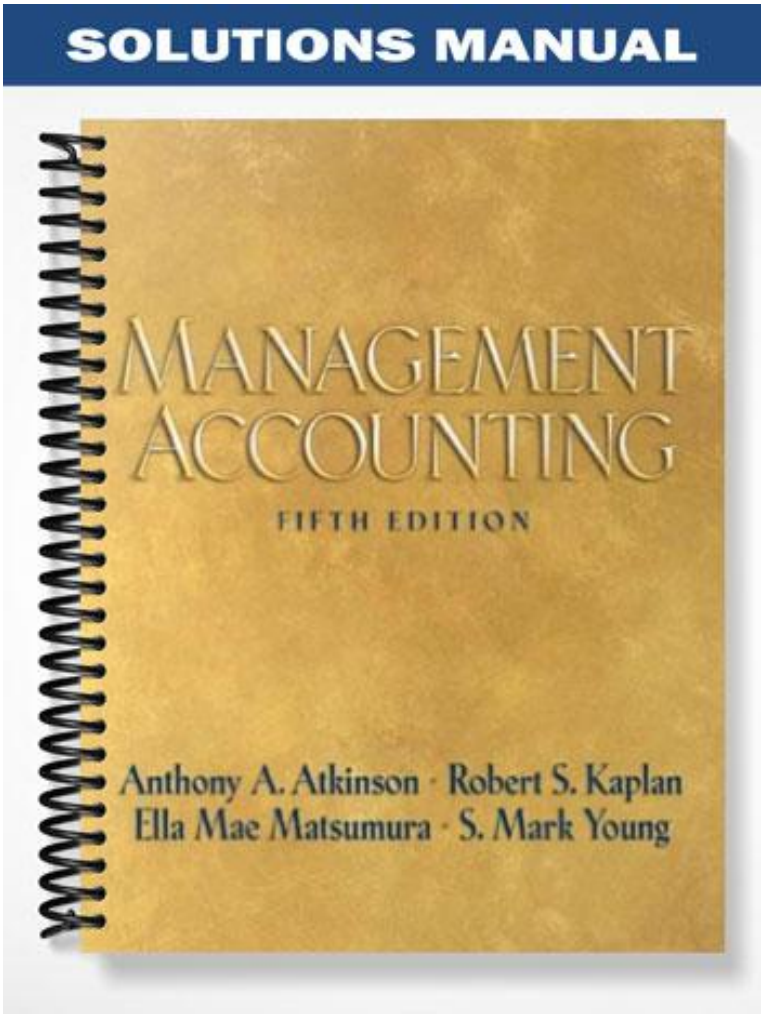
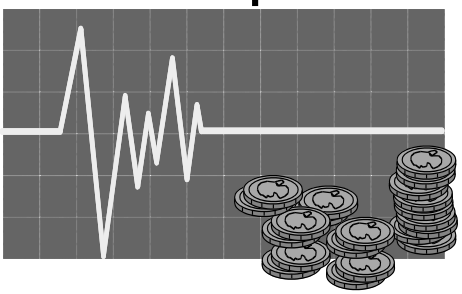
SOLUTIONS MANUAL



Chapter 2

Cost Management Concepts and Cost Behavior



QUESTIONS

2-1 Cost information is used in deciding whether to introduce a new product or discontinue an existing product (given the price and cost structure), assessing the efficiency of a particular operation, and budgeting. Cost information is also used for the valuation of inventory and cost of goods sold.

2-2 Different types of cost information are needed for different managerial purposes and decisions. For example, product cost information is used for product mix and pricing decisions. The cost of serving customer segments will include the cost of activities that support customer service. For management control purposes, an organization may compare actual costs to budgeted (standard) costs.

2-3 A **cost object** is something for which it is desired to compute a cost. Examples of cost objects include a product, a product line, or an organizational unit such as the call center that responds to customers' phone calls.

2-4 A **direct cost** is a cost of a resource or activity that is acquired for or used by a single cost object and is easily traced to the cost object, such as a product manufactured or service rendered. An **indirect cost** is the cost of a resource that was acquired to be used by more than one cost object. Indirect costs cannot be easily identified with individual cost objects.

2-5 **Variable costs** are the costs of variable resources, whose costs are proportional to the amount of the resource used. **Fixed costs** are the costs of capacity-related resources, which are acquired and paid for in advance of when the work is done. Fixed costs depend on how much of the resource (capacity) is acquired, rather than on how much is used. Depreciation on machinery is an example of a fixed cost.

2-6 Variable costs can be direct or indirect. For example, suppose the cost object is a passenger on an airplane. The cost of complimentary refreshments varies in proportion to the number of passengers, and is a direct variable cost. The cost of fuel varies with the number of flights (and perhaps to a small extent with respect the total weight of the passengers and their luggage, which is related to the number of passengers). The cost of the fuel that varies with the number of flights is an indirect variable cost.

In some cases, direct variable costs may be treated as indirect costs if it is inconvenient to account for them as direct costs and the cost is only a small part of total costs. Costs for materials such as glue or thread, for example, are variable costs with respect to products but are generally a very small part of product cost. These costs are consequently often labeled as indirect materials and included with manufacturing overhead.

2-7 Fixed costs can be direct or indirect. For example, in the case of a multi-product firm that acquires a special piece of equipment for the exclusive use of one product, that equipment would be fixed and direct to the product that uses it. If the equipment will be used to produce multiple products, its cost will be indirect.

2-8 For external reporting, costs in a manufacturing firm are classified as product costs or period costs. The portion of product costs assigned to the products sold in a period appears as cost of goods sold expense in that period's income statement; the remaining portion of product costs is assigned to the products in inventory and appears as an asset in the balance sheet. Period costs are expensed in the period incurred.

2-9 **Costs** represent the monetary value of goods and services expended to obtain current or future benefits. **Expenses** reported in the income statement are the costs of assets that the financial accountant deems have been used up when goods or services are sold (e.g., cost of goods sold), or period costs, whose benefits are not easily matched with products or services sold in a specific period (e.g., advertising).

2-10 The two principal categories of manufacturing costs are direct manufacturing costs (traced or assigned to the products that created those costs) and indirect manufacturing costs (allocated to products).

2-11 Only the manufacturing costs are included in the valuation of finished goods inventory. Therefore, traditional cost accounting systems, designed for valuing inventory, analyze these costs in greater detail in order to assign them to individual products.

