Chapter 11
Performance Measurement in Decentralized Organizations

Solutions to Questions

11-1 In a decentralized organization, decision-making authority isn't confined to a few top executives; instead, decision-making authority is spread throughout the organization.

11-2 The benefits of decentralization include: (1) by delegating day-to-day problem solving to lower-level managers, top management can concentrate on bigger issues such as overall strategy; (2) empowering lower-level managers to make decisions puts decision-making authority in the hands of those who have the most up-to-date information about day-to-day operations; (3) by eliminating layers of decision-making and approvals, organizations can respond more quickly to customers and to changes in the operating environment; (4) granting decision-making authority helps train lower-level managers for higher-level positions; and (5) empowering lower-level managers to make decisions can increase their motivation and job satisfaction.

11-3 The manager of a cost center has control over cost, but not revenue or the use of investment funds. A profit center manager has control over both cost and revenue. An investment center manager has control over cost and revenue and the use of investment funds.

11-4 Margin is the ratio of net operating income to total sales. Turnover is the ratio of total sales to average operating assets. The product of the two numbers is the ROI.

11-5 Residual income is the net operating income an investment center earns above the company's minimum required rate of return on operating assets.

11-6 If ROI is used to evaluate performance, investment center managers may reject profitable investment opportunities 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 avoids this problem because any project whose rate of return exceeds the company's minimum required rate of return will result in an increase in residual income.

11-7 A transfer price is the price charged when one responsibility center within a company provides goods or services to another responsibility center in the same company.

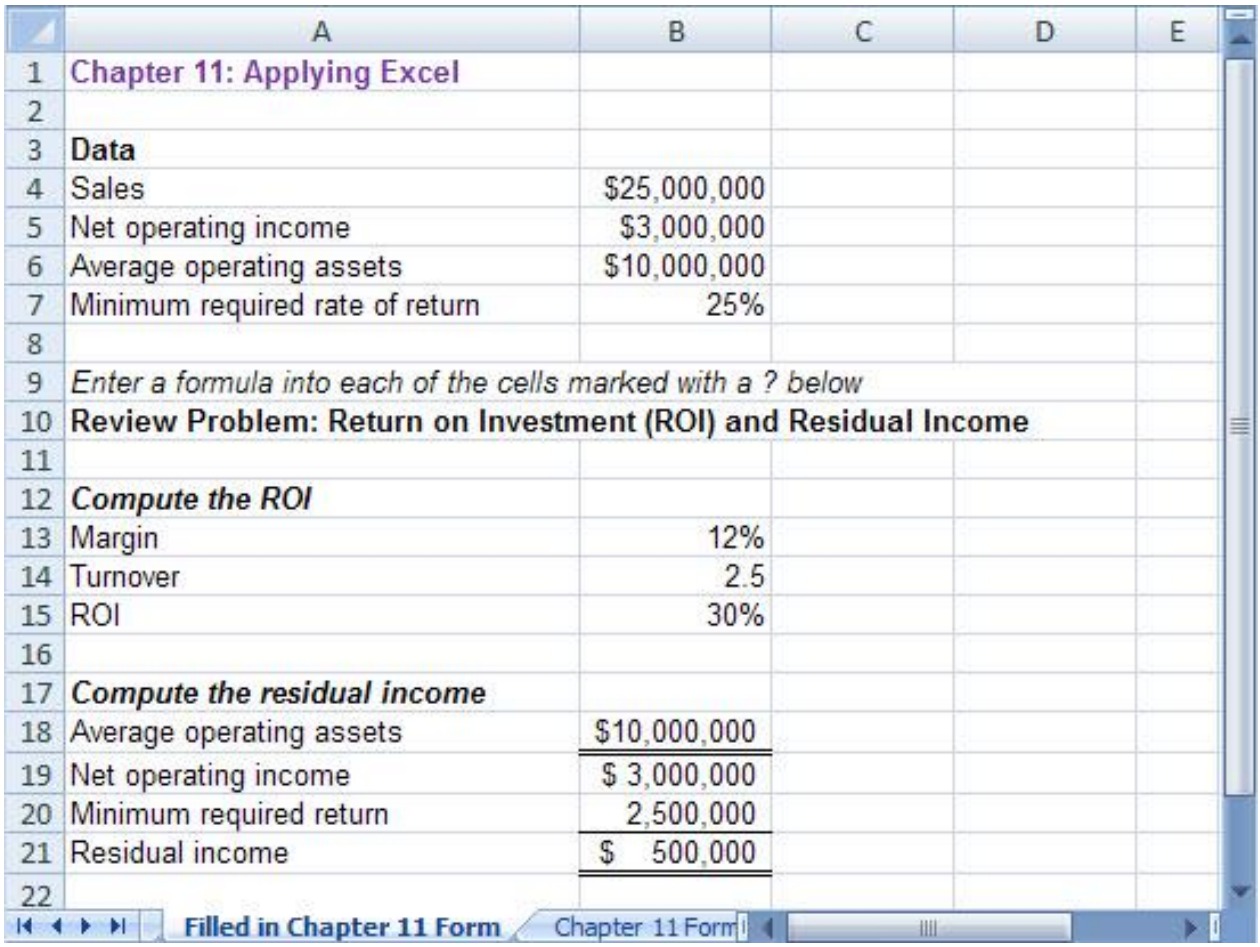
11-8 Suboptimization occurs when responsibility center managers forego additional companywide profits by making decisions that are not in the best interests of the overall company or even in the best interests of their own responsibility center.

