Appendix A | Marketing Math

Marketing involves people—customers, middlemen, and producers. Much of the business activity of these people is quantified in some manner. Consequently, knowledge of certain concepts in economics, accounting, and finance is essential for decision making in many areas of marketing. With that in mind, this appendix presents an overview—or, for many of you, a review—of (1) price elasticity of demand, (2) the operating statement, (3) markups, and (4) analytical ratios.

Price Elasticity of Demand

Price elasticity of demand refers to the responsiveness of quantity demanded to price changes. Specifically, it gauges the effect that a change in the price of a product has on amount sold and on total revenue. (Total revenue—that is, total sales in dollars—equals the unit price times the number of units sold.)

We say demand is **elastic** when (1) reducing the unit price causes an increase in total revenue *or* (2) raising the unit price causes a decrease in total revenue. In the first case, the lower price results in a boost in quantity sold that more than offsets the price cut—hence, the increase in total revenue. In the second case, the higher price results in a large drop in quantity sold that more than counters the potential gain from the price rise—hence, the decrease in total revenue.

These elastic demand situations are illustrated in Figure A.1. We start with a situation where, at $5 a sandwich, the Campus Sandwich Company sells 100 units and the total revenue (TR) equals $500. When the firm lowers price to $4, the quantity sold increases to 150 and total revenue also goes up—to $600. When the price is boosted to $6, however, the quantity sold drops off so much (to 70 sandwiches) that total revenue also declines (to $420). Thus demand is *elastic* when the price change (either up or down) and total revenue change move in the *opposite* direction.

Demand is **inelastic** when (1) a price cut causes total revenue to decline *or* (2) a price rise results in an increase in total revenue. In each of these situations, the changes in unit price more than offset the relatively small changes in quantities sold. That is, when the price is cut, the increase in quantity sold is not enough to offset the price cut, so total revenue goes down. And when the unit price is raised, it more than counters the decline in quantity sold, so total revenue goes up. Simply, demand is *inelastic* when the price change and the resulting change in total revenue go in the *same* direction.

Inelastic demand situations are illustrated in Figure A.2. Again we start with a unit price of $5, Paperbacks and More sells 100 units, and total revenue is

FIGURE A.1

Elastic demand.

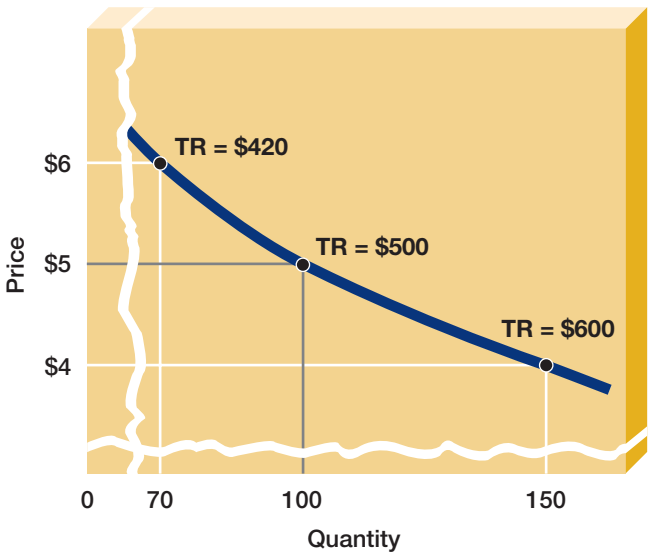
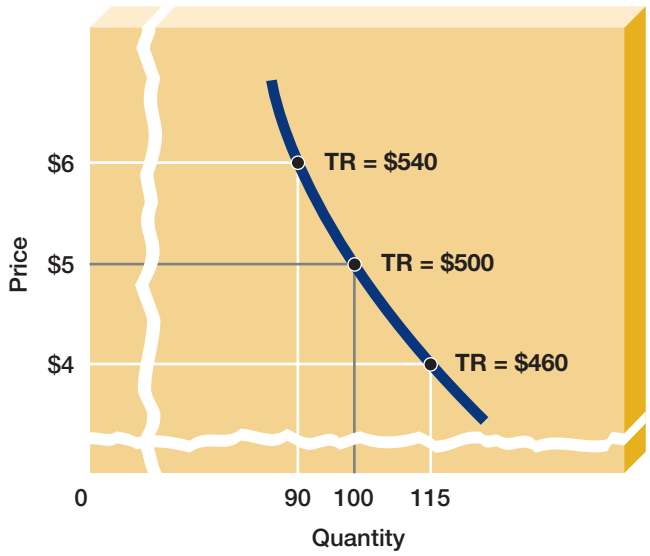


FIGURE A.2

Inelastic demand.



