In Chapter 8, we hinted at how you might determine whether a firm is making a profit or a loss by comparing the price of a good with its average total cost of production. A profit is, of course, preferred to a loss, but entrepreneurs usually want to do more than just make a profit. They want to make the maximum profit. You’ll learn precisely how they do it in this chapter. The rule followed to achieve profit maximization is to produce at an output where marginal cost equals marginal revenue. The entrepreneur can choose the best output level by comparing the extra revenue that can be obtained by selling one more unit of output with the extra cost of producing that unit. Once the profit-maximizing level of output has been selected, total profits are found by multiplying the difference between price and average total cost by the output.

On occasion, when the firm’s only prospect is incurring losses, the same MC = MR rule guides the entrepreneur to loss minimization. If the price at the loss-minimizing level of output is high enough to cover average variable costs, the firm should continue to produce in the short run. If the price at the loss-minimizing level of output is below average variable costs, the firm should shut down, producing nothing to minimize losses. Either way, the entrepreneur will face a loss because the firm’s fixed costs cannot all be covered in the short run. If this situation persists into the long run, the entrepreneur will go out of business.

Some economists and other social scientists have questioned whether businesses actually follow the MC = MR approach to profit maximization and loss minimization. In general, economists believe that they do behave this way, even though not all entrepreneurs are aware of the MC = MR rule.

After you study this chapter, you should be able to:

- Discuss the decisions entrepreneurs make about production and prices.
- Define profit.
- Calculate total revenue, marginal revenue, and average revenue.
- Explain why the marginal cost equals marginal revenue rule achieves profit maximization.
- Identify the area of profit on a graph showing average total costs, marginal cost, and marginal revenue.
- Justify producing at a loss when total variable costs are covered by total revenue.
- Evaluate alternative theories to profit maximization.

Concept Check — See how you do on these multiple-choice questions.

What sorts of activities must an entrepreneur oversee in the pursuit of the maximum possible profit?

1. Entrepreneurs must be expert in two distinct worlds of enterprise. These are
   a. hiring and firing workers
   b. employing capital and labor
   c. issuing stocks and bonds to raise capital
   d. overseeing production and marketing activities
   e. entering and leaving new markets
For the following question, recall the rule for profit maximization.

2. **Profit maximization** identifies the output level that has
   a. the lowest average total cost of production
   b. marginal revenue equal to marginal cost
   c. a high price for its output
   d. the biggest difference between marginal revenue and marginal cost
   e. the biggest difference between average revenue and marginal cost

The rule for loss minimization is the same as the rule for profit maximization.

3. **Loss minimization** occurs when a firm produces at an output level where
   a. price covers its fixed costs but not its variable costs
   b. it sets marginal revenue equal to marginal cost
   c. price covers its variable costs but not its fixed costs
   d. it sells for a price that is greater than marginal cost
   e. it sells for a price that is less than marginal cost

Not all social scientists agree that firms try to maximize profits following the MC = MR rule.

4. The **Lester-Machlup controversy** called into question the
   a. importance of marginal analysis to modern firms
   b. results of survey studies in economics
   c. ability of entrepreneurs to anticipate price changes
   d. ability of entrepreneurs to anticipate production costs
   e. mathematics behind the marginal cost equals marginal revenue rule

According to Galbraith, the primary goal for a corporate manager may be different from the primary goal for the corporation’s stockholders. This question focuses on the manager’s goal.

5. In John K. Galbraith’s view, the **primary goal for a corporate manager** is
   a. profit maximization
   b. loss minimization
   c. corporate survival
   d. to maximize the price of stocks
   e. to merge with other corporations

**Am I on the Right Track?**

Your answers to the questions above should be **d, b, c, a, and c**. One key to mastering this chapter is to understand the logic of the marginal cost equals marginal revenue rule and to be able to work with this rule using a graph of the firm’s average costs, marginal costs, and marginal revenue. The graphing tutorial and questions that follow the matching quiz on key words will help to better acquaint you with marginal analysis.
**Key Terms Quiz** — Match the terms on the left with definitions in the column on the right.

