

Key Concepts

Monopolistic Competition

The market structure of most industries lies between the extremes of perfect competition and monopoly. Monopolistic competition is one such “intermediate” industry structure. **Monopolistic competition** is a market structure in which:

- ◆ A large number of firms compete.
- ◆ Each firm produces a differentiated product (**product differentiation** is when a firm makes a good that is slightly different from the products of competing firms).
- ◆ Firms compete on product quality, price, and marketing. Brand-name products advertise their superiority to generics and generics advertise their low price.
- ◆ Firms are free to enter or exit the industry.

A monopolistically competitive firm faces a downward sloping demand curve because it produces a differentiated product. As a result, a monopolistically competitive firm’s marginal revenue curve lies below its demand curve.

Price and Output in Monopolistic Competition

In the short run:

- ◆ The firm maximizes its profit by producing the level of output such that $MR = MC$.
- ◆ The firm might earn an economic profit. If it does, free entry means that competitors eventually enter

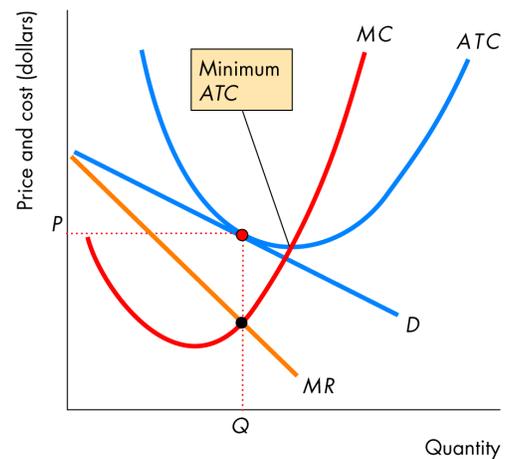
the industry. Alternatively, the firm might incur an economic loss. If it does, it (or other firms) eventually exit the industry.

In the long run:

- ◆ The firm maximizes its profit by producing the amount of output that sets $MR = MC$.
- ◆ The firm does not earn an economic profit or incur an economic loss, so $P = ATC$.

Figure 13.1 shows the long-run equilibrium for a monopolistically competitive firm.

FIGURE 13.1
The Long Run in Monopolistic Competition



A firm has *excess capacity* if it produces less than the efficient scale of output, the level of output for which ATC is at its minimum. Firms in monopolistic compe-

tition have excess capacity because, as Figure 13.1 shows, in the long run they do not produce at the minimum ATC . Firms in perfect competition do not have excess capacity because they produce at the minimum ATC . A firm's markup is the amount by which price exceeds marginal cost. Firms in monopolistic competition have a markup while firms in perfect competition do not have a markup.

Firms in monopolistic competition produce less than do firms in perfect competition, so on this count monopolistic competition is not efficient. But firms in monopolistic competition produce a large variety of differentiated products and consumers value variety.

■ Product Development and Marketing

Monopolistically competitive firms constantly strive to differentiate their products and (temporarily) earn an economic profit. The extent of innovation and product development is determined by the marginal cost and marginal revenue of innovation and development.

Monopolistically competitive firms spend huge amounts on marketing. Such selling costs are fixed costs, which shift the firm's ATC curve upward. Because all firms advertise, the effect of advertising on the demand for any particular firm's product is ambiguous. The efficiency of monopolistic competition is unclear. In some cases, the gains from product variety exceed the selling costs and extra cost from excess capacity. In other situations, the gains fall short of the costs.

■ What is Oligopoly?

Oligopoly is a market structure in which natural or legal barriers prevent the entry of new firms and in which a small number of firms compete. A **duopoly** is an oligopoly market with two firms.

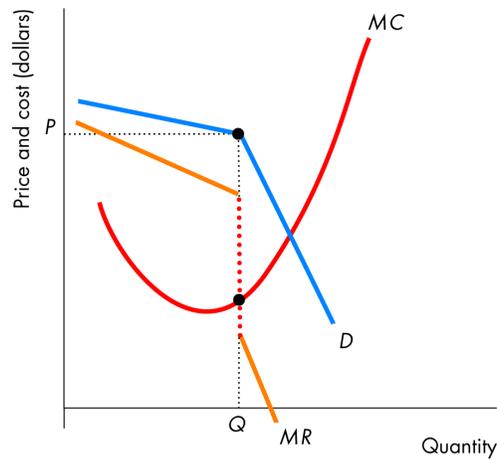
- ◆ Because there are a small number of firms, the firms are interdependent. Each firm's actions have a large effect on its profit and the profits of the other firms.
- ◆ A **cartel** is a group of firms acting together—colluding—to limit output, raise price, and increase economic profit. Cartels are illegal but even were they legal they tend to break down.

A market in which the Herfindahl-Hirschman Index exceeds 1,800 is usually an oligopoly.

■ Two Traditional Oligopoly Models

FIGURE 13.2

The Kinked Demand Curve Oligopoly



The kinked demand curve model:

- ◆ The firm believes that, if it raises its price, no competitors will follow but that, if it lowers its price, all its competitors will follow. The firm faces a kinked demand curve, with the kink at the current price and quantity, as illustrated in Figure 13.2.
- ◆ The kink causes a break in the MR curve. As long as the MC curve remains within this break, the firm's price and quantity do not vary.
- ◆ The model fails to tell what happens if firms discover that their beliefs are incorrect.

The dominant firm oligopoly model:

- ◆ One large firm has a substantial cost advantage over its many small competitors.
- ◆ The large firm acts like a monopoly and sets its profit-maximizing price. The small firms take this price as given and act like perfect competitors.