$500. When the store lowers the unit price to $4, the quantity of books sold increases to 115. But this is not enough to offset the price cut, so total revenue declines to $460. When the unit price is raised to $6, the quantity sold falls off to 90. But the price increase more than offsets the drop in quantity sold, so total revenue goes up to $540.

In general, the demand for necessities (salt, sugar, cigarettes, gasoline, telephone service, gas and electric service) tends to be inelastic. If the price of gasoline goes up or down, say 10 or 15 cents a gallon, the total number of gallons sold does not change very much. Simply, consumers need gasoline for their cars. Conversely, the demand for products purchased with discretionary income (luxury items, large appliances, furniture, autos) typically is much more elastic. That is why the demand for new electronics products often soars as prices decline in the early stages of the life cycle.

Moreover, the demand for individual *brands* is more elastic than is the demand for the broader *product* category. If consumers encounter an unsatisfactory price on an individual brand, they ordinarily can purchase an alternative brand. However, if they are displeased with the prices in an entire product category, they may not be able to find an alternative type of product to meet their needs. Thus the demand for Continental Airlines or Hertz rental cars is far more elastic (price sensitive) than is the demand for air travel or rental cars in general.

Price elasticity of demand is not just a theoretical concept in economics. It has practical value. By gauging whether demand for a product is elastic or inelastic, marketing executives are better able to establish suitable prices for their products.

The Operating Statement

A company prepares two main financial statements—a balance sheet and an operating statement. A **balance sheet** shows the assets, liabilities, and net worth of a company at a given time—for example, at the close of business on December 31, 2002.

The focus of our attention here, however, is the operating statement. Often called a *profit-and-loss statement* or an *income statement*, an **operating statement** is a summary of the firm's income and expenses over a period of time—for example, the 2002 calendar year. The operating statement shows whether the business earned a net profit or suffered a net loss during the period covered.

An operating statement can cover any period of time. To fulfill income tax requirements, virtually all firms prepare a statement covering operations during a calendar year or another 12-month period called a fiscal year. It is also common for businesses to prepare monthly, quarterly, and/or semiannual operating statements.

Table A.1 is an operating statement for a hypothetical firm, the Alpha-Zeta Company, which could be either a wholesaler or a retailer. The major difference between the operating statement of a middleman and that of a manufacturer is the cost-of-goods-sold section. A manufacturer shows the cost of goods *manufactured*, whereas the middleman's statement shows net *purchases*.

The essence of business is very simple. A company buys or makes a product and then (hopefully)

TABLE A.1

An Operating Statement for a Wholesaler or a Retailer

The Alpha-Zeta Company
Operating Statement for Month Ending December 31, 2002

Gross sales		$87,000	
Less: Sales returns and allowances	$ 5,500		
Cash discounts allowed	1,500	7,000	
Net sales			$80,000
Cost of goods sold			
Beginning inventory, December 1 (at cost)		$18,000	
Gross purchases	$49,300		
Less: Cash discounts taken on purchases	900		
Net purchases	$48,400		
Plus: Freight in	1,600		
Net purchases (at delivered cost)		50,000	
Cost of goods available for sale		$68,000	
Less: Ending inventory December 31 (at cost)		20,000	
Cost of goods sold			48,000
Gross margin			$32,000
Expenses			
Sales-force salaries and commissions		$11,000	
Advertising		2,400	
Office supplies		250	
Taxes (except income tax)		125	
Telepone and fax		250	
Delivery expenses		175	
Rent		800	
Heat, light, and power		300	
Depreciation		100	
Insurance		150	
Interest		150	
Bad debts		300	
Administrative salaries		7,500	
Office salaries		3,500	
Miscellaneous expenses		200	
Total expenses			27,200
Net profit before taxes			$ 4,800

sells it for a higher price. From the sales revenue, the seller intends to cover the cost of the merchandise and the expenses of the business and have something left over, which is called **net profit.** These relationships form the basic structure of an operating statement:

- Sales minus cost of goods sold equals gross margin.
- Gross margin minus expenses equals net profit.