1. profit maximization  _____ a. total revenue divided by the quantity of goods sold
2. average revenue  _____ b. output level at which profits will be maximized
3. marginal revenue  _____ c. someone with a personal and significant interest in the viability of the firm
4. MC = MR rule  _____ d. strategy for the firm when TR < TC
5. loss minimization  _____ e. the addition to total revenue from selling one more unit
6. shut down  _____ f. the greatest difference between total revenue and total cost
7. stakeholder  _____ g. when total revenue is less than total variable cost

**Graphing Tutorial**

In a graph featuring (1) the average total cost, (2) average variable cost, (3) marginal cost, and (4) marginal revenue curves, profit maximization, loss minimization, and shut down are all possible outcomes. The firm always produces at an output level where marginal revenue and marginal cost are equal. It is the firm’s profit-maximizing or loss-minimizing level of output. The profit or loss can be computed by multiplying the difference between price and average total cost by the output level. However, if a firm incurs a loss, it will shut down if its price is less than its variable costs. This makes sense. After all, why would a firm continue to produce if it were unable to pay for labor and other variable cost items? Fixed costs are unavoidable. But if a firm can pay its variable costs, it will continue to produce at a loss. Business could turn around for the firm. In the real world, firms are not always profitable.

Consider the Merkle Broom Company from the last study guide chapter. Suppose the price of a broom is $18 and the company can sell as many brooms as it wants at this price. Each time another broom is sold, $18 are added to total revenue. This price generates a marginal revenue curve that is a horizontal line at $18. The marginal revenue function is shown in the graph below with the Merkle Broom Company’s average total cost and marginal cost functions.
Merkle Broom maximizes profits by producing where $MC = MR$. When $MR = 18$, the profit-maximizing level of output is 8,000 brooms. The firm’s profit is shown as the rectangle, $(18.00 - 10.88) \times 8,000 = 56,960$. The average total cost is equal to $10.88$ at the 8,000-broom level of output.

Suppose the price drops from $18.00 per broom to $7.50 per broom. The graph below shows the new marginal revenue curve at $7.50$ per broom. $MC = MR$ at 5,400 brooms, the loss-minimizing output level.

The average total cost at 5,400 brooms is $9.00$. Therefore, the loss is $(9.00 - 7.50) \times 5,400 = 8,100$. Since the price is greater than average variable cost, the firm continues to operate at a loss. The loss is less than the $15,000$ loss (the amount of total fixed costs) that would be incurred at zero output. The firm is covering all of its variable costs and $6,900$ of its fixed costs.

Suppose that the price of brooms falls to $6.00$. The $P = MR$ curve is shown as a horizontal line at $6.00$ and $MC = MR$ at 5,000 brooms in the graph shown below. The loss is the difference between average total cost ($9$) and the price ($6$) multiplied by the output level (5,000) or $15,000$. This equals the firm’s total fixed cost. At a price of $6.00$, Merkle Broom Company is just able to cover its total variable costs. If the price drops below $6.00$, the loss will exceed $15,000$ so that it pays the firm to shut down.
An easy way to tell whether a firm is making a profit or a loss is to see if the marginal revenue curve is above or below the average total cost curve. If it’s above, then the firm earns a profit. If it’s below, then the firm incurs a loss.

**Graphing Pitfalls**

One common graphing mistake is to identify the area of profit incorrectly as shown below. The mistake is to identify the minimum point on the average total cost curve (where marginal cost intersects average total cost) as the profit-maximizing level of output. Follow the MC = MR rule for profit maximization and you won’t make this mistake.

The profit-maximizing level of output is where MC = MR, not where MC intersects ATC.
True-False Questions — If a statement is false, explain why.

1. To be successful, an entrepreneur needs to be able to monitor production and marketing decisions at the same time. (T/F)

2. The goal for an entrepreneur is to maximize total profit. (T/F)

3. Total profit is found by taking the difference between price and average total cost and then dividing by quantity. (T/F)

4. Marginal revenue is equal to total revenue divided by quantity. (T/F)

5. If price is constant, it is equal to marginal revenue, but greater than average revenue. (T/F)

6. Just as a firm maximizes its profit by producing where MR = MC, it minimizes its losses by producing where MR = MC. (T/F)