■ Oligopoly Games

Game theory is a tool for studying *strategic behavior*—behavior that takes into account the expected behavior of others and the recognition of mutual interdependence. Games have rules, strategies, payoffs, and an outcome:

- ◆ *Rules* specify permissible actions by players.

- ◆ **Strategies** are all the possible actions of each player, such as raising or lowering price, advertising, or product quality.
- ◆ *Payoffs* are the profits and losses of the players. A **payoff matrix** is a table that shows the payoffs for every possible action by each player.
- ◆ The *outcome* is determined by the players' choices. In a **Nash equilibrium**, Player *A* takes the best possible action given the action of Player *B*, and *B* takes the best possible action given the action of *A*.

A “prisoners’ dilemma” is a two-person game. In a one-time prisoners’ dilemma game, each confesses. The outcome is not the best equilibrium for the prisoners.

In a duopoly, the firms might have a **collusive agreement**, an agreement between two (or more) producers to form a cartel to restrict output, raise price, and increase profits. This sort of agreement is illegal in the United States. In a price-fixing game, each firm can comply with the agreement or can cheat by lowering its price and increasing its output. Each firm knows that if and if alone cheats, its profit is higher than if it complies with the agreement. In a one-time game, a prisoners’ dilemma Nash equilibrium emerges, in which each firm’s strategy is to cheat.

Other decisions of a firm — how much to spend in research and development, how much to spend on advertising, and so on — can often be analyzed using game theory.

- ◆ In a prisoners’ dilemma game, the invisible hand breaks down because it is neither player’s interest to cooperate if the other one cooperates.

A **dominant strategy equilibrium** occurs when each player has a best strategy that is the same regardless of the strategy of the other player. A game of chicken does not have a dominant strategy equilibrium. One example of a game of chicken is two drivers who race toward each other to see who “chickens.” Sometimes R&D benefits not only the firm that pays for the R&D but also its competitors, which leads to a game of chicken in which each firm wants the other firm to pay for the R&D. The Nash equilibrium is for one firm to conduct the R&D (to “chicken”) but it is not possible to predict which firm undertakes the R&D.

■ Repeated Games and Sequential Games

In a repeated game, other strategies can create a **cooperative equilibrium**, an equilibrium in which the play-

ers cooperate and thereby make and share the monopoly profit.

- ◆ A “tit-for-tat” strategy consists of taking the same action (cheating or not cheating) the other player took last period.
- ◆ A trigger strategy cooperates until the other player cheats and then plays the Nash equilibrium strategy (cheating) forever after.

In a repeated game the players might be able to attain the cooperative equilibrium because the long-run profit from colluding is greater than the short-run profit from cheating. But price wars can occur when new firms enter an industry, and the industry finds itself in a prisoners’ dilemma game.

In a sequential game, one firm makes a decision at the first stage of the game and the other makes a decision at the second stage. A sequential game can occur in a contestable market. A **contestable market** is a market in which one firm (or a small number operate) but in which entry and exit are free, so the existing firm faces competition from potential entrants. At the first stage, the existing firm sets its price and at the second stage potential entrants decide whether to enter or not. The firm in the market can play an entry-deterrence game:

- ◆ In an entry-deterrence game the firm in the market sets a competitive price (rather than a monopoly price) and earns a normal profit to order to keep potential competitors from entering the market.
- ◆ **Limit pricing** refers to the situation in which the existing firm sets the price at the highest level that inflicts a loss on an entrant. The prospect of incurring a loss keeps the potential competitors out of the market.

Helpful Hints

1. **BARRIERS TO ENTRY AND LONG-RUN ECONOMIC PROFIT** : Free entry leads to zero long-run economic profits both in perfect competition and monopolistic competition. If a monopoly is earning an economic profit, other firms would like to enter the monopoly’s industry, but barriers to entry keep them out. Whether a business can earn an economic profit in the long run revolves around the presence or absence of barriers to entry.
2. **HOW TO DETERMINE THE EQUILIBRIUM IN A PRISONERS’ DILEMMA GAME** : Learning how to

find the equilibrium of a prisoners' dilemma-type game is important. Take the example of Chris and Loren in a prisoner's dilemma. Each player has to choose between two strategies, confess or deny. First, set up the payoff matrix. Then look at the payoff matrix from Chris's point of view. Chris does not know whether Loren is going to confess or deny, so Chris asks two questions: (1) Assuming that Loren confesses, do I get a better payoff if I confess or deny? (2) Assuming that Loren denies, do I get a better payoff if I confess or deny? If Chris's best strategy is to confess, regardless of whether Loren confesses or denies, confessing is Chris's dominant strategy.

Next, look at the payoff matrix from Loren's point of view. Let Loren ask the equivalent two questions, and determine whether Loren has a dominant strategy. The combination of Chris's strategy and Loren's strategy comprises the equilibrium outcome of the game.

3. **THE PRISONERS' DILEMMA GAME AND THE REAL WORLD :** The key insight of the prisoners' dilemma game is the tension between the equilibrium outcome (in which both players' best strategy is to confess because they can't trust each other) and the fact that both players could make themselves better off if only they would cooperate. This tension helps explain events in the real world.

The Organization of Petroleum Exporting Countries (OPEC) provides a classic example of this tension. OPEC is a cartel that controls a large fraction of the world's oil. Looking at OPEC as a whole, restricting the supply of petroleum and keeping the price of petroleum high is in OPEC's interest. Keeping the price of petroleum high, perhaps near \$40 a barrel, which was the price about 20 years ago, would maximize the total revenues and profits of the OPEC nations. But when the price is this high, the *individual* interest of each nation lies in pumping more oil than the amount allocated to it under the OPEC agreement. Each nation figures that if it — and it alone — cheats on the output restriction imposed by the cartel agreement, the effect on the world price of oil would be small but the positive impact on its profit from selling more oil would be large. So each nation is tempted to cheat on the cartel.

