Chapter 12
Segment Reporting and Decentralization

Solutions to Questions

12-1 In a decentralized organization, decision-making 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 broader issues; (2) training lower-level managers to take on greater responsibility; (3) providing greater incentives and job satisfaction for lower-level managers; (4) improving decision-making, since decisions are made at the level where the problem is likely to be best understood; and (5) providing a more effective basis for measuring managerial performance through the creation of profit and investment centers.

12-3 A cost center manager has control over cost, but not revenue or investment funds. A profit center manager, by contrast, 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 management seeks cost or revenue data. Examples of segments include departments, operations, sales territories, divisions, product lines, and so forth.

12-5 Costs are assigned to a segment if and only if the costs are traceable to the segment. Such traceable costs are then separated into variable and fixed categories, and this distinction is maintained on all segmented statements. Common fixed costs should never be arbitrarily allocated to a segment.

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 traceable costs would include the salaries of department supervisors, depreciation of individual department machines, and utilities expense in the separate departments. Examples of common costs would be the salary of the production superintendent of the entire company, depreciation of a factory building shared by several departments, corporate image advertising, and periodic depreciation of machines shared by several departments.

12-7 The contribution margin is the portion of sales revenue remaining after deducting variable expenses. The segment margin is the margin 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 the segment would be overstated and its margin 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.

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, advertising might be traceable to a product line, but be a common cost of the 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 The ROI can be improved (1) by increasing sales (assuming unit contribution margins are positive), (2) by reducing expenses, or (3) by reducing assets.

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

12-13 If ROI is used to evaluate performance, managers may reject profitable investment opportunities that exceed the company's required rate of return if they would reduce the 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.

12-14 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.

12-15 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.

12-16 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.

12-17 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.

12-18 Using the market price as the transfer price can lead to incorrect decisions when the selling division has idle capacity. This happens because the buying division regards the transfer price as the cost of the transferred item, but from the standpoint of the company, the cost of the transferred item is just the variable cost of producing it. 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)

	Total		*CD*		*DVD*	
	Amount	*%*	*Amount*	*%*	*Amount*	*%*
Sales	$750,000	100.0	$300,000 *	100	$450,000 *	100
Less variable expenses	435,000	58.0	120,000	40	315,000	70
Contribution margin	315,000	42.0	180,000	60	135,000	30
Less traceable fixed expenses	183,000	24.4	138,000	46	45,000	10
Product line segment margin	132,000	17.6	$ 42,000	14	$ 90,000	20
Less common fixed expenses not traceable to products	105,000	14.0				
Net operating income	$ 27,000	3.6				

* CD: 37,500 packs × $8 per pack = $300,000;
DVD: 18,000 packs × $25 per pack= $450,000.
Variable expenses are computed in the same way.

Exercise 12-2 (20 minutes)

1. $75,000 × 40% CM ratio = $30,000 increased contribution margin in Dallas. 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 incorrect to multiply the $75,000 increase in sales by Dallas's 25% 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.

2. a. The segmented income statement follows:

			Segments			
	Total Company		*Houston*		*Dallas*	
	Amount	*%*	*Amount*	*%*	*Amount*	*%*
Sales	$800,000	100.0	$200,000	100	$600,000	100
Less variable expenses	420,000	52.5	60,000	30	360,000	60
Contribution margin	380,000	47.5	140,000	70	240,000	40
Less traceable fixed expenses	168,000	21.0	78,000	39	90,000	15
Office segment margin	212,000	26.5	$ 62,000	31	$150,000	25
Less common fixed expenses not traceable to segments	120,000	15.0				
Net operating income	$ 92,000	11.5				

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

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

Exercise 12-3 (15 minutes)

1. The company should focus its campaign on Landscaping Clients. The computations are:

	Construction Clients	*Landscaping Clients*
Increased sales	$70,000	$60,000
Market CM ratio	× 35%	× 50%
Incremental contribution margin	24,500	30,000
Less cost of the campaign	8,000	8,000
Increased segment margin and net operating income for the company as a whole	$16,500	$22,000

2. The $90,000 in traceable fixed expenses in Exercise 12-2 is now partly traceable and partly common. When we segment Dallas by market, only $72,000 remains a traceable fixed expense. This amount represents costs such as advertising and salaries that arise because of the existence of the construction and landscaping market segments. The remaining $18,000 ($90,000 – $72,000) becomes a common cost when Dallas is segmented by market. This amount would include such costs as the salary of the manager of the Dallas office that could not be avoided by eliminating either of the two market segments.

Exercise 12-4 (10 minutes)

A large number of costs are common to the departments in a grocery store. Building rent or depreciation would be a common cost, as would utilities, property taxes, insurance, and general management. In addition, the wages of stockers and cashiers, depreciation on cash registers and checkout counters, advertising, and janitorial costs would all be common costs.

The existence of such costs complicates and limits the use of accounting data in decision making because the costs are often allocated among departments and products. Such allocations must be arbitrary by the nature of common costs. Such allocations can produce misleading results, or distort the performance of a department or product line.

Exercise 12-5 (20 minutes)

1.

			Geographic Market					
	Total Company		*South*		*Central*		*North*	
	Amount	*%*	*Amount*	*%*	*Amount*	*%*	*Amount*	*%*
Sales	$1,500,000	100.0	$400,000	100	$600,000	100	$500,000	100
Less variable expenses	588,000	39.2	208,000	52	180,000	30	200,000	40
Contribution margin	912,000	60.8	192,000	48	420,000	70	300,000	60
Less traceable fixed expenses	770,000	51.3	240,000	60	330,000	55	200,000	40
Geographic market segment margin	142,000	9.5	$(48,000)	(12)	$ 90,000	15	$100,000	20
Less common fixed expenses not traceable to geographic markets*	175,000	11.7						
Net operating income (loss)	$ (33,000)	(2.2)						

*$945,000 – $770,000 = $175,000.

2. Incremental sales ($600,000 × 15%) $90,000
   Contribution margin ratio ..... × 70%
   Incremental contribution margin 63,000
   Less incremental advertising expense 25,000
   Incremental net operating income $38,000

   Yes, the advertising program should be initiated.

Exercise 12-6 (15 minutes)

	Division		
	Fab	*Consulting*	*IT*
Sales	$800,000 *	$650,000	$500,000
Net operating income	72,000 *	26,000	40,000 *
Average operating assets	400,000	130,000 *	200,000
Margin	9%	4% *	8% *
Turnover	2.0	5.0 *	2.5
Return on investment (ROI)	18% *	20%	20% *

*Given.

Note that the Consulting and IT Divisions employ different strategies to obtain the same 20% return. The Consulting Division has a low margin and a high turnover, whereas the IT Division has just the opposite.