7. An entrepreneur can avoid all costs in the short run by simply not producing. (T/F)

8. In the short run, a firm should stop producing if price is less than average variable cost. (T/F)

9. Professor Richard Lester's survey research of entrepreneurs supports the MR = MC theory of profit maximization. (T/F)

10. Shut down refers to a decision to cease production and incur a loss equal to the firm's fixed cost. (T/F)

11. Berle and Means have argued that a firm may be driven by management's desire to enhance the firm's image, as opposed to pure profit maximization. (T/F)

12. To John K. Galbraith, the primary goal of a modern corporation is a good return for stockholders. (T/F)

13. A basic theme of critics of the MR = MC rule for profit maximization is that modern corporations may be owned by stockholders who desire high profits, but they are run by managers whose goals may be quite different. (T/F)

14. Economists who support the MC = MR rule for profit maximization believe that this rule perfectly reflects firm behavior in the real world. (T/F)
15. As long as a unit of a good’s marginal revenue is greater than its marginal cost, profit can be increased by producing and selling it.  (T/F)

Multiple-Choice Questions

1. A firm maximizes profit by setting output where
   a. average total cost is at a minimum
   b. marginal cost intersects average total cost
   c. average variable cost is at a minimum
   d. long-run average cost is in the constant-cost range
   e. marginal revenue is equal to marginal cost

2. If total revenue is represented by a straight line from the origin, then the marginal revenue is
   a. less than price
   b. equal to price
   c. a downward-sloping line
   d. an upward-sloping line
   e. less than average revenue

3. If the market price for fish is $4, regardless of how many units are sold, then the firm's
   a. average revenue will be greater than $4
   b. marginal revenue will be greater than $4
   c. average revenue will be less than $4
   d. marginal revenue will be less than $4
   e. marginal revenue will be equal to $4

4. Suppose the market price increases to $5. If the firm produces 200 fish and its average total cost is $2, then its profit is
   a. $1,000
   b. $600
   c. negative
   d. $3
   e. $500

5. If price remains at $5 and the firm increases its output to 300 fish, raising its average total cost to $3, then
   a. there is no change in the firm's profit or loss position
   b. profit increases
   c. profit decreases
   d. loss increases
   e. loss decreases

6. The firm should shut down in the long run if its total revenue is less than
   a. marginal cost
   b. total cost
   c. fixed cost
   d. total variable cost
   e. average total cost
7. The firm's marginal revenue will be constant as long as
   a. the market price is constant
   b. the marginal cost is constant
   c. profit is constant.
   d. no new firms enter the industry
   e. entrepreneurs continue to accurately predict prices

8. Suppose that price is constant for a firm. If by producing and selling one more unit, the firm's total revenue increases more than its total cost increases, all of the following are true except that
   a. profit will increase
   b. marginal revenue is greater than marginal cost
   c. producing and selling the unit was a sound business decision
   d. average revenue increases
   e. the firm produces closer to the level of profit maximization

9. If a firm continues to produce and sell units of output where marginal cost is greater than marginal revenue, then the firm could
   a. earn more profit by producing and selling more units
   b. just break even with total revenue equal to total cost
   c. satisfy stockholders demands for high profits
   d. decrease its average total cost by producing more
   e. increase profit by decreasing output

10. How much profit a firm makes when the firm maximizes profit is determined by
    a. the MC = MR rule
    b. price times quantity, that is, PQ
    c. price minus total cost times quantity, that is, \((P - \text{TC})Q\)
    d. price minus average total cost times quantity, that is, \((P - \text{ATC})Q\)
    e. marginal revenue minus total cost times quantity, that is, \((\text{MR} - \text{TC})Q\)

11. Suppose that Oscar Merkle increases broom output by 1,000 and finds that total revenue increases by more than total cost. You can be sure that
    a. profit is maximized
    b. Merkle should not have increased broom output
    c. output should be increased even more to maximize profit
    d. a loss is generated
    e. Merkle should have decreased output to maximize profit

12. The average revenue for a firm is
    a. higher than the price for the first unit sold and lower than the price for the last unit sold
    b. increased with increasing sales
    c. the same as the price
    d. equal to the quantity sold divided by total revenue
    e. equal to the change in total revenue divided by the change in output