An example based on the Alpha-Zeta Company in Table A.1 follows:

	Sales	$80,000
less	Cost of goods sold	48,000
equals	Gross margin	32,000
less	Expenses	27,200
equals	Net profit	$ 4,800

Now let's look at the primary components in an operating statement.

Sales

The first line in an operating statement records **gross sales**—the total amount sold by an organization, stated in dollars. From this figure the Alpha-Zeta Company (hereafter, A-Z) deducts sales returns and sales allowances. A-Z also deducts discounts granted to employees when they purchase merchandise or services.

In virtually every firm at some time during an operating period, customers want to return or exchange merchandise. In a **sales return,** the customer is refunded the full purchase price in cash or credit. In a **sales allowance,** the customer keeps the merchandise but is given a reduction from the selling price because of some dissatisfaction. The income from the sale of returned merchandise is included in a company's gross sales, so returns and allowances must be deducted to calculate net sales.

Net Sales

The most important figure in the sales section of the statement is **net sales,** which represents the net amount of sales revenue, out of which the company will pay for the products and all its expenses. The net sales figure is also the one on which many operating ratios are based. It is designated as 100% (of itself), and the other items are then expressed as a percentage of net sales.

Cost of Goods Sold

As we work toward determining A-Z's net profit, we deduct from net sales the cost of the merchandise. To calculate the **cost of goods sold** in a retail or wholesale operation, we start with the value of any merchandise on hand at the beginning of the period. To this we add the net cost of what is purchased during the period. From this total we deduct the value of whatever remains unsold at the end of the period.

In Table A.1 the firm started with an inventory worth $18,000, and during the course of the month, it purchased goods that cost $50,000. Thus A-Z had a total of $68,000 worth of goods available for sale. If all were sold, the cost of goods sold would have been $68,000. At the end of the month, however, there was still $20,000 worth of merchandise on hand. Thus, during the month, A-Z sold goods that cost $48,000.

We just spoke of merchandise *valued at* a certain figure or *worth* a stated amount. Actually, the problem of inventory valuation is complicated and sometimes controversial. The rule of thumb is to value inventories at cost or market, whichever is lower. The application of this rule in the real world may be difficult. Assume that a store buys six beach balls at $5 each and the following week buys six more at $6 each. The company places all 12, jumbled, in a basket display for sale. Then one is sold, but there is no marking to indicate whether its cost was $5 or $6. Thus the inventory value of the remaining 11 balls may be $60 or $61. If we multiply this situation by thousands of purchases and sales, we begin to see the depth of the problem.

A figure deserving some comment is the **net cost of delivered purchases.** A company starts with its gross purchases at billed cost. Then it must deduct any purchases that were returned or any purchase allowances received. The company should also deduct any discounts taken for payment of the bill within a specified period of time. Deducting purchase returns, allowances, and discounts gives the net cost of purchases. Freight charges paid by the buyer (called **freight in**) are added to net purchases to determine the net cost of *delivered* purchases.

In a manufacturing concern, the cost-of-goods-sold section has a slightly different form. Instead of determining the cost of goods *purchased,* the firm determines the cost of goods *manufactured,* as in Table A.2. Cost of goods manufactured ($50,000) is added to the beginning inventory ($18,000) to ascertain the total goods available for sale ($68,000). Then, after the ending inventory of finished goods has been deducted ($20,000), the result is the cost of goods sold ($48,000).

To find the cost of goods *manufactured,* a company starts with the value of goods partially completed (beginning inventory of goods in process—$24,000). To this beginning inventory figure is added the cost of raw materials, direct labor, and factory overhead expenses incurred during the period ($48,000). The resulting figure is the total goods in process during the period ($72,000). By deducting the value of goods still in process at the end of the period ($22,000), management finds the cost of goods manufactured during that span of time ($50,000).