2-12 Inside the organization, costs serve two broad purposes: planning and evaluation. Cost calculations can be tailored to a specific purpose. For example, for planning purposes, cost might serve as a reference point for determining the selling price of a prospective product, or might be used in a budgeting model to forecast costs under different levels of production and selling activities. Evaluation purposes occur, for example, when comparing actual costs to budgeted (standard) costs or when judging whether a process is efficient compared with the costs of similar internal or external processes.

2-13 Contribution margin per unit is the difference between revenue per unit and variable cost per unit. The contribution margin is an important component of the equation to determine the breakeven point. It is also used to help evaluate whether or not an investment in a business venture can be profitable.

2-14 In evaluating whether a business venture will be profitable, the breakeven point is the volume at which the profit equals zero, that is, revenues equal costs.

2-15 The most accurate and complete cost system possible may be inordinately costly to implement. Although it is often difficult to compute the value of using a particular cost system, in principle the benefit should outweigh the cost of the system.

2-16 An opportunity cost is the sacrifice one makes when using a resource for one purpose instead of another.

2-17 Short-run is the period over which a decision-maker cannot adjust capacity. Short-run costs are variable costs, which vary in proportion to production. Long-run costs are the sum of variable and fixed costs associated with a cost object. Long-run costs are important for product planning purposes because they are an estimate of the cost of the all the resources consumed to make the product.

2-18 In the early part of the twentieth century, when formal cost systems were first installed at many businesses, direct labor comprised a large proportion of the total manufacturing cost. In today's industrial environment, direct labor comprises a much smaller portion of the total costs, while the share of indirect costs has grown considerably. As a result, cost accounting systems must now

analyze indirect costs in greater detail to reflect their true behavior. Cost accounting systems that use volume measures to allocate indirect costs may be very inaccurate.

2-19 The five categories of production-related activities and their descriptions are listed below.

1. Unit-related activities relate directly to the number of units produced (e.g., direct labor costs).
2. Batch-related activities relate to the number of batches produced rather than the number of units produced (e.g., machine setups).
3. Product-sustaining activities are performed to support the production and sale of individual products (e.g., product design).
4. Customer-sustaining activities enable the company to sell to an individual customer but are independent of the volume and mix of the products and services sold and delivered to the customer (e.g., technical support provided to individual customers).
5. Business-sustaining activities are required to support the upkeep of the plant or the basic functioning of the plant or the business (e.g., rent, plant maintenance, and CEO's salary).

2-20 Customer-related costs have attracted increasing attention in recent years because they are large and growing in many organizations. Furthermore, the costs can vary widely across different customers or customer segments. Organizations may use customer cost information to decide which customers or customer groups to retain or de-emphasize, or to decide on differential service fees to cover costs of services.

EXERCISES

2-21
(a) Manufacturing
(b) Nonmanufacturing
(c) Nonmanufacturing
(d) Nonmanufacturing
(e) Manufacturing
(f) Nonmanufacturing
(g) Nonmanufacturing
(h) Nonmanufacturing
(i) Manufacturing
(j) Nonmanufacturing
(k) Nonmanufacturing
(l) Nonmanufacturing

2-22
(a) Indirect
(b) Direct
(c) Direct
(d) Indirect
(e) Direct
(f) Indirect
(g) Indirect
(h) Indirect
(i) Direct
(j) Indirect
(k) Direct
(l) Indirect

2-23
(a) Unit-related
(b) Batch-related
(c) Product-sustaining
(d) Business-sustaining
(e) Unit-related
(f) Batch-related
(g) Product-sustaining
(h) Business-sustaining
(i) Batch-related
(j) Batch-related
(k) Business-sustaining
(l) Product-sustaining

2-24
(a) Unit- or batch-related
(b) Batch-related
(c) Product-sustaining
(d) Business-sustaining
(e) Batch-related
(f) Unit-related
(g) Business-sustaining
(h) Product-sustaining
(i) Business-sustaining
(j) Business-sustaining
(k) Business-sustaining
(l) Unit-related

2-25
(a) Fixed
(b) Variable
(c) Variable
(d) Fixed
(e) Variable
(f) Fixed
(g) Fixed or variable (if number of billing clerks can vary in the short run)
(h) Variable
(i) Variable
(j) Variable
(k) Fixed

2-26 (a) Variable
(b) Fixed or variable (if number of production workers can vary in the short run)
(c) Fixed
(d) Variable
(e) Fixed
(f) Fixed
(g) Variable
(h) Variable
(i) Fixed
(j) Fixed

2-27 (a) Let P = charges per patient-day.

$(2{,}300 \times P) - (45.70 \times 2{,}300) - 91{,}000) = 0$

P = \$196,110) 2,300 = \$85.27

(b) Let X = the average number of patient days per month necessary to generate a target profit of \$45,000 per month

Revenue – Costs = Income
(Price × Quantity) – Variable costs – Fixed costs = Income
$\$100X - \$45.70X - \$91{,}000 = \$45{,}000$
$\$54.30X = \$91{,}000 + \$45{,}000 = \$136{,}000$
X = 2,505 patient days (rounded)

2-28 (a) Contribution margin per unit = \$30 – \$19.50 = \$10.50

(b) Let X = the number of units sold to break even
Sales revenue – Costs = Income
(Price × Quantity) – Variable costs – Fixed costs = Income
$\$30X - \$19.50X - \$147{,}000 = \$0$
$\$10.50X - \$147{,}000 = 0$
X = 14,000 units

(c) Let X = the number of units sold to generate revenue necessary to earn pretax income of 20% of revenue
Sales revenue – Costs = Income
(Price × Quantity) – Variable costs – Fixed costs = Income
$\$30X - \$19.50X - \$147{,}000 = 0.2 \times \$30X$
$\$10.50X - \$147{,}000 = \$6X$
X = 32,667 units (rounded)
Desired revenue = $\$30X = \$30 \times 32{,}667 =$ $980,010

(d) Let Y = necessary increase in sales units
Incremental sales revenue – Incremental variable costs – Incremental fixed costs = $0
$\$30Y - \$19.50Y - \$38{,}500 = \$0$
$Y =$ 3,667 units (rounded)

2-29 (a)

Sales	$1,260,000
– Cost of Goods Sold (Expense)	$640,500
Gross Margin or Gross Profit	$619,500
Selling & Admin (or GS&A or Operating expenses)	$410,000
Net income (Operating income)	$209,500

(b) Revenue – Variable costs – Fixed costs = Profit
$1,260,000 – $570,000 – $480,500 = $209,500

(c) Let Y = sales dollars necessary for a before-tax target profit of $250,000

The contribution margin ratio = ($1,260,000 – $570,000)/$1,260,000 = 0.547619 (rounded).