Questions

■ True/False and Explain

Monopolistic Competition

1. Product differentiation gives each monopolistically competitive firm a downward sloping demand curve.
2. Monopolistically competitive firms compete only on price.

Price and Output in Monopolistic Competition

3. In the short run, to maximize its profit, a monopolistically competitive firm produces the level of output that sets $P = ATC$.
4. Monopolistically competitive firms can earn an economic profit in the long run.
5. Free entry is the basic reason that monopolistically competitive firms have excess capacity.
6. In monopolistic competition, price exceeds marginal cost.

Product Development and Marketing

7. A monopolistically competitive firm can earn an economic profit if it develops new products.
8. Monopolistically competitive firms have large marketing and selling costs.
9. Advertising can signal product quality.

What Is Oligopoly?

10. There are no barriers to entry in oligopoly.
11. An oligopolist will consider the reactions of its competitors before it decides to cut its price.

Two Traditional Oligopoly Models

12. The kinked demand curve model of oligopoly predicts that the firm will change its price only infrequently.
13. In a dominant firm oligopoly, the dominant firm sets the market price.

Oligopoly Games

14. In a one-time only prisoners' dilemma game, the best strategy for a prisoner is to confess only if the prisoner believes that the other player will confess.

15. If oligopolistic firms are able to sustain an output-restricting, price-increasing collusive agreement, they will produce the efficient level of output.
16. If two firms' decisions about whether to conduct R&D can be characterized as a game of chicken, the Nash equilibrium is for neither to conduct R&D.

Repeated Games and Sequential Games

17. Repeated games are more likely to have a cooperative equilibrium than one-time only games.
18. Price wars can break out when a small number of new firms enter an industry.
19. A single firm in a contestable market might be unable to earn an economic profit.
20. Limit pricing refers to attempts by firms to set their price at the highest possible limit.

Multiple Choice

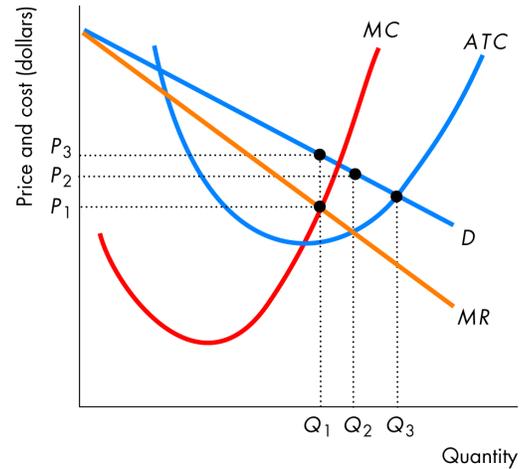
Monopolistic Competition

1. A monopolistically competitive firm is like a *monopoly* firm insofar as
 - a. both face perfectly elastic demand.
 - b. both earn an economic profit in the long run.
 - c. both have *MR* curves that lie below their demand curves.
 - d. neither is protected by high barriers to entry.
2. A monopolistically competitive firm is like a *perfectly competitive* firm insofar as
 - a. both face perfectly elastic demand.
 - b. both earn an economic profit in the long run.
 - c. both have *MR* curves that lie below their demand curves.
 - d. neither is protected by high barriers to entry.
3. Product differentiation
 - a. means that monopolistically competitive firms can compete on quality and marketing.
 - b. occurs when a firm makes a product that is slightly different from that of its competitors.
 - c. makes the firm's demand curve downward sloping.
 - d. All of the above answers are correct.

Price and Output in Monopolistic Competition

Figure 13.3 shows a monopolistically competitive firm in the short run. Use it for the next four questions.

FIGURE 13.3
Multiple Choice Questions 4, 5, 6, 7



4. How much output does the firm produce?
 - a. Q_1
 - b. Q_2
 - c. Q_3
 - d. None of the above
5. What price does the firm charge?
 - a. P_1
 - b. P_2
 - c. P_3
 - d. None of the above
6. What type of profit or loss is the firm earning?
 - a. An economic profit
 - b. A normal profit
 - c. An economic loss
 - d. An accounting loss
7. In the long run,
 - a. new firms will enter, and each existing firm's demand decreases.
 - b. new firms will enter, and each existing firm's demand increases.
 - c. existing firms will leave, and each remaining firm's demand decreases.
 - d. existing firms will leave, and each remaining firm's demand increases.

8. A monopolistically competitive firm has excess capacity because in the
- short run $MR = MC$.
 - short run the firm does not produce at the minimum marginal cost.
 - long run the firm does not produce at the minimum average total cost.
 - long run the firm earns an economic profit.
9. In the long run, a monopolistically competitive firm's economic profits are zero because of
- product differentiation.
 - the lack of barriers to entry.
 - excess capacity.
 - the downward-sloping demand curve of each firm.
14. Because an oligopoly has a small number of firms,
- each firm can act as a monopoly.
 - the firms are interdependent.
 - the firms may legally form a cartel.
 - the HHI for the industry is small.