Gross Margin

Gross margin is determined by subtracting cost of goods sold from net sales. Gross margin, sometimes called *gross profit,* is a key figure in the entire marketing program. When we say that a certain store has a *margin* of 30%, we are referring to the gross margin.

Expenses

Operating expenses are deducted from gross margin to determine net profit. The operating expense section includes marketing, administrative, and miscellaneous expenses. It does not, of course, include the cost of goods purchased or manufactured, because these costs have already been deducted.

TABLE A.2 **Cost-of-Goods-Sold Section of an Operating Statement for a Manufacturer**

Beginning inventory of finished goods (at cost)			$18,000
Cost of goods manufactured:			
Beginning inventory, goods in process		$24,000	
Plus: Raw materials	$20,000		
Direct labor	15,000		
Overhead	13,000	48,000	
Total goods in process		$72,000	
Less: Ending inventory, goods in process		22,000	
Cost of goods manufactured			50,000
Cost of goods available for sale			$68,000
Less: Ending inventory, finished goods (at cost)			20,000
Cost of goods sold			$48,000

Net Profit

Net profit is the difference between gross margin and total expenses. Obviously, a negative net profit is a loss.

Markups

Many retailers and wholesalers use markup percentages to determine the selling price of an article. Normally the selling price must exceed the cost of the merchandise by an amount sufficient to cover operating expenses and still leave the desired profit. The difference between the selling price of an item and its cost is the **markup,** sometimes referred to as the *mark-on*.

Typically, markups are expressed in percentages rather than dollars. A markup may be expressed as a percentage of either the cost or the selling price. Therefore, we must first determine which will be the *base* for the markup. That is, when we speak of a 40% markup, do we mean 40% of the *cost* or 40% of the *selling price*?

To determine the markup percentage when it is based on *cost,* we use the following formula:

$$\text{Markup \%} = \frac{\text{dollar markup}}{\text{cost}}$$

When the markup is based on *selling price,* the formula to use is:

$$\text{Markup \%} = \frac{\text{dollar markup}}{\text{selling price}}$$

All interested parties must know which base is being used in a given situation. Otherwise there can be considerable misunderstanding. To illustrate, suppose that Allan Aaron runs a clothing store and claims he needs a 50% markup to make a small net profit. Blanche Brister, who runs a competitive store, says she needs only a 33⅓% markup and that Aaron must be either inefficient or a big profiteer.

Actually, both merchants are using identical markups, but they are using different bases. Each seller buys hats at $6 apiece and sets the selling price at $9. This is a markup of $3 per hat. Aaron is expressing his markup as a percentage of cost—hence the 50% figure ($3 ÷ $6 = 0.5, or 50%). Brister is basing her markup on the selling price ($3 ÷ $9 = 0.333, or 33⅓%).

It would be a mistake for Aaron to try to get by on Brister's 33⅓% markup, as long as Aaron uses cost as his base. If Aaron used the 33⅓% markup, but *based it on cost,* the markup would be only $2. And the selling price would be only $8. This $2 markup, averaged over the entire hat department, would not enable Aaron to cover his usual expenses and make a profit. *It is conventional to state markup percentages as a percentage of selling price.*

Markup Based on Selling Price

The following diagram shows the relationships among selling price, cost, and markup. It can be used to calculate these figures regardless of whether the markup is stated in percentages or dollars, and whether the percentages are based on selling price or cost:

		Dollars	Percentage
	Selling price		
less	Cost	———	———
equals	Markup		

As an example, suppose a merchant buys an article for $90 and knows the markup based on selling price must be 40%. What is the selling price? By filling in the known information in the diagram, we obtain:

		Dollars	Percentage
	Selling price		100
less	Cost	90	
equals	Markup		40

The percentage representing cost must then be 60%. Thus the $90 cost is 60% of the selling price. The selling price is then $150. That is, $90 equals 60% of the selling price. Then $90 is divided by 0.6 (or 60%) to get the selling price of $150.