Exercise 12-7 (15 minutes)

1. ROI computations:

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

$$\text{Eastern Division: } \frac{\$90{,}000}{\$1{,}000{,}000} \times \frac{\$1{,}000{,}000}{\$500{,}000} = 9\% \times 2 = 18\%$$

$$\text{Western Division: } \frac{\$105{,}000}{\$1{,}750{,}000} \times \frac{\$1{,}750{,}000}{\$500{,}000} = 6\% \times 3.5 = 21\%$$

2. The manager of the Western Division seems to be doing the better job. Although her margin is three percentage points lower than the margin of the Eastern Division, her turnover is higher (a turnover of 3.5, as compared to a turnover of two for the Eastern 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 Eastern Division appears to be the strongest division. This fact underscores the importance of looking at turnover as well as at margin in evaluating performance in an investment center.

Exercise 12-8 (15 minutes)

	Company A	*Company B*	*Company C*
Sales	$400,000 *	$750,000 *	$600,000 *
Net operating income	$32,000	$45,000 *	$24,000
Average operating assets	$160,000 *	$250,000	$150,000 *
Return on investment (ROI)	20% *	18% *	16%
Minimum required rate of return:			
Percentage	15% *	20%	12% *
Dollar amount	$24,000	$50,000 *	$18,000
Residual income	$8,000	($5,000)	$6,000 *

*Given.

Exercise 12-9 (20 minutes)

1. ROI computations:

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

$$\text{Perth:} \quad \frac{\$630{,}000}{\$9{,}000{,}000} \times \frac{\$9{,}000{,}000}{\$3{,}000{,}000} = 7\% \times 3 = 21\%$$

$$\text{Darwin:} \quad \frac{\$1{,}800{,}000}{\$20{,}000{,}000} \times \frac{\$20{,}000{,}000}{\$10{,}000{,}000} = 9\% \times 2 = 18\%$$

2.

	Perth	*Darwin*
Average operating assets (a)	$3,000,000	$10,000,000
Net operating income	$ 630,000	$ 1,800,000
Minimum required return on average operating assets—16% × (a)	480,000	$ 1,600,000
Residual income	$ 150,000	$ 200,000

3. No, the Darwin Division is simply larger than the Perth 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 because of the larger dollar figures involved. In fact, in the case above, Darwin does not appear to be as well managed as Perth. Note from Part (1) that Darwin has only an 18% ROI as compared to 21% for Perth.

Exercise 12-10 (30 minutes)

1. Computation of ROI.

$$\text{Division A: ROI} = \frac{\$300{,}000}{\$6{,}000{,}000} \times \frac{\$6{,}000{,}000}{\$1{,}500{,}000} = 5\% \times 4 = 20\%$$

$$\text{Division B: ROI} = \frac{\$900{,}000}{\$10{,}000{,}000} \times \frac{\$10{,}000{,}000}{\$5{,}000{,}000} = 9\% \times 2 = 18\%$$

$$\text{Division C: ROI} = \frac{\$180{,}000}{\$8{,}000{,}000} \times \frac{\$8{,}000{,}000}{\$2{,}000{,}000} = 2.25\% \times 4 = 9\%$$

2.

	Division A	*Division B*	*Division C*
Average operating assets	$1,500,000	$5,000,000	$2,000,000
Required rate of return	× 15%	× 18%	× 12%
Required operating income	$ 225,000	$ 900,000	$ 240,000
Actual operating income	$ 300,000	$ 900,000	$ 180,000
Required operating income (above)	225,000	900,000	240,000
Residual income	$ 75,000	$ 0	$ (60,000)

Exercise 12-10 (continued)

3. a. and b.	*Division A*	*Division B*	*Division C*
Return on investment (ROI).....	20%	18%	9%
Therefore, if the division is presented with an investment opportunity yielding 17%, it probably would.....	Reject	Reject	Accept
Minimum required return for computing residual income....	15%	18%	12%
Therefore, if the division is presented with an investment opportunity yielding 17%, it probably would.....	Accept	Reject	Accept

If performance is being measured by ROI, both Division A and Division B probably would reject the 17% investment opportunity. The reason is that these companies are presently earning a return greater than 17%; thus, the new investment would reduce the overall rate of return and place the divisional managers in a less favorable light. Division C probably would accept the 17% investment opportunity, since its acceptance would increase the Division's overall rate of return.

If performance is being measured by residual income, both Division A and Division C probably would accept the 17% investment opportunity. The 17% rate of return promised by the new investment is greater than their required rates of return of 15% and 12%, respectively, and would therefore add to the total amount of their residual income. Division B would reject the opportunity, since the 17% return on the new investment is less than B's 18% required rate of return.

Exercise 12-11 (30 minutes)

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

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

Since there is enough idle capacity to fill the entire order from the Motor Division, there are no lost outside sales. And since the variable cost per unit is $21, the lowest acceptable transfer price as far as the selling division is concerned is also $21.

$$\text{Transfer price} = \$21 + \frac{\$0}{10{,}000} = \$21$$

b. The Motor Division can buy a similar transformer from an outside supplier for $38. Therefore, the Motor Division would be unwilling to pay more than $38 per transformer.

$$\text{Transfer price} \leq \text{Cost of buying from outside supplier} = \$38$$

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

$$\$21 \leq \text{Transfer price} \leq \$38$$

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 transformers transferred is only $21 and the company saves the $38 cost of the transformers purchased from the outside supplier.

Exercise 12-11 (continued)

2. a. Each of the 10,000 units transferred to the Motor Division must displace a sale to an outsider at a price of $40. Therefore, the selling division would demand a transfer price of at least $40. This can also be computed using the formula for the lowest acceptable transfer price as follows:

$$\text{Transfer price} \geq \$21 + \frac{(\$40 - \$21) \times 10{,}000}{10{,}000}$$

$$= \$21 + (\$40 - \$21) = \$40$$

   b. As before, the Motor Division would be unwilling to pay more than $38 per transformer.

   c. The requirements of the selling and buying divisions in this instance are incompatible. The selling division must have a price of at least $40 whereas the buying division will not pay more than $38. An agreement to transfer the transformers is extremely unlikely.

   d. From the standpoint of the entire company, the transfer should not take place. By transferring a transformer internally, the company gives up revenue of $40 and saves $38, for a loss of $2.

Exercise 12-12 (15 minutes)

1.

	Division A	*Division B*	*Total Company*
Sales	$3,500,000 [1]	$2,400,000 [2]	$5,200,000 [3]
Less expenses:			
Added by the division	2,600,000	1,200,000	3,800,000
Transfer price paid	—	700,000	—
Total expenses	2,600,000	1,900,000	3,800,000
Net operating income	$ 900,000	$ 500,000	$1,400,000

[1] 20,000 units × $175 per unit = $3,500,000.

[2] 4,000 units × $600 per unit = $2,400,000.

[3]

Division A outside sales (16,000 units × $175 per unit)	$2,800,000
Division B outside sales (4,000 units × $600 per unit)	2,400,000
Total outside sales	$5,200,000

Observe that the $700,000 in intracompany sales has been eliminated.

2. Division A should transfer the 1,000 additional units to Division B. Note that Division B's processing adds $425 to each unit's selling price (B's $600 selling price, less A's $175 selling price = $425 increase), but it adds only $300 in cost. Therefore, each tube transferred to Division B ultimately yields $125 more in contribution margin ($425 – $300 = $125) 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 tubes to Division B.

