

Chapter 12

Segment Reporting and Decentralization

Solutions to Questions

12-1 In a decentralized organization, decision-making authority isn't confined to a few top executives, but rather is spread throughout the organization with lower-level managers and other employees empowered to make decisions.

12-2 The benefits of decentralization include: (1) freeing top managers to focus on strategy, higher-level decision making, and coordinating activity; (2) improving operational decision making, since lower-level managers often have better information about local conditions; (3) enabling quicker response to customer needs; (4) training lower-level managers to take on greater responsibility; and (5) providing greater motivation and job satisfaction for lower-level managers.

12-3 A cost center manager has control over cost, but not revenue or investment funds. A profit center manager has control over both cost and revenue. An investment center manager has control over cost and revenue and investment funds.

12-4 A segment is any part or activity of an organization about which a manager seeks cost, revenue, or profit data. Examples of segments include departments, operations, sales territories, divisions, product lines, and so forth.

12-5 Under the contribution approach, costs are assigned to a segment if and only if the costs are traceable to the segment. Common costs are not allocated to segments under the contribution approach.

12-6 A traceable cost of a segment is a cost that arises specifically because of the existence of that segment. If the segment were eliminated, the cost would disappear. A common cost, by contrast, is a cost that supports more than one segment, but is not traceable in whole or in part to any one of the segments. If the departments of a company are treated as segments, then examples of the traceable costs of a department would include the salary of the department's supervisor, depreciation of machines used exclusively by the department, and the costs of supplies used by the department. Examples of common costs would include the salary of the general counsel of the entire company, the lease cost of the headquarters building, corporate image advertising, and periodic depreciation of machines shared by several departments.

12-7 The contribution margin is the difference between sales revenue and variable expenses. The segment margin is the amount remaining after deducting traceable fixed expenses from the contribution margin. The contribution margin is useful as a planning tool for many decisions, including those in which fixed costs don't change. The segment margin is useful in assessing the overall profitability of a segment.

12-8 If common costs were allocated to segments, then the costs of segments would be overstated and their margins would be understated. As a consequence, some segments may appear to be unprofitable and managers may be tempted to eliminate them. If a segment were eliminated because of the existence of arbitrarily allocated common costs, the overall profit of the

company would decline by the amount of the segment margin because the common cost would remain. The common cost that had been allocated to the segment would then be reallocated to the remaining segments—making them appear less profitable.

12-9 There are often limits to how far down an organization a cost can be traced. Therefore, costs that are traceable to a segment may become common as that segment is divided into smaller segment units. For example, the costs of national TV and print advertising might be traceable to a product line, but be a common cost of the geographic sales territories in which that product line is sold.

12-10 Margin refers to the ratio of net operating income to total sales. Turnover refers to the ratio of total sales to average operating assets. The product of the two numbers is the ROI.

12-11 Residual income is the net operating income an investment center earns above the company's minimum required rate of return on operating assets.

12-12 If ROI is used to evaluate performance, a manager of an investment center may reject a profitable investment opportunity whose rate of return exceeds the company's required rate of return but whose rate of return is less than the investment center's current ROI. The residual income approach overcomes this problem since any project whose rate of return exceeds the company's minimum required rate of return will result in an increase in residual income.

12-13 A transfer price is the price charged for a transfer of goods or services between segments of the same organization, such as two departments or divisions. Transfer prices are needed for performance evaluation purposes. The selling unit gets credit for the transfer price and the buying unit must deduct the transfer price as an expense.

12-14 If the selling division has idle capacity, any transfer price above the variable cost of producing an item for transfer will generate some additional profit.

12-15 If the selling division has no idle capacity, then the transfer price would have to cover at least the division's variable cost plus the contribution margin on lost sales.

12-16 Cost-based transfer prices are widely used because they are easily understood and convenient to use. Their disadvantages are that they can lead to poor decisions regarding whether transfers should be made, they provide little incentive for cost control, and the selling division makes no profit.

12-17 Using the market price as the transfer price can lead to incorrect decisions. When the selling division has idle capacity, the cost to the company of the transfer is just the variable cost of the item transferred. However, if the market price is used as the transfer price, the buying division regards the market price as the cost. If the market price exceeds the variable cost (which will ordinarily happen), managers in the buying division will make less than optimal pricing and other decisions concerning the product.

Exercise 12-1 (15 minutes)

	<i>Total</i>		<i>Weedban</i>		<i>Greengrow</i>	
	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>
Sales*	\$300,000	100	\$90,000	100	\$210,000	100
Less variable expenses..	<u>183,000</u>	<u>61</u>	<u>36,000</u>	<u>40</u>	<u>147,000</u>	<u>70</u>
Contribution margin	117,000	39	54,000	60	63,000	30
Less traceable fixed expenses.....	<u>66,000</u>	<u>22</u>	<u>45,000</u>	<u>50</u>	<u>21,000</u>	<u>10</u>
Product line segment margin	51,000	17	<u>\$ 9,000</u>	<u>10</u>	<u>\$ 42,000</u>	<u>20</u>
Less common fixed expenses not trace- able to products.....	<u>33,000</u>	<u>11</u>				
Net operating income....	<u>\$ 18,000</u>	<u>6</u>				

* Weedban: 15,000 units × \$6 per unit = \$90,000.
 Greengrow: 28,000 units × \$7.50 per unit = \$210,000.
 Variable expenses are computed in the same way.

Exercise 12-2 (10 minutes)

1. Margin = $\frac{\text{Net operating income}}{\text{Sales}}$
 $= \frac{\$600,000}{\$7,500,000} = 8\%$

2. Turnover = $\frac{\text{Sales}}{\text{Average operating assets}}$
 $= \frac{\$7,500,000}{\$5,000,000} = 1.5$

3. ROI = Margin \times Turnover
 $= 8\% \times 1.5 = 12\%$

Exercise 12-3 (10 minutes)

Average operating assets	<u>£2,800,000</u>
Net operating income.....	£600,000
Minimum required return:	
18% × average operating assets.....	<u>£504,000</u>
Residual income	<u>£ 96,000</u>

Exercise 12-4 (30 minutes)

1. a. The lowest acceptable transfer price from the perspective of the selling division is given by the following formula:

$$\text{Transfer price} \geq \text{Variable cost per unit} + \frac{\text{Total contribution margin on lost sales}}{\text{Number of units transferred}}$$

Since there is enough idle capacity to fill the entire order from the Hi-Fi Division, no outside sales are lost. And since the variable cost per unit is \$42, the lowest acceptable transfer price as far as the selling division is concerned is also \$42.

$$\text{Transfer price} \geq \$42 + \frac{\$0}{5,000} = \$42$$

- b. The Hi-Fi division can buy a similar speaker from an outside supplier for \$57. Therefore, the Hi-Fi Division would be unwilling to pay more than \$57 per speaker.

$$\text{Transfer price} \leq \text{Cost of buying from outside supplier} = \$57$$

- c. Combining the requirements of both the selling division and the buying division, the acceptable range of transfer prices in this situation is:

$$\$42 \leq \text{Transfer price} \leq \$57$$

Assuming that the managers understand their own businesses and that they are cooperative, they should be able to agree on a transfer price within this range and the transfer should take place.

- d. From the standpoint of the entire company, the transfer should take place. The cost of the speakers transferred is only \$42 and the company saves the \$57 cost of the speakers purchased from the outside supplier.

Exercise 12-4 (continued)

2. a. Each of the 5,000 units transferred to the Hi-Fi Division must displace a sale to an outsider at a price of \$60. Therefore, the selling division would demand a transfer price of at least \$60. This can also be computed using the formula for the lowest acceptable transfer price as follows:

$$\begin{aligned}\text{Transfer price} &\geq \$42 + \frac{(\$60 - \$42) \times 5,000}{5,000} \\ &= \$42 + (\$60 - \$42) = \$60\end{aligned}$$

- b. As before, the Hi-Fi Division would be unwilling to pay more than \$57 per speaker.
- c. The requirements of the selling and buying divisions in this instance are incompatible. The selling division must have a price of at least \$60 whereas the buying division will not pay more than \$57. An agreement to transfer the speakers is extremely unlikely.
- d. From the standpoint of the entire company, the transfer should not take place. By transferring a speaker internally, the company gives up revenue of \$60 and saves \$57, for a loss of \$3.

Exercise 12-5 (20 minutes)

1.

	<i>Total Company</i>		<i>Division</i>					
	<i>Amount</i>	<i>%</i>	<i>East</i>		<i>Central</i>		<i>West</i>	
	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>
Sales	\$1,000,000	100.0	\$250,000	100	\$400,000	100	\$350,000	100
Less variable expenses.....	<u>390,000</u>	<u>39.0</u>	<u>130,000</u>	<u>52</u>	<u>120,000</u>	<u>30</u>	<u>140,000</u>	<u>40</u>
Contribution margin	610,000	61.0	120,000	48	280,000	70	210,000	60
Less traceable fixed ex- penses	<u>535,000</u>	<u>53.5</u>	<u>160,000</u>	<u>64</u>	<u>200,000</u>	<u>50</u>	<u>175,000</u>	<u>50</u>
Divisional segment mar- gin.....	75,000	7.5	<u>\$(40,000)</u>	<u>(16)</u>	<u>\$ 80,000</u>	<u>20</u>	<u>\$ 35,000</u>	<u>10</u>
Less common fixed ex- penses not traceable to divisions*	<u>90,000</u>	<u>9.0</u>						
Net operating income (loss)	<u>\$ (15,000)</u>	<u>(1.5)</u>						

*\$625,000 – \$535,000 = \$90,000.

2. Incremental sales (\$350,000 × 20%)	\$70,000
Contribution margin ratio	× 60%
Incremental contribution margin	42,000
Less incremental advertising expense	<u>15,000</u>
Incremental net operating income	<u>\$27,000</u>

Yes, the advertising program should be initiated.

Exercise 12-6 (20 minutes)

1.
$$\text{Margin} = \frac{\text{Net operating income}}{\text{Sales}}$$
$$= \frac{\$150,000}{\$3,000,000} = 5.00\%$$

$$\text{Turnover} = \frac{\text{Sales}}{\text{Average operating assets}}$$
$$= \frac{\$3,000,000}{\$750,000} = 4.00$$

$$\text{ROI} = \text{Margin} \times \text{Turnover}$$
$$= 5\% \times 4 = 20\%$$

2.
$$\text{Margin} = \frac{\text{Net operating income}}{\text{Sales}}$$
$$= \frac{\$150,000(1.00 + 2.00)}{\$3,000,000(1.00 + 0.50)}$$
$$= \frac{\$450,000}{\$4,500,000} = 10.00\%$$

$$\text{Turnover} = \frac{\text{Sales}}{\text{Average operating assets}}$$
$$= \frac{\$3,000,000 (1.00 + 0.50)}{\$750,000}$$
$$= \frac{\$4,500,000}{\$750,000} = 6.00$$

$$\text{ROI} = \text{Margin} \times \text{Turnover}$$
$$= 10\% \times 6 = 60\%$$

Exercise 12-6 (continued)

3.
$$\begin{aligned} \text{Margin} &= \frac{\text{Net operating income}}{\text{Sales}} \\ &= \frac{\$150,000 + \$200,000}{\$3,000,000 + \$1,000,000} \\ &= \frac{\$350,000}{\$4,000,000} = 8.75\% \end{aligned}$$

$$\begin{aligned} \text{Turnover} &= \frac{\text{Sales}}{\text{Average operating assets}} \\ &= \frac{\$3,000,000 + \$1,000,000}{\$750,000 + \$250,000} \\ &= \frac{\$4,000,000}{\$1,000,000} = 4.00 \end{aligned}$$

$$\begin{aligned} \text{ROI} &= \text{Margin} \times \text{Turnover} \\ &= 8.75\% \times 4 = 35\% \end{aligned}$$

Exercise 12-7 (20 minutes)

- \$75,000 × 40% CM ratio = \$30,000 increased contribution margin in Minneapolis. Since the fixed costs in the office and in the company as a whole will not change, the entire \$30,000 would result in increased net operating income for the company.

