

## Section C

## Pricing

When demand is inelastic, the quantity demanded changes by a smaller percentage than price. Now, suppose the elasticity of demand for bread is .25. If the price of bread falls by 20%, this suggests that the quantity of bread sold will rise by 5% (25% of 20%). The 20% decrease in price is larger than the 5% increase in sales (quantity), so Total Revenue falls. On the other hand, if the price of bread were to increase by 16%, sales (quantity) would fall by 4%, and this would push Total Revenue up. Thus, when demand is inelastic, Total Revenue rises when price rises (output falls), and Total Revenue falls when price falls (output rises).

To a management accountant, understanding this relationship is important because if the coefficient of elasticity is known, then one can advise whether an increase or decrease in prices will maximize total revenue for the firm. The relationship is shown in the table below:

	Elastic $E > 1$	Inelastic $E < 1$	Unitary Elasticity $E = 1$
<b>Price Increases</b>	(TR Decreases)	TR Increases	TR Is Unchanged
<b>Price Decreases</b>	TR Increases	(TR Decreases)	TR Is Unchanged

Note: Memorizing this table for the exam will be helpful.

Question 16: If a product's demand is elastic and there is a decrease in price, the effect will be:

- a) A decrease in total revenue.
- b) No change in total revenue.
- c) A decrease in total revenue and the demand curve shifts to the left.
- d) An increase in total revenue.

(CMA Adapted)

Question 17: If the elasticity of demand for a normal good is expected to be 2.5, a 10% reduction in its price would cause:

- a) Total revenue to fall by 10%.
- b) Total revenue to fall by 25%.
- c) Quantity demanded to rise by 25%.
- d) Demand to decrease by 10%.

(CMA Adapted)

## Supply

The **law of supply** states that in the short run, there is a positive relationship between the price of a good or service and the quantity supplied. As the price of a good increases, producers are willing to supply more of the good to the market, causing an increase in the total quantity supplied. Similarly, as the price of the good decreases, producers are willing to supply less of it to the market because of the lower selling price. This causes a decrease in the total quantity supplied to the market as prices fall.

The law of supply is represented graphically as an upward sloping line.

### Market Equilibrium

**Market equilibrium** is defined as the **point where the demand curve intersects with the supply curve**.

This point determines the market price and the quantity that will be exchanged of a good, because at this point of intersection, the market price (the "equilibrium price") is such that the quantity demanded by consumers is exactly equal to the quantity supplied by firms.

Therefore, the pricing of any product or service is affected by the demand for and the supply of the product or service.

Many other factors affect pricing as well, including the market structure a particular firm operates in, the ways in which the firm differentiates its product from its competition, customers' perceptions of the value in the firm's products or services, what the competition is doing, and so forth.

### Short-Run Equilibrium Pricing

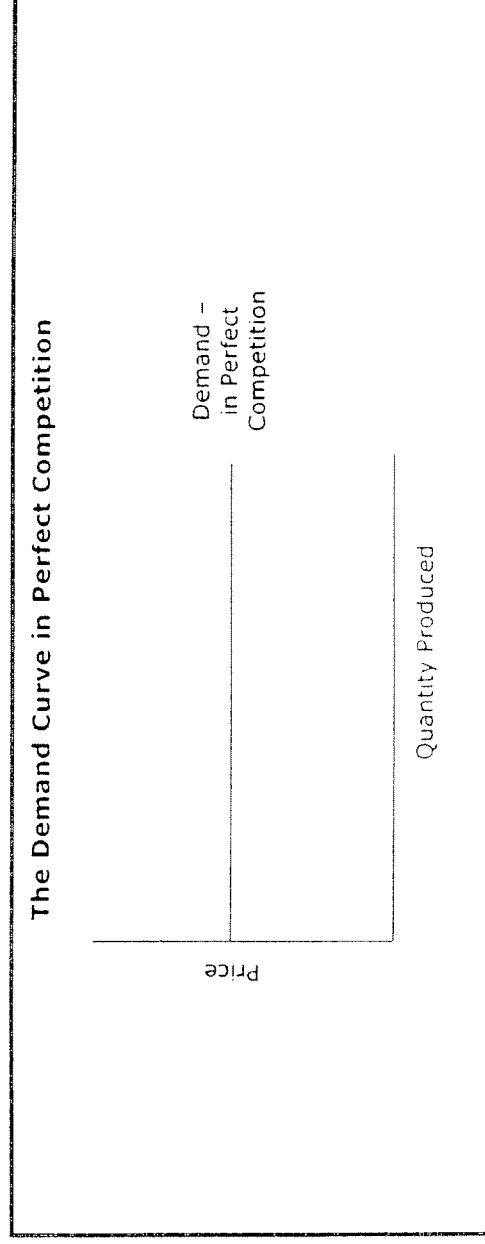
Nearly every firm has some fixed costs. As long as the revenue the firm can earn from producing and selling its product is greater than the firm's variable cost for that unit, the sale of that unit is contributing something to covering the fixed costs. However, if the equilibrium price at every level of output is lower than the firm's average variable cost, the firm will shut down because it will lose more by producing anything than it loses by producing nothing at all.

The price where the firm is just covering its average variable cost but where there is nothing extra to put toward covering the fixed costs is called the **shut-down price**. At this price, the firm is indifferent between producing or not producing. At any price below the shut-down price, the firm will shut down because there is no output level at which any variable costs can be covered.

If the equilibrium price is greater than the firm's average variable cost, any profit-maximizing firm will produce at the point where its marginal revenue is equal to marginal cost, because that is the output level at which its profit will be the greatest. Any time the marginal revenue of a unit is greater than that unit's marginal cost, producing and selling the unit will add to net income. If the marginal cost is greater than the marginal revenue, producing and selling that unit will reduce net income. So the point where further increases to output stop is the point where marginal revenue and marginal cost are equal. This determines how much the firm will produce.

### Short-Run Equilibrium Pricing In Pure Competition

The demand curve for a firm in pure competition is a horizontal line.



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The short-run equilibrium price for a firm in a perfectly competitive market is the market price. For a firm that is a price taker, as a firm in a perfectly competitive market is, the firm's price is also its average revenue as well as its marginal revenue. The horizontal demand line on the graph above is all of those things: Demand =  $AR = MR = P$ . As the firm increases its sales, its total revenue increases by the same amount for each unit sold.

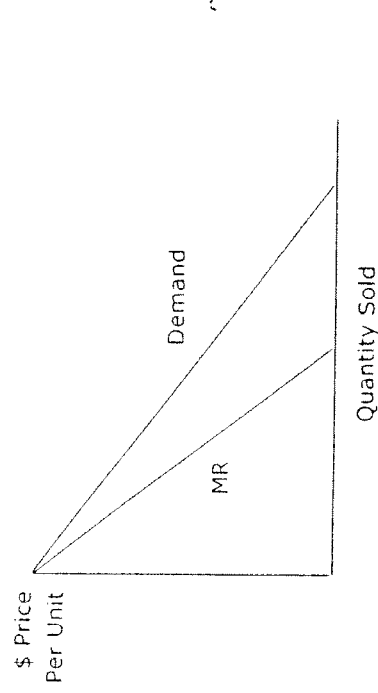
Since a firm in a perfectly competitive market wants to maximize its profits, it will produce at the level where its marginal cost of production is equal to the market price of the product (which is equal to its marginal revenue), as long as that market price is greater than the firm's average variable cost.

So in a perfectly competitive market, the price is determined by the market, and then the member firms pick the quantity of output that will maximize their profits – where their marginal revenue (the market price) equals their marginal cost. A perfectly competitive firm adjusts its level of output in response to changes in the market price to maximize its profit. However, this adjustment of output will have an immaterial effect on the total supply of the product available, because any individual firm constitutes a very small part of the total market. Thus, the output decisions that individual firms make have no effect on the market price.

The individual firm in pure competition is a **price taker**. In all other market structures (monopoly, monopolistic competition and oligopoly), where member firms face downward sloping demand curves, the individual firms are **price makers**, because firms in those industries can influence the product price to one degree or another through their output decisions.

### Short-Run Equilibrium Pricing in Monopoly

The demand and marginal revenue curves for a monopolist are illustrated in the graph below.