Exercise 12-13 (20 minutes)

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

$$\text{Transfer price} = \begin{matrix}\text{Variable cost} \\ \text{per unit}\end{matrix} + \frac{\begin{matrix}\text{Total contribution margin} \\ \text{on lost sales}\end{matrix}}{\text{Number of units transferred}}.$$

There is no idle capacity, so each of the 20,000 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 (= $50 – $30).

$$\text{Transfer price} = (\$30 - \$2) + \frac{\$20 \times 20{,}000}{20{,}000}$$

$$= \$28 + \$20 = \$48$$

The buying division, Division Y, can purchase a similar unit from an outside supplier for $47. Therefore, Division Y would be unwilling to pay more than $47 per unit.

$$\text{Transfer price} \leq \text{Cost of buying from outside supplier} = \$47$$

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 $20 per unit.

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

The buying division, Division Y, can purchase a similar unit from an outside supplier for $34. Therefore, Division Y would be unwilling to pay more than $34 per unit.

$$\text{Transfer price} \leq \text{Cost of buying from outside supplier} = \$34$$

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

$$\$20 \leq \text{Transfer price} \leq \$34$$

Problem 12-14 (30 minutes)

1.

	Total Company		Sales Territory			
			Central		Eastern	
	Amount	%	Amount	%	Amount	%
Sales	$900,000	100.0	$400,000	100	$500,000	100
Less variable expenses	408,000	45.3	208,000	52	200,000	40
Contribution margin	492,000	54.7	192,000	48	300,000	60
Less traceable fixed expenses	290,000	32.2	160,000	40	130,000	26
Territorial segment margin	202,000	22.4	$ 32,000	8	$170,000	34
Less common fixed expenses*	175,000	19.4				
Net operating income	$ 27,000	3.0				

*465,000 – $290,000 = $175,000.

	Central Territory		Product Line			
			Awls		Pows	
	Amount	%	Amount	%	Amount	%
Sales	$400,000	100.0	$100,000	100	$300,000	100
Less variable expenses	208,000	52.0	25,000	25	183,000	61
Contribution margin	192,000	48.0	75,000	75	117,000	39
Less traceable fixed expenses	114,000	28.5	60,000	60	54,000	18
Product line segment margin	78,000	19.5	$ 15,000	15	$ 63,000	21
Less common fixed expenses*	46,000	11.5				
Territorial segment margin	$ 32,000	8.0				

*$160,000 – $114,000 = $46,000.

Problem 12-14 (continued)

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

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

Problem 12-15 (60 minutes)

1. The segmented income statement follows:

	Total Company		*Wheat Cereal*		*Pancake Mix*		*Flour*	
	Amount	*%*	*Amount*	*%*	*Amount*	*%*	*Amount*	*%*
Sales	$600,000	100.0	$200,000	100.0	$300,000	100.0	$100,000	100
Less variable expenses:								
Materials, labor & other	204,000	34.0	60,000	30.0	126,000	42.0	18,000	18
Sales commissions	60,000	10.0	20,000	10.0	30,000	10.0	10,000	10
Total	264,000	44.0	80,000	40.0	156,000	52.0	28,000	28
Contribution margin	336,000	56.0	120,000	60.0	144,000	48.0	72,000	72
Less traceable fixed expenses:								
Advertising	123,000	20.5	48,000	24.0	60,000	20.0	15,000	15
Salaries	66,000	11.0	34,000	17.0	21,000	7.0	11,000	11
Equipment depreciation*	30,000	5.0	12,000	6.0	15,000	5.0	3,000	3
Warehouse rent**	12,000	2.0	4,000	2.0	7,000	2.3	1,000	1
Total	231,000	38.5	98,000	49.0	103,000	34.3	30,000	30
Product line segment margin	105,000	17.5	$ 22,000	11.0	$ 41,000	13.7	$ 42,000	42
Less common fixed expenses:								
General administration	90,000	15.0						
Net operating income	$ 15,000	2.5						

* $30,000 × 40%, 50%, and 10% respectively

** $0.50 per square foot × 8,000 square feet, 14,000 square feet, and 2,000 square feet respectively

Problem 12-15 (continued)

2. a. No, the wheat cereal should not be eliminated. The wheat cereal product is covering all of its own costs and is generating a $22,000 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 pancake mix. 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 pancake mix 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 probably 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 production 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 products, salaries are very high for wheat cereal. This should be thoroughly investigated to find the reason for the wide difference in cost. If these salaries can be reduced, it would greatly enhance the profitability of the wheat cereal, as well as the profitability of the company as a whole.
   ii. The company pays a commission of 10% on the selling price of any product. 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 12-16 (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 territories taken together.
   b. Additional columns showing percentages would be helpful in assessing performance and pinpointing areas of difficulty.
   c. The territorial expenses should be segregated into variable and fixed categories to permit the computation of both a contribution margin and a territorial segment margin.
   d. The corporate expenses are probably common to the territories and should not be allocated.

2. The corporate advertising has apparently been allocated on the basis of sales dollars; the general administrative expenses have apparently been allocated evenly between the three territories. 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. It is the segment margin that should be used in measuring the performance of a segment, not the net operating income or loss after allocating common expenses.

3. See the statement that follows.

4. The following points should be brought to the attention of management:
   a. Sales in Southern Europe are much lower than in the other two territories. This is not due to lack of salespeople since salaries in Southern Europe are about the same as in Middle Europe, which has the highest sales of the three territories.
   b. Southern Europe is spending less than half as much for advertising as Middle Europe. Perhaps this is the reason for Southern Europe's lower sales.
   c. Northern Europe has a poor sales mix in that it apparently is selling a large amount of low margin items. Note that it has a contribution margin ratio of only 49%, as compared to 64% or more for the other two territories.

Problem 12-16 (continued)

d. Northern Europe may be overstaffed. Its total salaries are much higher than in either of the other two territories.

e. Northern Europe is not covering its own traceable costs. Major attention should be given to changing the sales mix and reducing expenses in this territory.

Problem 12-16 (continued)

3.

	Total		*Southern Europe*		*Middle Europe*		*Northern Europe*	
	Amount in €s	*%*	*Amount in €s*	*%*	*Amount in €s*	*%*	*Amount in €s*	*%*
Sales	1,800,000	100.0	300,000	100	800,000	100	700,000	100
Less variable expenses:								
Cost of goods sold	648,000	36.0	93,000	31	240,000	30	315,000	45
Shipping expense	89,000	4.9	15,000	5	32,000	4	42,000	6
Total variable expenses	737,000	40.9	108,000	36	272,000	34	357,000	51
Contribution margin	1,063,000	59.1	192,000	64	528,000	66	343,000	49
Less traceable fixed expenses:								
Salaries	222,000	12.3	54,000	18	56,000	7	112,000	16
Insurance	39,000	2.2	9,000	3	16,000	2	14,000	2
Advertising	590,000	32.8	105,000	35	240,000	30	245,000	35
Depreciation	81,000	4.5	21,000	7	32,000	4	28,000	4
Total traceable fixed expenses	932,000	51.8	189,000	63	344,000	43	399,000	57
Territorial segment margin	131,000	7.3	3,000	1	184,000	23	(56,000)	(8)
Less common fixed expenses:								
Advertising (general)	90,000	5.0						
General administration	60,000	3.3						
Total common fixed expense	150,000	8.3						
Net operating loss	(19,000)	(1.1)						

Note: Columns may not total due to rounding.