A common situation facing merchants is to have competition set a ceiling on selling prices. Or possibly the sellers must buy an item to fit into one of their price lines. Then they want to know the maximum amount they can pay for an item and still get their normal markup. Assume that the selling price of an article is set at $60—set by competition or by a $59.95 price line. The retailer's normal markup is 35%. What is the most the retailer should pay for this article? Again let's fill in what we know in the diagram:

		Dollars	Percentage
	Selling price	60	100
less	Cost		
equals	Markup		35

The dollar markup is $21 (that is, 35% of $60). So by simple subtraction we find that the maximum cost the merchant will want to pay is $39.

Series of Markups

Markups are figured on the selling price at *each level of business* in a channel of distribution. A manufacturer applies a markup to determine its selling price. The manufacturer's selling price then becomes the wholesaler's cost. The wholesaler must determine its own selling price by applying its usual markup percentage based on its—the wholesaler's—selling price. The same procedure is carried out by the retailer, using the wholesaler's selling price as its—the retailer's—cost.

The following calculations illustrate this point:

Producer's cost $7
Producer's selling price $10
} Producer's markup = $3, or 30%

Wholesaler's cost $10
Wholesaler's selling price $12
} Wholesaler's markup = $2, or 16⅔%

Retailer's cost $12
Retailer's selling price $20
} Retailer's markup = $8, or 40%

Markup Based on Cost

If a firm customarily deals in markups based on cost—and sometimes this is done among wholesalers—the same diagrammatic approach may be employed. The only change is that cost will equal 100%. The selling price will be 100% plus the markup based on cost. As an example, a firm bought an article for $70 and wants a 20% markup based on cost. The markup in dollars is $14 (in other words, 20% of $70). The selling price is $84 (that is, $70 + $14):

		Dollars	Percentage
	Selling price	84	120
less	Cost	70	100
equals	Markup	14	20

The relationship between markups on cost and markups on selling price is important. For instance, if a product costs $6 and sells for $10, there is a $4 markup. This is a 40% markup based on selling price, but a 66⅔% markup based on cost. The following may be helpful in understanding these relationships and in converting from one base to another:

If selling price = 100% If cost = 100%

$$\$10 = 100\% \begin{cases} 60\% \rightarrow \text{Cost} = \$6.00 \leftarrow 100\% \\ 40\% \rightarrow \text{Markup} = \$4.00 \leftarrow 66\tfrac{2}{3}\% \end{cases} \$10 = 166\tfrac{2}{3}\%$$

The relationships between the two bases are expressed in the following formulas:

$$\%\ \text{markup on selling price} = \frac{\%\ \text{markup on cost}}{100\% + \%\ \text{markup on cost}}$$

$$\%\ \text{markup on selling price} = \frac{\%\ \text{markup on selling price}}{100\% - \%\ \text{markup on selling price}}$$

To illustrate the use of these formulas, let's say that a retailer has a markup of 25% on *cost*. This retailer wants to know what the corresponding figure is, based on selling price. In the first formula we get:

$$\frac{25\%}{100\% + 25\%} = \frac{25\%}{125\%} = 0.2, \text{ or } 20\%$$

A markup of 33⅓% based on *selling price* converts to 50% based on cost, according to the second formula:

$$\frac{33\frac{1}{3}\%}{100\% - 33\frac{1}{3}\%} = \frac{33\frac{1}{3}\%}{66\frac{2}{3}\%} = 0.5, \text{ or } 50\%$$

The markup is closely related to gross margin. Recall that gross margin is equal to net sales minus cost of goods sold. Looking below gross margin on an operating statement, we find that gross margin equals operating expenses plus net profit.

Normally the initial markup in a company, department, or product line must be set a little higher than the overall gross margin desired for the selling unit. The reason? Some reductions will be incurred before all the articles are sold. Because of one factor or another, certain items will not sell at the original price. They will have to be marked down—reduced in

price from the original level. Some pilferage, damages, and other shortages also typically occur.

Analytical Ratios

From a study of the operating statement, management can develop several ratios to evaluate the results of its marketing program. In most cases net sales is used as the base (100%). In fact, unless specifically mentioned to the contrary, all ratios reflecting gross margin, net profit, or any operating expense are stated as a percentage of net sales.