13. Marginal revenue is defined as
    a. total revenue divided by quantity
    b. total revenue divided by total cost
    c. the change in total revenue divided by the change in quantity
    d. the change in total cost divided by the change in total revenue
    e. the difference between total revenue and total cost
14. If a firm produces at a loss, then its
   a. total revenue must be greater than or equal to average variable cost
   b. total revenue must be greater than or equal to total variable cost
   c. marginal revenue must be at least equal to the minimum of the average variable cost curve
   d. total revenue must be at least equal to total fixed cost
   e. total revenue must be greater than total cost

15. If a firm produces where marginal revenue is greater than marginal cost, then we know that
   a. profits are being maximized
   b. profits could be increased by increasing output
   c. profits could be increased by decreasing output
   d. the difference between total revenue and total cost is maximized
   e. the firm’s costs are minimized

16. When economists refer to an entrepreneur "thinking on the margin," they mean that the entrepreneur
   a. is preoccupied with minor detail
   b. is concerned with how the next unit produced will affect profit or loss
   c. is concerned with past decisions
   d. wants to take every opportunity to improve the image of the firm
   e. wants to avoid the marginal loss

17. Richard Lester’s survey studies of business pricing practices suggested to him that firms
   a. set output levels so that marginal revenue is equal to marginal cost
   b. set prices at levels equal to average total cost
   c. do not follow the marginal revenue equal to marginal cost rule for profit maximization
   d. behave cautiously in order to guarantee the long-run survival of the firm
   e. charge the highest prices that consumers are willing and able to pay

18. Empire building refers to the observation that
   a. most industries are intent on achieving supremacy in the market
   b. modern corporations may be more intent on increasing their size than maximizing profit
   c. the typical firm converts profit into investment in order to grow
   d. profit leads to monopoly, which leads to industrial empires
   e. profit is to the entrepreneur what empires are to sovereigns

19. If a firm chooses an output level where MR = MC and P > ATC, then all of the following will be true except that
   a. the firm will have maximized profits
   b. total revenue will exceed total cost by the largest amount
   c. the firm should produce more output
   d. on a graph, profit is the rectangular area equal to per unit profit times output
   e. profit is equal to price minus average total cost multiplied by quantity

20. John Kenneth Galbraith believes that firms
   a. follow the marginal revenue equals marginal cost rule for profit maximization
   b. hire managers whose goal may be survival of the firm, not profit maximization
   c. maximize sales
   d. set price as a fixed mark-up over cost
   e. attempt to improve the firm’s status in the industry by improving its image
The following questions relate to the international, theoretical, interdisciplinary, and historical perspectives in the text.

21. Which of the following is least likely to be a reason for someone becoming an entrepreneur?
   a. extraordinary intelligence coupled with attendance at an elite university or college
   b. childhood adversity such as the death of a parent
   c. having been fired from a job
   d. being an immigrant
   e. being a member of a minority group

22. When the demand curve and the marginal revenue curves are downward sloping,
   a. demand lies below marginal revenue and has twice the slope
   b. demand intersects the horizontal axis halfway to the origin from where marginal revenue intersects the axis
   c. and demand becomes more elastic, marginal revenue becomes steeper
   d. marginal revenue intersects the horizontal axis halfway to the origin from where demand intersects the origin
   e. it is impossible for demand to increase

23. Under which of the following assumptions might profit maximization be considered an expression of greed?
   a. We live in a zero-sum world where one individual’s profits deprive another person of profits.
   b. We live in a world where each person enjoys profits proportional to their contribution to production.
   c. We live in a world where the highest profits go to those who support wars.
   d. We live in a world where most people pursue the accumulation of material wealth.
   e. We live in a world where it is necessary to have laws that regulate business practices.

24. Adam Smith believed that people work hard in order to accumulate more and more material possessions because
   a. that is the best way to provide for one’s children in the future
   b. it will result in gaining attention and approval from other members in society
   c. they are greedy and selfish
   d. they misperceive these possessions as necessities
   e. advertising convinces people that they need more possessions

**Fill in the Blanks**

1. Entrepreneurs live in two very different worlds of economic life — the world of ____________________

   and the world of ____________________.

2. A firm maximizes its profits by producing where ____________________.

3. If price is constant, then ______________ revenue is equal to ______________ revenue.

4. If, at the level of output where MC = MR, the price is less than average variable cost, the firm should ______________.
5. Some economists argue that a possible problem with the MC = MR rule as it is applied to modern corporations may be that corporate managers are more concerned with ________________ than with ________________.