It is not correct to multiply the \$75,000 increase in sales by Minneapolis' 24% segment margin ratio. This approach assumes that the segment's traceable fixed expenses increase in proportion to sales, but if they did, they would not be fixed.

- a. The segmented income statement follows:

	<i>Total Company</i>		<i>Segments</i>			
			<i>Chicago</i>		<i>Minneapolis</i>	
	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>
Sales	\$500,000	100.0	\$200,000	100	\$300,000	100
Less variable ex- penses	<u>240,000</u>	<u>48.0</u>	<u>60,000</u>	<u>30</u>	<u>180,000</u>	<u>60</u>
Contribution margin	260,000	52.0	140,000	70	120,000	40
Less traceable fixed expenses	<u>126,000</u>	<u>25.2</u>	<u>78,000</u>	<u>39</u>	<u>48,000</u>	<u>16</u>
Office segment mar- gin	134,000	26.8	<u>\$ 62,000</u>	<u>31</u>	<u>\$ 72,000</u>	<u>24</u>
Less common fixed expenses not trace- able to segments	<u>63,000</u>	<u>12.6</u>				
Net operating income...	<u>\$ 71,000</u>	<u>14.2</u>				

- b. The segment margin ratio rises and falls as sales rise and fall due to the presence of fixed costs. The fixed costs are spread over a larger base as sales increase.

In contrast to the segment ratio, the contribution margin ratio is stable so long as there is no change in either the variable expenses or the selling price per unit of service.

Exercise 12-8 (15 minutes)

1. The company should focus its campaign on the Dental market. The computations are:

	<i>Medical</i>	<i>Dental</i>
Increased sales	\$40,000	\$35,000
Market CM ratio.....	<u>× 36%</u>	<u>× 48%</u>
Incremental contribution margin.....	14,400	16,800
Less cost of the campaign.....	<u>5,000</u>	<u>5,000</u>
Increased segment margin and net operating income for the company as a whole	<u>\$ 9,400</u>	<u>\$11,800</u>

2. The \$48,000 in traceable fixed expenses in Exercise 12-7 is now partly traceable and partly common. When we segment Minneapolis by market, only \$33,000 remains a traceable fixed expense. This amount represents costs such as advertising and salaries of individuals that arise because of the existence of the Medical and Dental markets. The remaining \$15,000 (\$48,000 – \$33,000) becomes a common cost when Minneapolis is segmented by market. This amount would include costs such as the salary of the manager of the Minneapolis office that could not be avoided by eliminating either of the two market segments.

Exercise 12-9 (30 minutes)

1.
$$\text{Margin} = \frac{\text{Net operating income}}{\text{Sales}}$$
$$= \frac{\$70,000}{\$1,400,000} = 5\%$$

$$\text{Turnover} = \frac{\text{Sales}}{\text{Average operating assets}}$$
$$= \frac{\$1,400,000}{\$350,000} = 4.00$$

$$\text{ROI} = \text{Margin} \times \text{Turnover}$$
$$= 5\% \times 4 = 20\%$$

2.
$$\text{Margin} = \frac{\text{Net operating income}}{\text{Sales}}$$
$$= \frac{\$70,000 + \$18,200}{\$1,400,000 + \$70,000}$$
$$= \frac{\$88,200}{\$1,470,000} = 6\%$$

$$\text{Turnover} = \frac{\text{Sales}}{\text{Average operating assets}}$$
$$= \frac{\$1,400,000 + \$70,000}{\$350,000}$$
$$= \frac{\$1,470,000}{\$350,000} = 4.2$$

$$\text{ROI} = \text{Margin} \times \text{Turnover}$$
$$= 6\% \times 4.20 = 25.2\%$$

Exercise 12-9 (continued)

3.
$$\begin{aligned}\text{Margin} &= \frac{\text{Net operating income}}{\text{Sales}} \\ &= \frac{\$70,000 + \$14,000}{\$1,400,000} \\ &= \frac{\$84,000}{\$1,400,000} = 6\%\end{aligned}$$

$$\begin{aligned}\text{Turnover} &= \frac{\text{Sales}}{\text{Average operating assets}} \\ &= \frac{\$1,400,000}{\$350,000} = 4\end{aligned}$$

$$\begin{aligned}\text{ROI} &= \text{Margin} \times \text{Turnover} \\ &= 6\% \times 4 = 24\%\end{aligned}$$

4.
$$\begin{aligned}\text{Margin} &= \frac{\text{Net operating income}}{\text{Sales}} \\ &= \frac{\$70,000}{\$1,400,000} = 5\%\end{aligned}$$

$$\begin{aligned}\text{Turnover} &= \frac{\text{Sales}}{\text{Average operating assets}} \\ &= \frac{\$1,400,000}{\$350,000 - \$70,000} \\ &= \frac{\$1,400,000}{\$280,000} = 5\end{aligned}$$

$$\begin{aligned}\text{ROI} &= \text{Margin} \times \text{Turnover} \\ &= 5\% \times 5 = 25\%\end{aligned}$$

Exercise 12-10 (20 minutes)

1.	<i>(b)</i>	<i>(c)</i>	
<i>(a)</i>	<i>Net</i>	<i>Average</i>	
<i>Sales</i>	<i>Operating</i>	<i>Operating</i>	<i>ROI</i>
	<i>Income*</i>	<i>Assets</i>	<i>(b) ÷ (c)</i>
\$2,500,000	\$475,000	\$1,000,000	47.5%
\$2,600,000	\$500,000	\$1,000,000	50.0%
\$2,700,000	\$525,000	\$1,000,000	52.5%
\$2,800,000	\$550,000	\$1,000,000	55.0%
\$2,900,000	\$575,000	\$1,000,000	57.5%
\$3,000,000	\$600,000	\$1,000,000	60.0%

*Sales × Contribution Margin Ratio – Fixed Expenses

2. The ROI increases by 2.5% for each \$100,000 increase in sales. This happens because each \$100,000 increase in sales brings in an additional profit of \$25,000. When this additional profit is divided by the average operating assets of \$1,000,000, the result is an increase in the company's ROI of 2.5%.

Increase in sales	\$100,000	(a)
Contribution margin ratio.....	25%	(b)
Increase in contribution margin and net operating income (a) × (b)	\$25,000	(c)
Average operating assets.....	\$1,000,000	(d)
Increase in return on investment (c) ÷ (d).....	2.5%	

Exercise 12-11 (15 minutes)

	<i>Division</i>		
	<i>Alpha</i>	<i>Bravo</i>	<i>Charlie</i>
Sales	\$4,000,000	\$11,500,000 *	\$3,000,000
Net operating income.....	\$160,000	\$920,000 *	\$210,000 *
Average operating assets	\$800,000 *	\$4,600,000	\$1,500,000
Margin	4%*	8%	7%*
Turnover	5*	2.5	2
Return on investment (ROI) ..	20%	20%*	14%*

Note that Divisions Alpha and Bravo use different strategies to obtain the same 20% return. Division Alpha has a low margin and a high turnover, whereas Division Bravo has just the opposite.

*Given.

Exercise 12-12 (30 minutes)

1. ROI computations:

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

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

Division A:

$$\begin{aligned} \text{ROI} &= \frac{\$600,000}{\$12,000,000} \times \frac{\$12,000,000}{\$3,000,000} \\ &= 5\% \times 4 = 20\% \end{aligned}$$

Division B:

$$\begin{aligned} \text{ROI} &= \frac{\$560,000}{\$14,000,000} \times \frac{\$14,000,000}{\$7,000,000} \\ &= 4\% \times 2 = 8\% \end{aligned}$$

Division C:

$$\begin{aligned} \text{ROI} &= \frac{\$800,000}{\$25,000,000} \times \frac{\$25,000,000}{\$5,000,000} \\ &= 3.2\% \times 5 = 16\% \end{aligned}$$

2.

	<i>Division A</i>	<i>Division B</i>	<i>Division C</i>
Average operating assets	\$3,000,000	\$7,000,000	\$5,000,000
Required rate of return	<u>× 14%</u>	<u>× 10%</u>	<u>× 16%</u>
Required operating income	<u>\$ 420,000</u>	<u>\$ 700,000</u>	<u>\$ 800,000</u>
Actual operating income	\$ 600,000	\$ 560,000	\$ 800,000
Required operating income (above)	<u>420,000</u>	<u>700,000</u>	<u>800,000</u>
Residual income	<u>\$ 180,000</u>	<u>\$(140,000)</u>	<u>\$ 0</u>

Exercise 12-12 (continued)

3. a. and b.

	<i>Division A</i>	<i>Division B</i>	<i>Division C</i>
Return on investment (ROI)	20%	8%	16%
Therefore, if the division is presented with an investment opportunity yielding 15%, it probably would.....	Reject	Accept	Reject
Minimum required return for computing residual income.....	14%	10%	16%
Therefore, if the division is presented with an investment opportunity yielding 15%, it probably would.....	Accept	Accept	Reject

If performance is being measured by ROI, both Division A and Division C probably would reject the 15% investment opportunity. These divisions' ROIs currently exceed 15%; accepting a new investment with a 15% rate of return would reduce their overall ROIs. Division B probably would accept the 15% investment opportunity, since accepting it would increase the division's overall rate of return.

If performance is measured by residual income, both Division A and Division B probably would accept the 15% investment opportunity. The 15% rate of return promised by the new investment is greater than their required rates of return of 14% and 10%, respectively, and would therefore add to the total amount of their residual income. Division C would reject the opportunity, since the 15% return on the new investment is less than its 16% required rate of return.

Exercise 12-13 (15 minutes)

1. ROI computations:

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

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

Queensland Division:

$$\begin{aligned}\text{ROI} &= \frac{\$360,000}{\$4,000,000} \times \frac{\$4,000,000}{\$2,000,000} \\ &= 9\% \times 2 = 18\%\end{aligned}$$

New South Wales Division:

$$\begin{aligned}\text{ROI} &= \frac{\$420,000}{\$7,000,000} \times \frac{\$7,000,000}{\$2,000,000} \\ &= 6\% \times 3.5 = 21\%\end{aligned}$$

2. The manager of the New South Wales Division seems to be doing the better job. Although her margin is three percentage points lower than the margin of the Queensland Division, her turnover is higher (a turnover of 3.5, as compared to a turnover of two for the Queensland Division). The greater turnover more than offsets the lower margin, resulting in a 21% ROI, as compared to an 18% ROI for the other division.

Notice that if you look at margin alone, then the Queensland Division appears to be the stronger division. This fact underscores the importance of looking at turnover as well as at margin in evaluating performance in an investment center.

Exercise 12-14 (20 minutes)

1. ROI computations:

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

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

Osaka Division:

$$\begin{aligned} \text{ROI} &= \frac{¥210,000}{¥3,000,000} \times \frac{¥3,000,000}{¥1,000,000} \\ &= 7\% \times 3 = 21\% \end{aligned}$$

Yokohama Division:

$$\begin{aligned} \text{ROI} &= \frac{¥720,000}{¥9,000,000} \times \frac{¥9,000,000}{¥4,000,000} \\ &= 8\% \times 2.25 = 18\% \end{aligned}$$

2.