Two Traditional Oligopoly Models

15. A firm that has a kinked demand curve assumes that, if it raises its price, _____ of its competitors will raise their prices and that, if it lowers its price, _____ of its competitors will lower their prices.
- all; all
 - none; all
 - all; none
 - none; none
16. In the dominant firm model of oligopoly, the large firm acts like
- an oligopolist.
 - a monopolist.
 - a monopolistic competitor.
 - a perfect competitor.
17. In the dominant firm model of oligopoly, the smaller firms act like
- oligopolists.
 - monopolists.
 - monopolistic competitors.
 - perfect competitors.
10. Monopolistically competitive firms constantly develop new products in an effort to
- make the demand for their product more elastic.
 - increase the demand for their product.
 - increase the marginal cost of their product.
 - None of the above answers is correct.
11. When deciding upon how much to spend on product development, a firm will consider
- only the marginal revenue from product development.
 - only the marginal cost of product development.
 - both the marginal revenue and marginal cost of product development.
 - the price and average total cost of product development.
12. Which of the following statements about monopolistically competitive firms is correct?
- In the long run, they have deficient capacity.
 - They have high selling costs.
 - They produce the efficient amount of output.
 - They rarely advertise.

Oligopoly Games

18. In the prisoners' dilemma game with a Nash equilibrium,
- only one prisoner confesses.
 - neither prisoner confesses.
 - both prisoners confess.
 - any confession is thrown out of court.
19. In a duopoly with a collusive agreement, when is the *industry-wide* profit as large as possible?
- When both firms comply with the collusive agreement.
 - When one firm cheats on the cartel and the other firm does not.
 - When both firms cheat on the collusive agreement.
 - The answer is indeterminate because it depends on the industry's MR curve.
13. Suppose the efficient scale of production is such that a market has only three firms in it. This market is
- a three-firm monopoly
 - an economies-of-scale oligopoly.
 - a cost-based oligopoly.
 - a natural oligopoly.

What Is Oligopoly?

20. In a duopoly with a collusive agreement, when can *one firm* have the maximum possible profit?
- When both firms comply with the collusive agreement.
 - When one firm cheats on the agreement and the other firm does not cheat.
 - When both firms cheat on the agreement.
 - The answer is indeterminate because it depends on the firm's *MR* curve.

Firms A and B are in a duopoly game, so they can either comply with a cartel agreement or cheat on the agreement. The cartel agreement calls for each firm to boost its price and restrict the amount it produces. For the next 5 questions, use the following payoff matrix that shows the firms' economic profits.

		A's strategies	
		Cheat	Comply
B's strategies	Cheat	\$0	-\$1 million
	Comply	\$3 million	\$2 million

21. If firm A cheats on the cartel and firm B complies with the agreement, firm A's profit is
- \$3 million.
 - \$2 million.
 - zero.
 - \$1 million.
22. If firm A cheats on the cartel and firm B complies with the agreement, firm B's profit is
- \$3 million.
 - \$2 million.
 - zero.
 - \$1 million.
23. If this game is played only once,
- both firms A and B will cheat.
 - firm A will cheat and firm B will not cheat.
 - firm A will not cheat and firm B will cheat.
 - neither firm A nor firm B will cheat.
24. The equilibrium in the previous question is called a
- credible strategy equilibrium.
 - Nash equilibrium.
 - duopoly equilibrium.
 - cooperative equilibrium.
25. If this game is played repeatedly and both firms adopt trigger strategies so that the cooperative equilibrium emerges,
- both firms A and B will cheat.
 - firm A will cheat and firm B will not cheat.
 - firm A will not cheat and firm B will cheat.
 - neither firm A nor firm B will cheat.
26. If an R&D game between two firms is a game of chicken, then the equilibrium has
- both firms conducting the R&D.
 - neither firm conducting the R&D.
 - one of the two firms conducting the R&D.
 - a flaw because R&D *must* be done but the game's equilibrium is that it might be done.

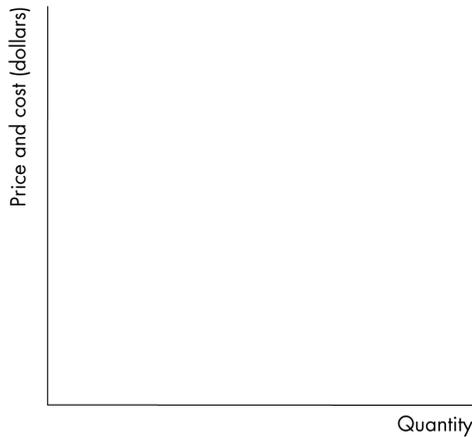
Repeated Games and Sequential Games

27. A strategy in which a firm takes the same action that the other firm did in the last period is a
- dominant strategy.
 - trigger strategy.
 - tit-for-tat strategy.
 - wimp's strategy.
28. Price wars can be the result of
- a cooperative equilibrium.
 - a firm playing a tit-for-tat strategy in which last period the competitors complied with a collusive agreement.
 - new firms entering the industry and immediately agreeing to abide by a collusive agreement.
 - new firms entering an industry and all firms then finding themselves in a prisoners' dilemma.
29. Limit pricing refers to
- the fact that a monopoly firm always sets the highest price possible.
 - a situation in which a firm might lower its price to keep potential competitors from entering its market.
 - how the price is determined in a kinked demand curve model of oligopoly.
 - none of the above.

Short Answer Problems

FIGURE 13.4

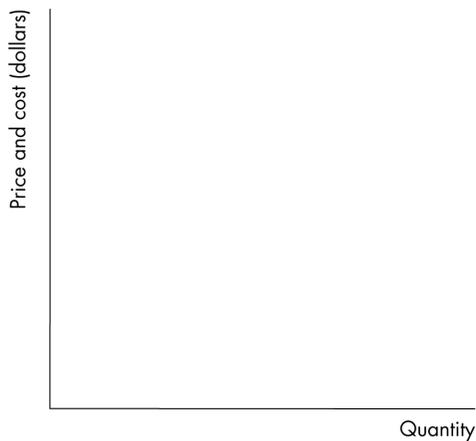
Short Answer Problem 1



1. In Figure 13.4 draw a diagram illustrating a monopolistically competitive firm that is earning an economic profit in the short run. Identify the area that equals the economic profit.

