

Strategic Decision Making in Oligopoly Markets

Learning Objectives

After reading Chapter 13 and working the problems for Chapter 13 in the textbook and in this Workbook, you should be able to do the following things

For simultaneous decisions:

- Explain why the interdependence of profits for oligopoly firms leads to strategic behavior.
- Analyze strategic decisions facing oligopolists making simultaneous decisions by employing the concepts of dominate strategies, dominated strategies, and Nash equilibrium.
- Employ best-response curves to find Nash equilibrium decisions in simultaneous decision situations.

For sequential decisions:

- Analyze strategic decisions facing oligopolists making sequential decisions by employing the roll-back method of finding best decisions.
- Determine whether first or second-mover advantages exist in sequential decisions.
- Explain how oligopoly firms may be able to engage in strategic entry deterrence through the use of limit pricing or capacity expansion strategies.

For repeated decisions:

- Explain why Nash equilibrium is considered a noncooperative solution for oligopoly decisions and what is meant by the terms “cooperation” and “cheating” in strategic decision making.
- Explain why cooperation can sometimes be achieved when decisions are repeated over time.
- Explain how to determine whether cooperation (i.e., choosing not to cheat) will increase the present value of a firm.
- Discuss four types of facilitating practices that can improve the chances for reaching a cooperative outcome in oligopoly decisions.
- Explain why cartel members usually choose to cheat on price-fixing agreements.
- Discuss the nature of tacit collusion as a means of achieving cooperative outcomes in oligopoly markets.

For strategic entry deterrence decisions:

- Explain why it is difficult, but not impossible, to create strategic barriers to entry by either limit pricing or capacity expansion.

Essential Concepts

- Interdependence of firms' profits, which is the distinguishing feature of oligopoly markets, arises when the number of firms in a market is small enough that every firm's price and output decisions affect the demand and marginal revenue conditions of every other firm in the market.
- *Game theory* provides a useful guideline on how to behave in strategic situations involving interdependence. A game is any decision-making situation in which people compete with each other for the purpose of gaining the greatest individual payoff (rather than group payoff) from playing the game.

This chapter is divided into four sections: Section 13.1 examines simultaneous decisions, Section 13.2 examines sequential decisions, Section 13.3 examines repeated decisions, and Section 13.4 examines strategic entry deterrence. The *Essential Concepts* for this chapter are organized accordingly.

Simultaneous Decisions:

1. Simultaneous decision games occur when managers must make their individual decisions without knowing the decisions of their rivals.
2. A *dominant strategy* is a strategy or action that always provides the best outcome no matter what decisions rivals make. When a dominant strategy exists, a rational decision maker always chooses to follow its own dominant strategy and predicts that if its rivals have dominant strategies, they will also choose to follow their dominant strategies.
3. A *dominant strategy equilibrium* exists when all decision makers have dominant strategies.
4. A *prisoners' dilemma* arises when all rivals possess dominant strategies, and in dominant strategy equilibrium, they are all worse off than if they had cooperated in making their decisions. In other words, there is a cell in the payoff table that makes every rival better off than in the dominant strategy equilibrium cell.
5. When a firm does not have a dominant strategy, but at least one of its rivals does have a dominant strategy, the firm's manager can predict with confidence that its rivals will follow their dominant strategies. A manager can then choose its own best strategy, knowing the actions that will almost certainly be taken by rivals possessing dominant strategies.
6. *Dominated strategies* are strategies or decisions that are never the best strategy for any of the decisions that rivals might make. Therefore, a dominated strategy would never be chosen and should be ignored or eliminated for decision-making purposes. If, after a first round of eliminating dominated strategies, other strategies become dominated as a result of the first-round elimination, then successive elimination of dominated strategies should continue until no dominated strategies remain in the final payoff table.

7. Strategically astute managers will search first for dominant strategies, and, if no dominant strategies can be discovered, they next look for dominated strategies. When neither form of strategic dominance exists, decision makers must employ a different concept for making simultaneous decisions.
8. In order for all firms in an oligopoly market to be predicting correctly each others' decisions—managers cannot make *best* decisions without making *correct* decisions—all firms must be choosing individually best actions given the predicted actions of their rivals, which they can then believe are correctly predicted. Thus, strategically astute managers look for mutually best decisions.
9. A *Nash equilibrium* is a set of actions or decisions for which all managers are choosing their best actions given the actions they expect their rivals to choose.
10. In Nash equilibrium, no single firm can unilaterally (by itself) make a different decision and do better. This characteristic of Nash equilibrium is called *strategic stability*, and it provides the fundamental reason for believing that strategic decision makers will likely decide on a Nash pair of decisions.
11. When managers face a simultaneous decision-making situation possessing a unique Nash equilibrium set of decisions, rivals can be expected to make the decisions leading to the Nash equilibrium. If there are multiple Nash equilibria, there is generally no way to predict the likely outcome.
12. All dominant strategy equilibria are also Nash equilibria, but Nash equilibria can occur without either dominant or dominated strategies.
13. Economists have developed a tool, called *best-response curves*, to analyze and explain simultaneous decisions when decision choices are continuous rather than discrete. A firm's best-response curve indicates the best decision to make (usually the profit-maximizing one) based on, or accounting for, the decision the firm expects its rival will make. A Nash equilibrium occurs at the price (or output) pair where the firms' best-response curves intersect.

Sequential Decisions:

1. In contrast to simultaneous decisions, the natural process of some decisions requires one firm to make a decision, and then a rival firm, knowing the action taken by the first firm, makes its decision. Such decisions are called *sequential decisions*. Even though they are made at different times, sequential decisions nonetheless involve strategic interdependence. Sequential decisions are linked over time: The best decision a manager can make today depends on how rivals will respond tomorrow.
2. The easiest way to analyze sequential decisions is to use a *game tree*. A game tree is a diagram showing firms' decisions as decision nodes with branches extending from the nodes, one for each action that can be taken at the node. The sequence of decisions usually proceeds from left to right along branches until final payoffs associated with each decision path are reached.
3. When firms make sequential decisions, managers make best decisions for themselves by working backwards through the game tree using the *roll-back method*. The roll-back method (also known as *backward induction*) results in a unique path that is also a Nash decision path: Each firm does the best for itself given the best decisions made by its rivals.

4. If letting your rivals know what you are doing by going first in a sequential decision game increases your payoff (relative to your payoff from going second), then a first-mover advantage exists. Alternatively, if reacting to a decision already made by a rival increases your payoff (relative to your payoff from going first), then a second-mover advantage exists.
5. To determine whether the order of decision making can confer an advantage when firms make sequential decisions, the roll-back method can be applied to the game trees for each possible sequence of decisions. If the payoff increases by being the first (second) to move, then a first-mover (second-mover) advantage exists. If the payoffs are identical, then order of play confers no advantage.
6. Managers can make strategic moves to achieve better outcomes for themselves, usually to the detriment of their rivals. Only credible strategic moves matter; rivals ignore any commitments, threats, or promises that will not be carried out should the opportunity to do so arise. There are three types of strategic moves: *commitments*, *threats*, and *promises*.
 - a. Managers make commitments by announcing, or demonstrating to rivals in some other way, that they will bind themselves to take a particular action or make a specific decision *no matter what action or decision is taken by its rivals*.
 - b. Threats, whether they are made explicitly or tacitly, take the form of a conditional statement, “If you take action *A*, I will take action *B*, which is undesirable or costly to you.”
 - c. Promises, like threats, are also conditional statements that must be credible to affect strategic decisions. Promises take the conditional form, “If you take action *A*, then I will take action *B* which is desirable or rewarding to you.”

Repeated Decisions:

1. Cooperation occurs when oligopoly firms make individual decisions that make every firm better off than they would be in a (noncooperative) Nash equilibrium.
2. Making noncooperative decisions is called “cheating” by game theorists, even though “cheating” does not imply that the firms have made any kind of agreement to cooperate.
3. Cooperation is possible in every prisoners’ dilemma decision, but cooperation is not strategically stable when the decision is made only once. In one-time prisoners’ dilemmas there can be no future consequences from cheating, so both firms *expect* the other to cheat, which in turn makes cheating the best response for each firm.
4. When decisions are repeated over and over again by the same firms, managers get a chance to punish cheaters. When cheating can be punished by making credible threats of punishment in later rounds of decision making, strategically astute managers can sometimes, but not always, achieve cooperation in prisoners’ dilemmas.
5. Cooperation increases a firm’s value when the present value of the costs of cheating exceeds the present value of the benefits from cheating. Alternatively, cheating increases a firm’s value when the present value of the benefits from cheating outweighs the present value of the costs of cheating. Cooperation is achieved in an oligopoly market when all firms decide not to cheat.