11-9 A service department's budgeted costs, rather than its actual costs, should be charged to operating departments. This prohibits a service department from passing on cost overruns to operating departments.

11-10 Sales dollars are often a very poor base for allocating costs because sales dollars vary from period to period, whereas the costs are often largely fixed. Therefore, a letup in sales effort in one department will shift allocated costs from that department to other, more successful departments. In effect, the departments putting forth the best sales efforts are penalized in the form of higher cost allocations.

Chapter 11: Applying Excel

The completed worksheet is shown below.

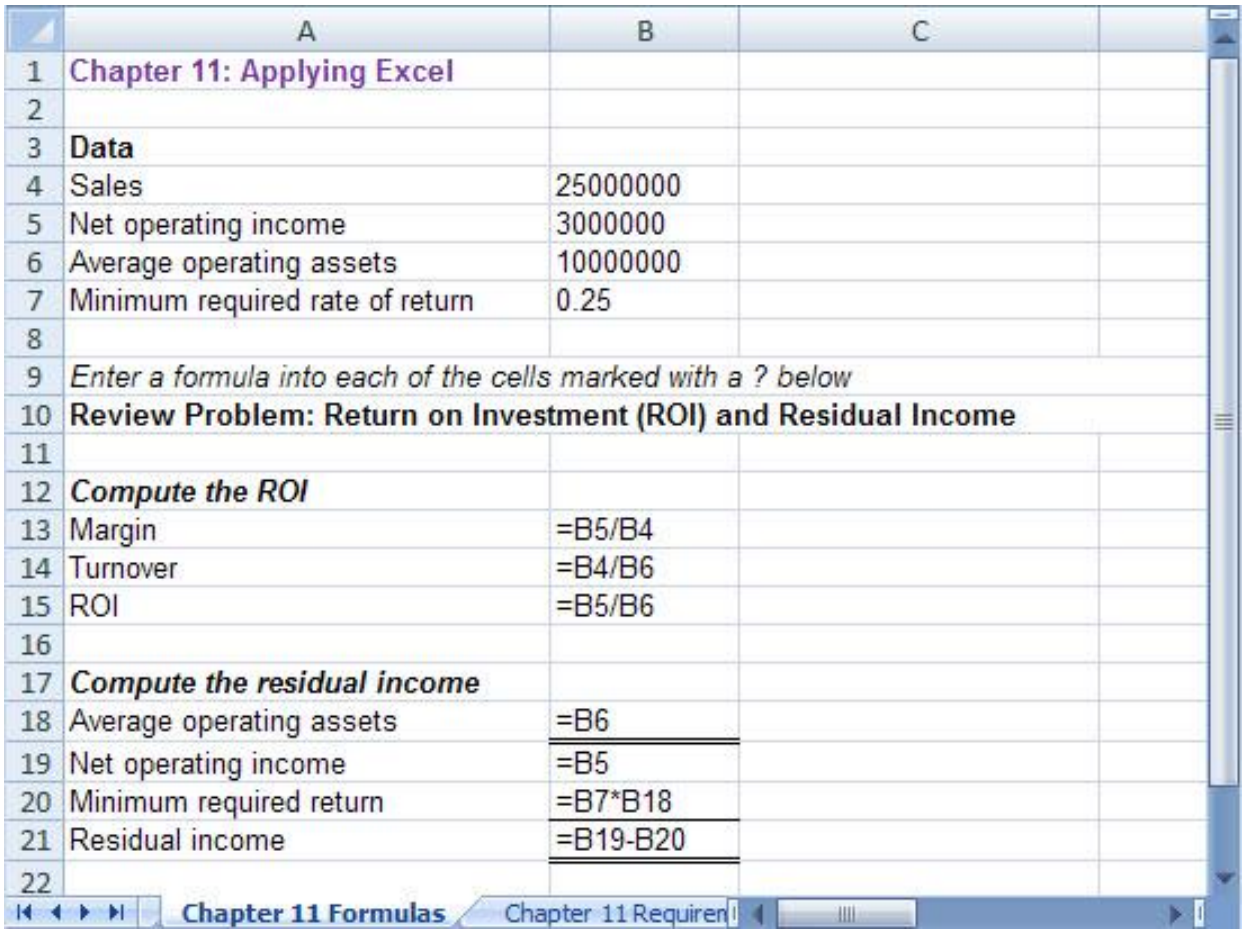


	A	B	C	D	E
1	Chapter 11: Applying Excel				
2					
3	**Data**				
4	Sales	$25,000,000			
5	Net operating income	$3,000,000			
6	Average operating assets	$10,000,000			
7	Minimum required rate of return	25%			
8					
9	*Enter a formula into each of the cells marked with a ? below*				
10	**Review Problem: Return on Investment (ROI) and Residual Income**				
11					
12	***Compute the ROI***				
13	Margin	12%			
14	Turnover	2.5			
15	ROI	30%			
16					
17	***Compute the residual income***				
18	Average operating assets	$10,000,000			
19	Net operating income	$ 3,000,000			
20	Minimum required return	2,500,000			
21	Residual income	$ 500,000			
22					

Filled in Chapter 11 Form | Chapter 11 Form

Chapter 11: Applying Excel (continued)

The completed worksheet, with formulas displayed, is shown below.