**Discussion Questions**

1. Why are firms often better able to predict their costs of production than the price of their product?

2. Discuss some alternative theories to profit maximization to describe the way firms behave. Why do most economists still subscribe to the notion that firms are profit maximizers?

3. If profit is equal to total revenue minus total cost, then how do we derive the equation profit = (P – ATC)Q? Show your work.

4. Why should a firm increase its output when MR > MC and decrease its output when MR < MC? Explain.
Problems

1. Titleless produces golf balls and can sell them for $15 each. The output, price, average revenue, marginal revenue, marginal cost, average variable cost, and average total cost are shown in the table below.

<table>
<thead>
<tr>
<th>Quantity (1000s)</th>
<th>Price ($/ball)</th>
<th>AR ($/ball)</th>
<th>MR ($/ball)</th>
<th>MC ($/ball)</th>
<th>AVC ($/ball)</th>
<th>ATC ($/ball)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>15</td>
<td></td>
<td>6</td>
<td>6</td>
<td>30</td>
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<td>36</td>
<td>18</td>
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</tr>
</tbody>
</table>

a. Fill in the values for average revenue and marginal revenue in the table above.

b. On the axes provided below, plot the marginal revenue and the average total, average variable, and marginal costs. What is the profit-maximizing level output? How do you know? How much profit will the firm make? Shade the area of profit on the graph.
2. Using the same data presented in the table above, suppose the price of golf balls drops to $3. Show the profit-maximizing or loss-minimizing level of output. Should this firm continue to produce at this price? How do you know? Calculate the amount of profit or loss at this price. Shade this area on the graph.

3. Suppose the price of golf balls drops to $2. What should the firm do now? How do you know?

**Everyday Applications**

Are you a grade point maximizer? How do you approach studying for a set of exams that are scheduled together? Subconsciously, I’ll bet you use marginal analysis to maximize the average of your grades on the exams. You weigh your current knowledge of the material against what you will gain from extra hours of studying. And, if you maximize correctly, you’ll study until the marginal gain in your grade is equal to the marginal cost (or opportunity cost) of another hour of studying. Through an economist’s lenses, life is full of subtle calculations of marginal revenues (gains) and marginal costs.

**Economics Online**

Many small businesses are in the service sector. They are as concerned as the next firm with maximizing profits. It’s no surprise, then, that there is a thriving market for business software to help service sector firms maximize profits. One addition to this market is Pacific Turn-Key Systems Profitmaster program. Check out the site (http://www.profit-master.com/Product_Info/ProfitMaster/Profmast.htm) to view some of the features of this software program that facilitates profit maximization for service firms.

**Answers to Questions**

**Key Terms Quiz**

a. 2           d. 5           g. 6
b. 4           e. 3

c. 7           f. 1

**True-False Questions**

1. True
2. True
3. False. Total profit is price minus average total cost times quantity.
4. False. Marginal revenue is equal to the addition to total revenue from selling one more unit of a good.
5. False. If the price is constant, then it is equal to both marginal revenue and average revenue.
6. True
7. False. Fixed costs must still be paid even when output is zero.
8. True
9. False. Lester’s research suggested that entrepreneurs have goals other than pure profit maximization.
10. True
11. True
12. False. To Galbraith, the primary goal for the corporation is survival.
13. True
14. False. Economists who support the \( MC = MR \) rule view it as a first approximation to reality that is logical and empirically verifiable.
15. True

**Multiple-Choice Questions**

1. e  6. b  11. c  16. b  21. a
2. b  7. a  12. c  17. c  22. d
3. e  8. d  13. c  18. b  23. a
4. b  9. e  14. b  19. c  24. b
5. a  10. d  15. b  20. b

**Fill in the Blanks**

1. production; markets
2. \( MC = MR \)
3. average; marginal
4. shut down
5. corporate survival; profit maximization

**Discussion Questions**

1. Costs of production are usually known in advance. They involve items, such as labor, that have been contracted for over a long period of time. On the other hand, the price of a firm’s output may be subject to extreme fluctuations, depending on the market. Changes in either demand or supply conditions in the market may affect the price of the firm’s output. Changes in the national economy may also have an effect on the price of the firm’s output. For example, a general downturn in the economy may cause people to stop purchasing the good.