FIGURE 13.5

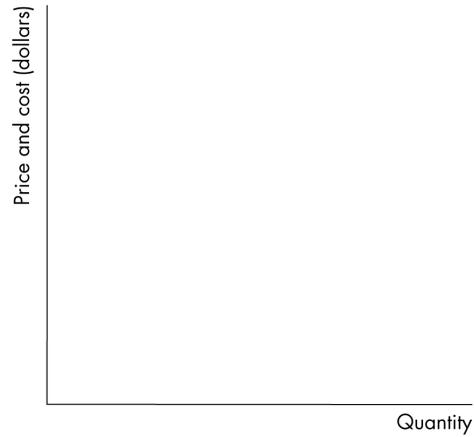
Short Answer Problem 2



2. In Figure 13.5 draw the long-run equilibrium for a monopolistically competitive firm. What conditions must be satisfied for long-run equilibrium?

FIGURE 13.6

Short Answer Problem 3



3. Suppose that a monopolistically competitive firm is initially in long-run equilibrium and it succeeds in further differentiating its product. As a result, the demand for its product increases. In Figure 13.6 show what happens to this firm in the short run. Without drawing a diagram, describe what happens in the long run.
4. Compare the advantages and disadvantages of perfect competition and monopolistic competition in terms of how they benefit society.
5. Explain why firms in oligopoly are interdependent while firms in perfect competition, monopolistic competition, and monopoly are not.
6. How can a price war that eliminates profits be explained with game theory?
7. Two firms — Tom's Taxis and Chet's Cabs — are the only two taxicab companies in a small college town. These firms are engaged in a duopoly game. If they both adhere to a collusive cartel agreement to restrict the number of their cabs and raise their price, each can earn an economic profit of \$2 million. However, if one company cheats on the agreement — by shading its price a bit and perhaps quietly acquiring some more taxis — and the other complies with the agreement, the cheater earns an economic profit of \$2.5 million and the complier suffers an economic loss of \$1 million. If both

Payoff Matrix for Short Answer Problem 7

		Tom's strategies	
		Cheat	Comply
Chet's strategies	Cheat		
	Comply		

cheat, both earn \$0 economic profit; that is, both earn a normal profit.

- Use the description of the situation to complete the payoff matrix above. Put Tom's payoffs in the darker triangles and Chet's in the other triangles.
- If this game is played only once, what is Tom's best strategy? What is Chet's best strategy? What will be the equilibrium outcome?
- When is the *joint* total profit the largest? When is Tom's profit the largest? Chet's profit?

Payoff Matrix for Short Answer Problem 8

		Tom's strategies	
		Cheat	Comply
Chet's strategies	Cheat		
	Comply		

- Suppose that the taxi firm duopoly game played in problem 7 changes: The payoffs are the same as before except when one player cheats and the other does not. Now the cheating player earns an economic profit of \$2.5 million, and the player com-

plying with the agreement earns an economic profit of \$0.5 million.

- Complete the second payoff matrix above for the new taxi firm duopoly game.
- Does Tom have a clear-cut best strategy? Does Chet? Is there a clear equilibrium outcome in this game?

Payoff Matrix for Short Answer Problem 9

		Tom's strategies	
		Cheat	Comply
Chet's strategies	Cheat	\$0	-\$2 million
	Comply	\$2.5 million	\$2 million

- The taxi market changes again so that the payoff matrix is as shown in the matrix for problem 9. Chet and Tom now see that they will be playing a repeated game. Chet knows that Tom has adopted a tit-for-tat strategy. Last period Chet did not cheat on the cartel agreement.
 - If Chet cheats this period, what is his profit? If he cheats this period, what is the maximum profit he can earn next period? What is his maximum two-period profit if he cheats?
 - If Chet complies with the agreement, what is the maximum profit he earns this period? If he complies next period, what will be his profit? If he does not cheat in either period, what is the two-period total profit he earns?
 - Is Chet likely to cheat this period? Why?

You're the Teacher

- "You know, I've really been studying the book and this study guide and now a lot of this stuff is making sense. I like the fact that firms in perfect competition, monopolistic competition, and monopoly actually have only one profit-maximization rule, the $MR = MC$ rule. It sure makes it easy if we don't

have to memorize different rules for different industries! Can you think of any other rules that are the same across all industries?" This student is correct: Common rules ease your work. Perhaps more importantly, common rules also show you that there are factors in common to firms in perfect competition, monopolistic competition, and mo-

nopoly. There is another rule that is common; it deals with when a firm earns an economic profit. With this hint, explain the other rule to the eager student.

Answers

■ True/False Answers

Monopolistic Competition

1. **T** By making its product different from those of its competitors, each monopolistically competitive firm has a unique product and hence a downward-sloping demand curve.
2. **F** Because its product is differentiated, monopolistically competitive firms compete on product quality and marketing, as well as on price.

Price and Output in Monopolistic Competition

3. **F** Monopolistically competitive firms use the same rule as all firms: to maximize their profit, produce so that MR equals MC .
4. **F** The firms cannot earn an economic profit in the long run because of the absence of barriers to entry.
5. **F** Monopolistically competitive firms have excess capacity because they produce differentiated goods.
6. **T** The firm sets $MR = MC$, but because $P > MR$, it is the case that $P > MC$. The difference between P and MC is the markup.

Product Development and Marketing

7. **T** Monopolistically competitive firms constantly try to further differentiate their products, and developing new products is one method they use.
8. **T** Marketing and advertising play key roles in monopolistically competitive firms' efforts to differentiate their products.
9. **T** Advertising can be used to signal to consumers that the product is high quality.

What Is Oligopoly?