Using equation (2.10),
Y = (Target Profit + Fixed Cost)/Contribution Margin Ratio
Y = ($250,000 + $480,500)/0.547619
$Y =$ $1,333,956.60

(d) Let Y = sales dollars necessary to break even

Using equation (2.11),
Y = Fixed Cost/Contribution Margin Ratio
Y = $480,500/0.547619
$Y =$ $877,434.85

2-30 (a)

	Alligators		Dolphins		Total
Units sold	140,000		60,000		200,000
Sales mix percentage*	.7		.3		
		Weighted average**		Weighted average**	Sum of weighted averages
Sales price per unit	$20.00	$14.00	$25.00	$7.50	$21.50
Variable costs per unit	$ 8.00	$ 5.60	$10.00	$3.00	$ 8.60
Unit CM	$12.00	$ 8.40	$15.00	$4.50	$12.90

* 140,000/(140,000 + 60,000) = .7; 60,000/(140,000 + 60,000) = .3
** $20 × .7 = $14; $8 × .7 = $5.60; $25 × .3 = $7.50; $10 × .3 = $3

Breakeven units = $1,290,000/$12.90 = 100,000 units. Of these, 100,000 × .7 = 70,000 will be alligators and 100,000 × .3 = 30,000 will be dolphins.

(b)

	Alligators		Dolphins		Total
Units sold	60,000		140,000		200,000
Sales mix percentage*	.3		.7		
		Weighted average**		Weighted average**	Sum of weighted averages
Sales price per unit	$20.00	$6.00	$25.00	$17.50	$23.50
Variable costs per unit	$ 8.00	$2.40	$10.00	$ 7.00	$ 9.40
Unit CM	$12.00	$3.60	$15.00	$10.50	$14.10

* 60,000/(140,000 + 60,000) = .3; 140,000/(140,000 + 60,000) = .7
** $20 × .3 = $6; $8 × .3 = $2.40; $25 × .7 = $17.50; $10 × .7 = $7

Breakeven units = $1,290,000/$14.10 = 91,489.36, which we round up to 91,490 units. Of these, 91,490 × .3 = 27,447 will be alligators and 91,490 × .7 = 64,043 will be dolphins.

(c) In part (b), the sales mix percentage for the higher-CM product (dolphins) is greater than in part (a). Consequently, fewer total units are required to break even (91,490 in part (b) versus 100,000 in part (a)).

2-31 (a) Healthy Hearth has sufficient excess capacity to handle the one-time (short-run) order for 1,000 meals next month. Consequently, the analysis focuses on incremental revenues and costs associated with the order:

Incremental revenue per meal	$3.50
Incremental cost per meal	3.00
Incremental contribution margin per meal	$0.50
Number of meals	× 1,000
Increase in contribution margin and operating income	$ 500

Healthy Hearth will be better off by $500 with this one-time order. Note that total fixed costs remain unchanged, so it is sufficient to evaluate the change in the contribution margin. If the order had been long-term, Healthy Hearth would need to evaluate whether the price provides the desired profitability considering the fixed costs and whether filling the government order might require giving up higher-priced regular sales.

(b) Healthy Hearth has insufficient excess capacity to handle the one-time order for 1,000 meals next month, and must give up regular sales of 500 meals at $4.50 each, resulting in an opportunity cost.

Incremental contribution margin from one-time order	
Incremental revenue per meal	$3.50
Incremental cost per meal	3.00
Incremental contribution margin per meal	$0.50
Number of meals	1,000
Increase in operating income from one-time order	$ 500
Opportunity cost	
Lost contribution margin on regular sales: 500 × ($4.50 – $3.00)	$(750)
Change in contribution margin and operating income	$(250)

Now, Healthy Hearth will be worse off by $250 with this one-time order. Again, total fixed costs remain unchanged, so it is sufficient to evaluate the change in the contribution margin.

2-32 (a)

	Customer 1		Customer 2	
Sales revenue		$1,200		$1,200
Cost of goods sold	$750		$750	
Support costs: 30% of revenue	360	1,110	360	1,110
Customer margin		$ 90		$ 90

(b)

	Customer 1		Customer 2	
Sales revenue		$1,200		$1,200
Cost of goods sold	$750		$750	
Support costs: $35 per order	70	820	420	1,170
Customer margin		$ 380		$ 30

(c) The current system does not reflect the different costs of serving customers with very different ordering patterns. Although the revenue and cost of goods sold are the same for both customers, customer 1 orders only twice per year and customer 2 orders 12 times per year. Because customer support costs are assigned on the basis of sales revenue, the reported support costs are the same for both customers, and both customers appear equally profitable. The proposed system more accurately assigns customer support costs to each customer based on the number of orders, showing the customer 1 is more profitable than customer 2 under the current pricing and sales volume.

PROBLEMS

2-33 (a)

Sales	$3,500,000
Cost of goods sold[a]	1,900,000
Gross margin	1,600,000
Selling and administrative expenses[b]	620,000
Net income before taxes, etc.	$980,000

[a]Cost of goods sold:

Carpenter labor to make shelves	$600,000
Wood to make the shelves	450,000
Depreciation on carpentry equipment	50,000
Miscellaneous fixed manufacturing overhead (support)	150,000
Rent for the building where the shelves are made	300,000
Miscellaneous variable manufacturing overhead (support)	350,000
	$1,900,000

[b]Selling and administrative expenses:

Sales staff salaries	$80,000
Office and showroom rental expenses	150,000
Advertising	200,000
Sales commissions based on number of units sold	180,000
Depreciation for office equipment	10,000
	$620,000

(b) The following items are variable costs:

Carpenter labor to make shelves	$600,000
Wood to make the shelves	450,000
Sales commissions based on number of units sold	180,000
Miscellaneous variable manufacturing overhead (support)	350,000
Total variable costs	$1,580,000

The variable costs per unit are \$1,580,000/50,000 = \$31.60. The following items are fixed costs:

Sales staff salaries	\$80,000
Office and showroom rental expenses	150,000
Depreciation on carpentry equipment	50,000
Advertising	200,000
Miscellaneous fixed manufacturing overhead (support)	150,000
Rent for the building where the shelves are made	300,000
Depreciation for office equipment	10,000
Total fixed costs	\$940,000

Let X = the number of units sold to earn a pre-tax profit of \$500,000
Revenue – Costs = Income
(Price × Quantity) – Variable costs – Fixed costs = Income
$\$70X - \$31.60X - \$940{,}000 = \$500{,}000$
X = 37,500 units

2-34 (a) Expected profit = 0.4(\$170,000 – 150,000) + 0.6(\$170,000 – 200,000) = \$8,000 – 18,000 = – \$10,000. Therefore, JF will not undertake the new project and will earn \$0.