Problem 12-17 (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 firm may shave its margins slightly hoping for a great enough increase in turnover to increase the overall rate of return. Fourth, it permits a manager to reduce important profitability elements to ratio form, which enhances comparisons between units (divisions, etc.) of the organization.

2.

	Companies in the Same Industry		
	A	*B*	*C*
Sales	$4,000,000*	$1,500,000*	$6,000,000
Net operating income	560,000*	210,000*	210,000
Average operating assets	2,000,000*	3,000,000	3,000,000*
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 by 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 above.

Problem 12-17 (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 50 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 (thereby requiring higher salaries or transportation charges), is it due to excessive materials costs, or is it due to still 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 12-18 (30 minutes)

1.

	Present	*New Line*		*Total*
(1) Sales	$21,000,000	$9,000,000		$30,000,000
(2) Net operating income	$1,680,000	$630,000	*	$2,310,000
(3) Operating assets	$5,250,000	$3,000,000		$8,250,000
(4) Margin (2) ÷ (1)	8.0%	7.0%		7.7%
(5) Turnover (1) ÷ (3)	4.00	3.00		3.64
(6) ROI (4) × (5)	32%	21%		28%

* Sales	$9,000,000
Less variable expenses (65% × $9,000,000)	5,850,000
Contribution margin	3,150,000
Less fixed expenses	2,520,000
Net operating income	$ 630,000

2. Fred Halloway 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 21%, whereas the company's overall ROI last year was only 18%. Thus, adding the new line would increase the company's overall ROI figure.

4. a.

	Present	*New Line*	*Total*
Operating assets	$5,250,000	$3,000,000	$8,250,000
Minimum required return	× 15%	× 15%	× 15%
Minimum net operating income	$ 787,500	$ 450,000	$1,237,500
Actual net operating income	$1,680,000	$ 630,000	$2,310,000
Minimum net operating income (above)	787,500	450,000	1,237,500
Residual income	$ 892,500	$ 180,000	$1,072,500

b. Under the residual income approach, Fred Halloway 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 12-19 (20 minutes)

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

	Ending Balances	*Beginning Balances*
Cash	$ 130,000	$ 125,000
Accounts receivable	480,000	340,000
Inventory	490,000	570,000
Plant and equipment (net)	820,000	845,000
Total operating assets	$1,920,000	$1,880,000

$$\text{Average operating assets} = \frac{\$1{,}880{,}000 + \$1{,}920{,}000}{2} = \$1{,}900{,}000$$

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

$$= \frac{\$627{,}000}{\$4{,}180{,}000} = 15\%$$

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

$$= \frac{\$4{,}180{,}000}{\$1{,}900{,}000} = 2.2$$

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

$$= 15\% \times 2.2 = 33\%$$

2.

Net operating income	$627,000
Minimum required return (20% × $1,900,000)	380,000
Residual income	$247,000

Problem 12-20 (60 minutes)

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

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

$$\text{Transfer price} = (\$63 - \$5) + \frac{(\$100 - \$63) \times 10{,}000}{10{,}000}$$

$$= \$58 + \$37 = \$95$$

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

$$\text{Transfer price} \leq \text{Cost of buying from outside supplier} = \$92$$

Division B won't pay more than $92 and Division A will not accept less than $95, so no deal is possible. There will be no transfer.

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

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

$$\text{Transfer price} = (\$19 - \$4) + \frac{(\$40 - \$19) \times 70{,}000}{70{,}000} = \$15 + \$21 = \$36$$

From the standpoint of the buying division, Division B:

$$\text{Transfer price} \leq \text{Cost of buying from outside supplier} = \$39$$

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

$$\$36 \leq \text{Transfer price} \leq \$39$$

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 $36 while the selling division argues just as strongly for $39.

Problem 12-20 (continued)

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

Division B's outside purchase price	$39
Division A's variable cost on the internal transfer	36
Potential added contribution margin lost to the company as a whole	$ 3
Number of units	× 70,000
Potential added contribution margin and company profits forgone	$210,000

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 Division A will be:

Suggested selling price per unit	$38
Division A's variable cost on the internal transfer	36
Potential added contribution margin per unit	$ 2
Number of units	× 70,000
Potential added contribution margin and divisional profits forgone	$140,000

The loss in potential profits in Division B will be:

Outside purchase price per unit	$39
Suggested price per unit inside	38
Potential cost avoided per unit	$ 1
Number of units	× 70,000
Potential added contribution margin and divisional profits forgone	$ 70,000

The total of these two amounts ($140,000 + $70,000) equals the $210,000 loss in potential profits for the company as a whole.

Problem 12-20 (continued)

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

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

$$\text{Transfer price} \geq \$35 + \frac{\$0}{20{,}000} = \$35$$

From the standpoint of the buying division, Division B:

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

$$\text{Transfer price} \leq \$60 - (0.05 \times \$60) = \$57$$

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

$$\$35 \leq \text{Transfer price} \leq \$57$$

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. Division A'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 Division B. Therefore, Division A's asset turnover should increase. The division's margin earned on sales should also increase, since its contribution margin will increase by $340,000 as a result of the new sales, with no offsetting increase in fixed costs:

Selling price	$52
Less variable costs	35
Contribution margin	$17
Number of units	× 20,000
Added contribution margin	$340,000

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

Problem 12-20 (continued)

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

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

$$\text{Transfer price} \geq \$25 + \frac{(\$45 - \$30) \times 30{,}000}{60{,}000} = \$25 + \$7.50 = \$32.50$$

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 Tuner Division has no idle capacity, so transfers from the Tuner Division to the Assembly Division would cut directly into normal sales of tuners to outsiders. Since the costs are the same whether a tuner is transferred internally or sold to outsiders, the only relevant cost is the lost revenue of $20 per tuner that could be sold to outsiders. This is confirmed below:

$$\text{Transfer price} \geq \$11 + \frac{(\$20 - \$11) \times 30{,}000}{30{,}000}$$

$$\geq \$11 + (\$20 - \$11) = \$20$$

Therefore, the Tuner Division will refuse to transfer at a price less than $20 per tuner.

