Lansing Company had net operating income of \$1,500,000 with sales of \$4,000,000. The company's average operating assets for the year were \$8,000,000 and its minimum required rate of return was 15%.

Required: Compute the company's residual income .

**Practice Problem #4**

Lafayette Company has 3 divisions: X, Y, and Z with the following data for the year:

	<u>X</u>	<u>Y</u>	<u>Z</u>
Sales	A	80,000	G
Net operating income	B	20,000	6,000
Average operating assets	100,000	D	H
Margin	4%	E	7%
Turnover	5	F	I
ROI	C	20%	14%

Required:            Compute the missing amounts above.

**Practice Problem #5**

The Homer Company manufactures basketballs. Last year's sales were \$700,000, net operating income was \$100,000, and average operating assets were \$800,000.

- Required:
- a) If next year's sales are unchanged and expenses and average operating assets are reduced by 10%, compute next year's ROI.
  - b) If the minimum required rate of return is 6%, what will be the residual income next year?

**Practice Problem #6**

The Water Management Company evaluates the performance of the Service and Irrigation Divisions using the return on investment (ROI) measure. The following information pertains to the two divisions as of the end of the current year.

	<u>Service</u>	<u>Irrigation</u>	<u>Total</u>
Units	8,000	250	
Investment	\$400,000	\$1,000,000	\$1,400,000
Expenses:			
Direct materials	40,000	400,000	440,000
Direct labor	200,000	200,000	400,000
Overhead	25,000	250,000	275,000
Selling costs	<u>15,000</u>	<u>150,000</u>	<u>165,000</u>
Total Expenses	\$280,000	\$1,000,000	\$1,280,000



The average service fee was \$50.00 per unit for the Service Division, while the average selling price of an irrigation system was \$5,000 for the Irrigation Division. The company requires a minimum return on investment of 12%.

- Required:
- a) Compute the ROI for both divisions and the company as a whole.
  - b) Based on ROI alone which division had the better performance?

### **Practice Problem #7**

Carver Company's balance sheet and income statement are provided below:

Carver Company  
Balance Sheet  
December 31

Cash	\$40,000
Accounts receivable	52,000
Inventory	80,000
Plant and equipment, net	280,000
Land held for future expansion	<u>76,000</u>
Total Assets	\$528,000
Accounts payable	\$45,000
Notes payable	58,000
Capital stock, no par	240,000
Retained earnings	<u>185,000</u>
Total liabilities and equity	\$528,000

Carver Company  
Income Statement  
Year Ended December 31

Sales	\$330,000
Variable manufacturing costs	68,000
Variable S&A costs	<u>48,000</u>
Contribution Margin	\$214,000
Fixed manufacturing costs	68,000
Fixed S&A costs	<u>56,000</u>
Net Income	\$90,000

- Required:
- a) Compute the margin, turnover, and return on investment for Carver Company.
  - b) What is the advantage of expanding the ROI formula to measure margin and turnover separately?

## True / False Questions

1. The most common method of evaluating a profit center manager is the segmented income statement.  
True    False
2. Investment center managers have control over the investment of assets.  
True    False
3. Segment margin and operating income are identical terms.  
True    False
4. Turnover is defined as the ratio of sales revenue to average invested assets.  
True    False
5. Margin is defined as the ratio of sales revenue to operating income.  
True    False
6. All other things the same, if a division's traceable fixed expenses decrease the division's segment margin will increase.  
True    False
7. All other things the same, a decrease in average operating assets will increase return on investment (ROI).  
True    False
8. When used in return on investment (ROI) calculations, operating assets include investments in land held for future use and investments in other companies.  
True    False
9. Residual income is primarily useful because it helps to compare the performance of divisions of different sizes.  
True    False
10. A decentralized organization is one in which decisions are made by top management and then implemented by managers at lower operating levels.  
True    False
11. An investment center is any responsibility center in an organization that controls cost and revenues and invested funds.  
True    False

12. The same cost can be traceable or common depending on how the segment is defined.  
True   False
13. In general, common fixed costs should be assigned to segments.  
True   False
14. If a company eliminates a segment of its business, the costs that were traceable to that segment should disappear.  
True   False
15. If four segments share \$800,000 in common fixed costs and one segment is eliminated, the common fixed costs will decrease by \$200,000.  
True   False

## Multiple Choice Questions

1. Decision-making authority spread throughout which organization?
  - a) Centralized organization
  - b) Decentralized organization
  - c) Participative organization
  - d) Top-down organization
  
2. Which of the following is NOT an advantage of decentralization?
  - a) Allows top managers to focus on strategic issues
  - b) Potential duplication of resources
  - c) Allows for development of managerial expertise
  - d) Managers can react quickly to local information
  
3. A manager does not have responsibility and authority over revenues in:
  - a) a cost center
  - b) an investment center
  - c) a profit center
  - d) a revenue center
  