(b) If JF knows what the cost will be, it will choose the following decisions:

If the cost is \$150,000, then JF will undertake the project and earn (\$170,000 – 150,000) = \$20,000.

If the cost is \$200,000, then JF will not undertake the project and earn \$0, which is greater than (\$170,000 – 200,000) = – \$30,000.

Therefore, JF's expected profit if the consultant is hired is 0.4(\$20,000) + 0.6(\$0) = \$8,000. Therefore, JF is willing to pay the difference between the expected profit after hiring the consultant and the expected profit without hiring the consultant, or \$8,000 –\$0 = \$8,000.

2-35 (a)

Direct material cost:		
• Cost of fabric used in dresses		$60,000
Direct labor cost:		
• Wages of dressmakers	$5,000	
• Wages of dress designers	4,000	9,000
Manufacturing support:		
• Wages of the employee who repairs the shop's pattern and sewing machines	2,000	
• Cost of electricity used in the Pattern Department	200	
• Depreciation on pattern machines and sewing Machines	10,000	
• Cost of insurance for the production employees (could instead be included under direct labor cost)	2,000	
• Rent for the building (6,000 × 1/2)	3,000	17,200
Selling costs:		
• Wages of sales personnel	1,000	
• Rent for the building (6,000 × 1/4)	1,500	2,500
Marketing costs:		
• Cost of new sign in front of retail shop	400	
• Cost of advertisements in local media	800	
• Cost of hiring a plane and a pilot to advertise	1,400	2,600
R & D costs:		
• Wages of designers who experiment with new fabrics and dress designs		3,000
General & administrative costs:		
• Salary of the owner's assistant	1,200	
• Rent for the building (6,000 × 1/4)	1,500	2,700
Total costs		$97,000

(b) Classifications in this question may depend on the interpretation of the production and selling processes, and assumptions about how various costs are related to activities.

Unit-related cost:		
• Cost of fabric used in dresses	$60,000	
• Wages of dressmakers	5,000	
• Wages of dress designers	4,000	
• Depreciation on pattern machines and sewing machines (depreciation on pattern machines could be included in product-sustaining cost)	10,000	79,000
Batch-related cost:		
• Wages of sales personnel (could also be classified as unit-related if customers generally purchase only one dress at a time)		1,000
Product-sustaining cost:		
• Cost of electricity used in the Pattern Department	200	
• Wages of designers who experiment with new fabrics and dress designs	3,000	3,200
Business-sustaining cost:		
• Wages of the employee who repairs the pattern and sewing machines	2,000	
• Salary of the owner's assistant	1,200	
• Cost of new sign in front of retail shop	400	
• Cost of advertisements in local media	800	
• Cost of hiring a plane and a pilot to advertise	1,400	
• Cost of insurance for the production Employees	2,000	
• Rent for the building	6,000	13,800
Total costs		$97,000

2-36 (a) The number of miles driven is an important activity measure in estimating the cost of driving. In comparing the cost of driving to work or taking public transportation, Shannon may also want to consider the cost of parking at work. The cost of parking may vary with the number of days at work or may be a flat rate per month.

(b) Incremental costs of driving include gas, oil, maintenance, and tire expenditures. Costs associated with driving also include toll costs and parking fees.

(c) Fixed costs include taxes, depreciation of the vehicle, car registration, and insurance.

(d) For a two-week vacation by car, two likely activity measures are number of miles driven and number of days (for lodging and meals).

2-37 (a) Estimated support costs based on direct labor cost:
May: $28,500 (= $9.50 × 3,000)

June: $39,900 (= $9.50 × 4,200)

Estimated support costs based on the new equation:

May: $42,000 (= $3,000 + [$200 × 50] + [$300 × 30] + [$20 × 1,000])

June: $54,200 (= $4,200 + [$200 × 70] + [$300 × 40] + [$20 × 1,200])

(b) The two sets of estimates differ because the old equation omits several important cost drivers that are not proportional to direct labor cost.

(c) Neither method recognizes that some support costs may be committed and will not vary unless their resource capacity is exceeded. This will lead to discrepancies with both methods. The second equation, however, is preferred because it recognizes important cost drivers.

2-38 (a)

Direct material cost	Meat, cheese, bread, lettuce and other ingredients.	$ 8,100
Direct labor cost	Cooks' wages.	5,000
Indirect support costs	Utilities, depreciation on cooking equipment, paper supplies, rent, and janitor's wages.	2,200
Selling support	Servers' wages	1,500
Marketing costs	Advertisement in local newspaper	300
Total cost		$17,100

***** A portion of utilities, janitor's wages, and rent could be allocated to administrative support, if we were given a suitable allocation basis.

(b)

Unit-related cost	Meat, cheese, bread, lettuce and other ingredients, cooks' wages, depreciation on equipment, and paper supplies.	$13,600
Batch-related cost	Servers' wages	1,500
Business-sustaining cost	Janitor's wages, utilities, rent, and advertisement in local newspaper.	2,000
Total cost		$17,100

2-39 (a) Costs that vary with number of passengers:
Meals and refreshments = $5

Let X = number of passengers needed to break even each week

Total revenue per week – costs per passenger per week – costs per flight per week – fixed costs per week = profit per week

($200 × X × 70) – ($5 × X × 70) – ($5,000 × 70) – $400,000 = $0

$13,650$X$ = $750,000

X = $750,000 ÷ $13,650 = 54.95 (i.e., 55 passengers per flight)

(b) Let N = number of flights to earn a profit of $500,000 per week

Number of passengers per flight = 60% × 150 = 90

($200 × 90 × N) – ($5 × 90 × N) – ($5,000 × N – $400,000) = $500,000

N = 71.71 (i.e., 72 flights)

(c) Fuel costs are fixed once the flights are scheduled, but these costs vary with the number of flights.