2. Richard Lester’s survey work suggested that entrepreneurs don’t think in terms of marginal units. Goals other than profit maximization may be more important. These could include empire building, improving the image of the firm, or simply corporate survival. Most of these theories suggest that there is a basic split in a modern corporation between stockholders who want to see profits maximized and management, whose goals may be quite different. Most economists think that the \( MR = MC \) thinking dominates for most firms, small and large in our economy. Even if the theory is at odds with some business behavior, it is a good first approximation of reality. Moreover, it can be shown empirically that most firms are profit maximizers.

3. Profit = \( TR - TC \)
   \[ = P(Q) - ATC(Q) \]
   Factoring, Profit = \( (P - ATC)Q \).

4. If \( MR > MC \), then producing and selling one more unit of output adds more to total revenue than it does to total cost. Therefore, profit increases. Similarly, if \( MR < MC \), cutting output subtracts more from total cost than it does from total revenue. Therefore, profit increases.

**Problems**

1. a. The average revenue and marginal revenue are the same as price. They are all $15.

   b. The graph shown on the following page gives the profit-maximizing output and level of profit. The firm maximizes profit by producing 7,000 balls. Profit is \( ($15.00 - $8.5)7,000 = $45,500 \). The profit-
maximizing level of output occurs where MR = MC.

2. The firm’s loss is shown below as the area defined by ($7 - $3) x 4,000 = $16,000. The average total cost is $7, and the marginal revenue equal to price is $3. The firm should continue to produce because price covers average variable cost.

3. The firm should shut down. The lowest point on the AVC curve is at $3, and the $2 price is below that.
Homework Questions

True-False Questions — If a statement is false, explain why.

1. If marginal revenue is greater than marginal cost, a profit-maximizing firm should continue to produce and sell more. (T/F)

2. Marginal revenue and average revenue are equal if price is constant. (T/F)

3. A firm whose losses are less than total fixed cost should continue to produce in the short run. (T/F)

4. The profit maximizing level of production for a firm is always where marginal revenue exceeds marginal cost by the greatest amount. (T/F)

5. According to John K. Galbraith, the goal of a modern corporation’s managers is the same as the goal of its shareholders, namely, profit maximization. (T/F)

Multiple-Choice Questions

1. If marginal revenue is equal to marginal cost at the minimum point on a firm’s average total cost curve, then
   a. the firm will incur a small loss
   b. profit for the firm is zero
   c. average revenue does not equal marginal revenue
   d. the firm should shut down
   e. the firm is not pursuing profit maximization

2. The key to success for most entrepreneurs is
   a. a commitment to hard work and having access to "deep pockets" for financial support
   b. an ability to judge when the stock market will make sharp changes
   c. being satisfied with moderate profit making
   d. a fair knowledge of production processes, coupled with luck
   e. personal drive, management skills, and an ability to correctly anticipate price changes

3. Consider a firm where price and marginal revenue are equal to 20, average total cost is equal to 12, and the level of output is 40. Profit is equal to
   a. 800
   b. 480
   c. 120
   d. 200
   e. 320
4. To maximize profit, a firm should continue to produce additional units of output as long as marginal revenue is greater than marginal cost because
   a. profit continues to increase
   b. this is where total revenue will be at a maximum
   c. this is where total cost will be at a minimum
   d. this is where the difference between total revenue and total cost is the greatest
   e. average total cost will begin to decrease

5. Suppose that the Merkle Broom Company produces brooms at an average variable cost of $7 per broom and the price is equal to marginal revenue at $8.50 per broom while average fixed costs are $3 per broom. Merkle Broom Company should
   a. shut down
   b. continue to produce at a loss
   c. double its plant and workforce in order to achieve economies of scale
   d. retool the plant to manufacture furniture
   e. downsize

Discussion Questions/Problems

1. Using a graph and words, explain why profit is maximized at the level of output where marginal revenue is equal to marginal cost.

2. Do firms really equate marginal revenue and marginal cost to maximize profit? Discuss and evaluate the various arguments.