6. A widely studied category of punishment strategies is known in game theory as *trigger strategies*. Managers implement trigger strategies by initially choosing the cooperative action and continuing to choose the cooperative action in successive repetitions of a decision until a rival cheats. The act of cheating then “triggers” a punishment phase in the next repetition of the game that may last one or more repetitions depending on the nature of the trigger scheme.
7. The two most commonly studied trigger strategies are *tit-for-tat* and *grim strategies*.
 - a. In a *tit-for-tat strategy*, cheating triggers punishment in the next decision period, and the punishment continues unless the cheating stops, which triggers a return to cooperation in the following decision period. In other words, if firm *B* cheated in the last decision period, firm *A* will cheat in this decision period. If firm *B* cooperated last time, then firm *A* will cooperate this time.
 - b. In a *grim strategy*, cheating triggers punishment in the next decision period, and the punishment continues forever, even if cheaters make cooperative decisions in subsequent periods.
8. Since cooperation usually increases profits, managers frequently adopt legal tactics, known as *facilitating practices*, designed to make cooperation more likely. Four such tactics are price matching, sale-price guarantees, public pricing, and price leadership:
 - a. *Price matching*: A firm commits to a price-matching strategy by publicly announcing, usually in an advertisement, that it will match any lower prices offered by its rivals. This largely eliminates the benefit to other firms from cutting their prices, and so price matching discourages noncooperative price-cutting.
 - b. *Sale-price guarantees*: Your firm offers a sale-price guarantee by promising customers who buy an item from you today that they are entitled to receive any sale price your firm might offer for some stipulated future period. The primary purpose of this tactic is to make it costly for firms to cut their prices.
 - c. *Public pricing*: Publicly available prices, which are timely and authentic, facilitate quick detection of noncooperative price cuts. Early detection of cheating both reduces the present value of benefits from cheating and increases the present value of the costs of cheating, which reduces the likelihood of noncooperative price-cutting.
 - d. *Price leadership*: Sometimes one oligopoly firm (the leader) sets its price at a level it believes will maximize total industry profit, and then the rest of the firms (the followers) cooperate by setting the same price. This arrangement, known as price leadership, does not require an explicit agreement among firms and is generally a lawful means of facilitating cooperative pricing.
9. Cartels are the most extreme form of cooperative oligopoly. Essentially a cartel is an explicit collusive agreement among firms to drive up prices by restricting total market output. Cartels are illegal in the United States, Canada, Mexico, Germany, and the European Union.
10. Cartels find it extremely difficult to maintain cooperatively set cartel prices because cartel pricing schemes are usually strategically unstable. The lack of strategic

stability of cartels stems from the incentive to cheat by lowering price. The incentive to cut price below the cartel price is great because, when undetected (and unmatched), price cutting occurs along a very elastic single-firm demand curve with the associated lure of much greater revenues for any one firm that cuts price. Of course the lure is great for every firm, and eventually many cartel members begin cutting their prices secretly. This causes price to fall sharply along a much steeper demand curve that reflects the firm's demand when many cartel members all lower price together.

11. A far less extreme form of cooperation among oligopoly firms is tacit collusion, which occurs when oligopoly firms cooperate without an explicit agreement or any other facilitating practices.

Strategic Entry Deterrence

1. Strategic entry deterrence occurs when an established firm (or firms) makes strategic moves designed to discourage or even prevent the entry of a new firm or firms into a market. Two types of strategic moves designed to manipulate the beliefs of potential entrants about the profitability of entering are limit pricing and capacity expansion.

Limit pricing

2. Under certain circumstances, an oligopolist, or possibly a monopolist, may be able to make a credible commitment to charge forever a price lower than the profit-maximizing price in order to discourage new firms from entering the market.

Capacity Expansion

3. Sometimes an established firm can make its threat of a price cut in the event of entry credible by irreversibly increasing its plant capacity. When increasing production capacity results in lower marginal costs of production for an established firm, the established firm's best response to entry of a new firm may then be to increase its own level of production, which requires the established firm to cut its price in order to sell the extra output.

Matching Definitions

best-response curve	payoff table
capacity expansion as a barrier to entry	price leadership
cartel	price matching
cheating	promises
commitments	repeated decisions
common knowledge	roll-back method
cooperation	second-mover advantage
credible	sequential decisions
decision nodes	simultaneous decision games
dominant strategy	strategic behavior
dominant strategy equilibrium	strategic entry deterrence
dominated strategies	strategic moves
first-mover advantage	strategic stability
game	successive elimination of dominated strategies
game theory	tacit collusion
game tree	threats
grim strategy	tit-for-tat strategy
limit pricing	
Nash equilibrium	
oligopoly	

- _____ Actions taken by firms to plan for and react to competition from rival firms.
- _____ A market consisting of a few relatively large firms, each with a substantial share of the market and all recognize their interdependence.
- _____ An analytical guide or tool for making decisions in situations involving interdependence.
- _____ Any decision-making situation in which people compete with each other for the purpose of gaining the greatest individual payoff.
- _____ A situation in which competing firms must make their individual decisions without knowing the decisions of their rivals.
- _____ A table showing, for every possible combination of decisions players can make, the outcomes or “payoffs” for each of the players in each decision combination.
- _____ A situation in which all decision makers know the payoff table, and they believe all other decision makers also know the payoff table.
- _____ A strategy or action that always provides the best outcome no matter what decisions rivals make.
- _____ Both players have dominant strategies and play them.

10. _____ Strategies that would never be chosen because at least one other strategy provides a higher payoff no matter what rivals choose to do.
11. _____ An iterative decision-making process in which dominated strategies are eliminated to create a reduced payoff table with fewer decisions for managers to consider.
12. _____ A set of actions for which all managers are choosing their best actions given the actions chosen by their rivals.
13. _____ In a Nash equilibrium cell, no decision maker can unilaterally change its decision and improve its individual payoff.
14. _____ A curve indicating the best decision (usually the profit-maximizing one) given the decision the manager believes a rival will make.
15. _____ A decision in which one firm makes its decision first, then a rival firm makes its decision.
16. _____ A diagram showing the structure and payoff of a sequential decision situation.
17. _____ Points in a game tree, represented by boxes, where decisions are made.
18. _____ Method of finding a Nash solution to a sequential decision by looking ahead to future decisions to reason back to the best current decision.
19. _____ A firm can increase its payoff by making its decision first.
20. _____ A firm can increase its payoff by making its decision second.
21. _____ A strategic move that will be carried out because it is in the best interest of the firm making the move to carry it out.
22. _____ Three kinds of actions that can be used to put rivals at a disadvantage: commitments, threats, or promises.
23. _____ Unconditional actions taken for the purpose of increasing payoffs to the committing firms.
24. _____ Conditional strategic moves that take the form, "If you do A, I will do B which is costly to you."
25. _____ Conditional strategic moves that take the form, "If you do A, I will do B which is desirable to you."
26. _____ When firms make decisions that make every firm better off than in a noncooperative Nash equilibrium.
27. _____ When a manager makes a noncooperative decision.
28. _____ Decisions made over and over again by the same firms.
29. _____ Punishment strategies that choose cooperative actions until an episode of cheating triggers a period of punishment.

30. _____ A trigger strategy that punishes after an episode of cheating and returns to cooperation if cheating ends.
31. _____ A trigger strategy that punishes forever after an episode of cheating.
32. _____ A strategic commitment to match any rival's lower price.
33. _____ A firm's promise to give its buyers today any sale price it might offer during a stipulated future period.
34. _____ Informing buyers about prices in a way that makes pricing information public knowledge.
35. _____ A leader firm sets the industry profit-maximizing price and the follower firms cooperate by all setting the same price.
36. _____ A group of firms that agree to limit competitive forces in a market.
37. _____ Cooperation among firms that does not involve an explicit agreement.
38. _____ Strategic moves taken by established firms to prevent entry of new firms.
39. _____ A firm can make a credible commitment to charge a price lower than the profit-maximizing price to discourage new firms from entering the firm's market.
40. _____ Strategy in which an established firm irreversibly expands capacity to make credible its threat to decrease price if entry occurs.

Study Problems

1. Two firms, Atlantis and Bacchus, compete primarily by price. Each firm chooses either a high price or a low price simultaneously. The following payoff table shows the profit each firm would earn in each of the four possible decision combinations.

		<i>Bacchus price</i>	
		<i>High</i>	<i>Low</i>
Atlantis price	High	A \$10,000, \$10,000	B \$5,000, \$20,000
	Low	C \$20,000, \$5,000	D \$8,000, \$8,000

- a. Does Atlantis have a dominant strategy? Why or why not?
 - b. Does Bacchus have a dominant strategy? Why or why not?
 - c. Does Atlantis have a dominated strategy? Explain why or why not.
 - d. Does Bacchus have a dominated strategy? Explain why or why not.
 - e. What is the outcome of this simultaneous decision? Why?
 - f. Is this decision situation a prisoners' dilemma? Explain why or why not.
 - g. Is cell C strategically stable? Explain why or why not.
 - h. Is cell D strategically stable? Explain why or why not.
2. Find the solution to the following advertising decision game between Coke and Pepsi by using the method of successive elimination of dominated strategies.