The Assembly Division can buy tuners from an outside supplier for $20, less a 10% quantity discount of $2, or $18 per tuner. Therefore, the Division would be unwilling to pay more than $18 per tuner.

$$\text{Transfer price} \leq \text{Cost of buying from outside supplier} = \$18$$

The requirements of the two divisions are incompatible. The Assembly Division won't pay more than $18 and the Tuner Division will not accept less than $20. 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 $18. If the Tuner Division meets this price, then profits in the Tuner Division and in the company as a whole will drop by $60,000 per year:

Lost revenue per tuner	$20
Outside supplier's price	$18
Loss in contribution margin per tuner	$2
Number of tuners per year	× 30,000
Total loss in profits	$60,000

Problem 12-21 (continued)

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

3. The Tuner Division has idle capacity, so transfers from the Tuner Division to the Assembly Division do not cut into normal sales of tuners to outsiders. In this case, the minimum price as far as the Assembly Division is concerned is the variable cost per tuner of $11. This is confirmed in the following calculation:

$$\text{Transfer price} = \$11 + \frac{\$0}{30{,}000} = \$11$$

The Assembly Division can buy tuners from an outside supplier for $18 each and would be unwilling to pay more than that 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:

$$\$11 \leq \text{Transfer price} \leq \$18$$

4. Yes, $16 is a bona fide outside price. Even though $16 is less than the Tuner Division's $17 "full cost" per unit, it is within the range given in Part 3 and therefore will provide some contribution to the Tuner Division.

If the Tuner Division does not meet the $16 price, it will lose $150,000 in potential profits:

Price per tuner.....	$16
Less variable costs	11
Contribution margin per tuner.....	$ 5

30,000 tuners × $5 per tuner = $150,000 potential increased profits

This $150,000 in potential profits applies to the Tuner Division and to the company as a whole.

5. No, the Assembly 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 purchase inside if better prices are available outside.

Problem 12-21 (continued)

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

Selling price	$20
Less variable costs	11
Contribution margin per tuner	$ 9

30,000 tuners × $9 per tuner = $270,000 increased profits

The Assembly Division will have a decrease in profits:

Inside purchase price	$20
Outside purchase price	16
Increased cost per tuner	$ 4

30,000 tuners × $4 per tuner = $120,000 decreased profits

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

Increased contribution margin in the Tuner Division	$ 9
Decreased contribution margin in the Assembly Division	4
Increased contribution margin per tuner	$ 5

30,000 tuners × $5 per tuner = $150,000 increased profits

So long as the selling division has idle capacity and the transfer price is greater than the selling division's variable costs, 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 Assembly Division and greatly enhances the profits of the Tuner Division.

Problem 12-22 (60 minutes)

1. Segments defined as product lines:

			Product Line					
	Leather Division		*Garments*		*Shoes*		*Handbags*	
	Amount	*%*	*Amount*	*%*	*Amount*	*%*	*Amount*	*%*
Sales	R1,500,000	100.0	R500,000	100	R700,000	100	R300,000	100
Less variable expenses	761,000	50.7	325,000	65	280,000	40	156,000	52
Contribution margin	739,000	49.3	175,000	35	420,000	60	144,000	48
Less traceable fixed expenses:								
Advertising	312,000	20.8	80,000	16	112,000	16	120,000	40
Administration	107,000	7.1	30,000	6	35,000	5	42,000	14
Depreciation	114,000	7.6	25,000	5	56,000	8	33,000	11
Total traceable fixed expenses	533,000	35.5	135,000	27	203,000	29	195,000	65
Product line segment margin	206,000	13.7	R 40,000	8	R217,000	31	R (51,000)	(17)
Less common fixed expenses:								
Administrative*	110,000	7.3						
Divisional segment margin	R 96,000	6.4						

*R217,000 – R107,000 = R110,000.

Problem 12-22 (continued)

2. Segments defined as markets for the handbag product line:

			Sales Market			
	Handbags		*Domestic*		*Foreign*	
	Amount	*%*	*Amount*	*%*	*Amount*	*%*
Sales	R300,000	100	R200,000	100	R100,000	100
Less variable expenses	156,000	52	86,000	43	70,000	70
Contribution margin	144,000	48	114,000	57	30,000	30
Less traceable fixed expenses:						
Advertising	120,000	40	40,000	20	80,000	80
Market segment margin	24,000	8	R 74,000	37	R(50,000)	(50)
Less common fixed expenses:						
Administrative	42,000	14				
Depreciation	33,000	11				
Total common fixed expenses	75,000	25				
Product line segment margin	R(51,000)	(17)				

Problem 12-22 (continued)

3.

	Garments	*Shoes*
Incremental contribution margin:		
35% × R200,000 increased sales.....	R70,000	
60% × R145,000 increased sales.....		R87,000
Less cost of the promotional campaign	30,000	30,000
Increased net operating income	R40,000	R57,000

Based on these data, the campaign should be directed toward the shoes product line. Notice that the analysis uses the contribution margin ratio rather than the segment margin ratio.

Problem 12-23 (60 minutes)

1.	*Total Company*		*District A*		*District B*		*District C*	
	Amount	*%*	*Amount*	*%*	*Amount*	*%*	*Amount*	*%*
Sales (15,000, 25,000 and 10,000 units @ $20)	$1,000,000	100.0	$300,000	100.0	$500,000	100.0	$200,000	100.0
Less variable expenses:								
Cost of goods sold @ $9	450,000	45.0	135,000	45.0	225,000	45.0	90,000	45.0
Shipping	51,250	5.1	11,250	3.7	25,000	5.0	15,000	7.5
Sales commissions	60,000	6.0	18,000	6.0	30,000	6.0	12,000	6.0
Order processing expense*	25,000	2.5	15,000	5.0	7,500	1.5	2,500	1.3
Total variable expenses	586,250	58.6	179,250	59.7	287,500	57.5	119,500	59.8
Contribution margin	413,750	41.4	120,750	40.3	212,500	42.5	80,500	40.2
Less traceable fixed expenses:								
Sales salaries	30,000	3.0	12,000	4.0	10,000	2.0	8,000	4.0
District advertising	75,000	7.5	20,000	6.7	25,000	5.0	30,000	15.0
District management salaries	40,000	4.0	12,000	4.0	15,000	3.0	13,000	6.5
Warehouse rent**	80,000	8.0	30,000	10.0	40,000	8.0	10,000	5.0
Total traceable fixed expenses	225,000	22.5	74,000	24.7	90,000	18.0	61,000	30.5
District segment margin	188,750	18.9	$ 46,750	15.6	$122,500	24.5	$ 19,500	9.7

Problem 12-23 (continued)

	Total Company	
	Amount	*%*
Less common fixed expenses:		
National advertising	115,000	11.5
Central office administrative expense***	75,000	7.5
Total common fixed expenses	190,000	19.0
Net operating loss	$ (1,250)	(0.1)

* $25,000 order processing costs ÷ 5,000 orders = $5.00 per order
$5.00 per order × 3,000 orders; 1,500 orders; and 500 orders
** $80,000 warehouse rent ÷ 160,000 square feet = $0.50 per square foot
$0.50 per square foot × 60,000 square feet; 80,000 square feet; and 20,000 square feet
*** $100,0000 – $25,000 variable order processing expense = $75,000 fixed

Problem 12-23 (continued)

2.