Gross Margin Percentage

The ratio of gross margin to net sales is termed simply **gross margin percentage.** In Table A.1 the gross margin percentage for A-Z is $32,000 ÷ $80,000, or 40%.

Net Profit Percentage

The ratio called **net profit percentage** is determined by dividing net profit by net sales. For A-Z this ratio is $4,800 ÷ $80,000, or 6%. This percentage may be calculated either before or after federal income taxes are deducted, but the result should be labeled to show which it is.

Operating Expense Ratio

When total operating expenses are divided by net sales, the result is the **operating expense ratio.** Using the figures in Table A.1, this ratio for A-Z is $27,200 ÷ $80,000, or 34%. In similar fashion we may determine the expense ratio for any given cost. Thus we note in the table that rent expense was 1%, advertising 3%, and sales-force salaries and commissions 13.75%.

Stockturn Rate

Management often measures the efficiency of its marketing operations by means of the **stockturn rate.** This figure represents the number of times an amount equal to the average size of the firm's inventory is *turned over,* or sold, during the period under study. The rate is calculated on either a cost or a selling-price basis. Both the numerator and the denominator of the fraction must be expressed in the same terms, either cost or selling price.

On a *cost* basis, the formula for stockturn rate is:

$$\text{Stockturn rate} = \frac{\text{cost of goods sold}}{\text{average inventory at cost}}$$

The average inventory is determined by adding beginning and ending inventories and dividing the result by 2. In Table A.1 the average inventory is ($18,000 + $20,000) ÷ 2 = $19,000. The stockturn rate then is $48,000 ÷ $19,000 = 2.53. Because inventories usually are abnormally low at the first of the year in anticipation of taking physical inventory, this average may not be representative. Consequently, some companies find their average inventory by adding the book inventories at the beginning of each month and then dividing this sum by 12.

Now let's assume inventory is recorded on a *selling-price* basis, as is done in most large retail organizations. Then the stockturn rate equals net sales divided by average inventory at selling price. Sometimes the stockturn rate is computed by dividing the number of *units* sold by the average inventory expressed in *units*.

Wholesale and retail trade associations in many types of businesses publish figures showing the average stockturn rate for their members. A firm with a low rate of stockturn is not generating sufficient sales volume or is carrying too much inventory. In either case, it is likely to be spending too much on storage and inventory. The company runs a high risk of obsolescence or spoilage.

If the stockturn rate gets too high, the company's average inventory may be too low. Often a firm in this situation is using hand-to-mouth buying (that is, buying small quantities and selling all or most of them before replenishing inventory). In addition to incurring high handling and billing costs, the company is likely to be out of stock on some items.

Markdown Percentage

Sometimes retailers are unable to sell products at the originally stated prices. When this occurs, they often reduce these prices to move the products. A **markdown** is a reduction from the original selling price. The size of an individual markdown is expressed as a percentage of the original sales price. To illustrate, a retailer purchases a hat for $6 and marks it up 40% to sell for $10. The hat does not sell at that price, so it is marked down to $8. Now the seller may advertise a price cut of 20% (which is $2 ÷ $10).

Management frequently finds it helpful to determine the markdown percentage. Then the size and number of markdowns and the reasons for them can be analyzed. Retailers, particularly, analyze markdowns.

Markdown percentage is calculated by dividing total dollar markdowns by total net sales during a given period. Two important points should be noted. First, the markdown percentage is determined in this fashion whether the markdown items were sold or are still in the store. Second, the percentage is calculated with respect to total net sales, and not only in con-

nection with sales of marked-down articles. As an example, assume that a retailer buys 10 sports hats at $6 each and prices them to sell at $10. Five hats are sold at $10. The other five are marked down to $8, and three are sold at the lower price. Total sales are $74 and total markdowns are $10. The retailer has a markdown ratio of $10 ÷ $74, or 13.5%.

Markdowns do not appear on the operating statement because they occur *before* an article is sold. The first item on an operating statement is gross sales. That figure reflects the actual selling price, which may be the selling price after a markdown has been taken.