		<i>Pepsi's budget</i>		
		<i>Low</i>	<i>Medium</i>	<i>High</i>
Coke's budget	Low	A \$400, \$400	B \$320, \$720	C \$560, \$600
	Medium	D \$500, \$300	E \$450, \$525	F \$540, \$500
	High	G \$375, \$420	H \$300, \$378	I \$525, \$680

- a. Are there any dominant strategies in the original payoff table?
- b. In the first round of elimination of dominated strategies, which strategies are eliminated, if any, for Coke? For Pepsi?
- c. After the first round of elimination, are there any more dominated strategies to eliminate? If so, identify them.
- d. After the first round of elimination, are there any dominant strategies? If so, identify them.
- e. The likely outcome of this advertising game is cell ____.
- f. Is the likely outcome a Nash equilibrium? Explain.
- g. Is the likely outcome strategically stable? Explain.

3. Find the solution to the following simultaneous pricing decision between Rattler Enterprises and Sidewinder, Inc.

		<i>Sidewinder's price</i>		
		<i>\$100</i>	<i>\$200</i>	<i>\$300</i>
Rattler's price	\$100	A \$5,000, \$3,600	B \$4,500, \$4,200	C \$4,200, \$4,500
	\$200	D \$6,000, \$7,000	E \$4,400, \$5,000	F \$5,000, \$4,600
	\$300	G \$3,750, \$3,200	H \$4,000, \$4,200	I \$5,500, \$3,600

Annual payoffs in millions of dollars of profit.

- Rattler's dominant strategy is _____ (\$100, \$200, \$300, or Rattler has no dominant strategy).
 - Sidewinder's dominant strategy is _____ (\$100, \$200, \$300, or Sidewinder has no dominant strategy).
 - Rattler's dominated strategy is _____ (\$100, \$200, \$300, or Rattler has no dominated strategy).
 - Sidewinder's dominated strategy is _____ (\$100, \$200, \$300, or Sidewinder has no dominated strategy).
 - The likely outcome of this simultaneous pricing decision is for Rattler to set a price of \$ _____ and Sidewinder to set a price of \$ _____. Explain why you chose this pair of decisions.
4. Managers of two competing automobile lubrication service facilities in a fashionable suburb of Los Angeles must make their pricing decisions simultaneously. Jiff Lube (J) and Oil Can Hank (O) face the following demand and long-run cost conditions, which are common knowledge to the managers

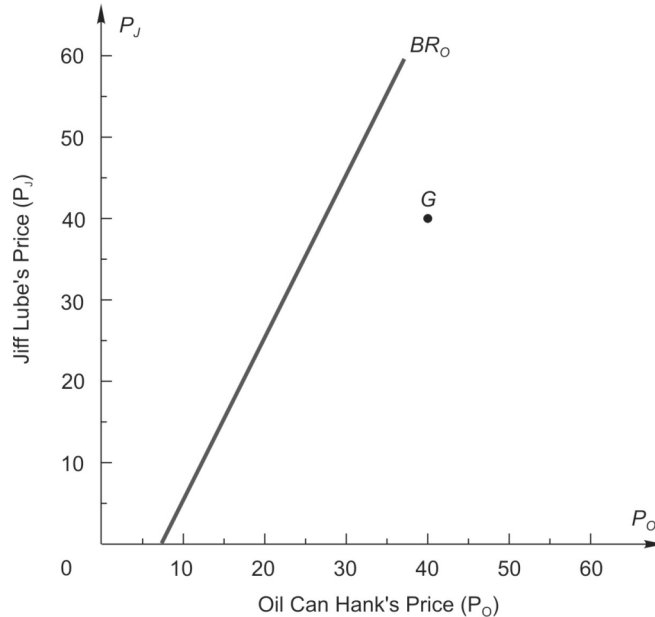
$$Q_J = 50 - 5P_J + 7.5P_O \quad \text{and} \quad LMC_J = LAC_J = \$10$$

$$Q_O = 60 - 6P_O + 6P_J \quad \text{and} \quad LMC_O = LAC_O = \$5$$

The prices, P_J and P_O , are the prices charged by Jiff Lube and Oil Can Hank, respectively, for a full-service lubrication. The quantities, Q_J and Q_O , are the respective quantities of full-service oil changes performed each week. The figure below shows Oil Can Hank's best-response curve, BR_O . Only one point on Jiff Lube's best-response curve, point G , is shown in the figure.

- Find a second point on Jiff Lube's best-response curve by finding the best response when Jiff Lube believes Oil Can Hank will set a price of \$7.50. Plot this price pair on the graph, label it H , draw the best-response curve for Jiff Lube, and label it BR_J .
- What prices do you expect Jiff Lube and Oil Can Hank to set? Explain why. Label this price pair point N on the graph.
- How much weekly profit does Jiff Lube make at point N ? Oil Can Hank?
- Explain carefully why the pair of prices at point G in the figure is not likely to be chosen by Jiff Lube and Oil Can Hank.

- e. Suppose the managers of the two firms decide to cooperate with each other by agreeing to set prices $P_J = \$30$ and $P_O = \$30$. Label this point C in the figure. How much weekly profit does Jiff Lube make at point C ? Oil Can Hank?
- f. Why didn't you give point C as your answer to part b ?



5. Sony and Zenith must each decide which technology to utilize in building their 2005 model high definition television (HDTV) sets: either Alpha technology or Beta technology. Sony has a technological advantage in using Alpha technology and Zenith has a technological advantage in using Beta technology. The payoff table below shows the profit outcomes for both firms in the various possible technology choice outcomes.

		<i>Zenith</i>	
		<i>Alpha</i>	<i>Beta</i>
Sony	Alpha	A \$16, \$12	B \$11, \$10
	Beta	C \$9, \$8	D \$13, \$15

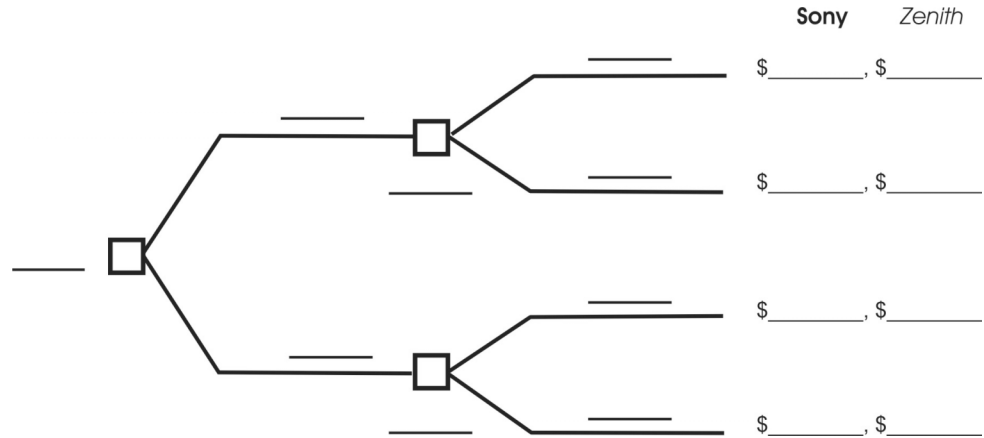
Payoffs in billions of dollars of profits.

Suppose the technology decision between Alpha and Beta will be made *simultaneously*. Answer the following questions:

- a. Sony's dominant strategy is _____ (Alpha, Beta, neither: it has no dominant strategy).
- b. Zenith's dominant strategy is _____ (Alpha, Beta, neither: it has no dominant strategy).
- c. This simultaneous decision game has TWO Nash equilibrium cells: _____ (A, B, C, D) and _____ (A, B, C, D).

Now suppose that Sony decides to make a strategic commitment to one of the technologies so that it can make the first move in a *sequential* decision game.

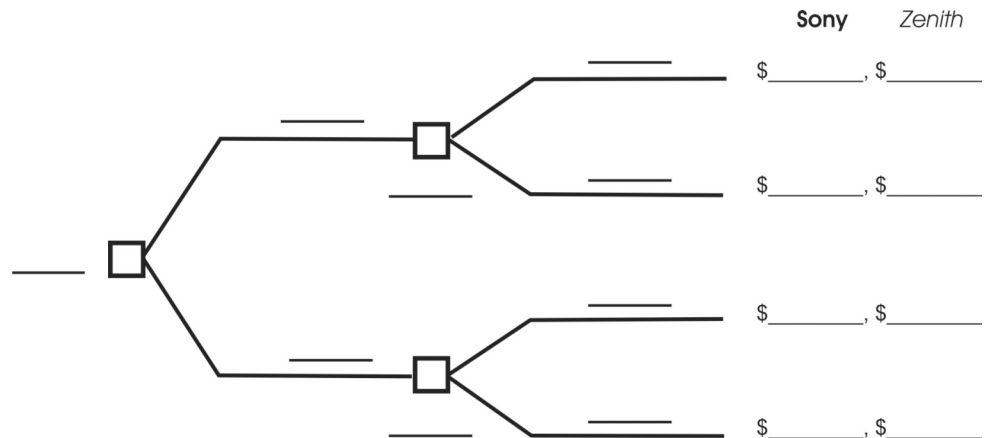
- d. Complete the following game tree for the sequential game in which Sony moves first, by filling in the blanks using the information in the preceding payoff table.