	District A	*District B*	*District C*
Contribution margin (a)	$120,750	$212,500	$80,500
Number of orders (b)	3,000	1,500	500
Contribution margin per order (a) ÷ (b)	$40.25	$141.67	$161.00

District A is taking many small orders, resulting in a contribution margin per order that is only one fourth that of District C. Given the high variable administrative cost of processing an order ($5), the sales staff should try to get customers to order less frequently in larger amounts. Apparently, it is possible to get fewer orders in larger amounts, as shown by the experience in both Districts B and C. If District A had written large enough orders during March to provide a contribution margin of $150 per order, then only 805 orders would have to be written during the month ($120,750 contribution margin ÷ $150 per order = 805 orders), rather than 3,000 orders. This would have reduced variable order processing costs by $10,975—enough to put the company in the black for the month:

Orders actually written	3,000
Orders that could have been written, at $150 contribution margin per order (above)	805
Difference	2,195
Variable cost to process an order	× $5
Potential savings in processing costs	$10,975

However, this approach is contrary to the JIT trend that emphasizes smaller, more frequent orders. A better solution may be to use process re-engineering to reduce the costs of processing an order.

3.

Incremental sales	$100,000
Contribution margin ratio	× 0.425
Incremental contribution margin	42,500
Less incremental advertising expense	25,000
Incremental segment margin (and company net operating income)	$ 17,500

Problem 12-23 (continued)

Yes, the expenditures would be justified. Note that the contribution margin ratio should be used in the computation, rather than the segment margin ratio. This answer assumes no change in the average size of an order in District B.

4. The following points should be brought to the attention of management:
   a. The large number of orders in District A, as discussed above.
   b. The sales staffs in Districts A and C are far less effective than the sales staff in District B, as shown below:

	District A	*District B*	*District C*
District sales (a)	$300,000	$500,000	$200,000
Number of salespersons (b)	6	5	4
Dollar sales per salesperson (a) ÷ (b)	$ 50,000	$100,000	$ 50,000

   c. Although District C has the least sales of any district, it has the highest district advertising expense. This may be indicative of poorly directed or ineffective advertising. Perhaps the district advertising programs should be coordinated through an advertising manager to ensure consistency and effectiveness in overall advertising efforts.
   d. Districts B and C have high shipping costs compared to District A. Shipping costs per unit in the three districts are:

	District A	*District B*	*District C*
Shipping expense (a)	$11,250	$25,000	$15,000
Number of units sold (b)	15,000	25,000	10,000
Shipping costs per unit (a) ÷ (b)	$0.75	$1.00	$1.50

   Perhaps company policy should determine the shipping method rather than allowing the sales staff to specify the shipping method. This might avoid unnecessary use of the more expensive shipping methods.

Problem 12-23 (continued)

e. Districts A and C have lower contribution margin ratios than District B, as a result of the higher ordering costs in District A and the higher shipping costs in District C. One advantage of the segmented statement as shown in Part (1) above is that it permits the computation of contribution margins and contribution margin ratios, as well as segment margins, thus providing management with more detailed information.

f. Sales in both Districts A and C are substantially lower than in District B. This may be a result of the low productivity per salesperson in these districts, combined with ineffective advertising in District C and perhaps insufficient advertising in District A.

In conclusion, unprofitable operations may be caused by a number of small problems rather than a single, large problem. Statements in the segmented format help to focus on potential small problem areas, such as shown above.

Problem 12-24 (30 minutes)

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

Ending balance	$15,500,000
Beginning balance ($15,500,000 ÷ 1.24)	12,500,000
Total	$28,000,000
Average balance ($28,000,00 ÷ 2)	$14,000,000

a.

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

$$= \frac{\$2{,}800{,}000}{\$35{,}000{,}000} \times \frac{\$35{,}000{,}000}{\$14{,}000{,}000}$$

$$= 8\% \times 2.5 = 20\%$$

b.

Net operating income		$2,800,000
Minimum required net operating income:		
Average operating assets	$14,000,000	
Minimum required return	× 15%	2,100,000
Residual income		$ 700,000

2. Presser's management would have been more likely to accept the investment offering an 18% return if residual income, rather than ROI, were used to evaluate performance and to determine bonuses. The investment would have lowered Presser's ROI because the expected return (18%) is lower than the division's historical returns (19% to 22%) as well as its most recent ROI (20%). On the other hand, the investment would increase the division's and the company's residual income. When bonuses are based on ROI, Presser's management is likely to reject any investment opportunity that promises a rate of return less than the division's current ROI, even if the rate of return on the investment exceeds the company's required rate of return.
3. Presser 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 to performance measurement.

Problem 12-25 (30 minutes)

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

$$= \frac{\$80{,}000}{\$1{,}000{,}000} \times \frac{\$1{,}000{,}000}{\$500{,}000}$$

$$= 8\% \times 2 = 16\%$$

2. $$\text{ROI} = \frac{\$90{,}000}{\$1{,}000{,}000} \times \frac{\$1{,}000{,}000}{\$500{,}000}$$

$$= \quad 9\% \quad \times \quad 2 \quad = \quad 18\%$$

(Increase) (Unchanged) (Increase)

3. $$\text{ROI} = \frac{\$80{,}000}{\$1{,}000{,}000} \times \frac{\$1{,}000{,}000}{\$400{,}000}$$

$$= \quad 8\% \quad \times \quad 2.5 \quad = \quad 20\%$$

(Unchanged) (Increase) (Increase)

4. The company has a contribution margin ratio of 40% ($20 CM per unit, divided by $50 selling price per unit). Therefore, a $100,000 increase in sales would result in a new net operating income of:

Sales	$1,100,000	100%
Less variable expenses	660,000	60
Contribution margin	440,000	40%
Less fixed expenses	320,000	
Net operating income	$ 120,000	

Problem 12-25 (continued)

$$\text{ROI} = \frac{\$120{,}000}{\$1{,}100{,}000} \times \frac{\$1{,}100{,}000}{\$500{,}000}$$

$$= \underset{\text{(Increase)}}{10.91\%} \times \underset{\text{(Increase)}}{2.2} = \underset{\text{(Increase)}}{24\%}$$

A change in sales affects *both* the margin and the turnover.

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

$$\text{ROI} = \frac{\$85{,}000}{\$1{,}000{,}000} \times \frac{\$1{,}000{,}000}{\$625{,}000}$$

$$= \underset{\text{(Increase)}}{8.5\%} \times \underset{\text{(Decrease)}}{1.6} = \underset{\text{(Decrease)}}{13.6\%}$$

6. $$\text{ROI} = \frac{\$80{,}000}{\$1{,}000{,}000} \times \frac{\$1{,}000{,}000}{\$320{,}000}$$

$$= \underset{\text{(Unchanged)}}{8\%} \times \underset{\text{(Increase)}}{3.125} = \underset{\text{(Increase)}}{25\%}$$

7. $$\text{ROI} = \frac{\$60{,}000}{\$1{,}000{,}000} \times \frac{\$1{,}000{,}000}{\$480{,}000}$$

$$= \underset{\text{(Decrease)}}{6\%} \times \underset{\text{(Increase)}}{2.08} = \underset{\text{(Decrease)}}{12.5\%}$$

Problem 12-26 (45 minutes)

1. The division's target net operating income is $36,000:

$$12\% \times \$300{,}000 = \$36{,}000$$

Let X = units sold
$4X = $2.50X + $234,000 + $36,000
$1.50X = $270,000
X = 180,000 bearings, or $720,000 in sales

a. $$\text{Margin} = \frac{\text{Net operating income}}{\text{Sales}} = \frac{\$36{,}000}{\$720{,}000} = 5\%$$

b. $$\text{Turnover} = \frac{\text{Sales}}{\text{Operating assets}} = \frac{\$720{,}000}{\$300{,}000} = 2.4$$

2. a. and b.