	<i>Osaka</i>	<i>Yokohama</i>
Average operating assets (a).....	<u>¥1,000,000</u>	<u>¥4,000,000</u>
Net operating income	¥ 210,000	¥ 720,000
Minimum required return on average operating assets: 15% × (a).....	<u>150,000</u>	<u>600,000</u>
Residual income	<u>¥ 60,000</u>	<u>¥ 120,000</u>

3. No, the Yokohama Division is simply larger than the Osaka Division and for this reason one would expect that it would have a greater amount of residual income. Residual income can't be used to compare the performance of divisions of different sizes. Larger divisions will almost always look better, not necessarily because of better management but simply because they are larger. In fact, in the case above, the Yokohama Division does not appear to be as well managed as the Osaka Division. Note from Part (1) that Yokohama has only an 18% ROI as compared to 21% for Osaka.

Exercise 12-15 (15 minutes)

1.		<i>Division A</i>	<i>Division B</i>	<i>Total Com- pany</i>
	Sales.....	<u>\$2,500,000</u> ¹	<u>\$1,200,000</u> ²	<u>\$3,200,000</u> ³
	Less expenses:			
	Added by the division...	1,800,000	400,000	2,200,000
	Transfer price paid	<u> </u>	<u>500,000</u>	<u> </u>
	Total expenses.....	<u>1,800,000</u>	<u>900,000</u>	<u>2,200,000</u>
	Net operating income	<u>\$ 700,000</u>	<u>\$ 300,000</u>	<u>\$1,000,000</u>

¹20,000 units × \$125 per unit = \$2,500,000.

²4,000 units × \$300 per unit = \$1,200,000.

³Division A outside sales

(16,000 units × \$125 per unit) \$2,000,000

Division B outside sales

(4,000 units × \$300 per unit) 1,200,000

Total outside sales..... \$3,200,000

Note that the \$500,000 in intracompany sales has been eliminated.

2. Division A should transfer the 1,000 additional circuit boards to Division B. Note that Division B's processing adds \$175 to each unit's selling price (B's \$300 selling price, less A's \$125 selling price = \$175 increase), but it adds only \$100 in cost. Therefore, each board transferred to Division B ultimately yields \$75 more in contribution margin (\$175 – \$100 = \$75) to the company than can be obtained from selling to outside customers. Thus, the company as a whole will be better off if Division A transfers the 1,000 additional boards to Division B.

Exercise 12-16 (15 minutes)

	<i>Company</i>		
	<i>A</i>	<i>B</i>	<i>C</i>
Sales	\$9,000,000 *	\$7,000,000 *	\$4,500,000 *
Net operating income.....	\$540,000	\$280,000 *	\$360,000
Average operating assets	\$3,000,000 *	\$2,000,000	\$1,800,000 *
Return on investment (ROI)	18%*	14%*	20%
Minimum required rate of return:			
Percentage	16%*	16%	15%*
Dollar amount.....	\$480,000	\$320,000 *	\$270,000
Residual income	\$60,000	\$(40,000)	\$90,000 *

*Given.

Exercise 12-17 (20 minutes)

1. The lowest acceptable transfer price from the perspective of the selling division is given by the following formula:

$$\text{Transfer price} \geq \text{Variable cost per unit} + \frac{\text{Total contribution margin on lost sales}}{\text{Number of units transferred}}$$

There is no idle capacity, so each of the 40,000 units transferred from Division X to Division Y reduces sales to outsiders by one unit. The contribution margin per unit on outside sales is \$20 (= \$90 – \$70).

$$\begin{aligned} \text{Transfer price} &\geq (\$70 - \$3) + \frac{\$20 \times 40,000}{40,000} \\ &= \$67 + \$20 = \$87 \end{aligned}$$

The buying division, Division Y, can buy a similar unit from an outside supplier for \$86. Therefore, Division Y would be unwilling to pay more than \$86 per unit.

$$\text{Transfer price} \leq \text{Cost of buying from outside supplier} = \$86$$

The requirements of the two divisions are incompatible and no transfer will take place.

2. In this case, Division X has enough idle capacity to satisfy Division Y's demand. Therefore, there are no lost sales and the lowest acceptable price as far as the selling division is concerned is the variable cost of \$60 per unit.

$$\text{Transfer price} \geq \$60 + \frac{\$0}{40,000} = \$60$$

The buying division, Division Y, can buy a similar unit from an outside supplier for \$74. Therefore, Division Y would be unwilling to pay more than \$74 per unit.

$$\text{Transfer price} \leq \text{Cost of buying from outside supplier} = \$74$$

In this case, the requirements of the two divisions are compatible and a transfer hopefully will take place at a transfer price within the range:

$$\$60 \leq \text{Transfer price} \leq \$74$$

Problem 12-18 (30 minutes)

1.

	<i>Total Company</i>		<i>Sales Territory</i>			
			<i>Northern</i>		<i>Southern</i>	
Sales.....	\$750,000	100.0 %	\$300,000	100 %	\$450,000	100 %
Less variable expenses	<u>336,000</u>	<u>44.8</u>	<u>156,000</u>	<u>52</u>	<u>180,000</u>	<u>40</u>
Contribution margin.....	414,000	55.2	144,000	48	270,000	60
Less traceable fixed expenses	<u>228,000</u>	<u>30.4</u>	<u>120,000</u>	<u>40</u>	<u>108,000</u>	<u>24</u>
Territorial segment margin	186,000	24.8	<u>\$ 24,000</u>	<u>8 %</u>	<u>\$162,000</u>	<u>36 %</u>
Less common fixed expenses not traceable to sales territories (\$378,000 – \$228,000 = \$150,000)	<u>150,000</u>	<u>20.0</u>				
Net operating income	<u>\$ 36,000</u>	<u>4.8 %</u>				

	<i>Northern Territory</i>		<i>Product Line</i>			
			<i>Paks</i>		<i>Tibs</i>	
Sales.....	\$300,000	100.0 %	\$50,000	100 %	\$250,000	100 %
Less variable expenses	<u>156,000</u>	<u>52.0</u>	<u>11,000</u>	<u>22</u>	<u>145,000</u>	<u>58</u>
Contribution margin.....	144,000	48.0	39,000	78	105,000	42
Less traceable fixed expenses	<u>70,000</u>	<u>23.3</u>	<u>30,000</u>	<u>60</u>	<u>40,000</u>	<u>16</u>
Product line segment margin.....	74,000	24.7	<u>\$ 9,000</u>	<u>18 %</u>	<u>\$ 65,000</u>	<u>26 %</u>
Less common fixed expenses not traceable to product lines (\$120,000 – \$70,000 = \$50,000)	<u>50,000</u>	<u>16.7</u>				
Territorial segment margin	<u>\$ 24,000</u>	<u>8.0 %</u>				

Problem 12-18 (continued)

2. Two insights should be brought to the attention of management. First, compared to the Southern territory, the Northern territory has a low contribution margin ratio. Second, the Northern territory has high traceable fixed expenses. Overall, compared to the Southern territory, the Northern territory is very weak.

3. Again, two insights should be brought to the attention of management. First, the Northern territory has a poor sales mix. Note that the territory sells very little of the Paks product, which has a high contribution margin ratio. This poor sales mix accounts for the low overall contribution margin ratio in the Northern territory mentioned in part (2) above. Second, the traceable fixed expenses of the Paks product seem very high in relation to sales. These high fixed expenses may simply mean that the Paks product is highly leveraged; if so, then an increase in sales of this product line would greatly enhance profits in the Northern territory and in the company as a whole.

Problem 12-19 (30 minutes)

1. Breaking the ROI computation into two separate elements helps the manager to see important relationships that might remain hidden if net operating income were simply related to operating assets. First, the importance of turnover of assets as a key element to overall profitability is emphasized. Prior to use of the ROI formula, managers tended to allow operating assets to swell to excessive levels. Second, the importance of sales volume in profit computations is stressed and explicitly recognized. Third, breaking the ROI computation into margin and turnover elements stresses the possibility of trading one off for the other in attempts to improve the overall profit picture. That is, a company may shave its margins slightly hoping for a great enough increase in turnover to increase the overall rate of return. Fourth, ratios make it easier to make comparisons between segments of the organization.

2.

	<i>Companies in the Same Industry</i>		
	<i>A</i>	<i>B</i>	<i>C</i>
Sales	\$600,000 *	\$500,000 *	\$2,000,000
Net operating income	\$84,000 *	\$70,000 *	\$70,000
Average operating assets	\$300,000 *	\$1,000,000	\$1,000,000 *
Margin.....	14%	14%	3.5% *
Turnover.....	2.0	0.5	2.0 *
Return on investment (ROI)	28%	7% *	7%

*Given.

Because of differences in size between Company A and the other two companies (notice that B and C are equal in income and assets), it is difficult to say much about comparative performance looking at net operating income and operating assets alone. That is, it is impossible to determine whether Company A's higher ROI is a result of its lower assets or its higher income. This points up the need to specifically include sales as an element in ROI computations. By including sales, light is shed on the comparative performance and possible problems in the three companies.

Problem 12-19 (continued)

NAA Report No. 35 states (p. 35):

“Introducing sales to measure level of operations helps to disclose specific areas for more intensive investigation. Company B does as well as Company A in terms of profit margin, for both companies earn 14% on sales. But Company B has a much lower turnover of capital than does Company A. Whereas a dollar of investment in Company A supports two dollars in sales each period, a dollar investment in Company B supports only fifty cents in sales each period. This suggests that the analyst should look carefully at Company B’s investment. Is the company keeping an inventory larger than necessary for its sales volume? Are receivables being collected promptly? Or did Company A acquire its fixed assets at a price level which was much lower than that at which Company B purchased its plant?”

Thus, by including sales specifically in ROI computations the manager is able to discover possible problems, as well as reasons underlying a strong or a weak performance. Looking at Company A compared to Company C, notice that C’s turnover is the same as A’s, but C’s margin on sales is much lower. Why would C have such a low margin? Is it due to inefficiency, is it due to geographical location (requiring higher salaries or transportation charges), is it due to excessive materials costs, or is it due to other factors? ROI computations raise questions such as these, which form the basis for managerial action.

To summarize, in order to bring B’s ROI into line with A’s, it seems obvious that B’s management will have to concentrate its efforts on increasing turnover, either by increasing sales or by reducing assets. It seems unlikely that B can appreciably increase its ROI by improving its margin on sales. On the other hand, C’s management should concentrate its efforts on the margin element by trying to pare down its operating expenses.

Problem 12-20 (30 minutes)

1.	<i>Present</i>	<i>New Line</i>	<i>Total</i>
(1) Sales.....	\$10,000,000	\$2,000,000	\$12,000,000
(2) Net operating income .	\$800,000	\$160,000 *	\$960,000
(3) Operating assets.....	\$4,000,000	\$1,000,000	\$5,000,000
(4) Margin (2) ÷ (1)	8%	8%	8%
(5) Turnover (1) ÷ (3)	2.5	2.0	2.4
(6) ROI (4) × (5)	20.0%	16.0%	19.2%

* Sales	\$2,000,000
Less variable expenses (60% × \$2,000,000)...	<u>1,200,000</u>
Contribution margin	800,000
Less fixed expenses	<u>640,000</u>
Net operating income.....	<u>\$ 160,000</u>

2. Dell Havasi will be inclined to reject the new product line, since accepting it would reduce his division's overall rate of return.
3. The new product line promises an ROI of 16%, whereas the company's overall ROI last year was only 15%. Thus, adding the new line would increase the company's overall ROI.