	A	B	C
1	Chapter 11: Applying Excel		
2			
3	**Data**		
4	Sales	25000000	
5	Net operating income	3000000	
6	Average operating assets	10000000	
7	Minimum required rate of return	0.25	
8			
9	*Enter a formula into each of the cells marked with a ? below*		
10	**Review Problem: Return on Investment (ROI) and Residual Income**		
11			
12	***Compute the ROI***		
13	Margin	=B5/B4	
14	Turnover	=B4/B6	
15	ROI	=B5/B6	
16			
17	***Compute the residual income***		
18	Average operating assets	=B6	
19	Net operating income	=B5	
20	Minimum required return	=B7*B18	
21	Residual income	=B19-B20	
22			

Chapter 11 Formulas | Chapter 11 Requiren

Chapter 11: Applying Excel (continued)

1. With the changes in average operating assets, the result is:

	A	B	C	D	E
1	Chapter 11: Applying Excel				
2					
3	**Data**				
4	Sales	$25,000,000			
5	Net operating income	$3,000,000			
6	Average operating assets	$8,000,000			
7	Minimum required rate of return	25%			
8					
9	*Enter a formula into each of the cells marked with a ? below*				
10	**Review Problem: Return on Investment (ROI) and Residual Income**				
11					
12	***Compute the ROI***				
13	Margin	12%			
14	Turnover	3.125			
15	ROI	38%			
16					
17	***Compute the residual income***				
18	Average operating assets	$ 8,000,000			
19	Net operating income	$ 3,000,000			
20	Minimum required return	2,000,000			
21	Residual income	$ 1,000,000			
22					

Chapter 11 Requirement 1 | Chapter 11 Re

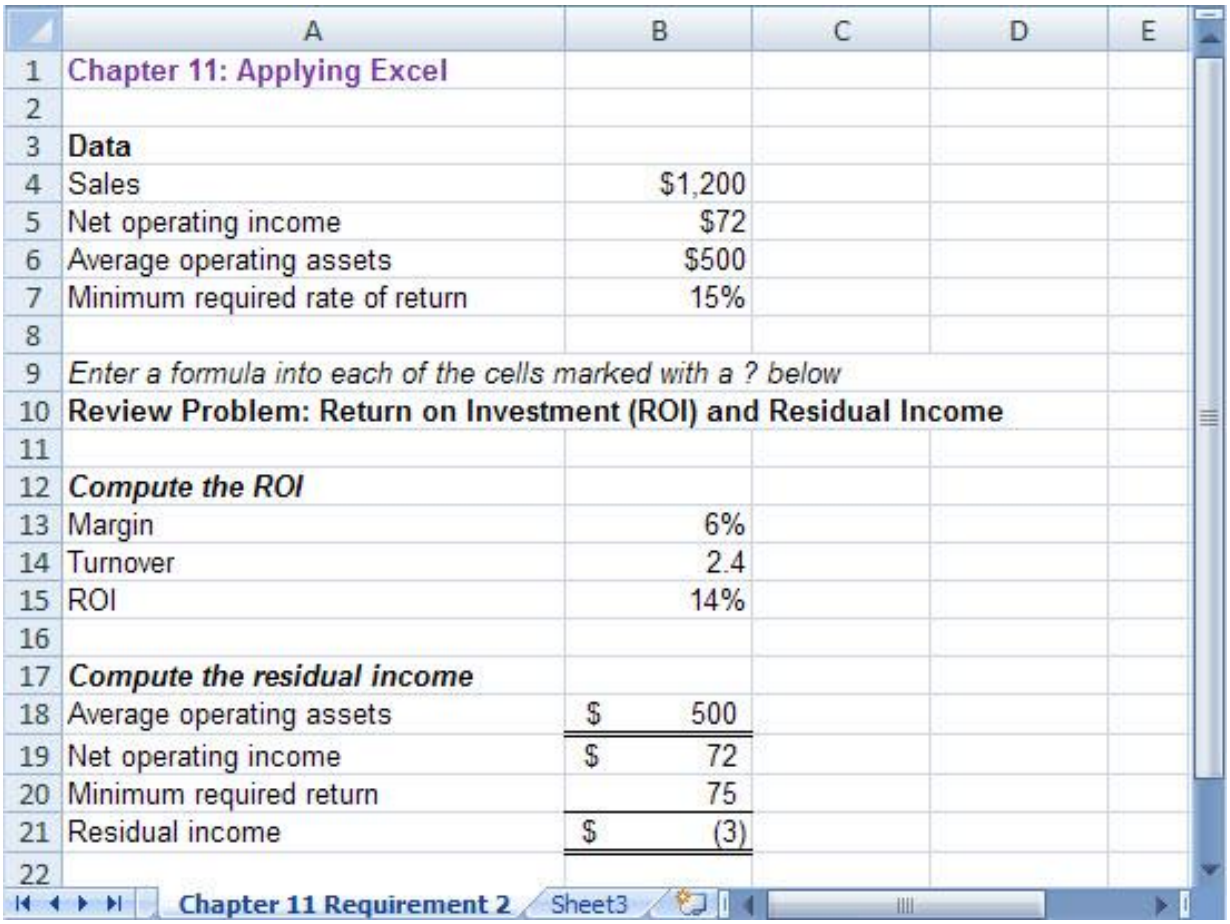
An increase in average operating assets will increase both the ROI and residual income.

ROI = Net operating income/Average operating assets

Residual income = Net operating income – Required return
Required return = Minimum required rate of return × Average operating assets

ROI increases because average operating assets is in the denominator of ROI. Residual income increases when average operating assets decreases because a reduction in the average operating assets results in a reduction of the required return.