10. **F** Oligopoly has only a small number of firms competing because barriers to entry prevent new firms from entering the market.
11. **T** This mutual interdependence makes oligopoly a difficult industry structure to analyze.

Two Traditional Oligopoly Models

12. **T** Shifts in the MC curve that do not move it beyond the vertical section of the MR curve have

no effect on the price that the firm charges nor on the quantity it produces.

13. **T** The dominant firm acts like a monopoly and the price it sets is the market price.

Oligopoly Games

14. **F** In a prisoners' dilemma game, the Nash equilibrium is for each player to confess.
15. **F** The collusive agreement described in the problem decreases output below its efficient level.
16. **F** In a game of chicken, the Nash equilibrium is for one firm to conduct R&D but it is not possible to predict which firm undertakes the R&D.

Repeated Games and Sequential Games

17. **T** Repeated games have strategies absent from games played only once, such as the tit-for-tat strategy, that can support the cooperative equilibrium. So, repeated games are more likely to have a cooperative equilibrium.
18. **T** When a small number of new firms enter a market, the firms might find themselves in a prisoners' dilemma in which competition forces the price of the product down.
19. **T** In a contestable market, if the firm sets its price so that it earns an economic profit, competitors enter the market.
20. **F** Limit pricing refers to the situation in which an established firm sets a low price in order to keep new competitors out of the market.

■ Multiple Choice Answers

Monopolistic Competition

1. **c** Both have downward-sloping demand curves, so both have MR curves that lie below their demand curves.
2. **d** The absence of high barriers to entry accounts for the large number of firms in each industry.
3. **d** Answer b is the definition of product differentiation and answers a and c are results of product differentiation.

Price and Output in Monopolistic Competition

4. **a** The monopolistically competitive firm maximizes its profit by producing so that $MR = MC$.
5. **c** With the firm producing Q_1 , the demand curve shows that the price of P_3 is the highest price that can be charged and sell all that is produced.

6. **a** The firm earns an economic profit because, at output of Q , $P > ATC$.
7. **a** New firms enter because they, too, want to earn an economic profit. As these firms enter, they decrease the demand for the existing firms' products, which reduces the economic profit.
8. **c** The firm produces less output than that which minimizes its long-run ATC .
9. **b** If firms in the industry are earning an economic profit, the absence of barriers to entry means that new firms enter the industry and compete away the economic profit.

Product Development and Marketing

10. **b** If the firm can increase the demand for its product, it can temporarily earn an economic profit.
11. **c** For virtually all business decisions, a firm compares the marginal revenue and marginal cost resulting from the decision.
12. **b** Monopolistically competitive firms incur large selling costs trying to differentiate their products.

What Is Oligopoly?

13. **d** A natural oligopoly occurs when the efficient scale of production is large enough so that the market can support only a small number of firms.
14. **b** The firms are interdependent because each firm's actions will affect its profit as well as its competitors' profits.

Two Traditional Oligopoly Models

15. **b** With this set of assumptions, the business believes that it will lose a large amount of sales if it raises its price, but pick up only a small amount if it lowers its price.
16. **b** When setting its price and quantity, the dominant firm acts as if it were a monopoly.
17. **d** The smaller firms are unable to affect the price charged by the large firm.

Oligopoly Games

18. **c** Both players confess even though it is in their joint interest for neither to confess.
19. **a** The interest of the industry as a whole is to maintain the cartel.

20. **b** Each firm's individual interest is to be the lone cheater on the cartel agreement. Compare this answer to the previous answer.
21. **a** Firm A's profits are in the darkened triangle in the square at the lower left.
22. **d** Firm B's profits are in the white triangle in the square at the lower left.
23. **a** Both firms adopt the strategy of cheating.
24. **b** A Nash equilibrium occurs when each player takes the best action possible, given the action of the other player.
25. **d** The cooperative equilibrium maximizes each firm's profit over the long haul.
26. **c** In the Nash equilibrium, one firm conducts the R&D, even though the firm that does not conduct the R&D has a higher profit.

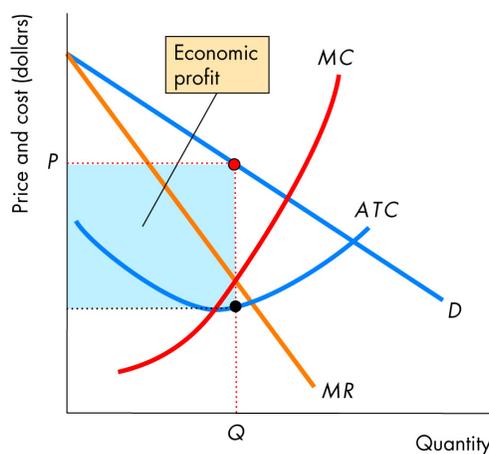
Repeated Games and Sequential Games

27. **c** Tit-for-tat implies that "I'll do to you what you did to me."
28. **d** Neither the new firms nor the old ones want a price war, but a prisoners' dilemma game might make a price war inevitable.
29. **b** Limit pricing can occur in contestable markets when the firm plays an entry deterrence game.