4. a.	<i>Present</i>	<i>New Line</i>	<i>Total</i>
Operating assets.....	\$4,000,000	\$1,000,000	\$5,000,000
Minimum return required	<u>× 12%</u>	<u>× 12%</u>	<u>× 12%</u>
Minimum net operating in- come.....	<u>\$ 480,000</u>	<u>\$ 120,000</u>	<u>\$ 600,000</u>
Actual net operating income	\$ 800,000	\$ 160,000	\$ 960,000
Minimum net operating in- come (above).....	<u>480,000</u>	<u>120,000</u>	<u>600,000</u>
Residual income.....	<u>\$ 320,000</u>	<u>\$ 40,000</u>	<u>\$ 360,000</u>

- b. Under the residual income approach, Dell Havasi would be inclined to accept the new product line, since adding the line would increase the total amount of his division's residual income, as shown above.

Problem 12-21 (45 minutes)

1. The lowest acceptable transfer price from the perspective of the selling division is given by the following formula:

$$\text{Transfer price} \geq \text{Variable cost per unit} + \frac{\text{Total contribution margin on lost sales}}{\text{Number of units transferred}}$$

The Pulp Division has no idle capacity, so transfers from the Pulp Division to the Carton Division would cut directly into normal sales of pulp to outsiders. Since the costs are the same whether the pulp is transferred internally or sold to outsiders, the only relevant cost is the lost revenue of \$70 per ton from the pulp that could be sold to outsiders. This is confirmed below:

$$\text{Transfer price} \geq \$42 + \frac{(\$70 - \$42) \times 5,000}{5,000} = \$42 + (\$70 - \$42) = \$70$$

Therefore, the Pulp Division will refuse to transfer at a price less than \$70 a ton.

The Carton Division can buy pulp from an outside supplier for \$70 a ton, less a 10% quantity discount of \$7, or \$63 a ton. Therefore, the Division would be unwilling to pay more than \$63 per ton.

$$\text{Transfer price} \leq \text{Cost of buying from outside supplier} = \$63$$

The requirements of the two divisions are incompatible. The Carton Division won't pay more than \$63 and the Pulp Division will not accept less than \$70. Thus, there can be no mutually agreeable transfer price and no transfer will take place.

2. The price being paid to the outside supplier, net of the quantity discount, is only \$63. If the Pulp Division meets this price, then profits in the Pulp Division and in the company as a whole will drop by \$35,000 per year:

Lost revenue per ton	\$70
Outside supplier's price	<u>\$63</u>
Loss in contribution margin per ton.....	\$7
Number of tons per year	<u>× 5,000</u>
Total loss in profits	<u>\$35,000</u>

Problem 12-21 (continued)

Profits in the Carton Division will remain unchanged, since it will be paying the same price internally as it is now paying externally.

3. The Pulp Division has idle capacity, so transfers from the Pulp Division to the Carton Division do not cut into normal sales of pulp to outsiders. In this case, the minimum price as far as the Carton Division is concerned is the variable cost per ton of \$42. This is confirmed in the following calculation:

$$\text{Transfer price} \geq \$42 + \frac{\$0}{5,000} = \$42$$

The Carton Division can buy pulp from an outside supplier for \$63 a ton and would be unwilling to pay more than that for pulp in an internal transfer. If the managers understand their own businesses and are cooperative, they should agree to a transfer and should settle on a transfer price within the range:

$$\$42 \leq \text{Transfer price} \leq \$63$$

4. Yes, \$59 is a bona fide outside price. Even though \$59 is less than the Pulp Division's \$60 "full cost" per unit, it is within the range given in Part 3 and therefore will provide some contribution to the Pulp Division.

If the Pulp Division does not meet the \$59 price, it will lose \$85,000 in potential profits:

Price per ton	\$59
Less variable costs	<u>42</u>
Contribution margin per ton.....	<u>\$17</u>

$$5,000 \text{ tons} \times \$17 \text{ per ton} = \$85,000 \text{ potential increased profits}$$

This \$85,000 in potential profits applies to the Pulp Division and to the company as a whole.

5. No, the Carton Division should probably be free to go outside and get the best price it can. Even though this would result in suboptimization for the company as a whole, the buying division should probably not be forced to buy inside if better prices are available outside.

Problem 12-21 (continued)

6. The Pulp Division will have an increase in profits:

Selling price	\$70
Less variable costs	<u>42</u>
Contribution margin per ton.....	<u>\$28</u>

5,000 tons × \$28 per ton = \$140,000 increased profits

The Carton Division will have a decrease in profits:

Inside purchase price	\$70
Outside purchase price.....	<u>59</u>
Increased cost per ton	<u>\$11</u>

5,000 tons × \$11 per ton = \$55,000 decreased profits

The company as a whole will have an increase in profits:

Increased contribution margin in the Pulp Division.....	\$28
Decreased contribution margin in the Carton Division	<u>11</u>
Increased contribution margin per ton.....	<u>\$17</u>

5,000 tons × \$17 per ton = \$85,000 increased profits

So long as the selling division has idle capacity, profits in the company as a whole will increase if internal transfers are made. However, there is a question of *fairness* as to how these profits should be split between the selling and buying divisions. The inflexibility of management in this situation damages the profits of the Carton Division and greatly enhances the profits of the Pulp Division.

Problem 12-22 (60 minutes)

1.	<u>Total Company</u>		<u>Cookbook</u>		<u>Travel Guide</u>		<u>Handy Speller</u>	
Sales	\$300,000	100 %	\$90,000	100 %	\$150,000	100 %	\$60,000	100 %
Less variable expenses:								
Printing cost	102,000	34	27,000	30	63,000	42	12,000	20
Sales commissions	30,000	10	9,000	10	15,000	10	6,000	10
Total variable expenses	<u>132,000</u>	<u>44</u>	<u>36,000</u>	<u>40</u>	<u>78,000</u>	<u>52</u>	<u>18,000</u>	<u>30</u>
Contribution margin	<u>168,000</u>	<u>56</u>	<u>54,000</u>	<u>60</u>	<u>72,000</u>	<u>48</u>	<u>42,000</u>	<u>70</u>
Less traceable fixed expenses:								
Advertising	36,000	12	13,500	15	19,500	13	3,000	5
Salaries	33,000	11	18,000	20	9,000	6	6,000	10
Equipment depreciation*	9,000	3	2,700	3	4,500	3	1,800	3
Warehouse rent**	<u>12,000</u>	<u>4</u>	<u>1,800</u>	<u>2</u>	<u>6,000</u>	<u>4</u>	<u>4,200</u>	<u>7</u>
Total traceable fixed expenses ..	<u>90,000</u>	<u>30</u>	<u>36,000</u>	<u>40</u>	<u>39,000</u>	<u>26</u>	<u>15,000</u>	<u>25</u>
Product line segment margin	<u>78,000</u>	<u>26</u>	<u>\$18,000</u>	<u>20 %</u>	<u>\$ 33,000</u>	<u>22 %</u>	<u>\$27,000</u>	<u>45 %</u>
Less common fixed expenses:								
General sales	18,000	6						
General administration	42,000	14						
Depreciation—office facilities .	<u>3,000</u>	<u>1</u>						
Total common fixed expenses ...	<u>63,000</u>	<u>21</u>						
Net operating income	<u>\$ 15,000</u>	<u>5 %</u>						

*\$9,000 × 30%, 50%, and 20%, respectively.

**\$48,000 square feet × \$3 per square foot = \$144,000; \$144,000 ÷ 12 months = \$12,000 per month.

\$12,000 ÷ 48,000 square feet = \$0.25 per square foot per month.

\$0.25 × 7,200 square feet, 24,000 square feet, and 16,800 square feet, respectively.

Problem 12-22 (continued)

2. a. No, the cookbook line should not be eliminated. The cookbook is covering all of its own costs and is generating an \$18,000 segment margin toward covering the company's common costs and toward profits. (Note: Problems relating to the elimination of a product line are covered in more depth in Chapter 13.)
 - b. No, it is probably unwise to focus all available resources on promoting the travel guide. The company is already spending nearly as much on the promotion of this line as it is on the other two lines together. Furthermore, the travel guide has the lowest contribution margin ratio of the three products. Nevertheless, we cannot say for sure which product should be emphasized in this situation without more information. If the equipment is being fully utilized, increasing the production of any one product would require cutting back on one of the other products. In Chapter 13 we will discuss how to choose the most profitable product when there is a constraint that forces such a trade-off between products.
3. At least three additional points should be brought to the attention of management:
 - i. Compared to the other two lines, salaries are very high for the cookbook line. This should be investigated to find the reason for the wide difference in cost.
 - ii. The company pays a commission of 10% on the selling price of any book. Consideration should be given to revising the commission structure to base it on contribution margin, rather than on sales.
 - iii. Management should consider JIT deliveries to reduce warehouse costs.

Problem 12-23 (20 minutes)

1. Operating assets do not include investments in other companies or in undeveloped land.

	<i>Ending Balances</i>	<i>Beginning Balances</i>
Cash	\$ 120,000	\$ 140,000
Accounts receivable	530,000	450,000
Inventory.....	380,000	320,000
Plant and equipment (net)	<u>620,000</u>	<u>680,000</u>
Total operating assets.....	<u>\$1,650,000</u>	<u>\$1,590,000</u>

$$\text{Average operating assets} = \frac{\$1,650,000 + \$1,590,000}{2} = \$1,620,000$$

$$\text{Margin} = \frac{\text{Net operating income}}{\text{Sales}}$$

$$= \frac{\$405,000}{\$4,050,000} = 10\%$$

$$\text{Turnover} = \frac{\text{Sales}}{\text{Average operating assets}}$$

$$= \frac{\$4,050,000}{\$1,620,000} = 2.5$$

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

$$= 10\% \times 2.5 = 25\%$$

2. Net operating income	\$405,000
Minimum required return (15% × \$1,620,000)	<u>243,000</u>
Residual income.....	<u>\$162,000</u>

Problem 12-24 (60 minutes)

1. From the standpoint of the selling division, Alpha Division:

$$\text{Transfer price} \geq \frac{\text{Variable cost per unit}}{\text{per unit}} + \frac{\text{Total contribution margin on lost sales}}{\text{Number of units transferred}}$$
$$\text{Transfer price} \geq (\$18 - \$2) + \frac{(\$30 - \$18) \times 5,000}{5,000} = \$16 + \$12 = \$28$$

But, from the standpoint of the buying division, Beta Division:

$$\text{Transfer price} \leq \text{Cost of buying from outside supplier} = \$27$$

Beta Division won't pay more than \$27 and Alpha Division will not accept less than \$28, so no deal is possible. There will be no transfer.

2. a. From the standpoint of the selling division, Alpha Division:

$$\text{Transfer price} \geq \frac{\text{Variable cost per unit}}{\text{per unit}} + \frac{\text{Total contribution margin on lost sales}}{\text{Number of units transferred}}$$
$$\text{Transfer price} \geq (\$65 - \$5) + \frac{(\$90 - \$65) \times 30,000}{30,000} = \$60 + \$25 = \$85$$

From the standpoint of the buying division, Beta Division:

$$\text{Transfer price} \leq \text{Cost of buying from outside supplier} = \$89$$

In this instance, an agreement is possible within the range:

$$\$85 \leq \text{Transfer price} \leq \$89$$

Even though both managers would be better off with *any* transfer price within this range, they may disagree about the exact amount of the transfer price. It would not be surprising to hear the buying division arguing strenuously for \$85 while the selling division argues just as strongly for \$89.