4. A manager has responsibility and authority over revenues, costs and assets in:
  - a) a cost center
  - b) an investment center
  - c) a profit center
  - d) a revenue center
  
5. Return on investment can be calculated as
  - a)  $ROI = \text{sales revenue} / \text{average invested assets}$
  - b)  $ROI = \text{operating income} / \text{sales revenue}$
  - c)  $ROI = \text{operating income} / \text{average invested assets}$
  - d)  $ROI = \text{average invested assets} / \text{sales revenue}$
  
6. Profit margin can be calculated as
  - a)  $\text{Sales revenue} / \text{average invested assets}$
  - b)  $\text{Operating income} / \text{sales revenue}$
  - c)  $\text{Operating income} / \text{average invested assets}$
  - d)  $\text{Average invested assets} / \text{sales revenue}$

7. Which of the following statements states a proper level of control?
- a) A profit center manager should be evaluated based on residual income, not ROI
  - b) An investment center manager should be evaluated based on ROI, not residual income
  - c) A profit center manager should be evaluated based on segment margin, not operating income
  - d) A cost center manager should be evaluated on costs and revenues, not just costs
8. Investment turnover can be calculated as
- a) Sales revenue/average invested assets
  - b) Operating income/sales revenue
  - c) Operating income/average invested assets
  - d) Average invested assets/sales revenue

The next 2 questions refer to the following information.

Arbor Co. has an operating income of \$120,000 on revenues of \$1,000,000. Average invested assets were \$600,000. Arbor requires an 8% minimum rate of return.

9. What is the return on investment?
- a) 8%
  - b) 10%
  - c) 12%
  - d) 20%
10. What is the profit margin?
- a) 8%
  - b) 10%
  - c) 12%
  - d) 20%
11. Minneapolis Corp. has an ROI of 10% and a residual income of \$10,000. If operating income equals \$20,000, what is average invested assets?
- a) \$200,000
  - b) \$66,667
  - c) \$450,000
  - d) \$150,000

12. Iowa City Inc. has a profit margin of 12% and an investment turnover of 2.5. Sales revenue is \$600,000. What is the operating income?
- a) \$180,000
  - b) \$28,800
  - c) \$72,000
  - d) \$240,000
13. Iowa City Inc. has a profit margin of 12% and an investment turnover of 2.5. Sales revenue is \$600,000. What is average invested assets?
- a) \$240,000
  - b) \$1,500,000
  - c) \$50,000
  - d) \$72,000
14. Columbus Corp. has revenues of \$1,500,000 resulting in an operating income of \$105,000. Average invested assets total \$750,000. Calculate the ROI if sales increase by 10% and the profit margin remains constant.
- a) 7.7%
  - b) 14%
  - c) 15.4%
  - d) 7.0%
15. Columbus Corp. has revenues of \$1,500,000 resulting in an operating income of \$105,000. Average invested assets total \$750,000. If sales increase by 10% and the investment level remains constant, what is the investment turnover?
- a) 2.00
  - b) 2.20
  - c) 7.0%
  - d) 7.7%
16. Urbana Corp. has sales revenue of \$500,000 resulting in operating income of \$54,000. Average invested assets total \$600,000, and the cost of capital is 6%. Calculate the return on investment if sales increase by 10% and the profit margin and invested assets remain the same.
- a) 9.0%
  - b) 9.9%
  - c) 10.8%
  - d) 6.0%

17. If the ROI of a project is greater than the minimum required rate of return, the residual income will be
  - a) equal to operating income
  - b) greater than zero
  - c) greater than operating income
  - d) greater than average invested assets
  
18. Beegeorge Corp. has an operating income of \$107,000, average invested assets of \$700,000, and a minimum required rate of return of 7%. What is the residual income?
  - a) \$100,000
  - b) \$166,667
  - c) \$42,000
  - d) \$58,000
  
19. Evanston Corp. has revenues of \$500,000 resulting in an operating income of \$54,000. Invested assets total \$600,000. Residual income is \$18,000. Calculate the new residual income if sales increase by 10% and the profit margin and invested assets increase by \$100,000.
  - a) \$17,400
  - b) \$0
  - c) \$3,240
  - d) \$36,000
  
20. Which of the following is not a limitation of return on investment?
  - a) Use of ROI may lead to goal incongruence.
  - b) ROI is a lagging indicator of financial performance.
  - c) ROI evaluates the short-term.
  - d) ROI is a commonly used measure for financial performance.
  