- e. For the sequential game in part *d*, use the roll-back method to find the Nash equilibrium decision path. Circle this decision path on the game tree above. Sony earns a profit of \$_____ and Zenith earns a profit of \$_____.

Suppose instead that Zenith decides to make a strategic commitment to one of the technologies so that it can make the first move in a sequential decision game.

- f. Complete the following game tree for the sequential game in which Zenith moves first, by filling in the blanks using the information in the payoff table.



- g. For the sequential game in part *f*, use the roll-back method to find the Nash equilibrium decision path. Circle this decision path on the game tree above. Sony earns a profit of \$_____ and Zenith earns a profit of \$_____.
- h. Does either firm have a first-mover advantage? Explain.
- i. Does either firm have a second-mover advantage? Explain.

6. Corsicana is a very small town with two fast-food restaurants, BK and Mac, situated on opposite corners of the only busy intersection in town. BK and Mac compete on the basis of the prices they set for their burger, fry, and soda combination meals. The *Corsicana Gazette*, the local newspaper in which they advertise their prices, is published once a month. On the last day of the month, BK and Mac simultaneously choose their combo meal prices, which will remain in effect for all of the next month.

The managers at BK and Mac only consider two possible prices: a low price of \$3 or a high price of \$4. The monthly profits from each of the four possible combinations of decisions are given in the following table:

		<i>BK's combo price</i>	
		<i>Low (\$3)</i>	<i>High (\$4)</i>
Mac's combo price	Low (\$3)	A \$3,000, \$5,500	B \$6,500, \$5,000
	High (\$4)	C \$2,000, \$9,000	D \$5,000, \$8,000

Payoffs in dollars of monthly profit.

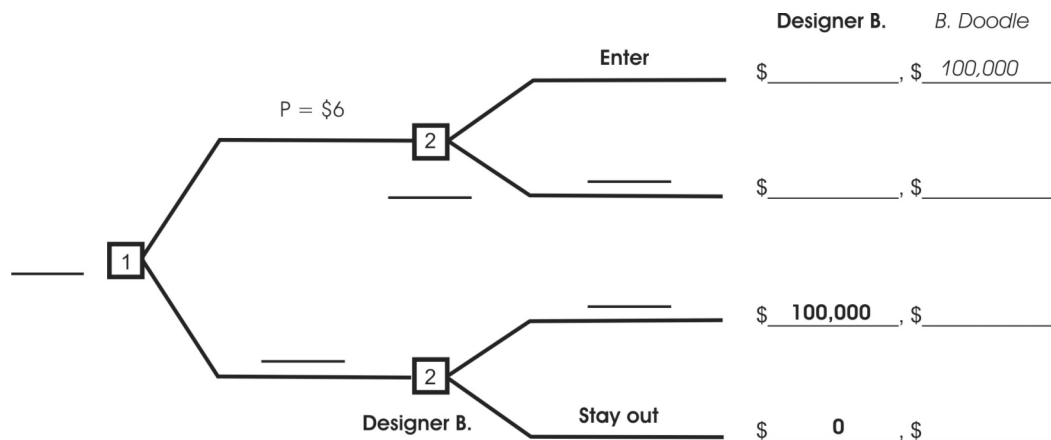
- Is the pricing decision facing Mac and BK a prisoners' dilemma? Why or why not?
 - What is the cooperative outcome? What is the noncooperative outcome?
 - Which cell(s) represent cheating in the pricing decision? Explain.
 - If Mac and BK make their pricing decision just one time, what are their pricing decisions likely to be? Explain.
7. If the monthly pricing decision in Problem 6 is made repeatedly:
- Can Mac make a credible threat to punish BK with a retaliatory price cut?
 - Can BK make a credible threat of a retaliatory price cut if Mac cheats?
8. Suppose in Problem 6 Mac and BK repeat their simultaneous pricing decisions every month. They had been cooperating, but now Mac's manager is thinking about whether to cheat or to continue cooperating. Mac's manager believes that, in such a small town, it can only get away with cheating for two months before town gossip reaches BK's manager and retaliation begins.

After BK's manager discovers the cheating, Mac's manager expects to be punished for two months (called the "eye-for-an-eye" strategy in Corsicana). After two months of punishment, Mac's manager expects the two firms will stop feuding and return to cooperation. Mac's manager employs a discount rate of 0.5 percent per month for computing present values.

- What is the monthly (undiscounted) gain to Mac from cheating? What is the present value of the benefit from cheating?
- What is the monthly (undiscounted) cost of punishment to Mac? What is the present value of the cost of cheating?
- Will the manager of Mac choose to cooperate or cheat? Explain.
- Suppose Mac's manager begins discounting future benefits and costs at a rate of 60 percent per month. Will Mac now choose to cooperate or cheat?

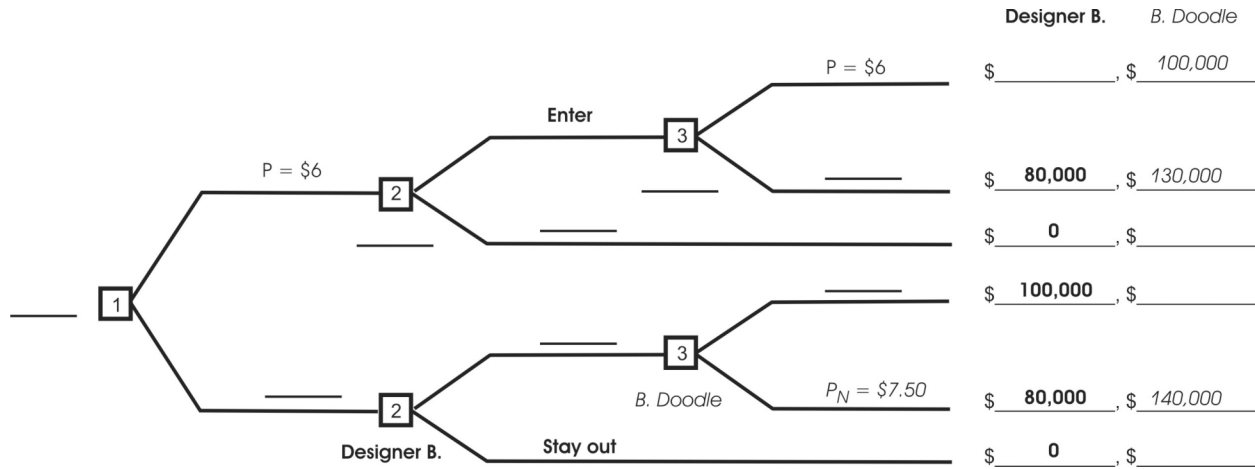
9. Burger Doodle, the only seller of gourmet hamburgers in a trendy shopping mall in Kansas City, charges \$10 per burger (the profit-maximizing price for a monopolist) and makes \$180,000 of profit per year. Designer Burger wants to open a competing burger restaurant in the mall. The owner-manager of Burger Doodle knows that if he lowers his burger price to \$6 and Designer Burger chooses to enter the market, Burger Doodle can make \$100,000 of annual profit while Designer Burger (facing higher costs) would suffer a loss of \$50,000 per year. If Burger Doodle charges \$6 and Designer Burger decides not to enter, then Burger Doodle makes \$150,000. The owner-manager also knows that if he keeps his price at the monopoly price of \$10 and Designer Burger decides to enter, Burger Doodle will make \$120,000 of profit annually while Designer Burger will make \$100,000 annually. Burger Doodle must make its pricing decision first, and then Designer Burger will decide whether to enter the market or stay out.

- The diagram below shows the game tree facing the owner-manager of Burger Doodle should he wish to try to deter Designer Burger from entering his market by lowering his price to \$6, the prospective limit price. Fill in the blanks to complete the following game tree (payoffs are annual profits).



- What condition must be met in order for Burger Doodle to be able to successfully implement a limit pricing strategy to deter Burger Designer from entering?
- Assuming the condition set forth in part *b* is met, show that setting the limit price of \$6 per burger will indeed deter entry of Designer Burger by using the roll-back method to find the likely outcome. Circle this decision path in the game tree above.