Problem 12-24 (continued)

b. The loss in potential profits to the company as a whole will be:

Beta Division's outside purchase price	\$89
Alpha Division's variable cost on the internal transfer....	<u>85</u>
Potential added contribution margin lost to the company as a whole.....	\$ 4
Number of units	<u>× 30,000</u>
Potential added contribution margin and company profits forgone.....	<u>\$120,000</u>

Another way to derive the same answer is to look at the loss in potential profits for each division and then total the losses for the impact on the company as a whole. The loss in potential profits in Alpha Division will be:

Suggested selling price per unit	\$88
Alpha Division's variable cost on the internal transfer....	<u>85</u>
Potential added contribution margin per unit.....	\$ 3
Number of units	<u>× 30,000</u>
Potential added contribution margin and divisional profits forgone.....	<u>\$ 90,000</u>

The loss in potential profits in Beta Division will be:

Outside purchase price per unit	\$89
Suggested price per unit inside	<u>88</u>
Potential cost avoided per unit.....	\$ 1
Number of units	<u>× 30,000</u>
Potential added contribution margin and divisional profits forgone.....	<u>\$ 30,000</u>

The total of these two amounts equals the \$120,000 loss in potential profits for the company as a whole.

3. a. From the standpoint of the selling division, Alpha Division:

$$\text{Transfer price} \geq \frac{\text{Variable cost}}{\text{per unit}} + \frac{\text{Total contribution margin on lost sales}}{\text{Number of units transferred}}$$

$$\text{Transfer price} \geq \$40 + \frac{\$0}{20,000} = \$40$$

Problem 12-24 (continued)

From the standpoint of the buying division, Beta Division:

$$\text{Transfer price} \leq \text{Cost of buying from outside supplier}$$

$$\text{Transfer price} \leq \$75 - (0.08 \times \$75) = \$69$$

In this case, an agreement is possible within the range:

$$\$40 \leq \text{Transfer price} \leq \$69$$

If the managers understand what they are doing and are reasonably cooperative, they should be able to come to an agreement with a transfer price within this range.

- b. Alpha Division's ROI should increase. Since the division has idle capacity, there should be little or no increase needed in the division's operating assets as a result of selling 20,000 units a year to Beta Division. Therefore, Alpha Division's turnover should increase. The division's margin earned on sales should also increase, since its contribution margin will increase by \$400,000 as a result of the new sales, with no offsetting increase in fixed costs:

Selling price	\$60
Less variable costs.....	<u>40</u>
Contribution margin	\$20
Number of units	<u>× 20,000</u>
Added contribution margin	<u>\$400,000</u>

Thus, with both the margin and the turnover increasing, the division's ROI would also increase.

4. From the standpoint of the selling division, Alpha Division:

$$\text{Transfer price} \geq \frac{\text{Variable cost per unit}}{\text{per unit}} + \frac{\text{Total contribution margin on lost sales}}{\text{Number of units transferred}}$$

$$\text{Transfer price} \geq \$21 + \frac{(\$50 - \$26) \times 45,000}{120,000} = \$21 + \$9 = \$30$$

Problem 12-25 (60 minutes)

1. The disadvantages or weaknesses to the company's format are as follows:
 - a. The company should include a column showing the combined results of the three regions taken together.
 - b. Additional columns showing percentages would be helpful in assessing performance and pinpointing areas of difficulty.
 - c. The regional expenses should be segregated into variable and fixed categories to permit the computation of both a contribution margin and a regional segment margin.
 - d. The corporate expenses are probably common to the regions and should not be arbitrarily allocated.
2. Corporate advertising expenses have been allocated on the basis of sales dollars; the general administrative expenses have been allocated evenly among the three regions. Such allocations should not be made under the contribution approach, since they can be misleading to management and tend to call attention away from the segment margin. The segment margin should be used to measure the performance of a segment, not the "net operating income" or "net loss" after allocating common expenses.

Problem 12-25 (continued)

3.	<i>Total</i>		<i>West</i>		<i>Central</i>		<i>East</i>	
	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>
Sales	<u>\$2,000,000</u>	<u>100.0</u>	<u>\$450,000</u>	<u>100.0</u>	<u>\$800,000</u>	<u>100.0</u>	<u>\$750,000</u>	<u>100.0</u>
Less variable expenses:								
Cost of goods sold	819,400	41.0	162,900	36.2	280,000	35.0	376,500	50.2
Shipping expense.....	<u>77,600</u>	<u>3.9</u>	<u>17,100</u>	<u>3.8</u>	<u>32,000</u>	<u>4.0</u>	<u>28,500</u>	<u>3.8</u>
Total variable expenses	<u>897,000</u>	<u>44.9</u>	<u>180,000</u>	<u>40.0</u>	<u>312,000</u>	<u>39.0</u>	<u>405,000</u>	<u>54.0</u>
Contribution margin	<u>1,103,000</u>	<u>55.1</u>	<u>270,000</u>	<u>60.0</u>	<u>488,000</u>	<u>61.0</u>	<u>345,000</u>	<u>46.0</u>
Less traceable fixed expenses:								
Advertising	518,000	25.9	108,000	24.0	200,000	25.0	210,000	28.0
Salaries	313,000	15.6	90,000	20.0	88,000	11.0	135,000	18.0
Utilities.....	40,500	2.0	13,500	3.0	12,000	1.5	15,000	2.0
Depreciation	<u>85,000</u>	<u>4.3</u>	<u>27,000</u>	<u>6.0</u>	<u>28,000</u>	<u>3.5</u>	<u>30,000</u>	<u>4.0</u>
Total traceable fixed ex- penses	<u>956,500</u>	<u>47.8</u>	<u>238,500</u>	<u>53.0</u>	<u>328,000</u>	<u>41.0</u>	<u>390,000</u>	<u>52.0</u>
Regional segment margin.....	<u>146,500</u>	<u>7.3</u>	<u>\$31,500</u>	<u>7.0</u>	<u>\$160,000</u>	<u>20.0</u>	<u>\$(45,000)</u>	<u>(6.0)</u>
Less common fixed expenses not traceable to the regions:								
Advertising (general)	80,000	4.0						
General admin. expenses.....	<u>150,000</u>	<u>7.5</u>						
Total common fixed expenses..	<u>230,000</u>	<u>11.5</u>						
Net loss	<u>\$ (83,500)</u>	<u>(4.2)</u>						

Note: Percentage figures may not total down due to rounding.

Problem 12-25 (continued)

4. The following points should be brought to the attention of management:
 - a. Sales in the West are much lower than in the other two regions. This is not due to lack of salespeople since salaries in the West are about the same as in the Central Region, which has the highest sales of the three regions.
 - b. The West is spending about half as much for advertising as the Central Region. Perhaps this is the reason for the West's lower sales.
 - c. The East apparently is selling a large amount of low-margin items. Note that it has a contribution margin ratio of only 46%, compared to 60% or more for the other two regions.
 - d. The East appears to be overstaffed. Its salaries are about 50% greater than in either of the other two regions.
 - e. The East is not covering its own traceable costs. Major attention should be given to improving the sales mix and reducing expenses in this region.
 - f. Apparently, the salespeople in all three regions are on a salary basis. Perhaps a change to a commission basis would encourage the sales staff to be more aggressive and improve sales throughout the company.

Problem 12-26 (60 minutes)

1.	(a)	(b)	(a) ÷ (b)
	<i>Total Cost</i>	<i>Total Activity</i>	<i>Rate</i>
Sales support	\$3,600,000	24,000 calls	\$150 per call
Order processing	1,720,000	8,600 orders	\$200 per order
Warehousing	940,000	117,500 square feet	\$8 per square foot
Packing and shipping ...	520,000	104,000 pounds shipped	\$5 per pound shipped

Assignment of expenses to markets:

	<u>Commercial Market</u>		<u>Home Market</u>		<u>School Market</u>	
	<i>Events or Transactions</i>	<i>Amount</i>	<i>Events or Transactions</i>	<i>Amount</i>	<i>Events or Transactions</i>	<i>Amount</i>
Sales support, at \$150 per call.....	8,000	\$1,200,000	5,000	\$ 750,000	11,000	\$1,650,000
Order processing, at \$200 per order.....	1,750	350,000	5,200	1,040,000	1,650	330,000
Warehousing, at \$8 per square foot	35,000	280,000	65,000	520,000	17,500	140,000
Packing and shipping, at \$5 per pound	24,000	120,000	16,000	80,000	64,000	320,000

Problem 12-26 (continued)

2. The segmented income statement follows (All dollar amounts are in thousands of dollars):

	<i>Total</i>		<i>Market</i>					
			<i>Commercial</i>		<i>Home</i>		<i>School</i>	
	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>
Sales	\$20,000	100.0	\$8,000	100.0	\$5,000	100.0	\$7,000	100.0
Less variable expenses:								
Cost of goods sold	9,500	47.5	3,900	48.8	2,400	48.0	3,200	45.7
Sales support.....	3,600	18.0	1,200	15.0	750	15.0	1,650	23.6
Order processing.....	1,720	8.6	350	4.4	1,040	20.8	330	4.7
Packing and shipping.....	520	2.6	120	1.5	80	1.6	320	4.6
Total variable expenses	<u>15,340</u>	<u>76.7</u>	<u>5,570</u>	<u>69.6</u>	<u>4,270</u>	<u>85.4</u>	<u>5,500</u>	<u>78.6</u>
Contribution margin	<u>4,660</u>	<u>23.3</u>	<u>2,430</u>	<u>30.4</u>	<u>730</u>	<u>14.6</u>	<u>1,500</u>	<u>21.4</u>
Less traceable fixed ex- penses:								
Warehousing	940	4.7	280	3.5	520	10.4	140	2.0
Advertising	1,460	7.3	700	8.8	180	3.6	580	8.3
General mgmt—salaries....	410	2.1	150	1.9	120	2.4	140	2.0
Total traceable fixed ex- penses	<u>2,810</u>	<u>14.1</u>	<u>1,130</u>	<u>14.1</u>	<u>820</u>	<u>16.4</u>	<u>860</u>	<u>12.3</u>
Market segment margin	<u>1,850</u>	<u>9.3</u>	<u>\$1,300</u>	<u>16.3</u>	<u>\$(90)</u>	<u>(1.8)</u>	<u>\$ 640</u>	<u>9.1</u>

[The statement is continued on the next page]

Problem 12-26 (continued)

	<i>Total</i>		<i>Market</i>					
	<i>Amount</i>	<i>%</i>	<i>Commercial</i>		<i>Home</i>		<i>School</i>	
	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>
Market segment margin	<u>1,850</u>	<u>9.3</u>	<u>\$1,300</u>	<u>16.3</u>	<u>\$(90)</u>	<u>(1.8)</u>	<u>\$ 640</u>	<u>9.1</u>
Less common fixed expenses not traceable to markets:								
Advertising.....	230	1.2						
General management	<u>900</u>	<u>4.5</u>						
Total common fixed expenses	<u>1,130</u>	<u>5.7</u>						
Net operating income.....	<u>\$ 720</u>	<u>3.6</u>						

Note: Percentage figures may not total down due to rounding.

Problem 12-26 (continued)

3. The following comments relate to the three markets:

Commercial market:

- The commercial market is the company's strongest segment rather than its weakest. It is generating enough segment margin by itself to cover all of the company's common costs.
- The manager of the commercial market is doing an outstanding job of controlling expenses. Expenses as a percentage of sales are lower than the company average for every category except cost of sales and advertising, and these latter two costs do not seem out of line.