	Sales Volume		
		*	
Units sold	160,000	180,000	200,000
(1) Sales @ $4.25, $4.00, and $3.75	$680,000	$720,000	$750,000
Less variable expenses @ $2.50	400,000	450,000	500,000
Contribution margin	280,000	270,000	250,000
Less fixed expenses	234,000	234,000	234,000
(2) Net operating income	$ 46,000	$ 36,000	$ 16,000
(3) Total assets	$290,000	$300,000	$310,000
(4) Margin (2) ÷ (1)	6.76%	5.00%	2.13%
(5) Turnover (1) ÷ (3)	2.34	2.40	2.42
ROI (4) × (5)	15.82%	12.00%	5.15%

*Column not required.

Problem 12-26 (continued)

3.

	Present Sales	*New Sales*	*Total Sales*
Units sold	180,000	20,000	200,000
(1) Sales @ $4.00 and $3.25	$720,000	$65,000	$785,000
Less variable expenses @ $2.50	450,000	50,000	500,000
Contribution margin	270,000	15,000	285,000
Less fixed expenses	234,000	0	234,000
(2) Net operating income	$ 36,000	$15,000	$ 51,000
(3) Total assets	$300,000	$25,000	$325,000
(4) Margin (2) ÷ (1)	5.00%	23.08%	6.50%
(5) Turnover (1) ÷ (3)	2.40	2.60	2.42
ROI (4) × (5)	12.00%	60.00%	15.73%

Yes, the manager of the Bearing Division should accept the $3.25 price. The additional sales at this price would increase the division's ROI.

Problem 12-27 (45 minutes)

1. The Consumer Products Division will probably reject the $400 price because it is below the division's variable cost of $420 per DVD player. This variable cost includes the $190 transfer price from the Board Division, which in turn includes $30 per unit in fixed costs. However, from the viewpoint of the Consumer Products Division, the entire $190 transfer price is a variable cost. Consequently, the Consumer Products Division will reject the $400 price offered by the overseas distributor.

2. If both the Board Division and the Consumer Products Division have idle capacity, then from the standpoint of the entire company the $400 offer should be accepted. By rejecting the $400 price, the company will lose $50 per DVD player in potential contribution margin:

Price offered per player		$400
Less variable costs per player:		
Board Division	$120	
Consumer Products Division	230	350
Potential contribution margin per player		$ 50

3. If the Board Division is operating at capacity, any boards transferred to the Consumer Products Division to fill the overseas order will have to be diverted from outside customers. Whether a board is sold to outside customers or is transferred to the Consumer Products Division, its production cost is the same. However, if a board is diverted from outside sales, the Board Division (and the entire company) loses the $190 in revenue. As a consequence, as shown below, there would be a net loss of $20 on each player sold for $400.

Price offered per player		$400
Less:		
Lost revenue from sales of boards to outsiders	$190	
Variable cost of Consumer Products Division	230	420
Net loss per player		($ 20)

Problem 12-27 (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).

Problem 12-28 (30 minutes)

1. In order to sell to the Home Products Division, the Compressor Division will lose the contribution margin being generated on sales of 100 compressors to outside customers, as shown below:

Selling price		$250
Less variable expenses:		
Direct materials	$50	
Direct labor	60	
Variable manufacturing overhead (50% × $40)	20	
Variable selling and administrative	10	
Total variable expenses		140
Contribution margin		$110

100 units × $110 per unit = $11,000 lost contribution margin

Therefore, from the perspective of the Compressor Division, the transfer price would have to be at least $450 as shown below:

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

$$\text{Transfer price} \geq \$175^{*} + \frac{\$110 \times 100}{40} = \$175 + \$275 = \$450$$

*$60 + $90 + $25 = $175

2. Any price below $450 will result in a decline in the profits of both the Compressor Division and the entire company. If the Compressor Division meets the price of $350, then overall profits will decrease by $4,000:

Lost contribution margin on outside sales of compressors	$275
Variable cost of producing compressors	175
Cost of producing compressors inside the company	450
Savings from not buying compressors from outside supplier	350
Net loss per compressor produced internally	$100
Number of compressors required	× 40
Total potential decrease in contribution margin and net operating income	$4,000

Case 12-29 (75 minutes)

1. See the segmented statement that follows. Supporting computations for the statement are given below:

Revenues:	
Membership dues (10,000 × $60)	$600,000
Assigned to the Journal (10,000 × $15)	150,000
Assigned to Membership Service	$450,000
Non-member journal subscriptions (1,000 × $20)	$ 20,000
Advertising (given)	$ 50,000
Books and reports (given)	$ 70,000
Continuing education courses (given)	$230,000
Occupancy costs:	
Membership Services ($100,000 × 0.3 + $20,000)	$ 50,000
Journal ($100,000 × 0.1)	10,000
Books and Reports ($100,000 × 0.1)	10,000
Continuing Education ($100,000 × 0.2)	20,000
Central staff ($100,000 × 0.3)	30,000
Total occupancy costs	$120,000
Printing costs:	
Journal (11,000 × $4)	$ 44,000
Books and Reports (given)	25,000
Continuing Education (plug)	13,000
Total printing costs	$ 82,000
Mailing costs:	
Journal (11,000 × $1)	$ 11,000
Books and Reports (given)	8,000
Central staff (plug)	5,000
Total mailing costs	$ 24,000

Case 12-29 (continued)

	Total	*Membership Services*	*Journal*	*Books and Reports*	*Continuing Education*
Revenues:					
Membership dues	$600,000	$450,000	$150,000		
Non-member journal subscriptions	20,000		20,000		
Advertising	50,000		50,000		
Books and reports	70,000			$ 70,000	
Continuing education courses	230,000				$230,000
Total revenues	970,000	450,000	220,000	70,000	230,000
Expenses traceable to segments:					
Salaries	320,000	170,000	60,000	40,000	50,000
Occupancy costs	90,000	50,000	10,000	10,000	20,000
Distributions to local chapters	210,000	210,000			
Printing	82,000		44,000	25,000	13,000
Mailing	19,000		11,000	8,000	
Continuing education instructors' fees	60,000				60,000
Total traceable expenses	781,000	430,000	125,000	83,000	143,000
Program segment margin	189,000	$ 20,000	$ 95,000	$ (13,000)	$ 87,000

(The segmented income statement is continued on the next page.)