■ Answers to Short Answer Problems

FIGURE 13.7

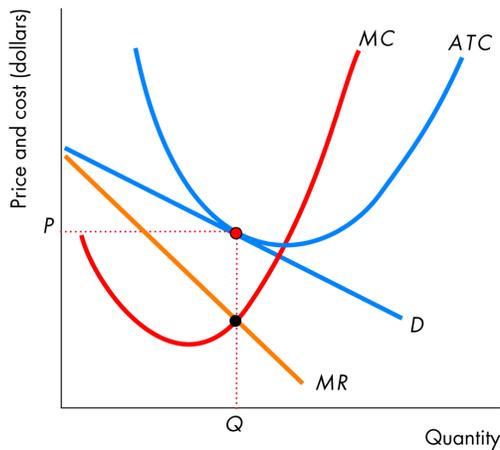
Short Answer Problem 1



1. Figure 13.7 shows the short-run equilibrium of a monopolistically competitive firm. To maximize its

profit, the firm produces so that $MR = MC$. At this level of output, $P > ATC$, so the firm earns an economic profit, as illustrated by the darkened rectangle. This diagram is identical to that of a monopoly firm earning an economic profit. Both monopoly and monopolistically competitive firms face downward-sloping demand curves, both produce so that $MR = MC$, and, as long as $P > ATC$, both firms earn an economic profit.

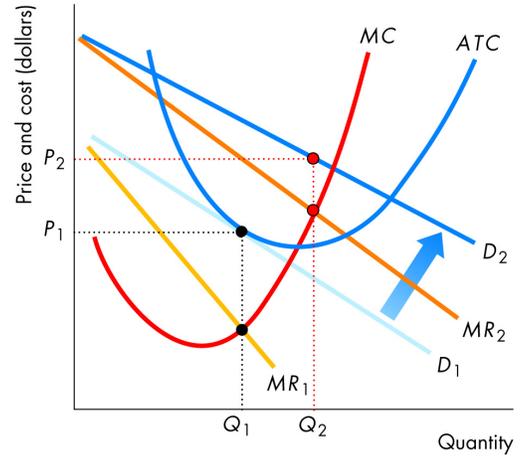
FIGURE 13.8
Short Answer Problem 2



2. Figure 13.8 shows the long-run equilibrium for a monopolistically competitive firm. Two conditions must be satisfied for this diagram to show the long-run equilibrium. Think of these requirements as a *firm condition* and a *market condition*. For the firm to be satisfied, it must maximize its profit, which requires that it be producing the amount of output so that $MR = MC$. Then, for there to be long-run equilibrium in the market, firms must have no incentive either to enter or exit the industry. As a result, there can be no economic profit, so $P = ATC$. (This second condition is not a choice of the firm; the firm would rather earn an economic profit. But for the market to be in long-run equilibrium, it is required.) Both conditions — production at $MR = MC$ and $P = ATC$ — are met in Figure 13.8 so Figure 13.8 illustrates the long-run equilibrium.
3. Figure 13.9 shows the effect when a monopolistically competitive firm succeeds in further differentiating its product. The demand for the firm's good

increases, thereby shifting the demand curve and the

FIGURE 13.9
Short Answer Problem 3



MR curve rightward. As a result, the firm increases its output from Q_1 to Q_2 and raises its price from P_1 to P_2 . The firm earns an economic profit.

In the long run, other firms copy its product. As they copy, the demand for the initial firm's good decreases; that is, the demand curve and MR curve shift leftward. Ultimately, demand decreases enough that the pioneering firm — and all other “copier” firms — no longer earn an economic profit. At this point, other firms do not have an incentive to copy the good and the market is in long-run equilibrium.

4. An advantage of perfect competition is that it produces at minimum average total cost, while monopolistic competition produces at a higher average total cost because of its excess capacity. Another advantage is that a perfectly competitive market is efficient; it produces the level of output that sets marginal social benefit equal to marginal social cost. A monopolistically competitive industry, however, is not efficient because the price of the product (which equals the marginal social benefit) exceeds the marginal social cost (which equals the marginal cost). The advantage of monopolistic competition is that product differentiation leads to greater product variety, which consumers value. In addition, monopolistically competitive firms have a greater incentive to innovate new and improved products and meth-

ods of production. Monopolistically competitive firms must do more advertising and sales promotion than perfectly competitive firms. To the extent that these activities provide valued services to consumers, they benefit society.

So, the loss in efficiency and the higher *ATC* that occurs in monopolistic competition must be weighed against the gain of greater product variety, greater incentives to innovate, and potentially valuable promotional activity.

5. Firms in oligopoly are interdependent because an oligopoly has only a small number of firms in the market. In this case, each firm's actions will affect its competitors' profits. In perfect competition and monopolistic competition, there are so many firms that any one firm's actions have no effect on its competitors. In monopoly, the firm has no competitors, so it is not interdependent with any other firm.
6. Game theory explains price wars as the consequence of firms in a colluding industry responding to the cheating of a firm or as the response to new firms entering the industry. If one firm cheats by cutting its price, all other firms will cut their prices, and a price war ensues. After the price has fallen sufficiently (perhaps so the firms earn zero economic profit), they have an incentive to rebuild their collusion. Alternatively, if new firms (or even just one) enter an industry, the old and new players might find themselves playing a prisoners' dilemma game. Neither set of firms wants the price to fall and profits to shrink, but they might be unable to collude successfully to keep the price and profit high.

Short Answer Problem 7 (a)

		Tom's strategies	
		Cheat	Comply
Chet's strategies	Cheat	\$0 / -\$1 million	-\$1 million / \$2.5 million
	Comply	\$2.5 million / -\$1 million	\$2 million / \$2 million

7. a. The payoff matrix is given above.
- b. Tom's best strategy is to cheat without regard to what Chet does. If Chet adheres to the agreement and does not cheat, Tom will cheat because his profit when cheating (\$2.5 million) exceeds his profit when he does not cheat (\$2 million). And, if Chet cheats, Tom also will cheat because his profit (\$0) is higher than the loss he would incur by not cheating (-\$1 million). Tom has a dominant strategy: cheat. In exactly the same way, Chet's profits are higher if he cheats regardless of what Tom does. So, Chet also has a dominant strategy of cheating. The Nash equilibrium outcome is for both Tom and Chet to cheat on the cartel agreement.
- c. The industry's total profits are highest (\$4 million) when neither Tom nor Chet cheat. Tom's profit is largest if he cheats and Chet does not. Similarly, Chet's profit is greatest if he alone cheats. Though each player's *individual* interest is to cheat, their *joint* interest is to comply.