Home Market:

- The home market spends very little on advertising. A more generous advertising budget may yield a substantial increase in sales in this segment.
- Order processing expenses are extremely high in the home market. Note from the data in the problem that more orders are written in this market (5,200 orders) than in the other two markets combined. This large number of orders, combined with the low overall sales in the home market, means that the home market is taking many small orders.
- Warehousing expenses are also high in the home market.
- The home market is not covering its own traceable costs. If sales can't be increased through a more generous advertising budget and through a concerted effort to make larger sales per order and other actions, then consideration should be given to eliminating this market segment.

School Market:

- The school market has extremely high sales support expenses. This is because nearly as many sales calls are made to this market (11,000 calls) as are made to the other two markets combined. Can contacts be made by phone or by other means?
- Over 60% of the packing and shipping expenses are traceable to the school market. The company may want to investigate cheaper shipping methods.

Problem 12-27 (30 minutes)

1. ROI = Margin × Turnover

$$\begin{aligned} &= \frac{\text{Net operating income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Average operating assets}} \\ &= \frac{\$360,000}{\$4,000,000} \times \frac{\$4,000,000}{\$2,000,000} \\ &= 9\% \times 2 = 18\% \end{aligned}$$

2.
$$\text{ROI} = \frac{\$360,000}{\$4,000,000} \times \frac{\$4,000,000}{\$1,600,000}$$

$$= \begin{array}{ccc} 9\% & \times & 2.5 \\ \text{(Unchanged)} & & \text{(Increase)} \end{array} = \begin{array}{c} 22.5\% \\ \text{(Increase)} \end{array}$$

3.
$$\text{ROI} = \frac{\$392,000}{\$4,000,000} \times \frac{\$4,000,000}{\$2,000,000}$$

$$= \begin{array}{ccc} 9.8\% & \times & 2 \\ \text{(Increase)} & & \text{(Unchanged)} \end{array} = \begin{array}{c} 19.6\% \\ \text{(Increase)} \end{array}$$

4. Interest is a financing expense and thus it is not used to compute net operating income.

$$\text{ROI} = \frac{\$380,000}{\$4,000,000} \times \frac{\$4,000,000}{\$2,500,000}$$

$$= \begin{array}{ccc} 9.5\% & \times & 1.6 \\ \text{(Increase)} & & \text{(Decrease)} \end{array} = \begin{array}{c} 15.2\% \\ \text{(Decrease)} \end{array}$$

Problem 12-27 (continued)

5. The company has a contribution margin ratio of 30% (\$24 CM per unit, divided by the \$80 selling price per unit). Therefore, a 20% increase in sales would result in a new net operating income of:

Sales (1.20 × \$4,000,000)	\$4,800,000	100 %
Less variable expenses.....	<u>3,360,000</u>	<u>70</u>
Contribution margin.....	1,440,000	<u>30 %</u>
Less fixed expenses.....	<u>840,000</u>	
Net operating income	<u>\$ 600,000</u>	

$$\begin{aligned} \text{ROI} &= \frac{\$600,000}{\$4,800,000} \times \frac{\$4,800,000}{\$2,000,000} \\ &= \begin{matrix} 12.5\% \\ \text{(Increase)} \end{matrix} \times \begin{matrix} 2.4 \\ \text{(Increase)} \end{matrix} = \begin{matrix} 30\% \\ \text{(Increase)} \end{matrix} \end{aligned}$$

6.
$$\begin{aligned} \text{ROI} &= \frac{\$320,000}{\$4,000,000} \times \frac{\$4,000,000}{\$1,960,000} \\ &= \begin{matrix} 8\% \\ \text{(Decrease)} \end{matrix} \times \begin{matrix} 2.04 \\ \text{(Increase)} \end{matrix} = \begin{matrix} 16.3\% \\ \text{(Decrease)} \end{matrix} \end{aligned}$$

7.
$$\begin{aligned} \text{ROI} &= \frac{\$360,000}{\$4,000,000} \times \frac{\$4,000,000}{\$1,800,000} \\ &= \begin{matrix} 9\% \\ \text{(Unchanged)} \end{matrix} \times \begin{matrix} 2.22 \\ \text{(Increase)} \end{matrix} = \begin{matrix} 20\% \\ \text{(Increase)} \end{matrix} \end{aligned}$$

Problem 12-28 (30 minutes)

1. The average operating assets for the year must be computed before determining the ROI and residual income. The computation is:

Ending balance.....	\$12,960,000
Beginning balance (\$12,960,000 ÷ 1.08).....	<u>12,000,000</u>
Total.....	<u>\$24,960,000</u>
Average balance (\$24,960,000 ÷ 2).....	<u>\$12,480,000</u>

- a. ROI = Margin × Turnover

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

$$= \frac{\$1,872,000}{\$31,200,000} \times \frac{\$31,200,000}{\$12,480,000} = 6\% \times 2.5 = 15\%$$

b. Net operating income		\$1,872,000
Minimum required net operating income:		
Average operating assets	\$12,480,000	
Minimum required return.....	<u>× 11%</u>	<u>1,372,800</u>
Residual income		<u>\$ 499,200</u>

2. The division's management would have been more likely to accept the investment opportunity if residual income, rather than ROI, had been used to evaluate performance and determine bonuses. The investment would have lowered the division's ROI because its expected return of 13% is lower than the division's historical returns of 14% to 17% as well as its most recent ROI of 15%. In contrast, the division's residual income would be increased by the investment opportunity. From the standpoint of the entire company, an investment whose return exceeds the minimum required return should be accepted. However, when bonuses are based on ROI, the division will likely reject any investment that lowers the division's ROI even if it exceeds the minimum required rate of return.
3. Reigis must be free to control all items related to profit (revenues and expenses) and investment if it is to be evaluated fairly as an investment center. This is true under both the ROI and residual income approaches.

Problem 12-29 (45 minutes)

1. The Quark Division will probably reject the \$340 price because it is below the division's variable costs of \$350 per set. This variable cost includes the \$140 transfer price from the Cabinet Division, which in turn includes \$30 per unit in fixed costs. Nevertheless, from the perspective of the Quark Division, the entire \$140 transfer price from the Cabinet Division is a variable cost. Thus, it will reject the offered \$340 price.
2. If both the Cabinet Division and the Quark Division have idle capacity, then from the perspective of the entire company the \$340 offer should be accepted. By rejecting the \$340 price, the company will lose \$60 in potential contribution margin per set:

Price offered per set		\$340
Less variable costs per set:		
Cabinet Division	\$ 70	
Quark Division	<u>210</u>	<u>280</u>
Potential contribution margin per set.....		<u>\$ 60</u>

3. If the Cabinet Division is operating at capacity, any cabinets transferred to the Quark Division to fill the overseas order will have to be diverted from outside customers. Whether a cabinet is sold to outside customers or is transferred to the Quark Division, its production cost is the same. However, if a set is diverted from outside sales, the Cabinet Division (and the entire company) loses the \$140 in revenue. As a consequence, as shown below, there would be a net loss of \$10 on each TV set sold for \$340.

Price offered per set.....		\$340
Less:		
Lost revenue from sales of cabinets to outsiders ...	\$140	
Variable cost of Quark Division.....	<u>210</u>	<u>350</u>
Net loss per TV		<u>(\$ 10)</u>

Problem 12-29 (continued)

4. When the selling division has no idle capacity, as in part (3), market price works very well as a transfer price. The cost to the company of a transfer when there is no idle capacity is the lost revenue from sales to outsiders. If the market price is used as the transfer price, the buying division will view the market price of the transferred item as its cost—which is appropriate since that is the cost to the company. As a consequence, the manager of the buying division should be motivated to make decisions that are in the best interests of the company.

When the selling division has idle capacity, the cost to the company of the transfer is just the variable cost of producing the item. If the market price is used as the transfer price, the manager of the buying division will view that as his/her cost rather than the real cost to the company, which is just variable cost. Hence, the manager will have the wrong cost information for making decisions as we observed in parts (1) and (2) above.

Problem 12-30 (60 minutes)

1. Segments defined as product lines:

	<i>Glass Division</i>		<i>Product Line</i>					
			<i>Flat Glass</i>		<i>Auto Glass</i>		<i>Specialty Glass</i>	
	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>
Sales.....	R600,000	100	R200,000	100	R300,000	100	R100,000	100
Less variable expenses	<u>300,000</u>	<u>50</u>	<u>130,000</u>	<u>65</u>	<u>120,000</u>	<u>40</u>	<u>50,000</u>	<u>50</u>
Contribution margin	<u>300,000</u>	<u>50</u>	<u>70,000</u>	<u>35</u>	<u>180,000</u>	<u>60</u>	<u>50,000</u>	<u>50</u>
Less traceable fixed expenses:								
Advertising.....	120,000	20	30,000	15	42,000	14	48,000	48
Depreciation.....	48,000	8	10,000	5	24,000	8	14,000	14
Administration.....	<u>42,000</u>	<u>7</u>	<u>14,000</u>	<u>7</u>	<u>21,000</u>	<u>7</u>	<u>7,000</u>	<u>7</u>
Total	<u>210,000</u>	<u>35</u>	<u>54,000</u>	<u>27</u>	<u>87,000</u>	<u>29</u>	<u>69,000</u>	<u>69</u>
Product line segment margin...	90,000	15	<u>R 16,000</u>	<u>8</u>	<u>R 93,000</u>	<u>31</u>	<u>R (19,000)</u>	<u>(19)</u>
Less common fixed expenses not traceable to product lines:								
Administration.....	<u>60,000</u>	<u>10</u>						
Divisional segment margin	<u>R 30,000</u>	<u>5</u>						

Problem 12-30 (continued)

2. Segments defined as markets for Specialty Glass:

	<i>Specialty Glass</i>		<i>Sales Market</i>			
	<i>Amount</i>	<i>%</i>	<i>Domestic</i>		<i>Foreign</i>	
	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>
Sales	R100,000	100	R60,000	100	R 40,000	100
Less variable expenses	<u>50,000</u>	<u>50</u>	<u>30,000</u>	<u>50</u>	<u>20,000</u>	<u>50</u>
Contribution margin.....	50,000	50	30,000	50	20,000	50
Less traceable fixed expenses:						
Advertising	<u>48,000</u>	<u>48</u>	<u>18,000</u>	<u>30</u>	<u>30,000</u>	<u>75</u>
Market segment margin	<u>2,000</u>	<u>2</u>	<u>R12,000</u>	<u>20</u>	<u>R(10,000)</u>	<u>(25)</u>
Less common fixed expenses not traceable to sales markets:						
Depreciation	14,000	14				
Administration	<u>7,000</u>	<u>7</u>				
Total.....	<u>21,000</u>	<u>21</u>				
Product line segment margin.....	<u>R (19,000)</u>	<u>(19)</u>				

3.

	<i>Flat Glass</i>	<i>Auto Glass</i>
Incremental contribution margin:		
35% × R40,000 increased sales.....	R14,000	
60% × R30,000 increased sales.....		R18,000
Less cost of the promotional campaign	<u>8,000</u>	<u>8,000</u>
Increased net operating income	<u>R 6,000</u>	<u>R10,000</u>

Based on these data, the campaign should be directed toward Auto Glass. Note that the analysis uses the contribution margin ratio rather than the segment margin ratio.