(d) In this case, there is no opportunity cost to the airline because the seat would otherwise go empty. The variable cost for the additional passenger is $5 for the meals and refreshments and perhaps a small amount of additional fuel cost.

2-40 (a)

$$\text{Johnson Co. breakeven point in number of rides} = \frac{\text{Capacity-related costs}}{\text{Unit contribution margin}}$$
$$= \frac{\$300{,}000}{\$6}$$
$$= 50{,}000 \text{ rides}$$

$$\text{Smith Co. breakeven point in number of rides} = \frac{\text{Capacity-related costs}}{\text{Unit contribution margin}}$$
$$= \frac{\$1{,}500{,}000}{\$15}$$
$$= 100{,}000 \text{ rides}$$

(b) Let x be the number of rides.

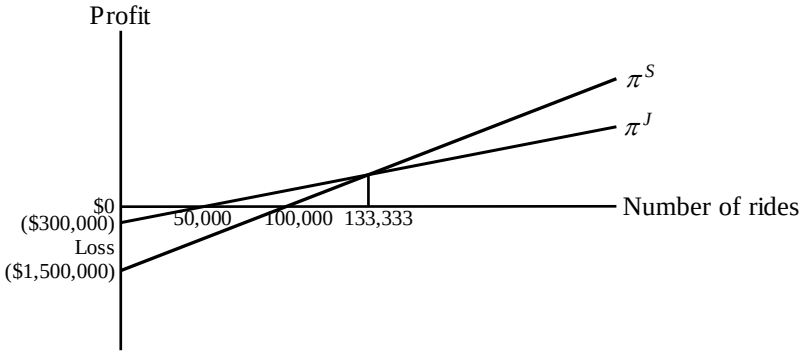
Johnson Co.'s profit function:

$$\pi^J = \$30x - 24x - 300{,}000 = \$6x - 300{,}000$$

Smith Co.'s profit function:

$$\pi^S = \$30x - 15x - 1{,}500{,}000 = \$15x - 1{,}500{,}000$$

Profit-Volume Chart



(c) We cannot say which firm's cost structure is more profitable as profits depend on sales volume. If sales drop to below 133,333 rides, Johnson Company's cost structure leads to more profits. However, if sales remain above 133,334 rides, then Smith Company's cost structure leads to more profits.

(d) The contribution margin generated must first cover the fixed costs and then the balance remaining after the fixed costs are fully covered goes toward profits. If the contribution margin is not sufficient to cover the fixed costs, then a loss occurs for the period. Once the breakeven point has been reached, profit will increase by the unit contribution margin for each additional unit sold. Here, Smith Company is more risky because it has higher fixed costs to cover and a higher unit contribution margin, which makes its profits more sensitive to decreases in the sales activity level.

2-41 (a) Contribution margin per unit:

Selling price		$250
Less variable costs:		
Variable production costs	$100	
Variable selling and distribution support	20	120
Contribution margin per unit		$130

(b) Let X = the sales volume at which the profit on sales is 10%

$$\begin{aligned} \text{Profit} &= 250X - 120X - (200{,}000 + 62{,}500) \\ &= 0.1 \times (250X) \\ 130X - 262{,}500 &= 25X \\ 105X &= 262{,}500 \\ X &= 2{,}500 \text{ units.} \end{aligned}$$

(c) (1) Single-shift operations ($0 \le X \le 4{,}400$):

Selling price	\$200
Variable costs	120
Contribution margin per unit	\$80

Fixed costs =
\$200,000 + \$62,500 + \$17,500 = \$280,000

Breakeven point = \$280,000 ÷ \$80 = 3,500 units
(note: $0 \le 3{,}500 \le 4{,}400$)

(2) Two-shift operations ($4{,}400 \le X \le 8{,}800$):

Selling price	$200
Variable costs	120
Contribution margin per unit	$80

Fixed costs =
$310,000 + $62,500 + $17,500 = $390,000

Breakeven point = $390,000 ÷ $80 = 4,875 units
(note: $4{,}400 \le 4{,}875 \le 8{,}800$)

(d) Profit to sales ratio in September:

$$= \frac{130 \times 3{,}000 - 262{,}500}{250 \times 3{,}000}$$

$$= \frac{390{,}000 - 262{,}500}{750{,}000}$$

$$= 0.17$$

(1) Single-shift operations ($0 \le X \le 4{,}400$)

$$200X - 120X - 280{,}000 = 0.17 \times 200X$$
$$80X - 280{,}000 = 34X$$
$$46X = 280{,}000$$
$$X = 6{,}087 \text{ units}$$

(Not acceptable because X cannot be more than 4,400 units with single-shift operations)

(2) Two-shift operations ($4{,}400 \le X \le 8{,}800$)

$$200X - 120X - 390{,}000 = 0.17 \times 200X$$
$$80X - 390{,}000 = 34X$$
$$46X = 390{,}000$$
$$X = 8{,}478 \text{ units}$$

(note: $4{,}400 \le 8{,}478 \le 8{,}800$)

2-42

Total labor cost	$114,800 *
Total materials cost	153,600 **
Total support cost	41,280 ***
Total lease payments	36,000
Total SG&A expenses	20,000
Total costs	$365,680

* Labor cost

Total labor hours required:	
$60 \times 800 \times 0.05$	2,400
60×4	240
$30 \times 1{,}600 \times 0.05$	2,400
30×4	120
	5,160
Labor hours available	4,000
Overtime hours required	1,160
Regular wages (= $20 × 4,000)	$ 80,000
Overtime wages (= $30 × 1,160)	34,800
Total labor cost	$114,800

** Materials cost

$1.60 × 60 × 800 = $76,800	
$1.60 × 30 × 1,600 = 76,800	$153,600

*** Support cost

$8 × 5,160 labor hours	$41,280

2-43 Week 1

$$\text{Standard minutes} = [1 \times 5{,}000 + 10 \times 4{,}500 + 15 \times 500 + 2 \times 400 + 0.5 \times 1{,}000] \times 130\%$$
$$= 58{,}800 \times 130\% = 76{,}440 \text{ minutes}$$