- d. Suppose the necessary condition for successful limit pricing (discussed in part *b*) cannot be achieved. The following diagram shows the game tree for the limit pricing decision when Burger Doodle can react to entry by Designer Burger by changing its initial price to the Nash price for two firms ($P_N = \$7.50$). Fill in the missing blanks to complete the game tree.



- e. Using the roll-back method in the above game tree, show that setting the limit price of \$6 per burger will *not* deter entry of Designer Burger by circling the likely decision path in the game tree.
- f. Explain how Burger Doodle might be able to expand its capacity to meet the condition set forth in part *b*.

Multiple Choice / True-False

1. In an oligopoly market,
 - a. a firm must lower price in order to sell more output.
 - b. each firm faces a demand curve that depends on how the firm's rivals behave.
 - c. a few firms account for a large portion of industry sales.
 - d. both *a* and *b*.
 - e. all of the above.
2. What is a dominant strategy?
 - a. A strategy that provides the best possible outcome for both firms.
 - b. A strategy that would never be the best choice.
 - c. A strategy that leads to the best outcome for a firm no matter what decision rivals make.
 - d. both *a* and *c*.
3. Profits are interdependent in oligopoly markets because
 - a. products are differentiated.
 - b. managers are trying to set prices cooperatively in order to maximize total industry profit.
 - c. entry into the market is restricted by some form of entry barrier.
 - d. each firm in the market is relatively large.
 - e. all of the above.
4. Which of the following is NOT an implication of oligopoly interdependence?
 - a. Strategic behavior.
 - b. The need to get into the heads of rival managers.
 - c. Making decisions that result in the equating of marginal revenue and marginal cost.
 - d. Thinking ahead in sequential decisions to anticipate rivals' future actions.
5. At the point of intersection of two best-response curves,
 - a. each manager is unable to achieve a higher payoff through any unilateral change of strategy.
 - b. each manager is doing his or her part to reach a Nash equilibrium.
 - c. total industry profit is maximized.
 - d. each firm is making the greatest possible individual profit.
 - e. both *a* and *b*.
6. A second-mover advantage
 - a. exists when a firm can earn greater profit by reacting to earlier decisions made by rivals.
 - b. always arises when there is not a first-mover advantage in a sequential decision.
 - c. arises because rivals have imperfect information about payoffs.
 - d. none of the above.

7. A credible commitment is
 - a. always irreversible.
 - b. a way of becoming the first-mover in sequential decision situation.
 - c. an unconditional strategic move.
 - d. both *a* and *c*.
 - e. all of the above.
8. A conditional strategic move, such as a threat or promise, can be credible only if
 - a. rivals believe the manager making the move can be *trusted* to follow through on any commitment, threat, or promise that he or she makes.
 - b. the strategic move harms rivals.
 - c. it can increase each firm's payoff.
 - d. it leads to a Nash equilibrium outcome.
 - e. none of the above.
9. Which of the following are trigger strategies?
 - a. eye-for-an-eye
 - b. tit-for-tat
 - c. grim
 - d. both *b* and *c*.
 - e. all of the above.
10. In every prisoners' dilemma situation, cooperation
 - a. is possible.
 - b. reduces the payoff to at least one of the firms.
 - c. reduces the payoff to all players.
 - d. is likely.
 - e. both *c* and *d*.
11. In a one-time prisoners' dilemma decision,
 - a. all firms expect the other firms to cheat.
 - b. cheating is usually not a value-maximizing decision.
 - c. cheating is less likely when the discount rate is low.
 - d. cheating is less likely when the discount rate is high.
12. In a repeated decision for which the present value of the benefits of cheating are less than the present value of the costs of cheating,
 - a. deciding not to cheat is a value-maximizing decision.
 - b. deciding to cooperate is a value-maximizing decision.
 - c. deciding to cheat is a value-maximizing decision.
 - d. both *a* and *b*.
13. In the United States, firms that engage in cooperative efforts to coordinate pricing
 - a. are always in violation of antitrust laws.
 - b. may face federal charges of illegal collusion if they cannot provide evidence that the coordination of prices was in the best interest of consumers.
 - c. are simply trying to reach a Nash equilibrium and are not viewed by courts as necessarily breaking any laws.
 - d. both *b* and *c*.

14. Punishment for cheating on pricing agreements usually takes the form of
 - a. a retaliatory advertising campaign.
 - b. a retaliatory price cut.
 - c. a legal suit.
 - d. a monetary fine.
15. Cooperation is achieved in an oligopoly market when
 - a. most of the firms in the market decide not to cheat.
 - b. some of the firms in the market decide not to cheat.
 - c. at least one of the firms in the market decides not to cheat.
 - d. all of the firms in the market decide not to cheat.
16. Price matching
 - a. is a strategic commitment.
 - b. is a flexible pledge to match any lower prices offered by rivals.
 - c. must be irreversible in order to have the desired effect.
 - d. both *a* and *c*.
 - e. both *b* and *c*.
17. Price leadership
 - a. is rather uncommon today.
 - b. is a pricing arrangement in which one firm in an oligopoly agrees to act as a cartel manager and set a price that will maximize the profits of all the firms in the oligopoly market.
 - c. would not be useful to a dominant firm if it could eliminate all its rivals through a price war.
 - d. none of the above.
18. Limit pricing can be difficult to practice successfully because
 - f. incumbents usually do better after a new firm enters by raising their prices.
 - g. incumbents usually do better after a new firm enters by lowering their prices.
 - h. new entrants frequently wish to engage in a price war to gain market share.
 - i. highly differentiated products make it difficult to raise price profitably.
 - j. knowledge is seldom common.
19. Increasing plant capacity can serve as a barrier to entry if
 - a. an increase in plant capacity lowers the marginal costs of production for an established firm.
 - b. the increase in plant capacity is reversible.
 - c. the increase in plant capacity is irreversible.
 - d. both *a* and *b*.
 - e. both *a* and *c*.
20. T F All dominant strategy equilibria are also Nash equilibria.
21. T F In simultaneous decisions, all firms make their decisions at precisely the same time.
22. T F In order for a set of predicted decisions to be mutually correct they

must also be mutually best decisions.

- 23. T F When there is a first-mover advantage, firms making decisions first always makes more profit than firms making their decisions second.
- 24. T F When oligopoly firms make Nash decisions that are also mutually best decisions for the firms, this indicates the firms are cooperating in their decision making and may be violating antitrust laws.
- 25. T F Cheating can occur even if managers have not made any explicit or implicit arrangements to cooperate.
- 26. T F Cooperation is more likely to occur the more difficult it is to monitor the prices of rivals.
- 27. T F Cartel members have an incentive to cheat by secretly lowering their own prices below the agreed upon cartel price because they individually face highly elastic demand curves.

Answers

MATCHING DEFINITIONS

1. strategic behavior
2. oligopoly
3. game theory
4. game
5. simultaneous decision games
6. payoff table
7. common knowledge
8. dominant strategy
9. dominant strategy equilibrium
10. dominated strategies
11. successive elimination of dominated strategies
12. Nash equilibrium
13. strategic stability
14. best-response curve
15. sequential decisions
16. game tree
17. decision nodes
18. roll-back method
19. first-mover advantage
20. second-mover advantage
21. credible
22. strategic moves
23. commitments
24. threats
25. promises
26. cooperation
27. cheating
28. repeated decisions
29. trigger strategies
30. tit-for-tat strategy
31. grim strategy
32. price matching
33. sale-price guarantee
34. public pricing
35. price leadership
36. cartel
37. tacit collusion
38. strategic entry deterrence
39. limit pricing
40. capacity expansion as a barrier to entry

STUDY PROBLEMS

1. a. Yes. Atlantis' best price is low no matter what it expects Bacchus to charge. If Bacchus is expected to price high, Atlantis would rather earn \$20,000 by pricing low than earn \$10,000 by pricing high. Alternatively, if Bacchus is expected to price low, Atlantis would rather earn \$8,000 by pricing low than earn \$5,000 by pricing high.