Short Answer Problem 8 (a)

		Tom's strategies	
		Cheat	Comply
Chet's strategies	Cheat	\$0 / \$0.5 million	-\$1 million / \$2 million
	Comply	\$2.5 million / \$0.5 million	\$2 million / \$2 million

8. a. The new payoff matrix is given above.
- b. Tom and Chet no longer have a dominant strategy. In particular, if Chet complies with the agreement, Tom wants to cheat because in this case his profit by cheating (\$2.5 million) exceeds his profit by complying (\$2 million). But, if Chet cheats on the agreement, Tom will want to comply. If Chet is cheating, Tom earns a profit of \$0.5 million by complying but \$0 by cheating. Hence Tom's best strategy depends on what Chet does. Chet is in the same situation: His

best strategy depends on what Tom does. Unlike the situation in problem 7, the outcome is not clear-cut. The equilibrium depends on which strategy Chet and Tom decide to pursue.

9. a. Last period Chet did not cheat, so Tom's tit-for-tat strategy means that Tom will not cheat this period. Because Tom will comply with the cartel agreement, Chet's profit this period by cheating is \$2.5 million. Next period Tom will cheat because Chet cheated this period. Therefore next period the most profit that Chet can earn is \$0 by also cheating. (If Chet complied with agreement and Tom cheated, Chet loses -\$2 million.) Over the two periods, Chet's total profit if he cheats in the first period is \$2.5 million.
- b. If Chet does not cheat this period, this period he will earn \$2 million. Because Chet complied with the agreement this period, Tom's tit-for-tat strategy means that next period Tom will comply with the agreement. Then, if Chet also complies next period, he will earn \$2 million. By complying each period Chet earns a total of \$4 million over the two periods.
- c. Chet is not likely to cheat. If he does, his total profits over the two periods are significantly less than if he complies over the two periods. So players in a repeated game are more likely to reach the cooperative equilibrium than players in a one-time game.

■ You're the Teacher

1. "One other rule works for a firm in perfect competition, monopolistic competition, and monopoly. In particular, if $P > ATC$, the firm earns an economic profit; if $P = ATC$, the firm earns a normal profit; and if $P < ATC$, the firm suffers an economic loss. Let's take the case of $P > ATC$ and find out why it means that the firm earns an economic profit. If we multiply both sides of the inequality by q , the amount of output the firm produces, we get $P \times q > ATC \times q$. Now, $P \times q$ (the price multiplied the amount produced) equals the firm's total revenue. And $ATC = TC \div q$, so multiplying ATC by q gives TC , the firm's total cost. So when $P > ATC$, total revenue exceeds total cost. Because the firm's normal profit is already included in its total cost, the fact that the firm's total revenue exceeds its total cost means that the 'extra' profit is an economic profit.

"But look, the main point of what I am saying is that we do have it easy: Here's another case where we don't have to memorize a bunch of different rules. If a firm finds that P exceeds ATC , it's earning an economic profit."

Chapter Quiz

1. In a duopoly game that is repeated many times, each player tries to
 - a. maximize the industry's total profit.
 - b. minimize the other player's profit.
 - c. maximize its market share.
 - d. maximize its profit.
2. In the long run, a monopolistic competitive firm ____ excess capacity and ____ a markup of price over marginal cost.
 - a. has; has
 - b. has; does not have
 - c. does not have; has
 - d. does not have; does not have
3. Which of the following statements about advertising is FALSE?
 - a. Advertising shifts the *ATC* curve upward.
 - b. Advertising can be sued to signal quality.
 - c. Advertising might increase the number of firms in an industry.
 - d. If all firms in an industry advertise, the advertising makes the firms' demands less elastic.
4. The major distinction between a monopolistically competitive industry and a perfectly competitive industry is that firms in a monopolistically competitive industry
 - a. produce identical products.
 - b. are protected by high barriers to entry.
 - c. produce at the minimum *ATC* in the long run.
 - d. produce a product that is different from those produced by its competitors.
5. If firms in a monopolistically competitive industry earn an economic profit,
 - a. other firms will enter the industry.
 - b. some firms will leave the industry.
 - c. firms will neither enter nor exit.
 - d. The premise of the question is wrong because monopolistically competitive firms cannot earn an economic profit.
6. A firm in which type of industry always has excess capacity in the long run?
 - a. Perfect competition
 - b. Monopolistic competition
 - c. Oligopoly
 - d. Monopoly
7. If one firm in a cartel cheats on a collusive agreement, its profits ____ and the profits of the other firms _____.
 - a. rise; rise
 - b. rise; fall
 - c. fall; rise
 - d. falls; fall
8. In the long run, a monopolistically competitive firm ____ earn an economic profit and a monopoly ____ earn an economic profit.
 - a. can; can
 - b. can; cannot
 - c. cannot; can
 - d. cannot; cannot
9. When each player selects his or her best strategy taking as given what the other player will do, the resulting equilibrium is called a
 - a. cooperative equilibrium.
 - b. tit-for-tat equilibrium.
 - c. Nash equilibrium.
 - d. trigger strategy equilibrium.
10. A strategy in which a player cooperates in the current period if the other player cooperated in the previous period, but cheats in the current period if the other player cheated in the previous period is called a
 - a. tit-for-tat strategy.
 - b. trigger strategy.
 - c. duopoly strategy.
 - d. dominant firm strategy.

The answers for this Chapter Quiz are on page 368