Week 2

$$\text{Standard minutes} = [1 \times 6{,}000 + 10 \times 5{,}000 + 15 \times 400 + 2 \times 300 + 0.5 \times 1{,}400] \times 130\%$$
$$= 63{,}300 \times 130\% = 82{,}290 \text{ minutes}$$

Week 3

$$\text{Standard minutes} = [1 \times 5{,}500 + 10 \times 4{,}800 + 15 \times 600 + 2 \times 500 + 0.5 \times 1{,}500] \times 130\%$$
$$= 64{,}250 \times 130\% = 83{,}525 \text{ minutes}$$

Week 4

$$\text{Standard minutes} = [1 \times 6{,}200 + 10 \times 5{,}500 + 15 \times 550 + 2 \times 600 + 0.5 \times 2{,}000] \times 130\%$$
$$= 71{,}650 \times 130\% = 93{,}145 \text{ minutes}$$

Week	Standard Minutes	Standard Hours	Number of Full-Time Equivalent Sales Consultants	
1	76,440	1,274.00	31.85	32
2	82,290	1,371.50	34.29	35
3	83,525	1,392.08	34.80	35
4	93,145	1,552.42	38.81	39

2-44 (a) Regular wages = \$18/hour and overtime wages = \$24/hour. Overtime wages will exceed the wages of an additional employee working 40 hours if the number of overtime hours is expected to exceed (18 × 40 ÷ 24) = 30 hours, which corresponds to (18 ÷ 24) = (30 ÷ 40) = 0.75 equivalent workers. Each employee is expected to service (6 × 40 ÷ 8) = 30 calls per week. Each call requires (8 ÷ 6) = 1.333 hours.

Week	Service Calls	Equiv. Workers	Workers Hired
1	1,280	42.67	42
2	1,340	44.67	44
3	1,200	40.00	40

(b)

Week	Workers Hired	Regular Wages	Overtime Hours	Overtime Wages	Total Wages
1	42	$30,240	26.67	$640	$30,880
2	44	31,680	26.67	640	32,320
3	40	28,800	0	0	28,800
Total cost		$90,720		$1,280	$92,000

(c)

Workers Hired	Regular Wages	Short Hours			Overtime Hours	Overtime Wages	Total Wages
		Week 1	Week 2	Week 3			
38	$82,080	186.67	266.67	80	533.33	$12,800	$94,880
39	84,240	146.67	226.67	40	413.33	9,920	94,160
40	86,400	106.67	186.67	0	293.33	7,040	93,440
41	88,560	66.67	146.67	0	213.33	5,120	93,680
42	90,720	26.67	106.67	0	133.33	3,200	93,920
43	92,880	0.00	66.67	0	66.67	1,600	94,480
44	95,040	0.00	26.67	0	26.67	640	95,680
45	97,200	0.00	0.00	0	0.00	0	97,200

The minimum cost is $93,440 when 40 workers are hired. This reflects an increase of $1,440 in costs when the staffing level is kept the same for all three weeks.

2-45 (a) This is a special order where the company has sufficient excess capacity to fill the order.

Incremental revenue	8,000 × $22	$176,000
Incremental VC	8,000 × ($5 + 4+1)	80,000
Incremental CM	8,000 × ($22 – 10)	$96,000

Because fixed costs are unchanged, the $96,000 incremental CM is the increase in income if the company accepts the special order.

(b) This is a special order where the company has insufficient excess capacity to fill the order, and therefore faces an opportunity cost if it fills the order.

Incremental CM from (a)	8,000 × ($22 – 10)	$96,000
Opportunity cost from lost sales*	5,000 × ($25 – (5 + 4))	80,000
Net increase in CM		$16,000

*The opportunity cost is the net benefit from the foregone CM on 5,000 boxes of regular sales.

Because fixed costs are unchanged, the $16,000 net increase in CM is the increase in income if the company accepts the special order.

2-46 (a) Variable costs per chip = $720,000/(80% × 2,000) = $450 per chip

$$\text{Profit} = (\$500 - \$450) \times 2{,}000 - 75{,}000 = \$25{,}000$$

(b) Fixed costs per chip = $75,000/2,000 = $37.50 per chip

Variable cost per chip	$450.00
Fixed cost per chip	37.50
Reported cost per unit	$487.50

(c) There is currently enough surplus capacity to produce the 200 units per week for the new order. The estimated increase in the company's profit if it accepts the order is ($480 − $450) × 200 = $6,000.

(d) Because there is not enough surplus capacity to produce the 600 units per week for the new order, the company faces an opportunity cost if it accepts the order. The company has surplus capacity of 2,000 – 1600 = 400 chips per week. If the company accepts the order, it will have to give up 200 chips per week of regular sales, at $500 revenue per chip. The company will gain ($480 – $450) × 600 = $18,000 per week from the special order, but that gain will be offset by lost margin from regular sales, ($500 – $450) × 200 = $10,000, for a net gain of $8,000 per week.

CASES

2-47 Wage rate = $3,600 ÷ 150 hours = $24/hour.

Neighboring laboratory charges $80 ÷ 2 hours = $40/hour, which also equals $100 ÷ 2.5 and $160 ÷ 4.

(a)

Month	Simple Routine	Simple Nonroutine	Complex	Total Hours	Equivalent Workers
June	800	250	450	4,025.0	26.83
July	600	200	400	3,300.0	22.00
August	750	225	450	3,862.5	25.75

Workers Hired	In-house Wages*	Hours Short June	July	August	Outside Hours	Outside Charges	Total Cost
20	$216,000	1,025	300	862.5	2,187.5	$87,500	$303,500
21	226,800	875	150	712.5	1,737.5	69,500	296,300
22	237,600	725	0	562.5	1,287.5	51,500	289,100
23	248,400	575	0	412.5	987.5	39,500	287,900
24	259,200	425	0	262.5	687.5	27,500	286,700
25	270,000	275	0	112.5	387.5	15,500	285,500
26	280,800	125	0	0.0	125.0	5,000	285,800
27	291,600	0	0	0.0	0.0	0	291,600

*$3,600 per month × 3 months = $10,800 for one worker for a quarter.

In-house wages equal $10,800 times the number of workers hired.
Dr. Barker should employ 25 workers at a total cost of $285,500.

(b) Outside charges will exceed the monthly wages of an additional worker hired by Barrington if the number of outside hours exceeds $3,600 ÷ $40 = 90. Therefore, Barrington should hire an additional employee when the outside services are expected to exceed 90 hours in any month, which corresponds to 90 ÷ 150 = 0.6 equivalent workers.

Month	Simple Routine	Simple Nonroutine	Complex	Total Hours	Equivalent Workers
June	800	250	450	4,025.0	26.83
July	600	200	400	3,300.0	22.00
August	750	225	450	3,862.5	25.75

Therefore, Barrington should hire 27 workers in June, 22 in July, and 26 in August.

Month	Workers Hired	Fixed Cost	Outside Hours	Outside Charges	Total Cost
June	27	$97,200	0	0	$97,200
July	22	79,200	0	0	79,200
August	26	93,600	0	0	93,600
Total cost					$270,000

2-48 (a)

Number of Deliveries Required	Delivery Capacity[a]	Overtime Hours	Regular Wages[c]	Overtime Cost	Total Cost	Unit Delivery Cost
		Number of Deliveries				
70	80	0	$480	$ 0	$480	$6.857
80	80	0	480	0	480	6.000
90	80	5[b]	480	90[d]	570	6.333

[a] 5 workers × 8 hours × 2 per hour = 80 deliveries

[b] (90 − 80) ÷ 2 = 5 hours

[c] $12 × 5 × 8 = $480

[d] $12 × 1.5 × 5 = $90

(b) Based on the old hiring policy

	Number of Deliveries Required	Delivery Capacity	Overtime Hours	Regular Hours	Overtime Cost	Total Cost	Unit Delivery Cost
Monday	65	80	0.0	$480	$0	$480	$7.385
Tuesday	70	80	0.0	480	0	480	6.857
Wednesday	80	80	0.0	480	0	480	6.000
Thursday	85	80	2.5	480	45	525	6.176
Friday	95	80	7.5	480	135	615	6.474
Total						$2,580	

Based on the new hiring policy

	Number of Deliveries Required	Delivery Capacity	Overtime Hours	Regular Hours	Overtime Cost	Total Cost	Unit Delivery Cost
Monday	65	64	0.5	$384	$9	$393	$6.046
Tuesday	70	64	3.0	384	54	438	6.257
Wednesday	80	80	0.0	480	0	480	6.000
Thursday	85	80	2.5	480	45	525	6.176
Friday	95	96	0.0	576	0	576	6.063
Total						$2,412	

The expected savings per week of the new hiring policy:
$2,580 – $2,412 = $168

2-49 (a) Loren is likely to focus his efforts on layout design, the product line that shows the highest reported profit. With the information provided up to this point, one can conjecture that Loren may be undercharging for layout design because there is great demand for Loren's layout design services, but no other lawn and garden businesses in the city are attempting to compete for the layout design business. If Loren is undercharging for layout design and thereby not adequately covering associated costs, profits will continue to deteriorate.

(b) Exhibits similar to Exhibits 2–22 and 2–23 appear below.

Loren's Lawn and Garden
Resource Use Information

	Cost	Capacity	Rate	Used	Allocation	Unused
Trucks and related costs	$50,000	800	$62.50	600	$37,500	$12,500
Lawn mowing equipment	37,500	1,500	25.00	1,200	30,000	7,500
Layout design equipment	150,000	400	375.00	400	150,000	0
Other maintenance equipment	87,500	700	125.00	500	62,500	25,000
	$325,000				$280,000	$45,000

Loren's Lawn and Garden
Product Line Income Statements

	Lawn Mowing	Layout Design	Other Maintenance	Total
Revenues	$287,500	$218,750	$312,500	$818,750
Direct costs	156,250	70,000	181,250	407,500
Margin	131,250	148,750	131,250	411,250
Cost of used capacity				
Own	30,000	150,000	62,500	242,500
Trucks	12,500	12,500	12,500	37,500
Cost of unused capacity	7,500	0	25,000	32,500
Product line profit	$81,250	–$13,750	$31,250	$98,750
Unused capacity cost				12,500
Business-sustaining costs				50,000
Organization profit				$36,250

Note that the product line profit numbers do not include the $50,000 of basic business-sustaining costs and the $12,500 of costs of unused truck capacity, since there is no practical way of allocating these costs to any one of the three lines of business. They must be covered by the margins created by each of the three business lines.

(c) Based on the exhibits in part (b), cutting back on lawn mowing and other maintenance is undesirable if capacity stays the same. Both these product lines have unused capacity. The layout design business is draining profits. The prices charged for layout do not reflect the costs of the associated specialized equipment, confirming the conjecture in part (a) that Loren's low prices are generating demand and discouraging competition. Loren can raise prices on the layout design business and try to increase volume in the lawn mowing and other maintenance business, to use available capacity.

(d) Compute revenues and variable costs per unit:

	Lawn Mowing		Layout Design		Other Maintenance	
	Per Unit	Total	Per Unit	Total	Per Unit	Total
Units sold	5,750		450		1,500	
Revenues	$50.00	$287,500	$486.11	$218,750	$208.33	$312,500
Variable costs	$27.17	$156,250	$155.56	$70,000	120.833	$181,250

Composite Product Calculation (performed in a computer spreadsheet; some quantities below are rounded.)

	Lawn Mowing		Layout Design		Other Maintenance		
	Per Unit	% Total	Per Unit	% Total	Per Unit	% Total	Total All
Units sold	5,750	74.675%	450	5.844%	1,500	19.48%	7,700
	Per Unit	Weight	Per Unit	Weight	Per Unit	Weight	Wgt Avg
Revenues	$50.00	37.34	$486.11	28.41	$208.33	40.58	106.33
Variable Costs	$27.17	20.29	$155.56	9.09	$120.83	23.54	52.92
Contribution Margin	$22.83	17.05	$330.56	19.32	$87.50	17.05	53.41

BEP = fixed costs/weighted average CM = $375,000/$53.41 = **7,021.28 units**

Multiply BEP by product line weights:

	Lawn Mowing		Layout Design		Other Maintenance		
	Per Unit	Total	Per Unit	Total	Per Unit	Total	Total All
BE units	**5,243.16**		**410.33**		**1,367.78**		
Revenues	$50.00	$262,158	$486.11	$199,468	$208.33	$284,954	$746,581
Variable costs	$27.17	$142,477	$155.56	$63,830	$120.83	$165,274	$371,581
Contribution margin	$22.83	$119,681	330.556	$135,638	$87.50	$119,681	$375,000
Fixed costs		$131,679		$100,191		$143,130	$375,000
Profit		–$11,999		$35,447		–$23,449	$0

2-50 (Numbers in square brackets below refer to reference numbers that appear at the end of the solution for this case.)

(a) An organization's value proposition defines what the organization tries to deliver to its customers. The value proposition includes four elements: price, quality, functionality and features, and service.

Nordstrom is an upscale retailer whose value proposition can be described as "quality, value, selection, and service" (http://about.nordstrom.com/aboutus/?origin=hp=leftnav, December 3, 2002) or "superior service and high quality, distinctive merchandise" (http://about.nordstrom.com/aboutus/investor.asp?origin=footer, April 7, 2003). Nordstrom's sales force is legendary for its customer service.

(b) Nordstrom centralized purchasing in an attempt to leverage its buying power. Previously, Nordstrom's buying transpired through more than 12 offices [5]. Nordstrom negotiated with suppliers to reduce markups on merchandise [6]. These measures should reduce Nordstrom's costs without adversely affecting the company's ability to fulfill its value proposition.

Nordstrom also laid off 2,500 employees between September 1 and October 19, 2001. Mindful of the importance of its sales staff, Nordstrom's layoffs focused on "back-office employees" [6]. Retaining most of the sales staff would help Nordstrom continue to fulfill its value proposition. Nevertheless, a retail analyst noted that Nordstrom needed to dramatically cut costs, pointing out that Nordstrom's annual selling, general, and administrative expenses of approximately $100 per square foot overshadowed the $60 industry average [2].

(c) Nordstrom invested in computerized inventory-tracking systems [5, 6]. The previous system relied partly on sales staff's handwritten notes in loose-leaf binders [2]. In addition to inventory management, new technology was introduced to improve customer service:

> Nordstrom's salespeople are getting ready to throw out their little black books. Instead of filling pages with handscrawled notes about customer's sizes and designer preferences, 20,000 sales clerks at the Seattle chain's 137 stores soon will be using new software and mobile devices to track their customers'

> tastes and match them to new merchandise arrivals and store promotions.
>
> For Nordstrom, what makes sense is getting customer information to retail sales personnel in real time, whether those customers are conducting business on the Web, in the store or over the telephone [3].

Sales staff could also contact customers as soon as a desired item arrived in the store and better serve repeat customers with readily available information on sizes and preferences [3].

Nordstrom's 2001 Annual Report (p. 4) reports that implementation of the perpetual inventory system is "going very well," with the expectation that the system will help buyers improve decision-making manage inventory, and respond quickly to trends. The 2001 Annual Report covers the fiscal year from February 2001 to January 2002.

(d) Nordstrom's efforts affected the classic cost-volume-profit elements of sales prices, product costs, product mix, and selling, general, and administrative expenses. The objective was to increase net income. In an effort to move excess inventory, Nordstrom ran a clearance sale, unusual for the company [6]. Nordstrom also altered its product mix by expanding its offerings of lower-priced merchandise. Nordstrom's efforts to decrease selling, general, and administrative expenses are described in part (b). Net sales increased about 7% in 2000 (comparing fiscal years ending January 2000 and January 2001) due to new store openings; comparable store sales were flat (Nordstrom 2001 Annual Report, p. 9). Operating income decreased 50% and gross profit as a percent of sales decreased.

In 2001 (comparing fiscal years ending January 2001 and January 2002), net sales increased about 2% due to new store openings; comparable store sales decreased during the year. Operating income increased 10% after declining 50% the year before. The following year, net sales increased 6% and operating income increased 30%. Gross profit as a percent of sales decreased in 2001 and increased in 2002 (http://about.nordstrom.com/aboutus/investor/10yr_stats_printable.asp, April 7, 2003).

(e) "Reinvent Yourself" was an advertising campaign that began in February 2000 (see [4] for details). The advertising campaign was Nordstrom's first national television advertising campaign and targeted younger shoppers than its traditional clientele, concurrent with Nordstrom's push to appeal to a younger clientele with "flashing lights and funky clothes" [1] and store columns painted orange for a more youthful look [6]. The ads did not emphasize Nordstrom's customer service. Instead, Nordstrom planned to impress customers with its service once they had ventured into the store [4].

The campaign was less than successful; the company announced that it had "overreached." Nordstrom had "alienated its faithful clientele" [6] by trying to appeal to younger shoppers. That is, there was an opportunity cost to targeting younger shoppers. Some financial results appear in part (d).

Nordstrom may need to reconsider its value proposition. Reference [2] comments:

> ..the retail world has changed since Nordstrom's heyday. With the rise of such speciality retailers as Talbots, The Limited, and Ann Taylor, competition is ferocious. And its old winning formula—great customer service—isn't the easy advantage it once was. Neiman Marcus Group Inc is now No. 1 in service among department-store chains. It generates annual sales of $490 per square foot, handily eclipsing second-place Nordstrom at $342. And Talbots Inc also took a page from Nordstrom's playbook. The Hingham (Mass.) chain improved its service and stuck to classic merchandise. The result: It ended last year as one of the best-performing retailers in the nation, with same-store sales jumping 17%.

The same article points out that in response to growing customer focus on value, Nordstrom needs excellence in inventory management and control of expenses in addition to its recognized excellence in the "art" of retailing.

References

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[4] Cuneo, A. Z. 2000. Nordstrom Breaks with Traditional Media Plan. *Advertising Age* (February 14), 4, 71.

[5] Lee, L. 2000. Nordstrom Cleans Out Its Closets. *Business Week* (May 22), 105.

[6] Merrick, A. 2001. Nordstrom Accelerates Plans to Straighten Out Business: Upscale Retailer Offers Lower-priced Goods, Lays Off Staff and Holds Clearance Sale. *Wall Street Journal* (October 19), B4.

Nordstrom provides the following list of references at its web site http://about.nordstrom.com/aboutus/faq/faq.asp#12:

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"With a New location in Dadeland Mall, Nordstrom Seeks to Become a Florida Institution," The Miami Herald, November 12, 2004

"Author of Books on Nordstrom Culture to Address Virginia Trade Show," Richmond Times-Dispatch, September 23, 2004

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