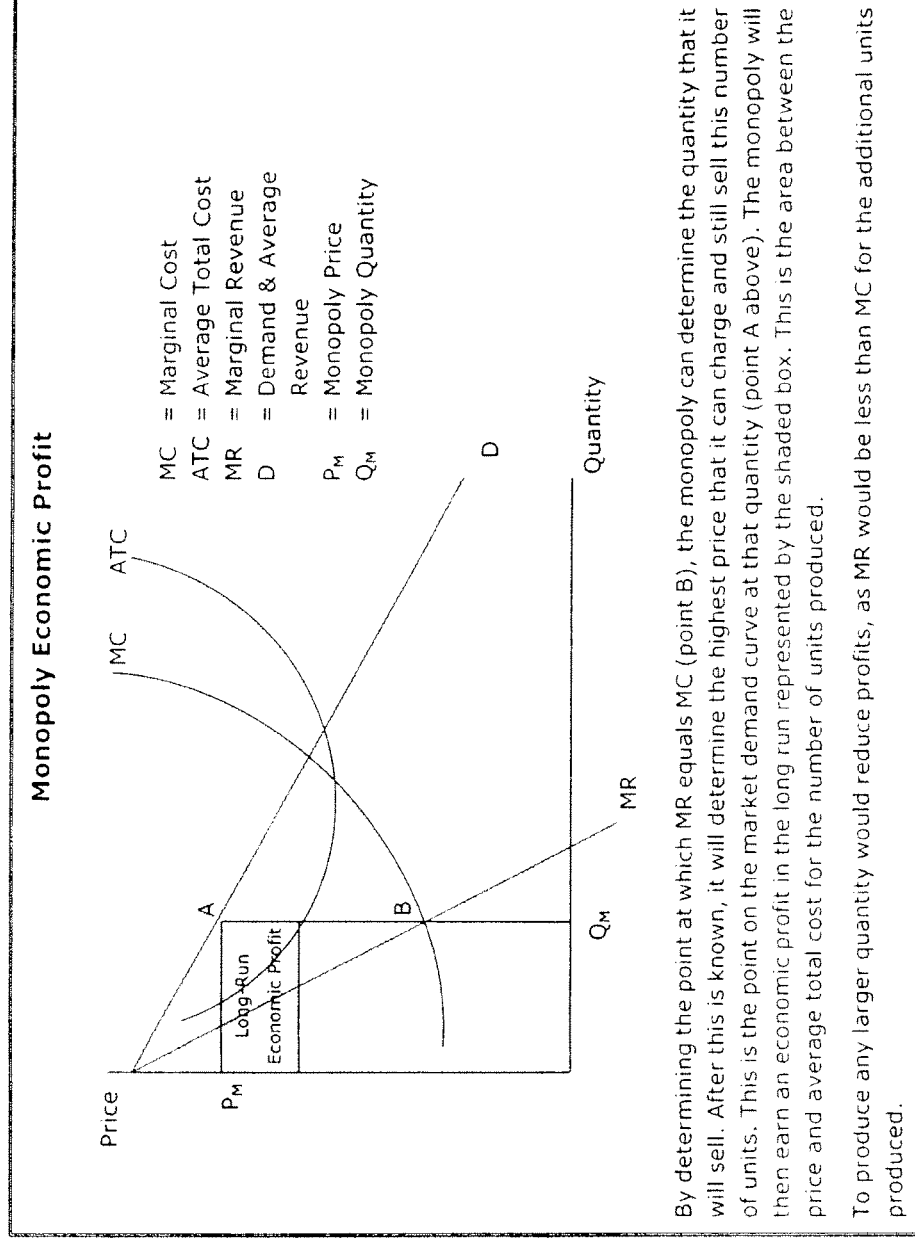


The marginal revenue curve (MR) is below the demand curve because as production increases, a monopolist that charges the same price for all of its output will have to lower its price in order to get consumers to buy that additional output. Therefore, the additional (marginal) revenue received from producing an additional unit will be less than the price received for that unit.

Monopolies determine the quantity to produce in the **same manner as firms in perfect competition** – they will produce as many units as they can until the marginal cost of production exceeds the marginal revenue from selling one more unit. Monopoly *quantity* is determined at the point where  **$MR=MC$** .

The determination of the price is done differently for a monopoly than it is for a firm in perfect competition. For the perfectly competitive firm, the price is set by the market and the individual firm cannot change it. However, in a monopoly, the monopolistic firm is able to influence the price that is charged. After the firm determines the quantity it will produce, it simply extends this quantity to the demand curve and sees what the maximum selling price is that it can charge for that number of units.

The graph on the following page shows the determination of quantity and price along with the economic profit that monopolies achieve. **Economic profit** is the amount by which total revenue exceeds the **total economic costs** of the company. Total economic costs include all of the explicit (cash) costs that are paid by the firm as well as the relevant implicit (opportunity) costs.



In a monopoly, the firm **produces less than the ideal output level** as the price of the product exceeds the marginal cost of its production. Compared with a perfectly competitive market, **prices will be higher and output levels lower** in a monopolized market. Additionally, **options are limited to consumers** as there is only one supplier of the product in the market.

In other market structures, the existence of economic profit in the industry would entice other firms to enter the market. The resulting increase in supply and in competitive pricing would cause the price to decrease to the point where there was no more economic profit for the member firms. However, one of the characteristics of a monopoly is that the barriers to entry are very high. Because of this, other firms cannot easily enter the market and so the economic profit or loss that a monopoly generates will usually not have any impact on the number of firms operating in the market. There will always be a single firm in the market, and that single firm will continue to charge higher prices and to generate economic profit.

### Short-Run Equilibrium Pricing in Monopolistic Competition

The demand curve of a monopolistically competitive firm is **highly elastic**. Remember we said that the demand for a product is *elastic* if the quantity demanded changes by a *larger percentage* than the associated change in the product's price.

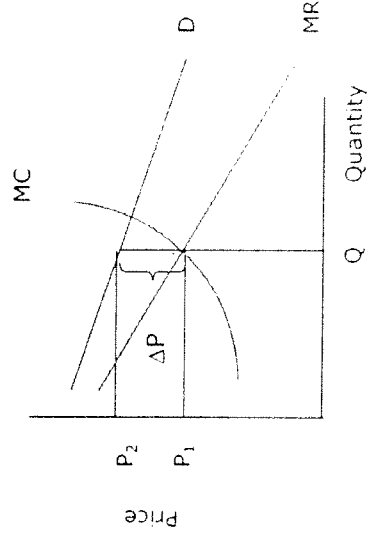
The elasticity of the monopolistically competitive firm's demand schedule is what distinguishes it from pure monopoly and from pure competition. The monopolistic competitor's demand is more elastic than the demand curve of the pure monopolist because the monopolistically competitive firm has many competitors that are selling products that are close substitutes for its product. Since the monopoly firm has no competitors, its demand curve is much less elastic. But the monopolistic competitor's demand is not perfectly elastic (a horizontal line) as the demand of the firm in pure competition is. The monopolistically competitive firm has

less competition than the purely competitive firm has, and its products are differentiated from those of its competitors. The products are similar but they are not perfect substitutes as is the case with pure competition.

In the short run, the monopolistically competitive firm maximizes its profit (or minimizes its loss) by producing at the level where marginal revenue equals marginal cost. After it sets its production level, it can do on a smaller scale the same thing the monopolist does: it can increase its price to the point on its demand line that indicates what it can charge for the quantity it wants to produce. In the short run, it realizes an economic profit, the area between  $P_1$  and  $P_2$  on the graph that follows.

However, in the long run, other firms will enter the industry because of the economic profits to be earned and as a result, the monopolistically competitive firm will ultimately have to lower its price to the point where there is no economic profit but MR and MC are equal.

**Short-Run Equilibrium for a Monopolistically Competitive Firm**



### Short-Run Equilibrium Pricing in Oligopoly

In one model of oligopoly, it is theorized that a **price decrease by one company will usually be matched** by another's price decreases, but a **price increase by one company will usually not be followed** by the other companies.

If a firm increases its price, it will lose volume to the other producers because by doing nothing, the other producers will secure more volume. If other firms fail to match a lower price, a price decrease would allow an oligopolist to capture more of the market. However, competitors tend to match a price decrease; so although a lower price will capture a higher volume, the increase in volume will not be enough to offset the lower price, and total revenue will decrease.

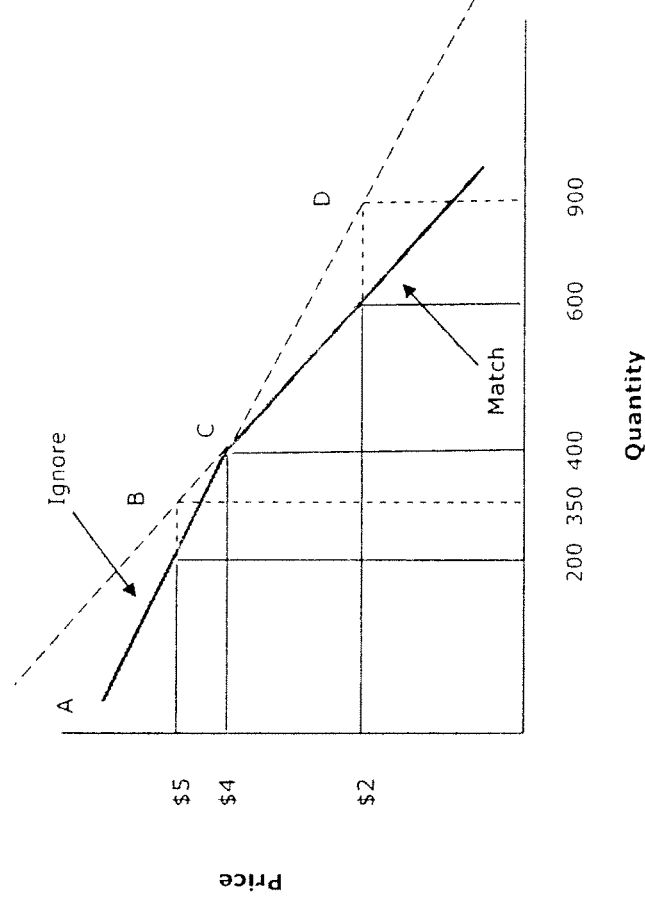
Because of this, an oligopolist faces a demand curve that has distinctly elastic and inelastic parts to it. The curve is relatively elastic when prices increase because the other firms will not follow a price increase and the firm will lose sales. This means that a small increase in price will lead to a large decrease in demand. Because of this, the firm is unlikely to raise its prices.

The curve is relatively inelastic when a firm decreases its price. This is because the other firms will match the price decrease. Therefore, the firm will need to make a large price decrease in order to gain any sales. Because the decrease in price will be larger than the increase in sales, the firm is unlikely to lower its price.

Given that there is a negative effect of either increasing or decreasing the price, prices in an oligopoly tend to be "sticky" (meaning that they do not change easily).

This kinked demand curve is shown below.

Kinked Demand Curve of an Oligopolistic Firm



If an oligopolistic firm believes if it increases its price from \$4 to \$5, that its rivals will **match** its price increase, then the firm will expect to gain  $\$150 (350 \times \$5) - (400 \times \$4)$  in sales. But it is more likely that its rivals will **ignore** the price increase, so the firm that raises its prices will be able to sell only 200 units after it raises its price to \$5 rather than the 350 units it expects (Point B). Thus, the firm's total revenue would fall from the oligopolistic equilibrium (Point C) of  $\$1,600$  to  $\$1,000$ . For any price increase that is unmatched by the other oligopolistic firms, this particular firm's demand segment (AC) will be quite elastic.

Now suppose that one of the oligopolistic firms tries **decreasing** its price from \$4 to \$2. If the firm expects that its rivals will **ignore** its price decrease, it will expect to gain  $\$200 (900 \times \$2) - (400 \times \$4)$  in sales. But it is more likely that its rivals will **match** the price decrease, and instead the firm will lose  $\$400$  in total revenue  $(400 \times \$4) - (600 \times \$2)$ , as it will be able to capture only 600 units, or an additional 200 units of sales following the price reduction rather than the 900 units it expects (Point D).

So an oligopolist actually faces two demand curves: one if its competitors match any price change that it makes and one if its competitors ignore any price change that it makes. Since competitors are likely to **match** a price decrease and **ignore** a price increase, the true demand curve faced by an oligopolistic firm will be kinked, as in the solid sections of the two demand curves shown above.

This illustrates the fact that oligopolistic firms strategically interact, and that every time a firm makes a decision about price or output, it must think about how its rivals will respond. Such strategic interaction may result in firms attempting to collude, or act in unison, to keep prices artificially high, for instance, at the level that would be expected if there were only one firm in the market with no competition. Such behavior (price fixing) is illegal in the U.S. under antitrust regulations. Even for parts of the world where it is not illegal, however, such agreements are many times doomed to failure, as individual firms will eventually succumb to the temptation to cheat on the collusive agreement by lowering its prices in order to capture a larger share of the market. Economists using "game theory," a branch of mathematics, model this type of strategic interaction between firms.

## Pricing Strategy

Both internal company factors and external factors in the company's environment affect a company's pricing decisions.

### Internal Factors Affecting Pricing Decisions

Internal factors that the company takes into consideration in setting prices are:

- **Its marketing objectives** – Its target market and the positioning the company has chosen for the product will affect the price. For example, if Martin Logan develops a new type of speaker for audiophiles (an audiophile is a person for whom the quality of sound in an audio system is very important) they will probably charge a very high price for it. This is known as **product quality leadership**. Other examples of objectives include:
  - 1) **Survival**, by a firm that has too much capacity and not enough sales;
  - 2) **Profit maximization**, when the company estimates what its demand and its costs will be at different price levels and chooses the price that produces the maximum current profit;
  - 3) **Market share leadership**, which will require that prices be set as low as possible;
  - 4) Setting prices low to **discourage competition**; and
  - 5) Setting prices to maintain resellers' loyalty, to avoid government intervention, to stabilize the market, to draw customers into a retail store, or setting the price of one product in order to improve sales of other products of the company.
- **Its marketing mix strategy** – Pricing decisions need to be coordinated with the other decisions in the marketing mix – product design, distribution (place), and promotion plans – to create a consistent marketing program. Decisions made about quality, promotion and distribution will affect pricing decisions. Marketers must consider the total marketing mix, because customers want products that give them the best value for the price they pay.
  - 1) **Target costing** may be used. Target costing begins with the selling price and then figures out how to produce the product at a cost that permits an adequate profit.
  - 2) Price and quality may be determined by customer needs. For instance, a piece of equipment could be manufactured inexpensively and sold cheaply; but its ongoing maintenance might be high. Customers might prefer equipment that they pay more for but which will be maintenance-free.
- **Its costs** – The company will want to charge a price that covers all of its costs, both fixed and variable, and gives it a fair profit. Costs include not only production costs but also distribution costs and selling costs. Costs determine the lower limit for prices. If a company's costs are higher than those of its competitors for the same product, the company will have to either price the product above its competitors' prices, or it will be less profitable than its competitors. This will put it at a competitive disadvantage.
- **Organizational considerations** – The company's management needs to decide who has the authority to set prices. In large companies, prices are usually set by division or product managers. In some cases, salespeople negotiate with customers within set price ranges. Others with input into the pricing decision are sales managers, production managers, finance managers, and accountants. However, senior management still determines pricing policies and may even approve prices proposed by lower-level managers.

## External Factors Affecting Pricing Decisions

External factors also affect pricing decisions, such as:

- **The market and demand** – The market and demand for the product set the upper limit for prices. Factors include what type of market the company operates in (monopoly, oligopoly, oligopolistic competition, or pure competition); what consumers perceive the value of the product to be; and what the product's demand curve and its price elasticity of demand is. Since these topics are covered extensively in the Part 1 CMA exam, they will not be elaborated on here.
- **Competitors' activities** – Competitors' prices, offers, and possible competitor reactions to the company's pricing is another external factor to consider. Companies need to know the prices and the quality of their competitors' products, and they need to compare their costs with those of their competitors. Consumers considering a purchase compare products in terms of value and price. If Martin Logan's speakers sound better than Bose's speakers, for example, Martin Logan can charge more. But if Martin Logan's speakers sound about the same as Bose's speakers, Martin Logan will have to price its speakers close to Bose's prices, or it will lose sales.
- **Other external factors** – Factors such as inflation, recession, and interest rates affect pricing strategies, because they affect the product costs as well as consumers' perceptions of the product's value to them. Resellers' reactions are also important, because the company's price needs to be set so that its resellers make a fair profit. The government also affects pricing decisions, with taxes and regulations being a concern. Social concerns may also be a factor that needs to be considered.

### INTERNAL FACTORS

Marketing Objectives

Marketing Mix Strategy

Costs

Organizational Considerations

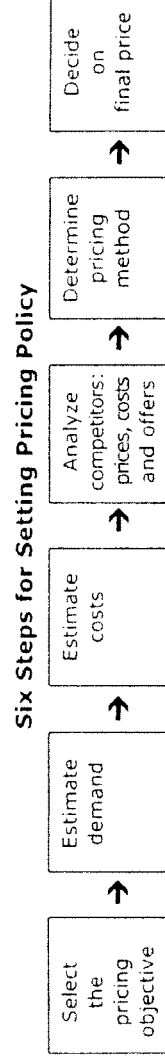
### EXTERNAL FACTORS

The Market and Demand

Competitors' Activities

Other External Factors

In summary, the company will follow a six-step, or similar, process in setting its pricing policy, as shown below:





### General Pricing Approaches

The price the company decides on will be higher than an amount that would not produce a profit and lower than one that is too high to produce adequate demand. The price floor is product cost. The ceiling is customer perception of the product's value. The best price is between these extremes and is determined by competitors' prices as well as the internal and external factors discussed above.

Thus, the basic factors that go into pricing decisions are: (1) **product cost**; (2) **customer perception** of the product's value; and (3) **competitors' prices**. Prices are usually set by a general pricing approach that includes one or more of these considerations.

Three general pricing approaches are used:

- 1) the **cost-based approach**,
- 2) the **value-based approach**, and
- 3) the **competition-based approach**.

### Cost-Based Approaches

Cost-based pricing includes cost-plus pricing, break-even pricing, and target profit pricing.

When cost-plus pricing is used, the company simply determines what its costs are and then adds a standard markup to the cost to arrive at the price for the product. Manufacturers often use cost-plus pricing, as do construction companies and printers. Professionals such as attorneys and accountants typically do the same thing. Some government contracts are also based on cost plus a specified markup.

The drawback to cost-plus pricing is that it ignores both customer demand and competitors' prices. But markup pricing persists, for several reasons:

- 1) Sellers can be more confident about their costs than about demand for their product. If the price is tied to the cost, then they do not have to make pricing adjustments to reflect changes in demand.
- 2) If all of the companies in an industry use the same pricing method, prices are similar and price competition is minimized.

Many decision-makers believe that cost-plus pricing is a fair way to set prices, because the sellers earn a fair return on their investments while not increasing their prices in response to an increase in demand.

In **break-even pricing** and **target profit pricing**, the firm determines a price at which it will break even or make a target profit. Target pricing is based on forecasts of total cost and total revenue at various sales volume levels.

However, as the price increases, demand decreases, and vice versa. Break-even pricing and target profit pricing do not take the price-demand relationship into account. So when this method is used, the company must also realize that sales volume will be affected by price and must build that into the model.

In cost-based pricing, the company designs a product, figures out the total costs to make the product, and sets a price that covers its cost plus a factor for profit. The marketing people must then convince the buyers that the product is worth that price. If the market decides that the price is too high, the company has to reduce its price and settle for lower profits, or leave the price high and settle for lower sales, also resulting in lower profits.

### Value-Based Approaches

Value-based pricing (also called buyer-based pricing) bases prices on **buyers' perceptions of the value of the product** instead of on the seller's cost. Value-based pricing is the reverse of cost-based pricing. The target price is based on customer perceptions of the value of the product. The targeted value and price are then used in making all the decisions about the product's design and what its costs must be. The pricing process begins with consumer needs and value perceptions, and the price is set to match that. Thus, price is a part of the marketing mix variables that are considered before the marketing program is set.

The company must, of course, be able to find out what value future buyers will assign to various products, and measuring perceived value can be difficult. If the company overestimates perceived value, it will price the product too high and sales will suffer. If the company underestimates the product's perceived value, it will underprice the product. Sales will be good, but the low price will produce less revenue than would be possible.

More companies are adopting value pricing strategies, and this has led to introduction of less expensive versions of brand-name products.

An important type of value pricing is called **everyday low pricing**. Everyday low pricing is used at the retail level to charge an everyday low price with few temporary price reductions.

Another type of pricing is called **high-low pricing**, and it involves charging high everyday prices but offering frequent discounts and sales. But constant sales and promotions increase costs and erode consumer confidence in the everyday prices. Consumers also lack the patience to wait for specials in order to make their purchases.

But to offer everyday low prices, a company's **costs** must be low. If a retailer lowers its prices but its costs remain high, it will not be in business for long.

### Competition-Based Approaches

Customers' use competitors' prices to form their perceived value of a product, and **going-rate pricing** is based almost entirely on competitors' prices. This does not mean that the company charges the same price as its competitors charge. It may charge the same price as its competitors, or it may charge more or less.

The firm's strategy may be determined by whether its products are homogeneous with (identical to) or nonhomogeneous with (different from) its competitors' products. If the industry is one selling a commodity, i.e., a homogeneous good with little differentiation among producers, competing firms normally all charge the same price. Smaller firms follow the lead of large firms.

However, if a company is a market leader faced with lower-priced competitors, it can elect to maintain its price while raising the perceived value or quality of its product, or perhaps launch a lower-priced "fighter" line. If the company cannot find ways to enhance its product or service, it will have to meet the competitor's price reduction. Responding to price cuts by competitors is complicated. It is important to attempt to understand the competitor's intent and potential duration of the price change.

Going-rate pricing is used extensively. Companies accept the going price as representative of the price that will yield a fair return.

Bidding on jobs also involves competition-based pricing. A company submits a bid that is based more on how it thinks its competitors will bid rather than on its costs. The winning bid will be the lowest price. The company tries to bid low enough to get the business without going so low as to make the contract unprofitable. At the same time, it wants to get as much as possible for the contract, so it doesn't want to underprice it.