2. With the revised data, the worksheet should look like this:



	A	B	C	D	E
1	Chapter 11: Applying Excel				
2					
3	**Data**				
4	Sales	$1,200			
5	Net operating income	$72			
6	Average operating assets	$500			
7	Minimum required rate of return	15%			
8					
9	*Enter a formula into each of the cells marked with a ? below*				
10	**Review Problem: Return on Investment (ROI) and Residual Income**				
11					
12	***Compute the ROI***				
13	Margin	6%			
14	Turnover	2.4			
15	ROI	14%			
16					
17	***Compute the residual income***				
18	Average operating assets	$ 500			
19	Net operating income	$ 72			
20	Minimum required return	75			
21	Residual income	$ (3)			
22					

Chapter 11 Requirement 2 | Sheet3

a. As shown above, the ROI is 14%.

b. As shown above, the residual income is $(3).

c. Because the ROI of 14% is less than minimum required return of 15%, the residual income is negative.

The Foundational 15

1. Last year's margin is:

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

$$= \frac{\$200{,}000}{\$1{,}000{,}000} = 20\%$$

2. Last year's turnover is:

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

$$= \frac{\$1{,}000{,}000}{\$625{,}000} = 1.6$$

3. Last year's return on investment (ROI) is:

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

$$= 20\% \times 1.6 = 32\%$$

4. The margin for this year's investment opportunity is:

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

$$= \frac{\$30{,}000^*}{\$200{,}000} = 15\%$$

* $\$200{,}000 - [\$200{,}000 \times (1 - 60\%)] - \$90{,}000 = \$30{,}000$

5. The turnover for this year's investment opportunity is:

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

$$= \frac{\$200{,}000}{\$120{,}000} = 1.67 \text{ (rounded)}$$

The Foundational 15 (continued)

6. The ROI for this year's investment opportunity is:

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

$$= 15\% \times 1.67 = 25\% \text{ (rounded)}$$

7., 8., and 9.

If the company pursues the investment opportunity, this year's margin, turnover, and ROI would be:

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

$$= \frac{\$200{,}000 + \$30{,}000}{\$1{,}000{,}000 + \$200{,}000}$$

$$= \frac{\$230{,}000}{\$1{,}200{,}000} = 19.2\% \text{ (rounded)}$$

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

$$= \frac{\$1{,}000{,}000 + \$200{,}000}{\$625{,}000 + \$120{,}000}$$

$$= \frac{\$1{,}200{,}000}{\$745{,}000} = 1.61 \text{ (rounded)}$$

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

$$= 19.2\% \times 1.61 = 30.9\% \text{ (rounded)}$$

10. The CEO would not pursue the investment opportunity because it lowers her ROI from 32% to 30.9%. The owners of the company would want the CEO to pursue the investment opportunity because its ROI of 25% exceeds the company's minimum required rate of return of 15%.

The Foundational 15 (continued)

11. Last year's residual income is:

Average operating assets.....	$625,000
Net operating income.....	$200,000
Minimum required return:	
15% × $625,000.....	93,750
Residual income.....	$106,250

12. The residual income for this year's investment opportunity is:

Average operating assets.....	$120,000
Net operating income.....	$30,000
Minimum required return:	
15% × $120,000.....	18,000
Residual income.....	$12,000

13. If the company pursues the investment opportunity, this year's residual income will be:

Average operating assets.....	$745,000
Net operating income.....	$230,000
Minimum required return:	
15% × $745,000.....	111,750
Residual income.....	$118,250

14. The CEO would pursue the investment opportunity because it would raise her residual income by $12,000 (= $118,250 – $106,250).

15. The CEO and the company would not want to pursue this investment opportunity because it does not exceed the minimum required return:

Average operating assets.....	$120,000
Net operating income ($200,000 ×	
50% – $90,000).....	$10,000
Minimum required return:	
15% × $120,000.....	18,000
Residual income.....	$ (8,000)

Exercise 11-1 (10 minutes)

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

$$= \frac{\$600{,}000}{\$7{,}500{,}000} = 8\%$$

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

$$= \frac{\$7{,}500{,}000}{\$5{,}000{,}000} = 1.5$$

3. ROI = Margin × Turnover

= 8% × 1.5 = 12%

Exercise 11-2 (10 minutes)

Average operating assets	$2,800,000
Net operating income.....	$ 600,000
Minimum required return:	
18% × $2,800,000.....	504,000
Residual income	$ 96,000

Exercise 11-3 (30 minutes)

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

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

Because there is enough idle capacity to fill the entire order from the Hi-Fi Division, no outside sales are lost. And because 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 11-3 (continued)

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

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

Because there is only enough idle capacity to fill 2,500 units from the Hi-Fi Division's order, 2,500 units of outside sales will be lost. Therefore, the lowest acceptable transfer price of $51 is computed as follows:

$$\text{Transfer price} = \$42 + \frac{(\$60 - \$42) \times 2{,}500}{5{,}000}$$

$$= \$42 + \$9 = \$51$$

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:

$$\$51 \leq \text{Transfer price} \leq \$57$$

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 $51 and the company saves the $57 cost of the speakers purchased from the outside supplier.

Exercise 11-3 (continued)

3. 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:

$$\text{Transfer price} = \$42 + \frac{(\$60 - \$42) \times 5{,}000}{5{,}000}$$

$$= \$42 + (\$60 - \$42) = \$60$$

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 11-4 (15 minutes)

1. and 2.