Return on Investment

A commonly used measure of managerial performance and of the operating success of a company is its rate of return on investment. We use both the balance sheet and the operating statement as sources of information. The formula for calculating **return on investment** (ROI) is as follows:

$$\text{ROI} = \frac{\text{net profit}}{\text{sales}} \times \frac{\text{sales}}{\text{investment}}$$

Two questions may come to mind. What do we mean by "investment"? Why do we need two fractions? It would seem that the sales component in each fraction would cancel out, leaving net profit divided by investment as the meaningful ratio.

To answer the first query, consider a firm whose operating statement shows annual sales of $1,000,000 and a net profit of $50,000. At the end of the year, the balance sheet reports:

Assets	$600,000	Liabilities		$200,000
		Capital stock	$300,000	
		Retained earnings	100,000	400,000
	$600,000			$600,000

The ROI figure is obviously affected by which figure we use. But is the investment $400,000 or $600,000? The answer depends on whether we are talking to the stockholders or to the company executives. Stockholders are more interested in the return on what they have invested—in this case, $400,000. The ROI calculation then is:

$$\text{ROI} = \frac{\$50{,}000}{\text{sales } \$1{,}000{,}000} \times \frac{\text{sales } \$1{,}000{,}000}{\text{investment } \$400{,}000} = 12\tfrac{1}{2}\%$$

Management, on the other hand, is more concerned with total investment, as represented by total assets ($600,000). This is the amount that the executives must manage, regardless of whether the assets were acquired by stockholders' investment, retained earnings, or loans from outside sources. Within this context the ROI computation becomes:

$$\text{ROI} = \frac{\text{net profit } \$50{,}000}{\text{sales } \$1{,}000{,}000} \times \frac{\text{sales } \$1{,}000{,}000}{\text{investment } \$600{,}000} = 8\tfrac{1}{3}\%$$

Regarding the second question, we use two fractions because we are dealing with two separate elements—the rate of profit on sales and the rate of capital turnover. Management really should determine each rate separately and then multiply the two. The rate of profit on sales is influenced by marketing considerations—notably, sales volume, price, product mix, and advertising effort. Capital turnover is a financial consideration that is not involved directly with costs or profits—only with sales volume and assets managed.

To illustrate, say our company's profits doubled with the same sales volume and investment because of an excellent marketing program this year. In effect, we doubled our profit rate with the same capital turnover:

$$\text{ROI} = \underbrace{\frac{\text{net profit } \$100{,}000}{\text{sales } \$1{,}000{,}000}}_{10\%} \times \underbrace{\frac{\text{sales } \$1{,}000{,}000}{\text{investment } \$600{,}000}}_{1\frac{2}{3}} = 16\tfrac{2}{3}\% \qquad 10\% \times 1\tfrac{2}{3} = 16\tfrac{2}{3}\%$$

As expected, this 16⅔% is twice the ROI calculated above.

Now assume that we earned our original profit of $50,000 but did it with an investment of only $500,000. We cut the size of our average inventory, and we closed some branch offices. By increasing our capital turnover from 1.67 to 2, we raised the ROI from 8⅓% to 10%, even though sales volume and profits were unchanged:

$$\text{ROI} = \underbrace{\frac{\$50{,}000}{\$1{,}000{,}000}}_{5\%} \times \underbrace{\frac{\$1{,}000{,}000}{\$500{,}000}}_{2} = 10\% \qquad 5\% \times 2 = 10\%$$

Finally, let's say that we increased our sales volume—we doubled it—but did not increase our profit or investment. The cost-profit squeeze has brought us "profitless prosperity." The following results occur:

$$\text{ROI} = \underbrace{\frac{\$50{,}000}{\$2{,}000{,}000}}_{2\frac{1}{2}\%} \times \underbrace{\frac{\$2{,}000{,}000}{\$600{,}000}}_{3\frac{1}{3}} = 8\tfrac{1}{3}\% \qquad 2\tfrac{1}{2}\% \times 3\tfrac{1}{3} = 8\tfrac{1}{3}\%$$

The profit rate was cut in half, but this was offset by a doubling of the capital turnover rate. The result was that the ROI was unchanged.