- b. Yes. Bacchus' best price is low no matter what it expects Atlantis to charge. If Atlantis is expected to price high, Bacchus would rather earn \$20,000 by pricing low than earn \$10,000 by pricing high. Alternatively, if Atlantis is expected to price low, Bacchus would rather earn \$8,000 by pricing low than earn \$5,000 by pricing high.
 - c. Yes. Since Atlantis would never find it best to price high no matter what decision Bacchus might make, high is a dominated strategy.
 - d. Yes. Since Bacchus would never find it best to price high no matter what decision Atlantis might make, high is a dominated strategy.
 - e. Because both firms have dominant strategies, a dominant strategy equilibrium exists and is likely to occur. It is also true that by eliminating the dominated strategy (high) for both firms leaves **Low**, *Low* as the likely outcome.
 - f. Yes, this is a prisoners' dilemma because when both firms choose their dominant strategies they each are worse off than if they could cooperate. In this decision situation, they could cooperate by both setting high prices and both firms would earn \$2,000 more profit in cell A.
 - g. No. In cell C, if Bacchus expects Atlantis to price low, then Bacchus can unilaterally increase its profit by choosing to price low and earn \$3,000 more in cell D. Strategic stability requires that neither firm can unilaterally change its decision and increase its payoff.
 - h. Yes. In cell D neither firm can change its own pricing decision by itself and earn greater profit.
2.
 - a. No.
 - b. In the first round of elimination of dominated strategies, **High** is eliminated for Coke and *Low* is eliminated for Pepsi.
 - c. Yes. In the second round of elimination of dominated strategies, *High* can be eliminated for Pepsi. Coke has no dominated strategies after the first round.
 - d. Yes. In the second round, *Medium* is a dominant strategy for Pepsi. Coke has no dominant strategy.
 - e. E (**Medium**, *Medium*)
 - f. Yes, cell E is a Nash equilibrium because **Medium**, *Medium* is a mutually best pair of decisions: Coke and Pepsi are both making their best decisions given the anticipated or expected decision of their rival.
 - g. Yes. In cell E, neither Coke nor Pepsi can, by itself (i.e., unilaterally), make a different decision and reach a higher level of profit.
3.
 - a. Rattler has no dominant strategy.
 - b. Sidewinder has no dominant strategy.
 - c. Rattler has no dominated strategy.
 - d. Sidewinder has no dominated strategy.
 - e. \$200; \$100 (cell D). The pair of decisions in cell D is a Nash equilibrium pair of decisions. In cell D, Rattler is doing the best it can for itself given that it expects Sidewinder to set a price of \$100. In cell D, Sidewinder is doing the best it can for itself given that it expects Rattler to set its price at \$200. Cell D is, of course, strategically stable since neither firm can unilaterally change its decision and make higher profit.
4.
 - a. Substitute $P_O = \$7.50$ into Jiff Lube's demand function to get $Q_J = 106.25 - 5P_J (= 50 - 5P_J + 7.5 \cdot 7.50)$. Next take the inverse of this demand to get Jiff Lube's inverse demand function: $P_J = 21.25 - 0.2Q_J$. Now you can get Jiff Lube's marginal revenue function: $MR_J = 21.25 - 0.4Q_J$. Now set $MR_J = LMC_J$ and solve for Jiff

Lube's profit-maximizing output when Oil Can Hank charges \$7.50: $MR_J = LMC_J \Rightarrow 21.25 - 0.4Q_J = 10 \Rightarrow Q_J^* = 28.125$. Substitute Q_J^* into Jiff Lube's inverse demand function to find Jiff Lube's best-response to Oil Can Hank's price of \$7.50: $P_J^* = \$15.62 = 21.25 - 0.2(28.125)$. So, point H is $P_J = \$15.62$ and $P_O = \$7.50$. Point H and the graph of BR_J are shown in the following figure.

- b. In a simultaneous decision, managers can be expected to set the Nash prices, which are mutually best prices. Nash prices are found at the intersection of the two best-response curves. Point N , the point of intersection, occurs at $P_J = \$25$ and $P_O = \$20$.
- c. Jiff Lube's profit (π_J) at point N is:

$$\pi_J = (25 - 10)(50 - 5 \cdot 25 + 7.5 \cdot 20) = \$15 \cdot 75 = \$1,125 / \text{week}.$$

Oil Can Hank's profit (π_O) at point N is:

$$\pi_O = (20 - 5)(60 - 6 \cdot 20 + 6 \cdot 25) = \$15 \cdot 90 = \$1,350 / \text{week}.$$

- d. Jiff Lube's manager does not believe Oil Can Hank will set its price at \$40 when Jiff Lube's sets its price at \$40. Both managers know that Oil Can Hank's best response to Jiff Lube's price of \$40 is for Oil Can Hank to lower price to \$27.50 (read this number off the graph).
- e. Jiff Lube's profit at point C is:

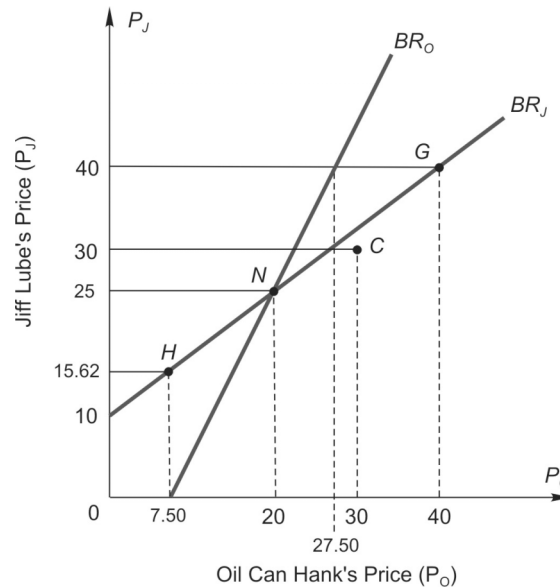
$$\pi_J = (30 - 10)(50 - 5 \cdot 30 + 7.5 \cdot 30) = \$20 \cdot 125 = \$2,500 / \text{week}$$

Oil Can Hank's profit at point C is:

$$\pi_O = (30 - 5)(60 - 6 \cdot 30 + 6 \cdot 30) = \$25 \cdot 60 = \$1,500 / \text{week}$$

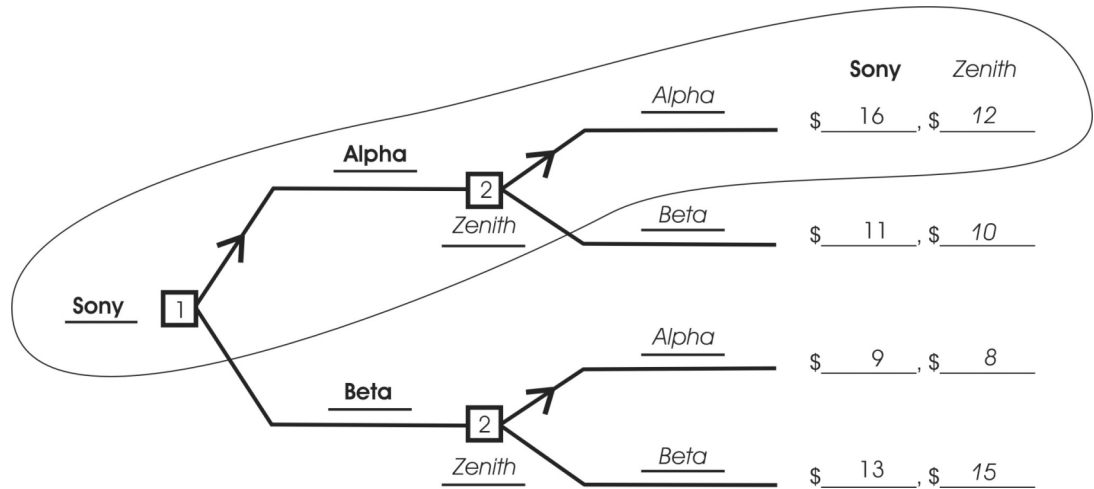
Both firms make greater profit at point C than at point N .

- f. Since the firms are making simultaneous decisions and cannot cooperate, point C will not be chosen, and point N is the expected outcome.

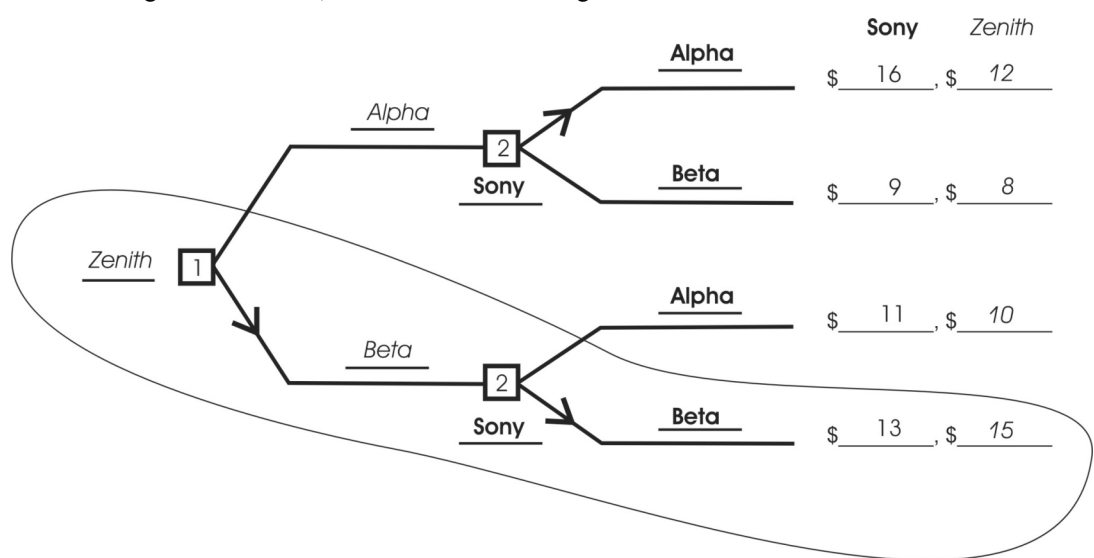


5. a. It has no dominant strategy
b. It has no dominant strategy
c. cells A and D are Nash equilibrium cells

d and e. \$16 billion; \$12 billion. See the figure below:



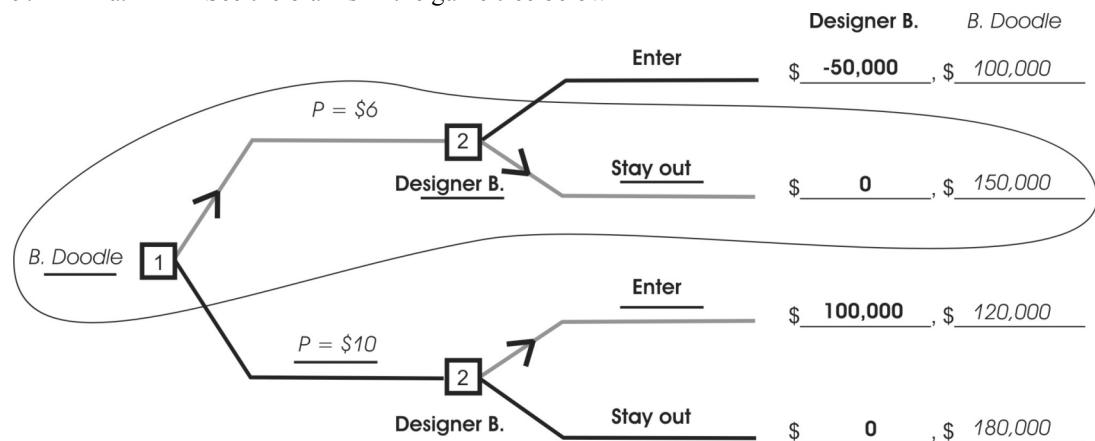
f and g. \$13 billion; \$15 billion. See the figure below:



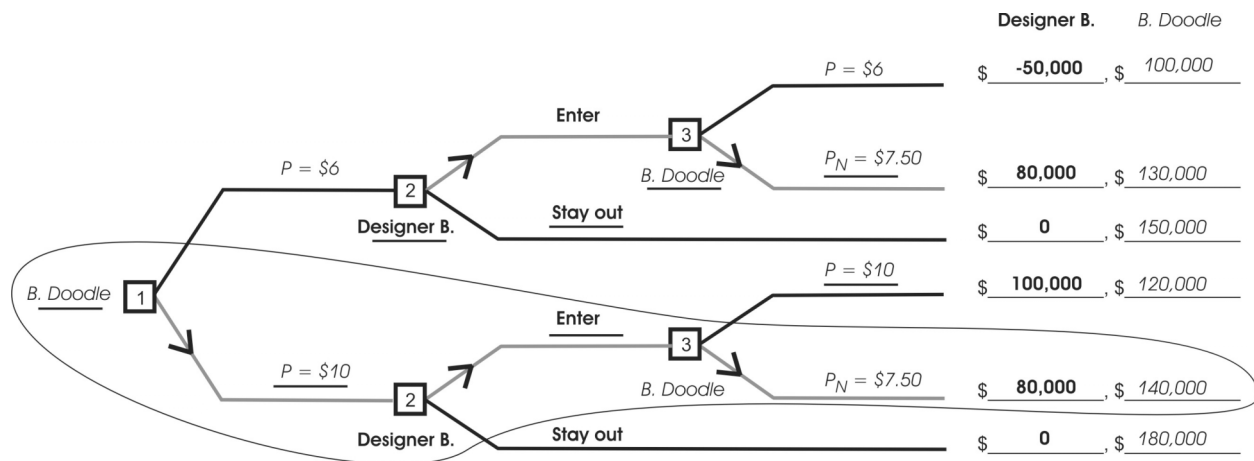
- h. Yes, both firms have a first-mover advantage because each firm makes more profit by going first.
 - i. No. Neither firm makes more profit by going second.
- 6.
- a. Yes. Both firms have dominant strategies, and the dominant strategy equilibrium makes both BK and Mac worse off than if they cooperated to reach cell D.
 - b. cooperate = High, High in cell D
noncooperative = Low, Low in cell A
 - c. In game theory, cheating means making a decision other than the cooperative decision. So, BK cheats in cell C, and Mac cheats in cell B.

- d. When the decision is made just once, both managers know that no punishment for cheating is possible. So, neither manager believes the other will cooperate since unilateral cheating against a cooperating rival will increase the profit of the cheater. Consequently, the dominant strategy equilibrium, which is also the Nash equilibrium, is likely to occur.
7. a. Yes. In cell C in which BK is cheating on Mac by pricing low while Mac prices high, Mac can increase its profit by \$1,000 (= \$3,000 – \$2,000) by carrying out its threat to lower price (i.e., by moving from cell C to cell A).
- b. Yes. In cell B in which Mac is cheating on BK by pricing low while BK prices high, BK can increase its profit by \$500 (= \$5,500 – \$5,000) by carrying out its threat to lower price (i.e., by moving from cell B to cell D).
8. a. \$1,500 per month; $\$2,977.65 = \frac{\$1,500}{(1.005)^1} + \frac{\$1,500}{(1.005)^2}$
- b. \$2,000 per month; $\$3,930.79 = \frac{\$2,000}{(1.005)^3} + \frac{\$2,000}{(1.005)^4}$
- c. Since $PV_{Costs \text{ of cheating}} > PV_{Benefits \text{ of cheating}}$, Mac will choose not to cheat and will cooperate.
- d. At a whopping 60 percent per month discount rate, Mac will choose to cheat since
- $$PV_{Benefits \text{ of cheating}} > PV_{Costs \text{ of cheating}}$$
- $$\$1,523.44 > \$793.46$$

9. a. See the blanks in the game tree below



- b. Burger Doodle must be able make an irreversible commitment to price at \$6 per burger. Otherwise, Designer Burger will believe it can enter, and then Burger Doodle will see that pricing at \$10 gives it \$120,000 of profit, which is more than the \$100,000 of profit it makes by sticking to the limit price of \$6 (after Designer Burger enters).
- c. If Burger Doodle can make an irreversible decision to price at \$6, the decision path is shown in the game tree above. Limit pricing succeeds in deterring entry.
- d. See the blanks in the game tree below



- e. The circled path in the game tree above shows that entry cannot be deterred. Whether Burger Doodle prices at \$6 or \$10 initially (at decision node 1), it will change its price to the Nash price of \$7.50 after Designer Burger chooses to enter (which it will do).
- f. If Burger Doodle, by expanding its capacity, is able to lower sufficiently its marginal costs of production, it can then make its threat (or its commitment) to maintain its price at \$6. Once Designer Burger believes Burger Doodle will stick to its \$6 price, Designer Burger will choose not to enter.

MULTIPLE CHOICE / TRUE-FALSE

1. e Because the firms in an oligopoly market are large relative to total market output, they will have some degree of market power and their individual decisions will affect every other rivals' demand.
2. c Be careful here. A firm has a dominant strategy if one strategy choice is the best strategy for each and every decision rivals might make. In a prisoners' dilemma, however, both players have a dominant strategy but there exists a set of decisions that provides a higher payoff for both players than they receive in the dominant strategy equilibrium.
3. d When firms have relatively large shares of total market sales their individual pricing, output, and advertising decisions will have an impact on the entire market, which makes the profits of the oligopoly firms interdependent.
4. c In every kind of market structure, managers maximize profit by making decisions that equate marginal revenue and marginal cost, regardless of whether there is interdependence of profits.
5. e The intersection of the best-response curves yields a strategically stable (Nash) equilibrium, but this does not imply that the firms are maximizing either their own individual profit (there is usually a better point for each firm) or their joint profits.
6. a Going second in a sequential decision situation can be advantageous if the second-mover can increase its payoff by knowing its rival's action before it makes its best decision.
7. e A credible commitment is an unconditional strategic move that must be irreversible in order to seize the first move in a strategic decision situation.
8. e To be credible, the threatened or promised action must be the best action to take when the time comes to make good on the threat or promise.