Problem 12-31 (45 minutes)

1. The number of valves that must be sold would be:

Let X = units sold

$$\$5X = \$3X + \$462,000 + \$98,000^*$$

$$\$2X = \$560,000$$

$$X = 280,000 \text{ valves, or } \$1,400,000 \text{ in sales}$$

$$*\$700,000 \times 14\% = \$98,000.$$

a. $\text{Margin} = \frac{\text{Net operating income}}{\text{Sales}} = \frac{\$98,000}{\$1,400,000} = 7\%$

b. $\text{Turnover} = \frac{\text{Sales}}{\text{Operating assets}} = \frac{\$1,400,000}{\$700,000} = 2.0$

2. and 3.

	<i>Sales Volume</i>		
	<u>260,000</u>	<u>280,000</u>	<u>300,000</u>
Units sold	<u>260,000</u>	<u>280,000</u>	<u>300,000</u>
(1) Sales @ \$5.20*, \$5.00 and \$4.80*	\$1,352,000	\$1,400,000	\$1,440,000
Less variable expense @ \$3.....	<u>780,000</u>	<u>840,000</u>	<u>900,000</u>
Contribution margin	572,000	560,000	540,000
Less fixed expenses	<u>462,000</u>	<u>462,000</u>	<u>462,000</u>
(2) Net operating income	<u>\$ 110,000</u>	<u>\$ 98,000</u>	<u>\$ 78,000</u>
(3) Total assets	<u>\$ 650,000</u>	<u>\$ 700,000</u>	<u>\$ 750,000</u>
(4) Margin (2) ÷ (1)	8.14%	7.00%	5.42%
(5) Turnover (1) ÷ (3)	2.08	2.00	1.92
ROI (4) × (5)	16.93%	14.00%	10.41%

$$*\$5.00 \times 1.04 = \$5.20; \$5.00 \times 0.96 = \$4.80.$$

Note: The \$280,000 column is not required.

Problem 12-31 (continued)

4.

	<i>Present</i>	<i>New</i>	<i>Total Sales</i>
	<i>Sales</i>	<i>Sales</i>	
Units sold.....	<u>280,000</u>	<u>20,000</u>	<u>300,000</u>
(1) Sales @ \$5.00 and \$4.25	\$1,400,000	\$85,000	\$1,485,000
Less variable expenses @ \$3...	<u>840,000</u>	<u>60,000</u>	<u>900,000</u>
Contribution margin	560,000	25,000	585,000
Less fixed expenses	<u>462,000</u>	<u>0</u>	<u>462,000</u>
(2) Net operating income	<u>\$ 98,000</u>	<u>\$25,000</u>	<u>\$ 123,000</u>
(3) Total assets	<u>\$ 700,000</u>	<u>\$50,000</u>	<u>\$ 750,000</u>
(4) Margin (2) ÷ (1)	7.00%	29.41%	8.28%
(5) Turnover (1) ÷ (3)	2.00	1.70	1.98
ROI (4) × (5)	14.00%	50.00%	16.39%

Yes, the manager of the Valve Division should accept the \$4.25 price.

Problem 12-32 (30 minutes)

1. The variable cost of the new tube will be:

Direct materials.....	\$ 60
Direct labor	49
Variable overhead (1/3 × \$54)	<u>18</u>
Total variable cost	<u>\$127</u>

The lost contribution margin on outside sales will be:

Selling price (regular tubes)	\$170
Less variable expenses:	
Direct materials	\$38
Direct labor	27
Variable overhead (25% × \$40)	10
Variable selling and administrative*	<u>5</u> <u>80</u>
Contribution margin per tube	<u>\$ 90</u>

*Total selling and administrative.....	\$390,000
Less fixed portion	<u>350,000</u>
Variable portion	<u>\$ 40,000</u>

\$40,000 ÷ 8,000 tubes = \$5 per tube.

The lowest acceptable transfer price from the perspective of the selling division is given by the following formula:

$$\text{Transfer price} \geq \text{Variable cost} + \frac{\text{Total contribution margin on lost sales}}{\text{Number of units transferred}}$$

$$\text{Transfer price} \geq \$127 + \frac{\$90 \times 3,000}{2,500} = \$127 + \$108 = \$235$$

2. Any price below \$235 will result in a decline in the profits of both the Tube Division and the entire company. If the Tube Division meets a price of \$200, then profits will decrease by \$87,500 as show below:

Minimum transfer price	\$235
Outside supplier's price	<u>200</u>
Potential decrease in contribution margin	\$ 35
Number of units	<u>× 2,500</u>
Total potential decrease in contribution margin and net operating income.....	<u>\$87,500</u>

Case 12-33 (90 minutes)

1.

	<u>Total Company</u>		<u>Product A</u>		<u>Product B</u>		<u>Product C</u>	
	<u>Amount</u>	<u>%</u>	<u>Amount</u>	<u>%</u>	<u>Amount</u>	<u>%</u>	<u>Amount</u>	<u>%</u>
Sales	<u>\$1,500,000</u>	<u>100.0</u>	<u>\$600,000</u>	<u>100</u>	<u>\$400,000</u>	<u>100</u>	<u>\$500,000</u>	<u>100</u>
Less variable expenses:								
Production.....	<u>336,000</u>	<u>22.4</u>	<u>108,000</u>	<u>18</u>	<u>128,000</u>	<u>32</u>	<u>100,000</u>	<u>20</u>
Selling.....	<u>142,000</u>	<u>9.5</u>	<u>60,000</u>	<u>10</u>	<u>32,000</u>	<u>8</u>	<u>50,000</u>	<u>10</u>
Total variable expenses.....	<u>478,000</u>	<u>31.9</u>	<u>168,000</u>	<u>28</u>	<u>160,000</u>	<u>40</u>	<u>150,000</u>	<u>30</u>
Contribution margin.....	<u>1,022,000</u>	<u>68.1</u>	<u>432,000</u>	<u>72</u>	<u>240,000</u>	<u>60</u>	<u>350,000</u>	<u>70</u>
Less traceable fixed expenses:								
Production.....	<u>376,000</u>	<u>25.1</u>	<u>180,000</u>	<u>30</u>	<u>36,000</u>	<u>9</u>	<u>160,000</u>	<u>32</u>
Selling.....	<u>282,000</u>	<u>18.8</u>	<u>102,000</u>	<u>17</u>	<u>80,000</u>	<u>20</u>	<u>100,000</u>	<u>20</u>
Total traceable fixed expenses...	<u>658,000</u>	<u>43.9</u>	<u>282,000</u>	<u>47</u>	<u>116,000</u>	<u>29</u>	<u>260,000</u>	<u>52</u>
Product segment margin	<u>364,000</u>	<u>24.3</u>	<u>\$150,000</u>	<u>25</u>	<u>\$124,000</u>	<u>31</u>	<u>\$ 90,000</u>	<u>18</u>
Less common fixed expenses:								
Production.....	<u>210,000</u>	<u>14.0</u>						
Administrative.....	<u>180,000</u>	<u>12.0</u>						
Total common fixed expenses....	<u>390,000</u>	<u>26.0</u>						
Net loss	<u>\$ (26,000)</u>	<u>(1.7)</u>						

Case 12-33 (continued)

2. Product C should not be eliminated. As shown on the income statement in part 1, product C is covering all of its own traceable costs and it is generating a segment margin of \$90,000 per month. If the product is eliminated, all of this segment margin will be lost to the company, resulting in even larger overall monthly losses.
3. No, the company should concentrate its remaining inventory of X7 chips on making product A, not product B. The company should focus on the product that will provide the greatest amount of contribution margin. Under the conditions posed, product A will provide the greatest amount of contribution margin since (1) it has a CM ratio of 72% as compared to only 60% for product B; (2) the two products have the same selling price, and therefore, due to its higher CM ratio, product A will generate a greater amount of contribution margin per chip than product B; and (3) the two products require the same number of chips per unit.
4. a. An income statement showing product C segmented by markets appears on the next page.
 - b. The following insights should be brought to the attention of management:
 1. Sales in the vending market are very low as compared to the home market.
 2. Variable selling expenses are 28% of sales in the vending market as compared to only 8% in the home market. Is this just the nature of the markets, or are the high variable selling expenses in the vending market a result of poor cost control?
 3. The traceable fixed selling expenses in the vending market are 50% higher than in the home market, even though the vending market has only a fraction of the sales of the home market. Why would these costs be so high in the vending market?
 4. The vending market has a negative segment margin. If sales can't be increased enough in future months to permit the market to cover its own costs, then consideration should be given to eliminating the market. (Instructor's note: The question of elimination of product lines and other segments is covered in more detail in Chapter 13.)

Case 12-33 (continued)

	<i>Product C</i>		<i>Vending Mar- ket</i>		<i>Home Market</i>	
	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>
Sales	<u>\$500,000</u>	<u>100</u>	<u>\$ 50,000</u>	<u>100</u>	<u>\$450,000</u>	<u>100.0</u>
Less variable expenses:						
Production.....	100,000	20	10,000	20	90,000	20.0
Selling.....	<u>50,000</u>	<u>10</u>	<u>14,000</u>	<u>28</u>	<u>36,000</u>	<u>8.0</u>
Total variable expenses	<u>150,000</u>	<u>30</u>	<u>24,000</u>	<u>48</u>	<u>126,000</u>	<u>28.0</u>
Contribution margin	350,000	70	26,000	52	324,000	72.0
Less traceable fixed expenses:						
Selling.....	<u>75,000</u>	<u>15</u>	<u>45,000</u>	<u>90</u>	<u>30,000</u>	<u>6.7</u>
Market segment margin	<u>275,000</u>	<u>55</u>	<u>\$(19,000)</u>	<u>(38)</u>	<u>\$294,000</u>	<u>65.3</u>
Less common fixed expenses not traceable to market segments:						
Production.....	160,000	32				
Selling*	<u>25,000</u>	<u>5</u>				
Total common fixed expenses.....	<u>185,000</u>	<u>37</u>				
Product segment margin	<u>\$ 90,000</u>	<u>18</u>				
*Total fixed selling expenses			\$100,000			
Less fixed selling expenses traceable to the markets			<u>75,000</u>			
Fixed selling expenses common to the markets.....			<u>\$ 25,000</u>			

Case 12-34 (45 minutes)

1. The Electrical Division is presently operating at capacity; therefore, any sales of X52 electrical fitting to the Brake Division will require that the Electrical Division give up an equal number of sales to outside customers. Using the transfer pricing formula, we get a minimum transfer price of:

$$\text{Transfer price} \geq \frac{\text{Variable cost per unit}}{\text{per unit}} + \frac{\text{Total contribution margin on lost sales}}{\text{Number of units transferred}}$$

$$\text{Transfer price} \geq \$4.25 + (\$7.50 - \$4.25)$$

$$\text{Transfer price} \geq \$4.25 + \$3.25$$

$$\text{Transfer price} \geq \$7.50$$

Thus, the Electrical Division should not supply the fitting to the Brake Division for \$5 each. The Electrical Division must give up revenues of \$7.50 on each fitting that it sells internally. Since management performance in the Electrical Division is measured by ROI, selling the fittings to the Brake Division for \$5 would adversely affect these performance measurements.

2. The key is to realize that the \$8 in fixed overhead and administrative costs contained in the Brake Division's \$49.50 "cost" per brake unit is not relevant. There is no indication that winning this contract would actually affect any of the fixed costs. If these costs would be incurred regardless of whether or not the Brake Division gets the airplane brake contract, they should be ignored when determining the effects of the contract on the company's profits. Another key is that the variable cost of the Electrical Division is not relevant either. Whether the fittings are used in the brake units or sold to outsiders, the production costs of the fittings would be the same. The only difference between the two alternatives is the revenue on outside sales that is given up when the fittings are transferred within the company.