	Northern Plant	*Southern Plant*	*Total*
Variable cost charges:			
$0.25 per ton × 130,000 tons.....	$ 32,500		
$0.25 per ton × 50,000 tons		$ 12,500	$ 45,000
Fixed cost charges:			
70% × $300,000	210,000		
30% × $300,000		90,000	300,000
Total charges	$242,500	$102,500	$345,000

3. Part of the $364,000 in total cost will not be charged to the plants, as follows:

	Variable Cost	*Fixed Cost*	*Total*
Total actual cost incurred.....	$54,000	$310,000	$364,000
Total charges (above).....	45,000	300,000	345,000
Spending variance.....	$ 9,000	$ 10,000	$ 19,000

The overall spending variance of $19,000 represents costs incurred in excess of the budgeted $0.25 per ton variable cost and budgeted $300,000 in fixed costs. This $19,000 in uncharged cost is the responsibility of the Transport Services Department.

Exercise 11-5 (15 minutes)

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

Note that Divisions Alpha and Bravo apparently have 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 11-6 (20 minutes)

1. ROI computations:

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

Osaka Division:

$$\text{ROI} = \frac{\$210{,}000}{\$3{,}000{,}000} \times \frac{\$3{,}000{,}000}{\$1{,}000{,}000} = 7\% \times 3 = 21\%$$

Yokohama Division:

$$\text{ROI} = \frac{\$720{,}000}{\$9{,}000{,}000} \times \frac{\$9{,}000{,}000}{\$4{,}000{,}000} = 8\% \times 2.25 = 18\%$$

2.

	Osaka	*Yokohama*
Average operating assets (a).....	$1,000,000	$4,000,000
Net operating income	$210,000	$720,000
Minimum required return on average operating assets: 15% × (a)	150,000	600,000
Residual income	$ 60,000	$120,000

Exercise 11-7 (20 minutes)

1.

	Division A	*Division B*	*Total Company*
Sales	$2,500,000[1]	$1,200,000[2]	$3,200,000[3]
Expenses:			
Added by the division	1,800,000	400,000	2,200,000
Transfer price paid		500,000	
Total expenses	1,800,000	900,000	2,200,000
Net operating income	$ 700,000	$ 300,000	$1,000,000

[1]20,000 units × $125 per unit = $2,500,000
[2]4,000 units × $300 per unit = $1,200,000
[3]Division 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 have 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 – 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 11-8 (15 minutes)

1. ROI computations:

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

Queensland Division:

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

New South Wales Division:

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

2. The manager of the New South Wales Division seems to be doing the better job. Although the New South Wales Division's margin is three percentage points lower than the margin of the Queensland Division, its turnover is higher (a turnover of 3.5, as compared to a turnover of 2.0 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 11-9 (15 minutes)

	Company A	*Company B*	*Company C*
Sales (a)	$9,000,000 *	$7,000,000 *	$4,500,000 *
Net operating income (b)	$540,000	$280,000 *	$360,000
Average operating assets (c)	$3,000,000 *	$2,000,000	$1,800,000 *
Return on investment (ROI) (b) ÷ (c)	18%*	14%*	20%
Minimum required rate of return:			
Percentage (d)	16%*	16%	15%*
Dollar amount (c) × (d)	$480,000	$320,000 *	$270,000
Residual income (b) – [(c) × (d)]	$60,000	$(40,000)	$90,000 *

*Given.

Exercise 11-10 (20 minutes)

1.

	Restaurants			
	Rick's Harborside	*Imperial Garden*	*Ginger Wok*	*Total*
Percentage of this year's sales	32%	50%	18%	100%
Allocation of this year's fixed administrative expenses (based on the above percentages)	$640,000	$1,000,000	$360,000	$2,000,000

2.

This year's allocation (above).....	$640,000	$1,000,000	$360,000	$2,000,000
Last year's allocation	800,000	750,000	450,000	2,000,000
Increase (decrease) in allocation.....	$(160,000)	$ 250,000	$(90,000)	$ 0

The manager of the Imperial Garden undoubtedly will be upset about the increased allocation of fixed administrative expense. Such an increased allocation may be viewed as a penalty for an outstanding performance.

3. Sales dollars is not ordinarily a good base for allocating fixed costs. The departments with the greatest sales will be allocated the greatest amount of cost and the costs allocated to a department will be affected by the sales in *other* departments. In our illustration above, the sales in two restaurants remained static and the sales in the third increased. As a result, less cost was allocated to the restaurants with static sales and more cost was allocated to the one restaurant that showed improvement during the period.

Exercise 11-11 (20 minutes)

1.

(a) Sales	*(b) Net Operating Income**	*(c) Average Operating Assets*	*ROI (b) ÷ (c)*
$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 of 25% – Fixed Expenses of $150,000

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 11-12 (30 minutes)

1.
$$\text{Margin} = \frac{\text{Net operating income}}{\text{Sales}}$$
$$= \frac{\$70{,}000}{\$1{,}400{,}000} = 5\%$$
$$\text{Turnover} = \frac{\text{Sales}}{\text{Average operating assets}}$$
$$= \frac{\$1{,}400{,}000}{\$350{,}000} = 4$$
$$\text{ROI} = \text{Margin} \times \text{Turnover}$$
$$= 5\% \times 4 = 20\%$$

2.
$$\text{Margin} = \frac{\text{Net operating income}}{\text{Sales}}$$
$$= \frac{\$70{,}000 + \$18{,}200}{\$1{,}400{,}000 + \$70{,}000}$$
$$= \frac{\$88{,}200}{\$1{,}470{,}000} = 6\%$$
$$\text{Turnover} = \frac{\text{Sales}}{\text{Average operating assets}}$$
$$= \frac{\$1{,}400{,}000 + \$70{,}000}{\$350{,}000}$$
$$= \frac{\$1{,}470{,}000}{\$350{,}000} = 4.2$$
$$\text{ROI} = \text{Margin} \times \text{Turnover}$$
$$= 6\% \times 4.2 = 25.2\%$$

Exercise 11-12 (continued)

3.
$$\text{Margin} = \frac{\text{Net operating income}}{\text{Sales}}$$
$$= \frac{\$70{,}000 + \$14{,}000}{\$1{,}400{,}000}$$
$$= \frac{\$84{,}000}{\$1{,}400{,}000} = 6\%$$
$$\text{Turnover} = \frac{\text{Sales}}{\text{Average operating assets}}$$
$$= \frac{\$1{,}400{,}000}{\$350{,}000} = 4$$
$$\text{ROI} = \text{Margin} \times \text{Turnover}$$
$$= 6\% \times 4 = 24\%$$

4.
$$\text{Margin} = \frac{\text{Net operating income}}{\text{Sales}}$$
$$= \frac{\$70{,}000}{\$1{,}400{,}000} = 5\%$$
$$\text{Turnover} = \frac{\text{Sales}}{\text{Average operating assets}}$$
$$= \frac{\$1{,}400{,}000}{\$350{,}000 - \$70{,}000}$$
$$= \frac{\$1{,}400{,}000}{\$280{,}000} = 5$$
$$\text{ROI} = \text{Margin} \times \text{Turnover}$$
$$= 5\% \times 5 = 25\%$$

Exercise 11-13 (20 minutes)

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

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

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).

$$\text{Transfer price} = (\$70 - \$3) + \frac{\$20 \times 40{,}000}{40{,}000}$$

$$= \$67 + \$20 = \$87$$

1b. 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.

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

1c. There is no range of acceptable transfer prices. The requirements of the two divisions are incompatible and no transfer will take place.

Exercise 11-13 (continued)

2a. 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.

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

2b. 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.

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

2c. As shown below, the range of acceptable transfer prices is $60 to $74. In this case, the requirements of the two divisions are compatible and a transfer hopefully will take place.

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

Exercise 11-14 (30 minutes)

1. ROI computations:

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

Division A:

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

Division B:

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

Division C:

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

2.

	Division A	*Division B*	*Division C*
Average operating assets	$3,000,000	$7,000,000	$5,000,000
Required rate of return	× 14%	× 10%	× 16%
Minimum required return	$ 420,000	$ 700,000	$ 800,000
Actual operating income.....	$ 600,000	$ 560,000	$ 800,000
Minimum required return (above)	420,000	700,000	800,000
Residual income	$ 180,000	$(140,000)	$ 0

Exercise 11-14 (continued)

3. a. and b.

	Division A	*Division B*	*Division C*
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 because 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 because the 15% return on the new investment is less than its 16% required rate of return.

Exercise 11-15 (20 minutes)

1.

	Long-Run Average Number of Employees	*Percentage*
Cutting Department.....	180	30%
Milling Department.....	120	20%
Assembly Department....	300	50%
Total.....	600	100%

	Cutting	*Milling*	*Assembly*
Variable cost charges:			
$80 per employee × 150 employees .	$ 12,000		
$80 per employee × 80 employees ...		$ 6,400	
$80 per employee × 270 employees .			$ 21,600
Fixed cost charges:			
30% × $400,000	120,000		
20% × $400,000		80,000	
50% × $400,000			200,000
Total charges	$132,000	$86,400	$221,600

2. Part of the total actual cost should not be charged to the operating departments as shown below:

	Variable Cost	*Fixed Cost*	*Total*
Total actual costs incurred	$41,000	$408,000	$449,000
Total charges	40,000	400,000	440,000
Spending variance.....	$ 1,000	$ 8,000	$ 9,000

The overall spending variance of $9,000 represents costs incurred in excess of the budgeted variable cost of $80 per employee and the budgeted fixed cost of $400,000.

This $9,000 in uncharged costs is the responsibility of the Medical Services Department.

Exercise 11-16 (15 minutes)

1.
$$\text{Margin} = \frac{\text{Net operating income}}{\text{Sales}}$$
$$= \frac{\$150{,}000}{\$3{,}000{,}000} = 5\%$$
$$\text{Turnover} = \frac{\text{Sales}}{\text{Average operating assets}}$$
$$= \frac{\$3{,}000{,}000}{\$750{,}000} = 4$$
$$\text{ROI} = \text{Margin} \times \text{Turnover}$$
$$= 5\% \times 4 = 20\%$$

2.
$$\text{Margin} = \frac{\text{Net operating income}}{\text{Sales}}$$
$$= \frac{\$150{,}000(1.00 + 2.00)}{\$3{,}000{,}000(1.00 + 0.50)}$$
$$= \frac{\$450{,}000}{\$4{,}500{,}000} = 10\%$$
$$\text{Turnover} = \frac{\text{Sales}}{\text{Average operating assets}}$$
$$= \frac{\$3{,}000{,}000(1.00 + 0.50)}{\$750{,}000}$$
$$= \frac{\$4{,}500{,}000}{\$750{,}000} = 6$$
$$\text{ROI} = \text{Margin} \times \text{Turnover}$$
$$= 10\% \times 6 = 60\%$$

Exercise 11-16 (continued)

3.