### New Product Pricing Strategies

When a company introduces a new product, it has to determine a positioning strategy for its product on quality and price and set the price. A company generally uses a **pricing structure** or pricing strategy that it applies to all the different items it produces and/or sells. The pricing structure incorporates changes in product prices, because a new product will be priced differently from an established one. Prices will be adjusted from time to time to reflect changes in costs and demand. And prices of an individual product will change as the product moves through its life cycle.

Some pricing strategies that may be followed when a new product is introduced are the following:

- **Market penetration pricing** – When a company wants to penetrate a market quickly and maximize its market share with a new product, it may set a low initial price with the expectation that high sales volume will result. The resulting high sales volume is expected to lead to lower unit costs and higher long-term profit. The goal is to win market share, stimulate market growth and discourage competition.
- In order for this strategy to work, the market must be price-sensitive, so that sales will increase as a result of the low price. Production and distribution costs must decrease as sales volume increases. The low price must be sustainable, and it must be effective at keeping competitors out.
- **Market skimming** – A company unveiling a new technology may set an initial high price to “skim” the market and then quickly reduce the price to attract new customers after those who could afford to pay the highest price have purchased. This is often followed by subsequent lowering of prices, thereby skimming maximum revenues from the different market segments.

### Product Mix Pricing Strategies

A product that is part of a product mix where the various products have related demand and costs and face different amounts of competition needs to be priced so as to maximize the profits of the entire product mix. Product mix pricing strategies include **product line pricing**, **optional-product pricing**, **captive-product pricing**, **by-product pricing**, and **product bundle pricing**.

- **Product-line pricing** – A company generally creates product lines rather than single products. Each successive item in the line offers more features and costs more. An example could be a jewelry store that offers ladies’ earrings at four price levels: \$10 for very low; \$25 for low; \$50 for average; and \$100 for high quality. **Price points** are used in product-line pricing to establish levels such as the ladies’ earrings, and customers shop at their preferred price point.
- **Optional-product (feature) pricing** – Optional products, features and services can be offered along with the main product, such as a personal computer with a minimum amount of memory and speed advertised at a low price with optional upgrades available. Pricing is difficult because the company must decide what features are included as standard, and which are options.
- **Captive-product pricing** – When a product requires the use of additional or “captive products,” such as a low-priced razor that requires high-priced replacement blades, this is captive-product pricing. Ink-jet printers are typically priced low, because the company makes its money on the sale of ink cartridges for them.
- **By-product pricing** – Production of certain goods such as steel or chemicals may result in by-products. These by-products have no real value to the manufacturer that generates them. However, storing and/or disposing of them will create additional costs, which will impact the profitability and thus the price of the main product. Instead, the manufacturer will try to find a place to sell the by-products, perhaps to other manufacturers that can use them as raw materials. By-products should be priced at as high a price as possible, but the manufacturer should accept any price that is higher than the cost of storing and delivering them to the purchaser. Whatever the manufacturer can receive from their sale reduces the cost of the main product, and some by-products can even be profitable in themselves. Furthermore, recycling industrial waste from one manufacturing process into raw material for another manufacturing process is an environmentally responsible business practice.
- **Product-bundling pricing** – Product bundling occurs when a sellers bundles products, features or services together and offers the bundle at a price that is lower than the price of the items if purchased individually. For example, a software vendor may create a suite of programs and offer them together at a reduced price. If the customer has only one option – to purchase the entire bundle or to purchase nothing – that is called **pure bundling**. However, if the consumer has a choice between buying the bundle or buying one or more of the bundled items individually (at a higher per-unit price), that is called **mixed bundling**.

## Short-Run and Long-Run Pricing Decisions

Most pricing decisions are either short-run (less than a year) or long-run (longer than a year). Two key differences affect pricing for the long run in relation to the short-run:

- 1) Costs that are irrelevant for short-run pricing, such as fixed costs, may be relevant in the long run as they become variable costs. In the long run, all costs are variable.
- 2) Profit margins in long-run pricing decisions are set to earn a return on investment. In the short run, prices are decreased when demand is low and increased when demand is strong. Short-term decisions maximize contribution.

**Short-run** pricing decisions are usually influenced by short-run conditions that affect the demand and supply, such as capacity – either too much or too little – or competitors' prices.

Over the **long run**, however, customers prefer stable and predictable prices. Greater price stability is also better for the company selling the goods, because it (1) reduces the need to monitor competitors' prices; (2) improves the company's ability to plan; and (3) builds long-term business relationships.

Both short-run pricing and long-run pricing take into consideration the "three Cs," customers, competitors and costs. However, their starting points differ.

## Short-Run Pricing

Short-run pricing is opportunistic and more responsive to changes in demand than long-run pricing.

In short-run pricing decisions, fixed costs are frequently irrelevant, because they cannot be changed in the short term. This means that at a minimum the selling price needs to be at least the variable costs of production. For instance, the cost of a special order will be only the variable costs associated with its production, since the fixed costs will not increase because of the special order (as long as the company has the excess capacity to fill the order without reducing production of other goods).

Availability of production capacity also plays an important part in short-term pricing. If a company has unused (excess) capacity, it will be more likely to price its products lower than it would be if it were operating at 100% capacity. They will do this because it is better to make a small profit and use the capacity than to have the factory sit unused.

Another consideration in short-run pricing is competitors and what they are bidding. If bidding on a one-time special order, the company would want to bid a price that covers its incremental costs but is lower than competing bids.

## Long-Run Pricing

To determine a long-run price that will be stable over time and also earn the desired long-run return, a company must know its long-run costs, including all costs involved in the production and sale of the product. This incorporates fixed costs and indirect manufacturing costs.

There are two approaches to setting long-run prices: (1) a **market-based** approach, or (2) a **cost-based** approach, also called **cost-plus**. The market-based approach starts with the customer and competitor, and then looks at costs. The cost-based approach looks first at costs and considers customers and competitors secondarily. Which strategy an individual company uses generally depends on what type of market the company is operating in.

## The Market-Based Pricing Approach

Note: This is the first of the two long-run pricing approaches.

The market-based approach focuses on what the customers want and how competitors will react to what the company does. Companies operating in **competitive markets**, such as oil and gas, use this approach.

In this market, one company's products or services are very similar to another company's, so an individual company has no influence over the price to charge. Each company accepts the market price.

**Target pricing** is an important form of market-based pricing. A target price is a price based on knowledge of customer perception of the value of the product or service and what customers are willing to pay, as well as knowledge of competitors' responses.

Steps in establishing a target price and a target cost are:

- 1) The company develops a new product that meets the needs of potential customers.
- 2) The company estimates the price that potential customers will be willing to pay, based on customers' perceived value for the product, as well as projected sales at that price. Prices that customers will be willing to pay and projected sales come from marketing department input, which may be determined through market research or other marketing techniques.

Pricing would also be based on expected responses from competitors. This information could come from competitors' customers, suppliers and employees. Or it may be derived by means of **reverse engineering**, which is the process of taking apart competitors' products and analyzing them to determine design, materials and technology used.

- 3) The target price then determines what the **target cost** per unit needs to be in order to earn the target operating income per unit. The target cost per unit is the target price minus the target operating income per unit.

Calculation of the target cost must include all future costs, both variable and fixed. But the **target cost** is only that: a target to shoot for. The target cost may be lower than the company's actual current costs. The company must then find ways to reduce costs such as seeking cost concessions from suppliers.

- 4) **Value engineering** is performed. Value engineering is an evaluation of all the business functions in the value chain with the objective of reducing costs while satisfying customer needs. This may lead to design improvements, materials specification changes or modifications in manufacturing methods.

In **value engineering**, management distinguishes between a **value-added cost** and a **non-value-added cost**. If a **value-added cost** were eliminated, it would reduce the product's value, or usefulness, to customers. Since value-added costs cannot be eliminated, value engineering seeks to reduce their costs by improving efficiency.

On the other hand, if a **non-value-added cost** were eliminated, it would not reduce the value or utility of the product. A non-value-added cost is a cost the customer is not willing to pay for. Examples of non-value-added costs are costs for expediting, re-work and repair; and these are costs that can be reduced through improvements to the manufacturing process.

**Locked-in costs** must also be recognized in value engineering. For example, direct materials costs per unit are **locked in** (or designed in) at an early stage in the development of a product, and they are difficult to reduce later. Scrap and re-work costs may be locked in by a faulty design. For example, in the software industry, costly and difficult-to-fix errors that appear during coding and testing are already locked in by bad design at the beginning. The costs may not have been incurred yet, but they will be. If the costs have not been locked in early, costs can be reduced right up to the time they are incurred, and the costs may be reduced by improved operating efficiency and productivity measures. However, when locked-in costs are a factor, the key to reducing them is in the product design, and value engineering must focus on making innovations and modifications at this early stage.

## The Cost-Based Pricing Approach

Note: This is the second of the two long-run pricing approaches.

The cost-based approach focuses on what it costs to manufacture the product and the price necessary to both recoup the company's investment and achieve a desired return on its investment. It is used in a market where there is **product differentiation**, such as automobile manufacturing.

A company using this method calculates the cost of production and then adds a markup. This markup is a percentage of the cost of production. The company may use whatever it wants as the cost of production, but the most common costs to use are:

- 1) Total cost,
- 2) Absorption manufacturing costs,
- 3) Variable manufacturing costs, or
- 4) Total Variable costs.

The company must be certain that it **does not take into account** the cost of any unused fixed assets when calculating its cost of production. If the cost of these unused fixed assets were included in the cost of the product, it would cause the price to be based on a figure that is higher than the actual "cost" of production. The higher price would, in turn, lead to a decreased demand and further idle fixed assets. This is called the **downward demand spiral**. In order to prevent this, the company should not include the costs of idle fixed assets in its calculation of the cost of production for the purpose of determining prices.

In cost-plus pricing, a target percentage markup over cost is determined, and the price is based on the full cost per unit to manufacture the product, plus the markup.

The target percentage markup is based on the target annual operating income the company desires, divided by invested capital. "Invested capital" for this purpose is defined in many ways, but one of the more common is that it is equal to Total Assets, both long-term and current. However, the "target percentage markup" is not the same percentage as the target "rate of return on investment," because the divisors are different. The company must first calculate what its target rate of return on investment is, then express that as a dollar amount per unit, and then use that dollar amount to determine the markup percentage that is needed to achieve that return.

**Example (if a company has one product only):** ABC Industries has total invested capital (total assets) of \$100,000,000. If ABC's pre-tax target return on invested capital is 15%, its target annual pre-tax operating income needs to be  $15\% \times \$100,000,000$ , or \$15,000,000. ABC estimates that it can sell 200,000 widgets per year. Therefore, ABC will require pre-tax operating income of \$75 per unit ( $\$15,000,000 \div 200,000$ ) to achieve a pre-tax net operating income of \$15,000,000. Therefore, \$75 must be added to the cost per unit to derive the price to charge. If the cost per unit is \$750, the markup percentage is  $\$75 \div \$750$ , or 10%, and the price will be \$825 per unit ( $\$750 + \$75$ ).

In practice, of course, companies rarely have only one product, and so it can be difficult to determine the invested capital for one product out of the number of products produced. Therefore in practice, companies usually estimate the markup percentage that will be sufficient to earn the required return on invested capital. The markup percentage used is also affected by competition. If a market is highly competitive, markups and thus profit margins will tend to be lower.

Question 18: A newly developed product by Paterno Co. is expected to sell 5,000 units per year and the costs of producing this product are expected to be, in total, \$450,000 per year. Paterno would like to have a gross profit of 30% of the sales price. In order to achieve this, what price (rounded to the nearest dollar) does Paterno need to set for this product?

- a) \$117
- b) \$120
- c) \$129
- d) \$135

(HOCK)

### Government Contracts, the CASB, and Cost Plus Pricing

In 1970, the US Congress established the Cost Accounting Standards Board (CASB) to achieve uniformity and consistency in cost accounting standards for contracts and subcontracts with the US government. The CASB established standards regarding cost measurement, assignment and allocation in contracts with the US government. The standards are applicable only to contracts greater than \$500,000.

This was a result of the fact that often the US had paid large amounts for simple products because of contracts that were negotiated as cost plus, and the suppliers had been very liberal in their interpretation of what was a cost.

### Cost-Plus and Target Pricing Used Together

In a market where there is product differentiation, companies would be more likely to consider both the market and the costs – giving equal emphasis to both strategies.

Sales prices set by cost-plus pricing are prospective prices only. In the above example, ABC's price for widgets was determined to be \$825 per unit. However, ABC operates in a fairly competitive market, and customer and competitor reactions to this price may require a price reduction to \$720 per unit. This will reduce the markup percentage to only 4%, unless costs are reduced. ABC will need to employ the value engineering described under target pricing in order to reduce its costs if it expects to produce the widgets at its required rate of return.

Target pricing used alone reduces the need to go back and forth between setting a cost-plus price, then evaluating that price in light of customer preferences and competitor responses, then calculating a target cost. Instead, target pricing begins with the customer preferences and competitor responses. The market and the market price then motivate managers to reduce costs to achieve the target cost. If they are not able to reduce costs sufficiently, the company must either redesign the product or accept a smaller profit margin.

### Product Life-Cycle Pricing and Costing

The **product life cycle** is the time from the initial research and development on a product to the point when the company no longer offers customer servicing and support for the product. **Life-cycle costing** tracks and accumulates all the costs of each product all the way through the value chain. Other terms for life-cycle costing are "cradle-to-grave costing" and "womb-to-tomb costing." A product's life cycle usually spans several years.

Life-cycle budgeted costs are used in pricing decisions because they incorporate costs that might not otherwise be considered. If costs for research and development and other nonproduction costs such as marketing, distribution and customer service are significant, it is essential to include them in the product's cost along with the direct manufacturing costs.

The price set is the price that will maximize life-cycle operating income. A company may decide to bring the new product out at an exceptionally high or exceptionally low price and then adjust the price later. A life-cycle budget will incorporate this strategy. Target pricing and target costing often utilize life-cycle costing in order to develop life-cycle budgets for products that estimate costs and revenues over the entire life of the product.

### Product Life-Cycle (PLC) Strategies

Brands, products and technologies all have **life cycles**. The stages in the life cycle of a product are:

- **Product development stage** – During product development, there are no sales and so no revenues. The company's investment costs increase.
- **Introduction stage** – This stage is typically one of slow growth and minimal profits, because of the heavy upfront expenses to introduce a new product.
- **Growth stage** – If the introduction stage is successful, the product will experience rapid sales growth and increasing profits in the **growth** stage.
- **Maturity stage** – Sales growth usually slows down in this stage and profits level off or decrease. The company has to spend more for marketing to defend the product against the competition.
- **Decline stage** – Sales drop and profits fall.

Some products remain in the maturity stage for a long time, and some enter the decline stage but then cycle back to the growth stage, perhaps because the company successfully repositions the product.

Specific marketing strategies are used at each stage of the product life cycle.

### Introduction Stage Strategies

When the product is first launched, the **introduction** takes time, and sales growth is slow. **The marketing objective at this stage is to create trial of the product.** Promotion spending needs to be high in order to educate consumers about the new product and to get them to try it. Distribution channels are selectively built. The company, as well as its competitors, produce only basic versions of the product and focus sales promotion efforts on buyers who are the most ready to buy, the so-called **early-adopters**.

Pricing at this stage may be high, assuming a skim pricing strategy for a high profit margin as the early adopters buy the product and the firm seeks to recoup development costs quickly. However, in some cases a penetration pricing strategy is used and introductory prices are set low to gain market share rapidly.

### Growth Stage strategies

If the new product gets through the introduction stage successfully, it will enter the **growth** stage, when sales increase rapidly. In addition to the early-adopters, who continue to buy, the later buyers will begin buying if they hear favorable information about the product. New competitors will enter the market because of the opportunity for profits and will introduce new product features, causing the market to expand. Prices remain at the same level, or they may fall slightly. Companies keep their promotional spending at a high level, possibly increasing it slightly. The company still needs to educate the consumers, but now it must counter the competition's efforts, as well. Profits increase because promotion costs and fixed manufacturing costs are spread over a larger volume.

**The marketing objective at this stage is to maximize market share.** The firm's strategy in this stage will include continuously improving product quality and adding new product features and models. Pricing may be maintained at a high level if demand is high, or it may be reduced to capture more of the market, as in market penetration pricing. Although product awareness advertising continues, some advertising will be shifted from the goal of building product awareness to the goal of building product conviction and purchase. Sales promotion is less important because consumer demand is heavy. The company will lower prices at appropriate times to attract more buyers. The company uses this time to build an intensive distribution channel. If the company invests heavily in product improvement, promotion, and distribution, it should attain a dominant position in the market. However, it gives up current profits to do so.



### Maturity Stage strategies

The maturity stage usually lasts longer than the other stages, and it creates more challenges to the marketer. Most existing products are in their maturity stage, and most of marketing management is dealing with mature products.

Sales peak during this stage, but sales growth slows down. Because of the slowdown in sales growth, many producers with many products are in the market, so there is overcapacity in the market. Although profits are still high, prices begin to decrease while at the same time promotion costs increase, leading to lower profits. Weaker companies drop out of the market, and only the stronger companies remain.

**The marketing objective at this stage is to maximize profit while defending market share.** At this stage, product managers should look for ways to modify the market, product, and marketing mix. **Modifying the market** means increasing total consumption of the current product by the market. The company will look for new market segments as users and for new ways to increase usage among current customers. **Modifying the product** involves changing things like the product's quality, its performance, its features, or its style in order to attract new users and increase usage. **Modifying the market mix** includes changing one or more of the marketing mix elements (the four Ps – product, price, promotion and place) to improve sales. It might cut prices in response to competition or launch a new advertising campaign or use sales promotions such as coupons or premiums.

### Decline Stage Strategies

Technological advances and other factors ultimately cause sales to decline. In the decline stage, more firms withdraw from the market. The ones that remain may cut back on their product offerings, and they may cut the promotion budget and reduce prices further.

**The marketing objective at this stage is to reduce expenditures and "milk" (make the most of) the brand.** Management needs to identify products that are in the decline stage by monitoring sales, market share, costs and profits, in order to decide whether to **maintain**, **harvest**, or **drop** each of the declining products. If management decides to **maintain** the brand, they may do that without change, if they believe that other competitors will leave the industry. Or, management may decide to maintain the product but reposition it or reformulate it in hopes of moving it back to the growth stage. Alternatively, management may decide to **harvest** the product. This includes reducing costs by withdrawing R&D, advertising, sales promotion and selling support and hope that sales will hold up anyway.

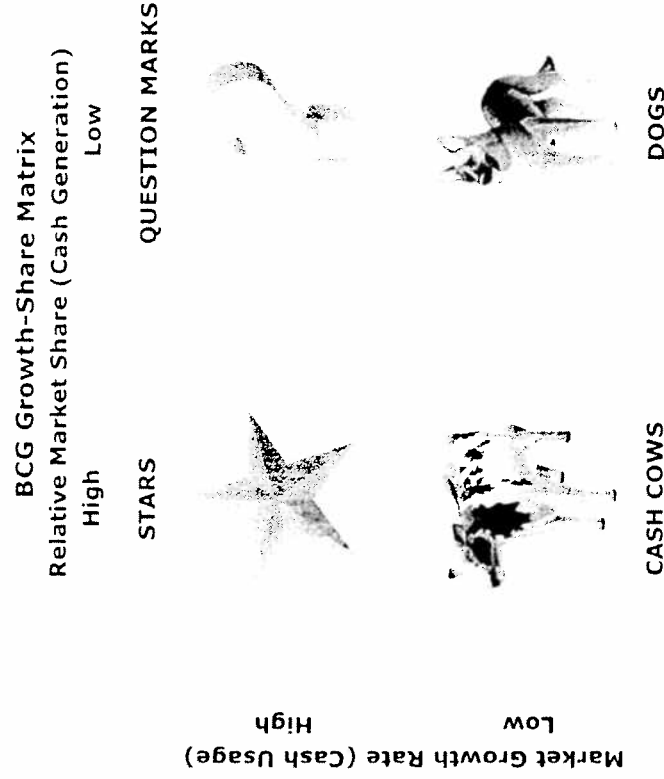
The price will probably be cut at this point. If sales do hold up, this tactic will increase short-term profits. Prices may be maintained for products that will be continued because they serve a niche market if they are profitable.

The last option is to **drop** the product from the line. The company may be able to sell the product to another firm, or simply liquidate it. If the goal is to liquidate the inventory of discontinued products, the price will be cut to accomplish that. If the company is planning to find a buyer, it will want to **maintain** the product until it can be sold and not **harvest** it.

### Boston Consulting Group Growth-Share Matrix

Another way of analyzing a product's position in its life cycle was developed by the Boston Consulting Group in the 1970s. It is called the **BCG Matrix**, or **Growth-Share Matrix**. The BCG Matrix was developed to assist corporations in analyzing the life cycles of their product lines in order to make better decisions about allocation of resources.

The BCG Matrix classifies products into four categories based on the growth of the markets they are in and their share of those markets. The matrix is a square with four quadrants. Market growth rate is along the side and relative market share is along the top. A product's position on the relative market share scale (high or low) indicates its cash generation capability; and its position on the market growth rate scale (high or low) indicates its need for cash for investment.



A **star** is in an industry that has a **high** market growth rate, and the product has a **high** share of the market.

A **star** generates a lot of cash because it has a high share of its market. However, because the market is growing rapidly, the star's sales are also growing rapidly. As a result, it has a high need for cash for investment. Therefore, the net amount of cash a **star** generates is not great. If a **star** can maintain a high market share, the star will become a **cash cow** when the market's growth rate declines, generating more cash than it consumes. Stars are important because they ensure future cash generation. The company may adjust the price of a star several times, decreasing it to claim market share and as the product's market share and popularity grow, increasing the price to maximize revenue.

A **question mark** is a product in an industry with a **high** market growth rate, but the product has a **low** share of the market. Because the market is growing rapidly, the question mark's sales are also growing rapidly, so it will consume a lot of cash for investment. However, because of its low market share, it does not generate much cash. A **question mark** has potential to gain market share and become a **star** and then eventually a **cash cow** when the growth rate of the market slows. But for the present, a **question mark** is considered a "problem child" because its net cash generated is negative. Furthermore, if the **question mark** does not attain a greater share of its market, it will turn into a **dog** when the growth rate of the market declines. A **question mark** may or may not be worthy of the additional investment that would be required to increase its market share. It needs careful analysis to determine whether or not to invest more money in it. Because a question mark needs to increase its market share quickly in order to avoid turning into a dog, pricing of a question mark should be aggressive.

A **cash cow** is in an industry with a **low** market growth rate, but the product has a **high** share of the market. **Cash cows** are in mature markets in which the growth rate has slowed, but they are market leaders. **Cash cows** generate more cash than they consume. They are regarded as boring, but any company would be glad to have them. They should be "milked" to extract their profits without investing much cash in them. Investment in a **cash cow** would be wasted money because of the slow growth of the industry. The characteristics of a cash cow product do not change much, customers know what they are getting, and the price does not change much either.

A **dog** is in a mature industry with a **low** market growth rate, and it has a **low** share of the market. A **dog** does not consume much cash, but it does not generate much cash, either. It is usually barely breaking even. The investment money tied up in it has little potential, and it depresses the company's Return on Assets.

**Dogs** should be sold off, and pricing is not a major concern.

## Section C

### Pricing Strategy

The natural life cycle for a business unit or a product is that it begins as a **question mark**, then turns into a **star**, then when the market stops growing, it turns into a **cash cow**. At the end of its life cycle, the **cash cow** turns into a **dog**. However, if the **question mark** never turns into a **star**, it goes straight to **dogdom** when the market's growth rate slows.

A diversified company with a balanced portfolio will have some **stars**, some **question marks**, and some **cash cows**. The **stars'** high market share and high growth rate assure the future. The **question marks** have potential to become stars if they receive the necessary investment. The **cash cows** supply the cash to fund the future growth of the stars and the question marks.

**Example – BusinessSoft Co.** is about to launch a new product. The company expects a six-year life cycle from the moment it starts developing this product through its last sale and installation of the product. However, it also expects to provide after-purchase services as part of the contract within and beyond this period.

The company costs' estimates are:

R&D.....	\$750,000
Design .....	500,000
Manufacturing costs.....	300,000
Marketing .....	200,000
Distribution.....	100,000
Customer service.....	250,000
After-purchase support (as per the contract) .....	60,000

The company plans to produce and sell 1,500 installations of the product and earn a 40% mark-up over the whole life costs of the company, relating to this product. Also, the company envisages that an average client would incur around \$500 of installation, training, operating, maintaining and disposal costs relating to usage of this product. **What is the expected total whole-life cost per installation to the customer?**

#### Solution:

First, calculate the price BusinessSoft will charge:

The total whole-life costs to BusinessSoft are:  $\$750,000 + \$500,000 + \$300,000 + \$200,000 + \$100,000 + \$250,000 + \$60,000 = \$2,160,000$ . To meet the profit target, the total revenue must be  $\$2,160,000 \div 40\% = \$3,024,000$ . **So, the price per customer is \$2,016** ( $\$3,024,000 \div 1500$  installations).

Then, calculate the **total** cost to the customer:

The total whole-life costs to the customer equals the sum of the price and the ownership costs:  $\$2,016 + \$500 = \$2,516$

So, the product total whole-life (customer life-cycle) costs to the customer are **\$2,516**.

### Other Considerations in Price Setting

**Price discrimination** is the practice of charging different prices for the same product to different customers.

An example of this is in the airline industry, where a carrier will charge a lower rate if someone stays over a Saturday night. This usually separates business travelers (whose demand is inelastic) from pleasure travelers (whose demand is elastic) and charges them different prices depending on the elasticity of their demand.

**Peak-load pricing** involves charging a higher price for the same product or service at times when demand is the greatest. This also reflects supply and demand, because prices charged when capacity is most in demand will represent what competing customers are willing to pay. When excess capacity is available, prices are lower. This pricing method is used in the telecommunications, electric utility and travel industries.

## Illegal Pricing

When a company sets its prices in the US, it must make sure that the prices do not violate any US laws.

- It is illegal to set a price below the cost of the product simply to drive out competitors and restrict the supply, then later recover the money lost by the low pricing through increased market and increased prices. This is **predatory pricing**.
- The **Robinson-Patman Act** makes it illegal for manufacturers to discriminate between customers in the US based on prices.
- It is also illegal to set **collusive prices**. This occurs when one or more companies **act together** to either restrict output or to set prices at an artificially high level.
- **Dumping** a product occurs when a company sets the price of the product artificially low and then sells it in another country. Though this may not be illegal, it is unethical and will often lead to retaliatory tariffs and taxes by the country in which the product was dumped.

One of the very critical issues related to dumping is the determination of what the cost of production is. If the goods were produced in a country other than the US and the US determines cost of production using US labor rates, this probably does not accurately reflect the true cost of labor in the production of the goods in question.

## The Impact of Cartels on Pricing

A cartel is a group of firms that create a formal, written agreement that governs how much each member will produce and charge. The objective of a cartel is to limit competitive forces within a market. The cartel can assign certain regions over which each firm will have exclusive operating control, thus giving each individual cartel firm monopoly power. If output is limited so as to create a shortage at the current price, this has the same effect as fixing the price. This is the strategy used by the OPEC oil cartel. These practices are illegal in the U.S. and in many other countries, though not in some international markets.

Studies have been done that have shown the median overcharge resulting from cartels is approximately 25%.

## Other Collusive Activity

Alternatively, secret collusion may take place among firms with no explicit contract. Even though it is illegal in the U.S., several incidents have taken place and have been prosecuted under antitrust laws. Bids for government contracts have been "divided up" among contracting firms by means of unwritten agreements as to which firm will submit the low bid for each contract. Collusion can be even subtler than that, involving "tacit understandings" about product pricing. The character of tacit understandings makes them more difficult to detect and prosecute, even though they are also illegal.

## Cost-Volume-Profit (CVP) Analysis

Cost-volume-profit analysis (CVP), also called **breakeven analysis**, is used primarily for short-run decision-making. In the short run, the market usually determines the prices and costs of a company's products. We have seen how the market governs prices – by the price consumers are willing to pay and by actions of competitors. We also know that costs can be reduced to a certain degree by seeking cost concessions from suppliers and by value engineering. Beyond that, the only thing the company can control is what products and what quantities it will produce and sell – in other words, the supply of the product.

Therefore, CVP analysis is used by firms to determine what products they will supply and the amount they will supply at a given price and cost. Since prices and costs are reasonably fixed in the short run, the profitability of a product will be most dependent upon the quantity sold. Therefore, CVP analysis is used to calculate the effect on profitability of changes in product mix and in quantities sold.

CVP analysis enables a company to find the level of production and sales, both in units and in dollars, required for the company to break even. It may also be used to determine the level of production and sales necessary to achieve a certain level of profit. CVP analysis examines **the relationship that volume has with costs, revenue and profits**.

In order for CVP to work mathematically, a number of assumptions need to be made in order to simplify the real world and all of the variables that occur in it. The main assumptions that we must make are:

- **All costs are either variable or fixed costs** – this means that we assume there are no mixed – semi-fixed or semi-variable – costs.
- **Total costs and total revenues are predictable and linear** (straight line) in relation to output units within the relevant range and time period. This means that changes in the level of revenues and total costs arise only because of changes in the number of units produced and sold.
- **Fixed costs remain constant** over the relevant range. Fixed costs include both **direct** fixed costs and **indirect** (allocated) fixed costs.
- **Unit variable costs remain constant over the relevant range**. That means that **total** variable costs change in proportion to activity level. Like fixed costs, variable costs include both direct variable costs and indirect variable costs.
- **The unit selling price remains constant over the relevant range**, and the **sales mix will remain constant** as the level of total units sold changes.
- **Finished goods and work-in-progress inventory do not change** significantly (meaning production = sales).
- **The time value of money is ignored**.

In the real world, these assumptions may not hold. For example, as quantity of direct materials purchased increases, the supplier may offer a lower price per unit. And in order to make more sales, it may be necessary to reduce the price per unit. When this occurs, the analysis becomes more complex.

Note: There are several kinds of costing, including job-order costing, joint costing, absorption (full) costing, and variable (or direct) costing. For CVP analysis, variable costing provides the best information. In variable costing the fixed manufacturing overheads are expensed each period. The various kinds of costing as well as variable costing are covered in more detail for the CMA Part 1 exam.

### Contribution Margin

CVP analysis is based on the fact that there are two kinds of costs in producing a product: fixed and variable. Fixed costs to a company are just that – fixed. Within the relevant range, fixed costs in total are not influenced by the level of production or sales. Variable costs are costs per unit of production. Thus, variable costs change in total in response to changes in the level of production or sales.

Therefore, the difference between the selling price of an item and the variable costs that are incurred to produce and sell that item is the amount that goes toward covering the fixed costs of a company.

This amount is also called **unit contribution margin** (or simply **contribution**) and is calculated as follows:

$$\text{Unit Contribution Margin} = \text{Selling price per unit} - \text{Variable costs per unit}$$

The total contribution margin can be calculated two ways:

$$\text{Total Contribution Margin} = \text{Unit Contribution Margin} \times \text{Number of Units Sold}$$

or

$$\text{Total Contribution Margin} = \text{Total Revenue} - \text{Total Variable Costs}$$

Example: Ray Company, a manufacturer of cell phones, sells them to wireless service providers for \$60 each. Ray Company's variable cost is \$35 per phone. The **unit contribution margin** is:

$$\$60 - \$35 = \$25$$

If Ray Company sells 10,000 phones, Total Revenue will be 10,000 × \$60, or \$600,000. Total Variable Cost will be 10,000 × \$35, or \$350,000. The **total contribution margin** is:

$$\$25 \times 10,000 = \$250,000$$

or

$$\$600,000 - \$350,000 = \$250,000$$

### Contribution Margin Ratio

If unit contribution margin is **expressed as a percentage of the sales price**, it is the Contribution Margin Ratio, or Contribution Margin Percentage. The formula is:

$$\text{Contribution Margin Ratio} = \frac{\text{Contribution Margin per unit}}{\text{Selling Price per unit}}$$

The Contribution Margin Ratio can also be calculated using total contribution margin and total revenues instead of per unit amounts:

$$\text{Contribution Margin Ratio} = \frac{\text{Total Contribution Margin}}{\text{Total Revenue}}$$

## Section C

### Cost-Volume-Profit (CVP) Analysis

Example: Assume all of the same information from the previous example.

Ray Company's Contribution Margin Ratio using unit amounts is:

$$\text{Contribution Margin Ratio} = \frac{\$25}{\$60} = \underline{\underline{.416667}} \text{ or } 41.6667\%$$

Ray Company's Contribution Margin Ratio using totals is:

$$\text{Contribution Margin Ratio} = \frac{\$250,000}{\$600,000} = \underline{\underline{.416667}}$$

This means that 41.6667% of the selling price is contribution. This contribution will first be used to cover Ray's fixed costs and then once the fixed costs have been covered, this contribution will become profit.

The concept of **contribution margin** is an important one in CVP analysis. Contribution margin tells us the amount of revenues minus variable costs available to recover fixed costs. Once the fixed costs have been recovered, contribution margin contributes to operating income.

Question 19: A retail company determines its selling price by marking up variable costs 60%. In addition, the company uses frequent selling price markdowns to stimulate sales. If the markdowns average 10%, what is the company's contribution margin ratio?

- a) 27.5%
- b) 30.6%
- c) 37.5%
- d) 41.7%

(CIA Adapted)

### Contribution Margin Income Statement

Under CVP analysis, the income statement is presented in such a way that it shows variable costs together and fixed costs together, which then shows a key item that does not appear on the standard income statement – **contribution margin** – as follows:

	Revenues
-	<u>Variable costs</u>
=	<b>Contribution margin</b>
-	<u>Fixed costs</u>
=	<u><b>Operating Income</b></u>

Note: You can use this formula to check an answer on the exam. At the breakeven point number of units, the operating profit will be \$0.

## Cost-Volume-Profit (CVP) Analysis

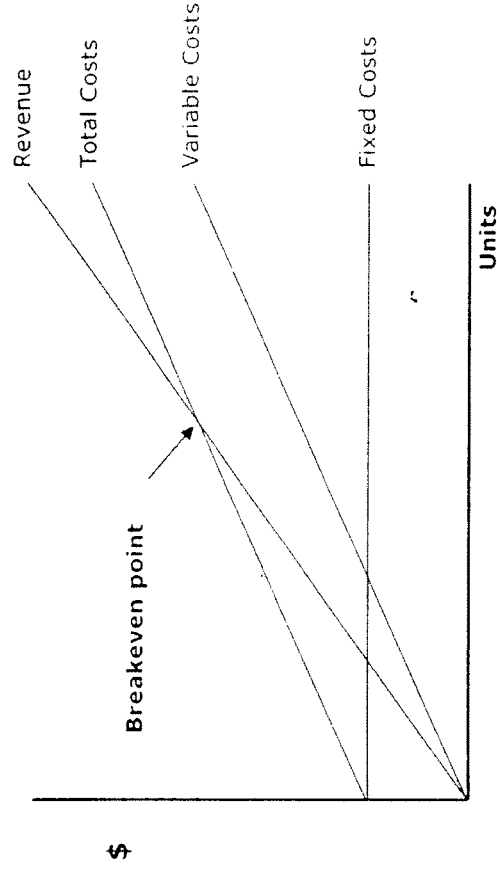
### CMA Part 2

Example: Carl Company sells its product for \$100 per unit. Fixed costs are \$120,000, and the variable cost is \$60 per unit. The unit contribution margin is \$40 per unit (\$100 – \$60). This is the contribution to the coverage of fixed costs made by the sale of each unit. The following shows how the contribution margin increases as sales volume increases and more of the fixed costs are recovered, and operating income goes from negative to positive:

Sales Volume:	<u>1,000</u>	<u>2,000</u>	<u>3,000</u>	<u>4,000</u>	<u>5,000</u>
Revenues @ \$100	\$100,000	\$200,000	\$300,000	\$400,000	\$500,000
Variable Costs @ \$60	<u>60,000</u>	<u>120,000</u>	<u>180,000</u>	<u>240,000</u>	<u>300,000</u>
Contribution Margin	\$ 40,000	\$ 80,000	\$120,000	\$160,000	\$200,000
Fixed Costs	<u>120,000</u>	<u>120,000</u>	<u>120,000</u>	<u>120,000</u>	<u>120,000</u>
Operating Income	\$ ( 80,000)	\$ ( 40,000)	\$ -0-	\$ 40,000	\$ 80,000

## Breakeven Analysis

Graphically, the breakeven point can be shown like this:



Managers need to know what level of sales is necessary to cover all costs, both fixed and variable, so that the company does not have a loss. Because this is a mathematical process that is based on the relationships between lines, there are a few different ways in which the breakeven point can be calculated. It can be calculated to find the breakeven point in units, or it can be calculated to find the break-even point in revenue.

### Breakeven Point in Units

In order to calculate the breakeven point in **number of units**, we simply divide the fixed costs by the contribution margin per unit.

$$\frac{\text{Total Fixed Costs}}{\text{Unit Contribution Margin}} = \text{BEP in Units}$$

In other words, the breakeven point is calculated as follows: Each unit that is sold produces a contribution to the coverage of fixed costs. If you divide total fixed costs by the contribution per unit, the result will be the number of units that must be sold in order to cover your fixed costs.



## Section C

### Cost-Volume-Profit (CVP) Analysis

Example: Ray Company's fixed costs total \$150,000. Ray's breakeven point in units is:

$$\text{Breakeven point in units} = \frac{\$150,000}{\$25} = 6,000 \text{ units}$$

We can prove this by using the standard profit formula, which is Profit = Total Revenue – Total Variable Costs – Total Fixed Costs.

$$\begin{aligned} \text{Profit} &= (6,000 \times \$60) - (6,000 \times \$35) - \$150,000 \\ &= \$360,000 - \$210,000 - \$150,000 \\ &= \$0 \end{aligned}$$

#### Breakeven Point in Revenue

We can also calculate breakeven point in revenue by using the contribution margin **ratio**. When we use the contribution margin ratio, the result is the breakeven point in terms of revenue and not in units. However, once the breakeven revenue is calculated, it is a simple conversion to calculate the breakeven units. The formula is:

$$\frac{\text{Total Fixed Costs}}{\text{Contribution Margin Ratio}} = \text{BEP in Dollars of Revenue}$$

Example: Ray Company's breakeven point in dollars of revenue is Calculated as follows.

Ray Company's Contribution Margin Ratio is .416667 (\$25 / \$60):

$$\text{Breakeven point in revenue} = \frac{\$150,000}{.416667} = \$360,000$$

Proof:

$$\text{BEP in units} = \frac{\$360,000}{\$60} = 6,000 \text{ units}$$

$$\begin{aligned} \text{Profit} &= (6,000 \times \$60) - (6,000 \times \$35) - \$150,000 \\ &= \$360,000 - \$210,000 - \$150,000 = \$0 \end{aligned}$$

## Cost-Volume-Profit (CVP) Analysis

### CMA Part 2

Example: Given a selling price of \$4.00 and variable costs of \$2.20, what is the breakeven point in units if fixed costs are \$4,600?

The unit contribution margin is \$1.80 per unit (\$4.00 – \$2.20). This is the contribution to the coverage of fixed costs that is made by the sale of each unit.

BEP in units =

$$\text{BEP in units} = \frac{\text{Fixed Costs}}{\text{Contribution Margin Per Unit}} = \frac{\$4,600}{\$1.80} = 2,555.55 = \underline{2,556}$$

\$4,600 of fixed costs means that the number of units that must be sold to break even is 2,556. Actually, the math of \$4,600/\$1.80 is equal to 2,555.55; however, since it is not possible to sell .55 of a unit, we must round this answer to the next highest whole number.

What is the breakeven point in dollars of revenue?

The Contribution Margin Ratio = \$1.80/\$4.00 = .45

BEP in revenue = Total Fixed Costs / Contribution Margin Ratio

$$\text{BEP in revenue} = \$4,600 / .45 = \$10,222$$

Proof of both the breakeven point in number of units and the breakeven point in dollars of revenue:

Profit = Revenue – Total Variable Costs – Total Fixed Costs

$$= \$10,222 - (2,555.55 \times \$2.20) - \$4,600$$

$$= \$10,222 - \$5,622 - \$4,600 = 0$$

Note: If you are seeking the breakeven point, an income tax rate given in a problem is extraneous information, because at a breakeven level, there will be no taxable income and therefore no income tax.

Question 20: A company manufactures a single product. Estimated cost data regarding this product and other information for the product and the company are as follows:

Sales price per unit	\$40
Total variable production cost per unit	\$22
Sales commission (on sales)	5%
Fixed costs and expenses:	
Manufacturing overhead	\$5,598,720
General and administrative	\$3,732,480
Effective income tax rate	40%

The number of units the company must sell in the coming year in order to reach its breakeven point is:

- a) 388,800 units
- b) 518,400 units
- c) 583,200 units
- d) 972,000 units

(CIA Adapted)

## Section C

### Cost-Volume-Profit (CVP) Analysis

#### Profit Requirement

Most companies do not have a goal of merely breaking even. Most companies have a profit goal, and therefore you need to know how to use these same formulas to determine how many units must be sold, or how many dollars in revenue are needed, to reach a certain amount of profit.

This necessary level of profit may be expressed either as a total dollar amount (\$200,000, for example) or as some percentage of total sales (15% of sales revenue, for example). The formula that we will use to calculate the profit point will depend on the manner in which the profit is to be determined. We will look first at the specific dollar amount of profit and then the percentage of sales.

#### Specific Dollar Amount Profit Requirement

When there is a specific profit requirement, we will use the same formula as before, except this required profit is treated as an **additional fixed cost** that must be covered by the contribution margin. This makes sense, as management has declared that not only do all fixed costs need to be covered, but also the target amount of profit needs to be met. It is **treated as a fixed cost**, as this amount of target profit does not change as the level of production changes.

Example: Let us assume the same information as in the previous example (a selling price of \$4.00 and variable costs of \$2.20, and fixed costs are \$4,600), and add that the company must achieve a minimum pre-tax profit of \$5,000 (the effect of taxes is covered later). What is the required sales level to achieve this?

The contribution margin is still \$1.80 per unit, but as there is now a profit to achieve, the numerator becomes Fixed Costs + Required Profit. The required profit is treated as a Fixed Cost.

Required Units for \$5,000 profit = Fixed Costs + Required Profit

Contribution Margin Per Unit

$$\begin{array}{rcl} \text{Required Units for \$5,000 profit} & = & \frac{\$4,600 + \$5,000}{\$1.80} = 5,333.33, \text{ or } \mathbf{5,334 \text{ units}} \end{array}$$

We can also make this calculation using the contribution margin in order to calculate the breakeven point in sales revenue. Remember the Contribution Margin Ratio is:

$$\begin{array}{rcl} \text{Unit Contribution Margin} & = & \frac{\$1.80}{\$4.00} = .45 \\ \text{Selling Price} & & \$4.00 \end{array}$$

So the target profit volume in dollars of revenue with a \$5,000 profit requirement is:

$$\begin{array}{rcl} \$4,600 + \$5,000 & & \\ \text{.45} & & \\ \hline & = & \mathbf{\$21,333.33} \end{array}$$

To prove that, we can multiply 5,334, the required number of units (above), by the sales price of \$4.00, and the result is \$21,336. (Difference due to rounding.)

### Profit as a Percentage of Sales

The required profit may also be stated in a percentage form, such as a profit percentage based on the sales price. In this case, you need to calculate the profit that is required from each unit in order to achieve this level of profit. This profit that each unit must generate is then treated as a variable cost and reduces the contribution from each unit. This profit requirement becomes an **additional variable cost** used in the calculation of the contribution per unit.

Example: Let us assume the same facts as the previous example, but change the profit requirement to a profit level of 35% of sales.

Once again, the sales price is \$4.00, variable costs are \$2.20 per unit, and fixed costs are \$4,600. However, in this example we must achieve a certain **percentage of sales** as profit, so the contribution per unit is going to be **lower** than previously. Because the profit will be a percentage of sales, it now becomes an adjustment (a **decrease**) to the contribution margin per unit in the denominator. The variable costs now consist of the actual variable costs of \$2.20 per unit **as well as the required profit**, which is 35% of the sales price of \$4.00, or \$1.40 per unit. These two items change the effective contribution margin to \$.40, calculated as follows: \$4.00 – \$2.20 VC – \$1.40 P = \$.40.

Thus, the number of units of sales required to achieve a profit level of 35% of sales is:

$$\frac{\$4,600.00}{\$4.00 - \$2.20 - \$1.40} = 11,500$$

The required amount of revenue is:

$$\begin{array}{rcl} \$4,600.00 & = & \$46,000 \\ [\$ .40 \div \$4.00] \end{array}$$

We can prove this with the following **contribution income statement**:

Revenue (11,500 × \$4)	\$46,000
Variable Costs (11,500 × \$2.20)	(25,300)
Fixed Costs	( 4,600)
Profit	\$16,100

$$\text{And } \$46,000 \times .35 = \$16,100.$$

What we have calculated so far has ignored the effect of taxes. When we were calculating breakeven point this was reasonable as taxes would be \$0 at the breakeven point. However, now that we are calculating the point for different levels of profits, taxes become relevant.

### Specific Dollar Amount of After-Tax Profit

It is very likely that a question will ask for the needed level of revenues or number of units in order to achieve a certain amount of **after-tax profit**. This, again, could be expressed as either a specified amount or as a percentage of revenue.

The formula that we just looked at to calculate a profit point uses the pre-tax profit in its calculation (there was no inclusion of tax rate in the calculation). Therefore, if the question asks for an after-tax profit, we will need to convert the after-tax profit to a pre-tax profit. This is done with the following calculation.

$$\text{Target pre-tax income} = \frac{\text{Target after-tax income}}{(1 - \text{tax rate})}$$

## Section C

### Cost-Volume-Profit (CVP) Analysis

This resulting pre-tax income amount is then used to find the needed revenue or number of units, using the formulas as described above:

$$\frac{\text{Target Profit}}{\text{Volume in Units}} = \frac{\text{Fixed Costs} + \text{Target Pre-Tax Income}}{\text{Contribution Margin Per Unit}}$$

or

$$\frac{\text{Target Profit}}{\text{Volume in \$}} = \frac{\text{Fixed Costs} + \text{Target Pre-Tax Income}}{\text{Contribution Margin Ratio}}$$

Example: For our company with a sale price per unit of \$4.00, variable costs of \$2.20, fixed costs of \$4,600, an **after-tax** net income requirement of \$5,000, and a tax rate of 40%, the required number of units sold and required amount of revenue are:

**Pre-tax income** required:  $\$5,000 / (1 - .40) = \$8,333$

**Number of units** =  $(\$4,600 + \$8,333) / \$1.80 = 7,185$

**Calculation of target profit revenue needed:**

Contribution margin ratio =  $\$1.80 / \$4.00 = .45$

**Target profit revenue** =  $(\$4,600 + \$8,333) / .45 = \$28,740$

Proof:

Revenue:  $7,185 \times \$4.00$  \$28,740

Variable costs  $7,185 \times \$2.20$  (15,807)

Fixed costs (4,600)

Effective Income Tax Rate @ .40 \$ 8,333

Net Income after tax (3,333)

\$ 5,000

### Specific Percentage of Revenue as After-Tax Net Income

As with a fixed dollar amount of profit, if the target profit is an after-tax percentage of revenue, we will need to calculate the pre-tax percentage of revenue. This is done as follows:

$$\frac{\text{Target pre-tax amount per unit}}{\text{Target after-tax amount per unit}} = \frac{1}{(1 - \text{tax rate})}$$

This will give you the pre-tax amount that will be used as the additional variable cost to be used in the breakeven calculation. The next step will be to calculate the number of units of sales required, by dividing fixed costs by the adjusted contribution margin. Then to determine the revenue required, you will calculate the adjusted contribution margin ratio and divide the fixed costs by that adjusted contribution margin ratio.

Example: For our company with a sale price per unit of \$4.00, variable costs of \$2.20, and fixed costs of \$4,600, we now have an **after-tax** net income requirement of 20% of revenue. This time, the tax rate is 30%. The required number of units sold and required amount of revenue are:

**Required Pre-tax Contribution Per Unit is calculated as follows:**

The after-tax contribution per unit is \$.80 (20% of the \$4 per unit sales price). To calculate the pre-tax amount per unit, we do the following:

$$\frac{\text{Required After-Tax Net Income Per Unit}}{(1 - \text{tax rate})} = \frac{.2 \times \$4.00}{.70} = \underline{\$1.1429}$$

This means that each unit sold must have \$1.1429 of contribution (which in this case also covers profit) in order for the company to have an after-tax profit equal to 20% of sales.

**Calculation of target number of units:**

$$\begin{aligned} \text{Contribution margin per unit} &= \$4.00 - \$2.20 = \$1.1429 &= \$1.1429 \\ \text{Required number of units} &= \$4,600 \div .6571 &= \underline{7,000 \text{ units}} \end{aligned}$$

**Calculation of target revenue:**

$$\begin{aligned} \text{Contribution margin ratio} &= \$.6571 \div \$4.00 &= .16428 \\ \text{Target profit revenue} &= \$4,600 \div .16428 &= \underline{\$28,000 \text{ of revenue}} \end{aligned}$$

**Proof:**

$$\begin{aligned} \text{Revenue: } 7,000 \times \$4.00 &= \$28,000 \\ \text{Variable costs } 7,000 \times \$2.20 &= (15,400) \\ \text{Fixed costs} &= \underline{(4,600)} \end{aligned}$$

$$\begin{aligned} \text{Effective Income: Tax Rate @ .30} &= \$8,000 \\ \text{Net Income after tax} &= \underline{\underline{(2,400)}} \\ &= \underline{\underline{\$5,600}} \end{aligned}$$

$$\$5,600 / \$28,000 = .20 \text{ or } \underline{\underline{20\%}}$$

Question 21: Total production costs of prior periods for a company are listed as follows. Assume that the same cost behavior patterns can be extended linearly over the range of 3,000 to 35,000 units and that the cost driver for each cost is the number of units produced.

The company is concerned about its current operating performance that is summarized as follows:

Sales (\$12.50 per unit)	\$300,000
Variable costs	180,000
Net operating loss	(40,000)

How many additional units should have been sold in order for the company to break even?

- a) 32,000
- b) 16,000
- c) 12,800
- d) 8,000

(CIA Adapted)