Case 12-34 (continued)

Selling price of the brake units		\$50.00
Less:		
The cost of the fittings used in the brakes (i.e. the lost revenue from sale of fittings to outsiders).....	\$ 7.50	
Variable costs of the Brake Division excluding the fitting (\$22.50 + \$14.00).....	<u>36.50</u>	<u>44.00</u>
Net positive effect on the company's profit.....		<u>\$ 6.00</u>

Therefore, the company as a whole would be better off by \$6.00 for each brake unit that is sold to the airplane manufacturer.

3. As shown in part (1) above, the Electrical Division would insist on a transfer price of at least \$7.50 for the fitting. Would the Brake Division make any money at this price? Again, the fixed costs are not relevant in this decision since they would not be affected. Once this is realized, it is evident that the Brake Division would be ahead by \$6.00 per brake unit if it accepts the \$7.50 transfer price.

Selling price of the brake units		\$50.00
Less:		
Purchased parts (from outside vendors)	\$22.50	
Electrical fitting X52 (assumed transfer price)	7.50	
Other variable costs	<u>14.00</u>	<u>44.00</u>
Brake Division contribution margin		<u>\$ 6.00</u>

In fact, since there is a positive contribution margin of \$6, any transfer price within the range of \$7.50 to \$13.50 (= \$7.50 + \$6.00) will improve the profits of both divisions. So yes, the managers should be able to agree on a transfer price.

4. It is in the best interests of the company and of the divisions to come to an agreement concerning the transfer price. As demonstrated in part (3) above, any transfer price within the range \$7.50 to \$13.50 would improve the profits of both divisions. What happens if the two managers do not come to an agreement?

Case 12-34 (continued)

In this case, top management knows that there should be a transfer and could step in and force a transfer at some price within the acceptable range. However, such an action, if done on a frequent basis, would undermine the autonomy of the managers and turn decentralization into a sham.

Our advice to top management would be to ask the two managers to meet to discuss the transfer pricing decision. Top management should not dictate a course of action or what is to happen in the meeting, but should carefully observe what happens in the meeting. If there is no agreement, it is important to know why. There are at least three possible reasons. First, the managers may have better information than the top managers and refuse to transfer for very good reasons. Second, the managers may be uncooperative and unwilling to deal with each other even if it results in lower profits for the company and for themselves. Third, the managers may not be able to correctly analyze the situation and may not understand what is actually in their own best interests. For example, the manager of the Brake Division may believe that the fixed overhead and administrative cost of \$8 per brake unit really does have to be covered in order to avoid a loss.

If the refusal to come to an agreement is the result of uncooperative attitudes or an inability to correctly analyze the situation, top management can take some positive steps that are completely consistent with decentralization. If the problem is uncooperative attitudes, there are many training companies that would be happy to put on a short course in team building for the company. If the problem is that the managers are unable to correctly analyze the alternatives, they can be sent to executive training courses that emphasize economics and managerial accounting.

Case 12-35 (75 minutes)

1. See the segmented statement on the second following page. Supporting computations for the statement are given below:

Revenues:

Membership dues (20,000 × \$100)	\$2,000,000
Assigned to Magazine Subscriptions Division (20,000 × \$20)	<u>400,000</u>
Assigned to Membership Division	<u>\$1,600,000</u>
Non-member magazine subscriptions (2,500 × \$30)....	<u>\$ 75,000</u>
 Reports and texts (28,000 × \$25)	 <u>\$ 700,000</u>
Continuing education courses:	
One-day (2,400 × \$75).....	\$ 180,000
Two-day (1,760 × \$125).....	<u>220,000</u>
Total revenue	<u>\$ 400,000</u>

Salary and personnel costs:

	<i>Salaries</i>	<i>Personnel Costs</i> <i>(25% of Salaries)</i>
Membership Division	\$210,000	\$ 52,500
Magazine Subscriptions Division	150,000	37,500
Books and Reports Division	300,000	75,000
Continuing Education Division	<u>180,000</u>	<u>45,000</u>
Total assigned to divisions	840,000	210,000
Corporate staff.....	<u>80,000</u>	<u>20,000</u>
Total	<u>\$920,000</u>	<u>\$230,000</u>

Case 12-35 (continued)

Some may argue that, except for the \$50,000 in rental cost directly attributed to the Books and Reports Division, occupancy costs are common costs that should not be allocated. The correct treatment of the occupancy costs depends on whether they could be avoided in part by eliminating a division. In the solution below, we have assumed they could be avoided.

Occupancy costs (\$230,000 allocated + \$50,000 direct to the Books and Reports Division = \$280,000):

Allocated to:

Membership Division		
(\$230,000 × 0.2)		\$ 46,000
Magazine Subscriptions Division		
(\$230,000 × 0.2)		46,000
Books and Reports Division		
(\$230,000 × 0.3 + \$50,000)		119,000
Continuing Education Division		
(\$230,000 × 0.2)		46,000
Corporate staff		
(\$230,000 × 0.1)		<u>23,000</u>
Total occupancy costs		<u>\$280,000</u>
Printing and paper costs		\$320,000
Assigned to:		
Magazine Subscriptions Division		
(22,500 × \$7)	\$157,500	
Books and Reports Division		
(28,000 × \$4)	<u>112,000</u>	<u>269,500</u>
Remainder—Continuing Education Division		<u>\$ 50,500</u>
Postage and shipping costs		\$176,000
Assigned to:		
Magazine Subscriptions Division		
(22,500 × \$4)	\$ 90,000	
Books and Reports Division		
(28,000 × \$2)	<u>56,000</u>	<u>146,000</u>
Remainder—corporate staff		<u>\$ 30,000</u>

Case 12-35 (continued)

	<i>Division</i>				
	<i>Association Total</i>	<i>Membership</i>	<i>Magazine Subscriptions</i>	<i>Books & Reports</i>	<i>Continuing Education</i>
Revenues:					
Membership dues	\$2,000,000	\$1,600,000	\$400,000		
Non-member magazine subscrip- tions	75,000		75,000		
Advertising	100,000		100,000		
Reports and texts	700,000			\$700,000	
Continuing education courses	400,000				\$400,000
Total revenues	<u>3,275,000</u>	<u>1,600,000</u>	<u>575,000</u>	<u>700,000</u>	<u>400,000</u>
Expenses traceable to segments:					
Salaries	840,000	210,000	150,000	300,000	180,000
Personnel costs	210,000	52,500	37,500	75,000	45,000
Occupancy costs	257,000	46,000	46,000	119,000	46,000
Reimbursement of member costs to					
local chapters	600,000	600,000			
Other membership services	500,000	500,000			
Printing and paper	320,000		157,500	112,000	50,500
Postage and shipping	146,000		90,000	56,000	
Instructors' fees	80,000				80,000
Total traceable expenses	<u>2,953,000</u>	<u>1,408,500</u>	<u>481,000</u>	<u>662,000</u>	<u>401,500</u>
Division segment margin	<u>322,000</u>	<u>\$ 191,500</u>	<u>\$ 94,000</u>	<u>\$ 38,000</u>	<u>\$ (1,500)</u>

[The statement is continued on the next page.]

Case 12-35 (continued)

[Continuation of the segmented income statement.]

	<i>Division</i>				
	<i>Association Total</i>	<i>Membership</i>	<i>Magazine Subscriptions</i>	<i>Books & Reports</i>	<i>Continuing Education</i>
Division segment margin.....	<u>322,000</u>	<u>\$ 191,500</u>	<u>\$ 94,000</u>	<u>\$ 38,000</u>	<u>\$ (1,500)</u>
Less common expenses not traceable to divisions:					
Salaries—corporate staff.....	80,000				
Personnel costs.....	20,000				
Occupancy costs.....	23,000				
Postage and shipping	30,000				
General and administrative	<u>38,000</u>				
Total common expenses.....	<u>191,000</u>				
Excess of revenues over expenses	<u>\$ 131,000</u>				

Case 12-35 (continued)

2. While we do not favor the allocation of common costs to segments, the most common reason given for this practice is that segment managers need to be aware of the fact that common costs do exist and that they must be covered.

Arguments against allocation of all costs:

- Allocation bases will need to be chosen arbitrarily since no cause-and-effect relationship exists between common costs and the segments to which they are allocated.
- Management may be misled into eliminating a profitable segment that appears to be unprofitable because of allocated common costs.
- Segment managers usually have little control over common costs. They should not be held accountable for costs over which they have no control.
- Allocations of common costs undermine the credibility of performance reports. Segment managers may resent such allocations and ignore the entire performance report as arbitrary and unfair.

Group Exercise 12-36

The answers to this question will depend on the nature of the financial reports students obtain from their college.

Group Exercise 12-37

Note: This is a very difficult problem that requires an excellent understanding of the course to this point and analytical skills.

The two groups—representing managers in a transfer pricing negotiation—*should* be able to come to an agreement concerning the transfer price.

From the standpoint of the Consumer Products Division, a deal with the Industrial Products Division to acquire the electric motors at the transfer price “TP” makes sense only if the deal will increase the division’s residual income over and above what it would be without producing and selling the new sorbet maker. In other words, the residual income from the sorbet maker itself, after taking into account the deduction for the cost of the electric motor, must be positive:

$$\text{Residual income from the sorbet maker} > \$0$$

$$\text{Contribution margin} - \text{Fixed cost} - \text{Minimum required return} > \$0$$

$$(\$89 - \$54 - \text{TP}) \times 50,000 - \$180,000 - 0.20 \times \$3,000,000 > \$0$$

$$(\$35 - \text{TP}) \times 50,000 - \$180,000 - \$600,000 > \$0$$

$$(\$35 - \text{TP}) \times 50,000 - \$780,000 > \$0$$

$$(\$35 - \text{TP}) \times 50,000 > \$780,000$$

$$(\$35 - \text{TP}) > \$15.60$$

$$\text{TP} < \$19.40$$

Therefore, any transfer price that is less than \$19.40 will result in an increase in the Consumer Product Division’s residual income if the sorbet maker product is launched.

Group Exercise 12-37 (continued)

On the other hand, from the standpoint of the Industrial Products Division, selling the electric motor to the Consumer Products Division will make sense only if the Industrial Products Division's residual income is increased. This will occur if and only if:

$$\text{Residual income from selling the electric motor} > \$0$$

$$\text{Contribution margin} - \text{Fixed cost} - \text{Minimum required return} > \$0$$

$$(\text{TP} - \$13) \times 50,000 - \$30,000 - 0.20 \times \$400,000 > \$0$$

$$(\text{TP} - \$13) \times 50,000 - \$30,000 - \$80,000 > \$0$$

$$(\text{TP} - \$13) \times 50,000 > \$110,000$$

$$(\text{TP} - \$13) > \$2.20$$

$$\text{TP} > \$15.20$$

Therefore, any transfer price in excess of \$15.20 will result in an increase in the Industrial Product Division's residual income if the sorbet maker product is launched.

Combining the two requirements, any transfer price within the range $\$15.20 < \text{TP} < \19.40 will result in an increase in both Divisions' residual incomes. Therefore, the two groups should be able to come to a mutually satisfactory agreement.

However, they may fail to come to an agreement. This could occur for a number of reasons, just as in the real world. They may not be able to figure out what is in their own best interests. They may get caught up in the negotiations and lose sight of their goal—which should be to maximize residual income. Or negotiations may break down over fairness and equity issues.