Questions and Problems

1. Construct an operating statement from the following data and compute the gross margin percentage:

Purchases at billed cost	$15,000
Net sales	30,000
Sales returns and allowances	200
Cash discounts given	300
Cash discounts earned	100
Rent	1,500
Salaries	6,000
Opening inventory at cost	10,000
Advertising	600
Other expenses	2,000
Closing inventory at cost	7,500

2. Prepare a retail operating statement from the following information and compute the markdown percentage:

Rent	$ 9,000
Closing inventory at cost	28,000
Sales returns	6,500
Cash discounts allowed	2,000
Salaries	34,000
Markdowns	4,000
Other operating expenses	15,000
Opening inventory at cost	35,000
Gross sales	232,500
Advertising	5,500
Freight in	3,500
Gross margin as percentage of sales	35

3. What percentage markups on cost correspond to the following percentages of markup on selling price?
   a. 20%
   b. 37½%
   c. 50%
   d. 66⅔%

4. What percentage markups on selling price correspond to the following percentages of markup on cost?
   a. 20%
   b. 33⅓%
   c. 50%
   d. 300%

5. A hardware store bought a gross (12 dozen) of hammers, paying $602.40 for the total order. The retailer estimated operating expenses for this product to be 35% of sales, and wanted a net profit of 5% of sales. The retailer expected no markdowns. What retail selling price should be set for each hammer?

6. Competition in a line of sporting goods limits the selling price on a certain item to $25. If the store owner feels a markup of 35% is needed to cover expenses and return a reasonable profit, what is the most the owner can pay for this item?

7. A retailer with annual net sales of $2 million maintains a markup of 66⅔% based on cost. Expenses average 35%. What are the retailer's gross margin and net profit in dollars?

8. A company has a stockturn rate of five times a year, a sales volume of $600,000, and a gross margin of 25%. What is the average inventory at cost?

9. A store has an average inventory of $30,000 at retail and a stockturn rate of five times a year. If the company maintains a markup of 50% based on cost, what are the annual sales volume and cost of goods sold?

10. From the following data, compute the gross margin percentage and the operating expense ratio:

    Stockturn rate = 9

    Average inventory at selling price = $45,000

    Net profit = $20,000

    Cost of goods sold = $350,000

11. A ski shop sold 50 pairs of skis at $90 a pair, after taking a 10% markdown. All the skis were originally purchased at the same price and had been marked up 60% on cost. What was the gross margin on the 50 pairs of skis?

12. A women's clothing store bought 200 suits at $90 each. The suits were marked up 40%. Eighty were sold at that price. The remaining suits were each marked down 20% from the original selling price, and all were sold. Compute the sales volume and markdown percentage.

13. An appliance retailer sold 60 portable cassette players at $40 each after taking markdowns equal to 20% of the actual selling price. Originally all the cassette players had been purchased at the same price and were marked up 50% on cost. What was the gross margin percentage earned in this situation?

14. An appliance manufacturer produced a line of small appliances advertised to sell at $30. The manufacturer planned for wholesalers to receive a 20% markup, and retailers a 33⅓% markup. Total manufacturing costs were $12 per unit. What did retailers pay for the product? What were the manufacturer's selling price and percentage markup?

15. A housewares manufacturer produces an article at a full cost of $4.80. It is sold through a manufacturers' agent directly to large retailers. The agent receives a 20% commission on sales, the retailers earn a margin of 30%, and

the manufacturer plans a net profit of 10% on the selling price. What is the retail price of this article?

16. A building materials manufacturer sold a quantity of a product to a wholesaler for $350, and the wholesaler in turn sold it to a lumberyard. The wholesaler's normal markup was 15%, and the retailer usually priced the item to include a 30% markup. What is the selling price to consumers?

17. From the following data, calculate the return on investment, based on a definition of *investment* that is useful for evaluating managerial performance:

Net sales	$800,000
Gross margin	280,000
Total assets	200,000
Cost of goods sold	520,000
Liabilities	40,000
Average inventory	75,000
Retained earnings	60,000
Operating expenses	240,000
Markup	35%