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

$$= \frac{\$150{,}000 + \$200{,}000}{\$3{,}000{,}000 + \$1{,}000{,}000}$$

$$= \frac{\$350{,}000}{\$4{,}000{,}000} = 8.75\%$$

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

$$= \frac{\$3{,}000{,}000 + \$1{,}000{,}000}{\$750{,}000 + \$250{,}000}$$

$$= \frac{\$4{,}000{,}000}{\$1{,}000{,}000} = 4$$

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

$$= 8.75\% \times 4 = 35\%$$

Problem 11-17 (20 minutes)

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

	Beginning Balances	*Ending Balances*
Cash	$ 140,000	$ 120,000
Accounts receivable	450,000	530,000
Inventory	320,000	380,000
Plant and equipment (net)	680,000	620,000
Total operating assets	$1,590,000	$1,650,000

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

2. The margin, turnover, and return on investment (ROI) are calculated as follows:

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

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

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

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

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

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

3. The residual income is calculated as follows:

Net operating income	$405,000
Minimum required return (15% × $1,620,000)	243,000
Residual income	$162,000

Problem 11-18 (20 minutes)

1.

	Forming Department	*Assembly Department*	*Total*
Variable costs:			
$0.40 per machine-hour × 190,000 machine-hours.....	$ 76,000		
$0.40 per machine-hour × 70,000 machine-hours.....		$28,000	$104,000
Fixed costs:			
70% × $150,000	105,000		
30% × $150,000		45,000	150,000
Total cost charged	$181,000	$73,000	$254,000

2. Any difference between the budgeted and actual variable cost per machine-hour or between the budgeted and actual total fixed cost would not be charged to the other departments. The amount not charged would be:

	Variable Cost	*Fixed Cost*	*Total*
Actual cost incurred during the year ...	$110,000	$153,000	$263,000
Cost charged (above)	104,000	150,000	254,000
Cost not charged (spending variance).	$ 6,000	$ 3,000	$ 9,000

The costs not charged are spending variances of the Maintenance Department and are the responsibility of the Maintenance Department's manager.

Problem 11-19 (30 minutes)

1. Breaking the ROI computation into two separate elements reveals important relationships that otherwise might remain hidden. First, the importance of asset turnover 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 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 large 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. The missing information is as follows:

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

*Given.

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?"

Problem 11-19 (continued)

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 11-20 (60 minutes)

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

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

   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. The costs are the same whether the pulp is transferred internally or sold to outsiders, so 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 $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 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.....	$63
Loss in contribution margin per ton	$7
Number of tons per year.....	× 5,000
Total loss in profits	$35,000

Problem 11-20 (continued)

Profits in the Carton Division will remain unchanged because 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:

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

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:

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

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
Variable costs	42
Contribution margin per ton	$17

5,000 tons × $17 per ton = $85,000 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 be free to go outside and get the best price it can. Even though this would result in lower profits for the company as a whole, the buying division should not be forced to buy inside if better prices are available outside.

Problem 11-20 (continued)

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

Selling price	$70
Variable costs	42
Contribution margin per ton	$28

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	59
Increased cost per ton	$11

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	11
Increased contribution margin per ton	$17

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 11-21 (30 minutes)

Requirements 1., 2., and 3.:

	This Year	*New Line*	*Next Year*
(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
	Variable expenses (60% × $2,000,000)	1,200,000
	Contribution margin	800,000
	Fixed expenses	640,000
	Net operating income	$ 160,000

4. Dell Havasi will be inclined to reject the new product line because accepting it would reduce his division's overall rate of return.

5. The new product line promises an ROI of 16%, whereas the company's overall ROI this year was only 15%. Thus, adding the new line would increase the company's overall ROI.

6a. through 6c.:

	This Year	*New Line*	*Next Year*
Operating assets	$4,000,000	$1,000,000	$5,000,000
Minimum return required	× 12%	× 12%	× 12%
Minimum required return	$ 480,000	$ 120,000	$ 600,000
Actual net operating income	$ 800,000	$ 160,000	$ 960,000
Minimum required return (above)	480,000	120,000	600,000
Residual income	$ 320,000	$ 40,000	$ 360,000

6d. Under the residual income approach, Dell Havasi would be inclined to accept the new product line because adding the product line would increase the total amount of his division's residual income, as shown above.

Problem 11-22 (45 minutes)

1.

	Auto Division	*Truck Division*
Variable costs:		
$3 per meal × 20,000 meals	$60,000	
$3 per meal × 20,000 meals		$60,000
Fixed costs:		
65% × $40,000.....	26,000	
35% × $40,000.....		14,000
Total cost charged.....	$86,000	$74,000

The variable costs are charged using the budgeted rate per meal and the actual meals served. The fixed costs are charged in predetermined, lump-sum amounts, based on budgeted fixed costs and peak-load capacity. Any difference between budgeted and actual costs is not charged to the operating divisions, but rather is treated as a spending variance of the cafeteria:

	Variable	*Fixed*
Total actual cost for the month.....	$128,000	$42,000
Total cost charged above ($60,000 + $60,000; $26,000 + $14,000).....	120,000	40,000
Spending variance—not allocated	$ 8,000	$ 2,000

2.

Actual variable cost	$128,000
Actual fixed cost.....	42,000
Total actual cost.....	$170,000

One-half of the total cost, or $85,000, would be allocated to each division, because the same number of meals was served in the two divisions during the month.

Problem 11-22 (continued)

3. This method has two major problems. First, allocating the total actual cost of the service department to the operating departments essentially allocates the spending variances to the operating departments. This forces the inefficiencies of the service department onto the operating departments. Second, allocating the fixed costs of the service department according to the actual level of activity in each operating department results in the allocation to one operating department being affected by the actual activity in the other operating departments. For example, if the activity in one operating department falls, the fixed charges to the other operating departments will increase.

4. Managers may understate their peak-period needs to reduce their charges for fixed service department costs. Top management can control such ploys by careful follow-up, with rewards being given to those managers who estimate accurately, and severe penalties assessed against those managers who understate their departments' needs. For example, departments that exceed their estimated peak-period maintenance requirements may be forced to hire outside maintenance contractors, at market rates, to do their maintenance work during peak periods.

Problem 11-23 (45 minutes)

1. The Quark Division will probably reject the $340 price because it is below the division's variable cost of $350 per set. This variable cost includes the $140 transfer price from the Screen 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 Screen Division is a variable cost. Thus, it will reject the offered $340 price.

2. If both the Screen 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:

Foregone revenue offered per set.....		$(340)
Foregone variable costs per set:		
Screen Division	$ 70	
Quark Division	210	280
Foregone contribution margin per set		$ (60)

3. If the Screen Division is operating at capacity, any screens transferred to the Quark Division to fill the overseas order will have to be diverted from outside customers. Whether a screen 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 Screen 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 screens to outsiders...	$140	
Variable cost of Quark Division	210	350
Net loss per TV		$(10)

Problem 11-23 (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 because 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 11-24 (30 minutes)

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

$$= \frac{\$360{,}000}{\$4{,}000{,}000} \times \frac{\$4{,}000{,}000}{\$2{,}000{,}000}$$

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

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

$$= \underset{\text{(Unchanged)}}{9\%} \times \underset{\text{(Increase)}}{2.5} = \underset{\text{(Increase)}}{22.5\%}$$

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

$$= \underset{\text{(Increase)}}{9.8\%} \times \underset{\text{(Unchanged)}}{2} = \underset{\text{(Increase)}}{19.6\%}$$

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

$$= \underset{\text{(Increase)}}{9.5\%} \times \underset{\text{(Decrease)}}{1.6} = \underset{\text{(Decrease)}}{15.2\%}$$

Problem 11-24 (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 %
Variable expenses.....	3,360,000	70 *
Contribution margin.....	1,440,000	30 %
Fixed expenses	840,000	
Net operating income	$ 600,000	

* $56 ÷ $80 = 70%

$$\text{ROI} = \frac{\$600{,}000}{\$4{,}800{,}000} \times \frac{\$4{,}800{,}000}{\$2{,}000{,}000}$$

$$= \underset{\text{(Increase)}}{12.5\%} \times \underset{\text{(Increase)}}{2.4} = \underset{\text{(Increase)}}{30\%}$$

6. $$\text{ROI} = \frac{\$320{,}000}{\$4{,}000{,}000} \times \frac{\$4{,}000{,}000}{\$1{,}960{,}000}$$

$$= \underset{\text{(Decrease)}}{8\%} \times \underset{\text{(Increase)}}{2.04} = \underset{\text{(Decrease)}}{16.3\%}$$

7. $$\text{ROI} = \frac{\$360{,}000}{\$4{,}000{,}000} \times \frac{\$4{,}000{,}000}{\$1{,}800{,}000}$$

$$= \underset{\text{(Unchanged)}}{9\%} \times \underset{\text{(Increase)}}{2.22} = \underset{\text{(Increase)}}{20\%}$$

Problem 11-25 (60 minutes)

1a., 1b., and 1c.:

From the standpoint of the selling division, Alpha Division:

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

$$\text{Transfer price} = (\$18 - \$2) + \frac{(\$30 - \$18) \times 5{,}000}{5{,}000} = \$16 + \$12 = \$28$$

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

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

There is no range of acceptable transfer prices. 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.

2a., 2b., and 2c.:

From the standpoint of the selling division, Alpha Division:

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

$$\text{Transfer price} = (\$65 - \$5) + \frac{(\$90 - \$65) \times 30{,}000}{30{,}000} = \$60 + \$25 = \$85$$

From the standpoint of the buying division, Beta Division:

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

In this instance, the range of acceptable transfer prices is:

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

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 11-25 (continued)

2d. 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	85
Potential added contribution margin lost to the company as a whole	$ 4
Number of units	× 30,000
Potential added contribution margin and company profits forgone	$120,000

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 Alpha Division will be:

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

The loss in potential profits in Beta Division will be:

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

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

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

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

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

Problem 11-25 (continued)

3b. and 3c.

From the standpoint of the buying division, Beta Division:

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

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

In this case, the range of acceptable transfer prices is:

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

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.

3d. Alpha Division's ROI should increase. The division has idle capacity, so selling 20,000 units a year to Beta Division should cause no increase in the division's operating assets. Therefore, Alpha Division's turnover should increase. The division's margin should also increase, because 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
Variable costs	40
Contribution margin	$20
Number of units	× 20,000
Added contribution margin	$400,000

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:

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

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

Case 11-26 (60 minutes)

1. The Electrical Division is presently operating at capacity; therefore, any sales of X52 electrical fittings 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:

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

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

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

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

   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. Because 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 11-26 (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)	36.50	44.00
Net positive effect on the company's profit		$ 6.00

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 because 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	14.00	44.00
Brake Division contribution margin		$ 6.00

In fact, because 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.

Case 11-26 (continued)

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?

   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.