21. LaFayette has a profit margin of 16% based on revenues of \$400,000 and an investment turnover is 2. What is the residual income when the minimum required rate of return is 10%?
  - a) \$44,000
  - b) \$20,000
  - c) \$40,000
  - d) \$64,000

# Solutions to Practice Problems

## Practice Problem #1

	<u>W</u>	<u>Z</u>	<u>Total</u>
Sales	\$ 144,000	\$ 360,000	\$ 504,000
Variable Expenses	<u>99,000</u>	<u>262,500</u>	<u>361,500</u>
Contribution Margin	45,000	97,500	142,500
Traceable Fixed Expenses	<u>15,000</u>	<u>65,000</u>	<u>80,000</u>
Product Segment Margin	\$ 30,000	\$ 32,500	62,500
Common Fixed Expenses			<u>44,000</u>
Operating income			\$18,500

## Practice Problem #2

$$\text{Margin} = \frac{\text{Net operating income}}{\text{Sales}} = \frac{1,000,000}{8,000,000} = 12.5\%$$

$$\text{Turnover} = \frac{\text{Sales}}{\text{Average operating assets}} = \frac{8,000,000}{4,000,000} = 2.0$$

$$\text{ROI} \quad \text{Margin X Turnover} = 12.5\% \times 2.0 = 25.0\%$$

## Practice Problem #3

Average operating assets	\$8,000,000
Minimum rate of return	<u>15%</u>
Minimum required income	\$1,200,000
Net operating income	<u>\$1,500,000</u>
Residual Income	\$300,000



**Practice Problem #4**

*In the order solved:*

C	Margin X Turnover	4% x 5	= 20%
B	ROI X Average operating assets	20% x \$100,000	= \$20,000
A	Net operating income / Margin	\$20,000 / 4%	= \$500,000
E	Net operating income / Sales	\$20,000 / \$80,000	= 25%
F	ROI / Margin	20% / 25%	= .80
D	Sales / Turnover	\$80,000 / 1	= \$100,000
I	ROI / Margin	14% / 7%	= 2
H	Net operating income / ROI	\$6,000 / 14%	= \$42,857
G	Net operating income / Margin	\$6,000 / 7%	= \$85,714

**Practice Problem #5**

a)

	<u>Last Year</u>	<u>Change</u>	<u>Next Year</u>	
<u>ROI:</u>				
<u>Net operating income</u>	<u>\$100,000</u>	<u>\$60,000</u>	<u>\$160,000</u>	<u>= 22.2%</u>
Average operating assets	800,000	(80,000)	720,000	
<u>Change in Income:</u>				
Sales	\$700,000			
Net operating income	<u>100,000</u>			
Expenses	600,000			
Decrease %	<u>10%</u>			
Decrease in expenses	\$60,000	= Change in Income		

b)

<u>Residual Income:</u>		
Average operating assets	\$800,000	\$720,000
Minimum rate of return	<u>6%</u>	<u>6%</u>
Minimum required income	\$48,000	\$43,200
Net operating income	<u>\$100,000</u>	<u>\$160,000</u>
Residual Income	\$52,000	\$ 116,800

**Practice Problem #6**

a)

	<u>Service</u>	<u>Irrigation</u>	<u>Total</u>
Units	8,000	250	
Service Fee/Selling Price	<u>\$50</u>	<u>\$5,000</u>	
Total Revenue	\$400,000	\$1,250,000	\$1,650,000
Total Expenses	<u>280,000</u>	<u>1,000,000</u>	<u>1,280,000</u>
Operating Income	\$120,000	\$250,000	\$370,000
Investment	\$400,000	\$1,000,000	\$1,400,000
ROI:	30%	25%	27.4%

b) Service Division had the better performance with a higher ROI.

**Practice Problem #7**

a)

Margin	<u>Income</u> Sales	<u>\$90,000</u> \$330,000	=	27.3%
Turnover	<u>Sales</u> Assets	<u>\$330,000</u> \$528,000-76,000	=	.73
Turnover	<u>Income</u> Assets	<u>\$90,000</u> \$528,000-76,000	=	19.9%
Proof:	Margin 27.3%	X	Turnover .73	= 19.9%

b) Separating the ROI calculation into margin and turnover provides:

- Insight into operating profitability (margin) and operating efficiency (turnover).
- Recognition the key role that sales plays in improving ROI even though it is not part of the ROI formula.
- For profit center managers to be properly measured on their ability to improve ROI through improving margin. Recall that profit center managers do not have control over invested assets and therefore are somewhat limited in their ability to improve ROI through improving turnover.

## Solutions to True / False Problems

1. True
2. True
3. False - Segment margin does not include common fixed expenses which are not traceable to a particular segment.
4. True
5. False - Margin is the ratio of operating income to sales revenue.
6. True
7. True
8. False - Operating assets do NOT include investments in land held for future use and investments in other companies. These are not part of operating assets. Operating assets may be described as assets which are necessary to carry on the day to day activities of a business.
9. False - Residual income is the excess of income over a stated minimum return. It is not useful in comparing various divisions
10. False - A decentralized organization is one in which decisions are made by managers at lower operating levels and implemented by those managers.
11. True
12. True
13. False - Common fixed costs should NOT be assigned to segments. These are costs that are incurred for the benefit of the entire organization and NOT easily traceable to a particular segment.
14. True
15. False - Common fixed expenses should NOT be affected by the elimination of one segment. No decrease would be expected.

## Solutions to Multiple Choice Questions

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