Case 12-29 (continued)

Less common expenses:	
Salaries—corporate staff	120,000
Occupancy costs	30,000
Mailing	5,000
General administrative	27,000
Total common expenses	182,000
Excess of revenues over expenses	$ 7,000

Note: Some may argue that apart from the $20,000 in rental cost directly attributed to Membership Services, occupancy costs are common costs that should not be allocated to programs. The correct treatment of the occupancy costs depends on whether they could be avoided in part by eliminating a program. We have assumed that they could be avoided.

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

   Arguments against allocation of common costs include:

   - Allocation bases must be chosen arbitrarily since there is no cause-and-effect relationship 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 the common costs. They should not be held accountable for costs over which they have little or no control.
   - Allocations of common costs tend to undermine the credibility of performance reports.

Case 12-30 (45 minutes)

1. The Electronics Division is presently operating at capacity; therefore, any sales of the XL5 circuit board to the Clock Division will require that the Electronics Division give up an equal number of sales to outside customers. Using the transfer pricing formula, we get a minimum transfer price of:

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

$$\text{Transfer price} = \$8.25 + (\$12.50 - \$8.25)$$

$$\text{Transfer price} = \$8.25 + \$4.25$$

$$\text{Transfer price} = \$12.50$$

   Thus, the Electronics Division should not supply the circuit board to the Clock Division for $9 each. The Electronics Division must give up revenues of $12.50 on each circuit board that it sells internally. Since management performance in the Electronics Division is measured by ROI and dollar profits, selling the circuit boards to the Clock Division for $9 would adversely affect these performance measurements.

2. The key is to realize that the $10 in fixed overhead and administrative costs contained in the Clock Division's $69.75 cost per timing device 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 Clock Division gets the oven timing device 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 Electronics Division is not relevant either. Whether the circuit boards are used in the timing devices or sold to outsiders, the production costs of the circuit boards would be the same. The only difference between the two alternatives is the revenue on outside sales that is given up when the circuit boards are transferred within the company.

Case 12-30 (continued)

Selling price of the timing devices		$70.00
Less:		
The cost of the circuit boards used in the timing devices (i.e. the lost revenue from sale of circuit boards to outsiders)	$12.50	
Variable costs of the Clock Division excluding the circuit board ($30.00 + $20.75)	50.75	63.25
Net positive effect on the company's profit		$ 6.75

Therefore, the company as a whole would be better off by $6.75 for each timing device that is sold to the oven manufacturer.

3. As shown in part (1) above, the Electronics Division would insist on a transfer price of at least $12.50 for the circuit board. Would the Clock 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 Clock Division would be ahead by $6.75 per timing device if it accepts the $12.50 transfer price.

Selling price of the timing devices		$70.00
Less:		
Purchased parts (from outside vendors)	$30.00	
Circuit board XL5 (assumed transfer price)	12.50	
Other variable costs	20.75	63.25
Clock Division contribution margin		$ 6.75

In fact, since the contribution margin is $6.25, any transfer price within the range of $12.50 to $19.25 (= $12.50 + $6.75) 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 $12.50 to $19.25 would improve the profits of both divisions. What happens if the two managers do not come to an agreement?

Case 12-30 (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 Clock Division may believe that the fixed overhead and administrative cost of $10 per timing device 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 12-31 (90 minutes)

1.

	Total		*Line A*		*Line B*		*Line C*	
	Amount	*%*	*Amount*	*%*	*Amount*	*%*	*Amount*	*%*
Sales	$1,000,000	100.0	$400,000	100.0	$250,000	100	$350,000	100.0
Less variable expenses:								
Production	242,500	24.3	80,000	20.0	75,000	30	87,500	25.0
Selling	50,000	5.0	20,000	5.0	12,500	5	17,500	5.0
Total	292,500	29.3	100,000	25.0	87,500	35	105,000	30.0
Contribution margin	707,500	70.7	300,000	75.0	162,500	65	245,000	70.0
Less traceable fixed expenses:								
Production	200,000	20.0	107,000	26.8	30,000	12	63,000	18.0
Selling	100,000	10.0	40,000	10.0	10,000	4	50,000	14.3
Total	300,000	30.0	147,000	36.8	40,000	16	113,000	32.3
Product line segment margin	407,500	40.7	$153,000	38.2	$122,500	49	$132,000	37.7
Less common fixed expenses:								
Production*	300,000	30.0						
Administrative	150,000	15.0						
Total	450,000	45.0						
Net operating loss	$ (42,500)	(4.3)						

* Total fixed production costs	$500,000
Less traceable fixed production costs	200,000
Common fixed production costs	$300,000

Case 12-31 (continued)

2. No, production of Line B, not Line A, should be cut back. Under the conditions posed, it does not appear that the company will be able to avoid any fixed costs (either traceable or common) when production is cut back. Both Lines A and B sell for $100 per unit. Since the contribution margin ratio of Line A is 75%, its unit contribution margin is $75. And since the contribution margin ratio of Line B is 65%, its unit contribution margin is $65. Since the company must choose between using a B4 chip to produce one unit of Line A or one unit of Line B, Line A is clearly the better choice since its unit contribution margin is $10 higher.

   Some students will disagree with this analysis, and state that Mr. Aiken is correct in cutting back production of Line A. These students will base their argument on Line B's higher segment margin percentage (notice from the income statement in part (1) that Line B has a segment margin ratio of 49%, as compared to only 38.2% for Line A). However the segment margin should not be used for decision-making. Unlike contribution margin percentages, the segment margin percentages are unstable because fixed cost is included in the segment margin. Thus, as total sales change, the segment margin percentages change also.

3. Line C should not be eliminated. Notice from the income statement in part (1) that the line is covering all of its own traceable costs, and is generating a segment margin of $132,000 per month. If the line is discontinued, all of this segment margin will be lost to the company and the overall monthly loss will worsen.

Case 12-31 (continued)

4. a.

	Total		*Home Market*		*Foreign Market*	
	Amount	*%*	*Amount*	*%*	*Amount*	*%*
Sales	$350,000	100.0	$300,000	100.0	$50,000	100.0
Less variable expenses:						
Production	87,500	25.0	75,000	25.0	12,500	25.0
Selling	17,500	5.0	15,000	5.0	2,500	5.0
Total	105,000	30.0	90,000	30.0	15,000	30.0
Contribution margin	245,000	70.0	210,000	70.0	35,000	70.0
Less traceable fixed expenses:						
Selling	50,000	14.3	10,000	3.3	40,000	80.0
Market segment margin	195,000	55.7	$200,000	66.7	$ (5,000)	(10.0)
Less common fixed expenses:						
Production	63,000	18.0				
Product line segment margin	$132,000	37.7				

b. At least the following three points should be brought to the attention of management:

1. Compared to the home market, sales in the foreign market are very low.
2. Fixed selling expenses are very high in the foreign market, totaling four times as much each month as in the home market. Why?
3. The foreign market is not covering all of its own traceable fixed expenses, and thus the market is showing a negative segment margin. If sales cannot be increased sufficiently in future months for the foreign market to cover its own traceable expenses, then consideration should be given to eliminating the market.

Group Exercise 12-32

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