9. d Tit-for-tat and grim strategies are the two most widely known trigger strategies.
 10. a This is one of the characteristics of a prisoners' dilemma situation.
 11. a Regardless of the discount rate, in a one-time prisoners' dilemma rivals expect each other to cheat since there can be no punishment for cheating in a one-time game.
 12. d If $PV_{\text{Benefits of cheating}} < PV_{\text{Costs of cheating}}$, then cheating would decrease the present value of a firm. Consequently, deciding not to cheat and to cooperate instead is consistent with maximizing the value of the firm.
 13. a Any form of coordinating prices is illegal per se in the United States.
 14. b Because cooperation in setting prices is illegal, managers cannot challenge noncooperative behavior in court or impose fines.
 15. d In an oligopoly market, all the firms need to decide not to cheat in order for cooperation to occur.
 16. d Price matching is a strategic commitment—and so must be irreversible in order to be credible—to match any lower prices offered by rivals.
 17. d None of these statements characterize price leadership.
 18. a New entrants know that, in most cases, incumbent firms will not want to keep prices low if the entrant does indeed carry out its plans to enter the market. Consequently, the threat by incumbents to keep prices low to punish entry is not a credible threat in most cases.
 19. e Increased plant capacity can served as an entry barrier only if it is an irreversible commitment that lowers marginal costs, which thereby makes higher output and lower prices a credible threat.
-
20. T In dominant strategy equilibrium, both firms are doing the best they can *no matter what* their rivals choose so they must also be doing the best they can *given* what their rivals choose.
 21. F To be a simultaneous decision, the firms cannot know at the time they make their decisions what decisions their rivals have made, are making, or will make.
 22. T In order for all managers to believe they are correctly predicting their rivals' decisions, they must predict that all rivals are making the best decisions for themselves given the decisions they all expect their rivals to make.
 23. F If a firm experiences a first-mover advantage, then it earns a greater payoff *for itself* by going first than by going second. This does *not* mean that it earns a higher payoff *than its rivals* by going first.
 24. F Nash decision making is not a sign of cooperation. The firms are only doing best for themselves given what they expect their rivals will do. It is frequently the case that if rivals could indeed collude or cooperate, they could all do better individually at decision sets other than the Nash point.
 25. T Cheating does not imply that rivals have explicitly or tacitly agreed to cooperate.
 26. F Cheating is more likely to occur the more difficult it is to monitor rivals' prices.
 27. T Any *one* member of the cartel believes it can cut price and gain a great deal of sales because demand is quite elastic when only *one* cartel member cuts price.

Homework Exercises

1. The *Tampa Tribune* and the *St. Petersburg Times* compete for readers in the Tampa Bay market for newspapers. Recently, both newspapers considered changing the prices they charge for their Sunday editions. Suppose they considered the following payoff table for making a *simultaneous* decision to charge either a low price of \$0.50 or a high price of \$1.00:

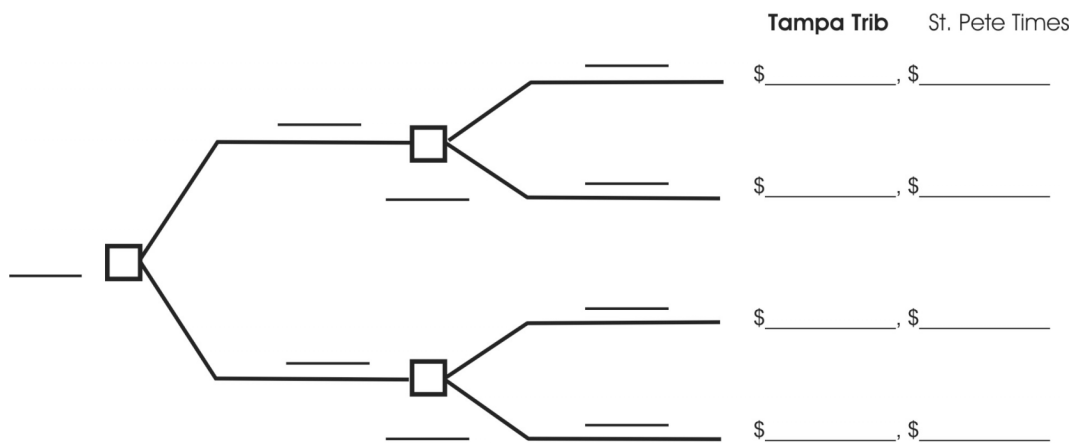
		<i>St. Petersburg Times</i>	
		<i>Low Price</i>	<i>High Price</i>
		<i>\$0.50</i>	<i>\$1.00</i>
Tampa Tribune	Low price \$0.50	A \$45,000, \$30,000	B \$35,000, \$20,000
	High price \$1.00	C \$40,000, \$45,000	D \$50,000, \$40,000

Payoffs in dollars of profit per Sunday edition.

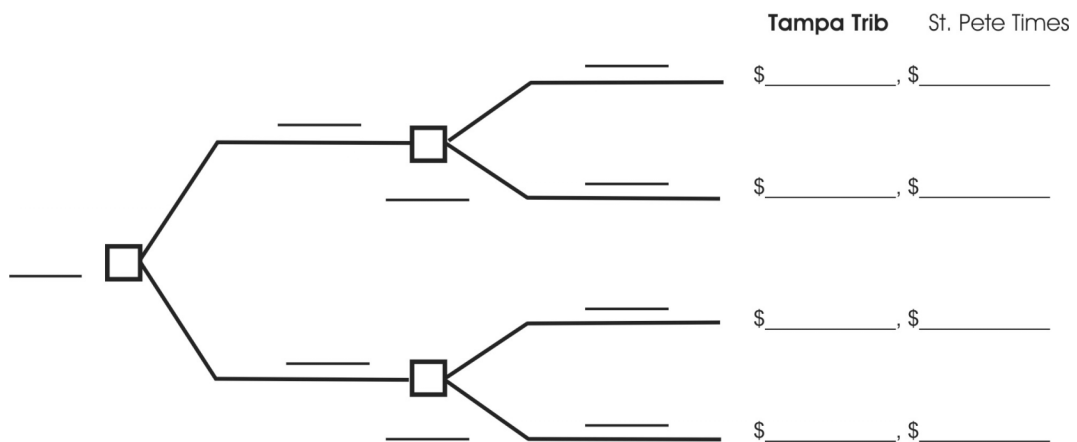
- a. *St. Petersburg Times*' dominant strategy is _____ (low price, high price, it has no dominant strategy).
- b. *Tampa Tribune*'s dominant strategy is _____ (low price, high price, it has no dominant strategy).
- c. *St. Petersburg Times*' dominated strategy is _____ (low price, high price, it has no dominated strategy).
- d. *Tampa Tribune*'s dominated strategy is _____ (low price, high price, it has no dominated strategy).
- e. Cell _____ is a Nash equilibrium.
- f. The Nash equilibrium cell in part e _____ (is, is not) a dominant strategy equilibrium.
- g. Cell D _____ (is, is not) strategically stable. Explain briefly in the space provided below:

2. Now suppose the newspaper pricing decision in Homework Exercise 1 is made sequentially. Using the payoff table in the previous exercise, complete the two sequential game trees on the next page. In the first game tree (the top one), let the *St. Petersburg Times* make the first pricing decision. In the second game tree (the bottom one), let the *Tampa Tribune* go first. After you complete the two game trees, solve both sequential decision games using the roll-back method. Circle the solution path on each game tree. Then, after solving both sequential decision games, answer the following questions:
- The *St. Petersburg Times* experiences a _____ (first-mover advantage, second-mover advantage, neither a first- nor a second-mover advantage). Explain your answer.
 - The *Tampa Tribune* experiences a _____ (first-mover advantage, second-mover advantage, neither a first- nor a second-mover advantage). Explain your answer.
 - Can you predict which newspaper is likely to go first in this sequential decision? Explain. [Hint: Remember that the payoff table is common knowledge to both managers.]

Tampa Tribune goes first



St. Petersburg Times goes first



3. Smith Cable, Inc. and Jones Glass Fibre Works are the two largest suppliers of a specialty fiber-optic cable used by NASA and military defense contractors. On the first day of every month, both companies post on the Internet a list of prices for their various fiber-optic cable products—either high prices or low prices. The pricing decisions are made simultaneously (neither firm knows the prices the other will charge for the current month when their pricing decisions are made). The managers at both firms employ a 1.75 percent per month discount rate for calculating present values of future benefits and costs. The following payoff table provides the monthly profits for Smith and Jones:

		<i>Smith Cable, Inc.</i>	
		<i>High prices</i>	<i>Low prices</i>
Jones Glass Fibre Works	High prices	A \$7, \$4	B \$2, \$5.5
	Low prices	C \$8, \$1	D \$4, \$2

Payoffs in dollars of monthly profit

The managers of both firms believe that they can get away with cheating for one month but believe they will then be punished for two months when they get caught.

- a. Smith Cable will choose to _____ (cheat, cooperate) because the present value of the benefits of cheating equals \$_____ million while the present value of the costs of cheating equals \$_____ million.
Show your computations here:

- b. Jones Fibre will choose to _____ (cheat, cooperate) because the present value of the benefits of cheating equals \$_____ million while the present value of the costs of cheating equals \$_____ million.
Show your computations here: