Name: ________________________ Class: ___________________ Date: __________ ID: A

Econ8500_Game_Theory

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. A common assumption about the player in a game is that
a. neither player knows the payoff matrix.
b. the players have different information about the payoff matrix.
c. only one of the players pursues a rational strategy.
d. the specific identity of the players is irrelevant to the play of the game.

____ 2. In a zero-sum game,
a. what some players win, the others lose.
b. the sum of each player’s winnings if the game is played many times must be zero.
c. the game is fair – each person has an equal chance of winning.
d. the long-run profits of each player must be zero.

____ 3. The Prisoner’s Dilemma is not a constant-sum game because
a. some outcomes are better than others for both players.
b. the prisoners’ sentences are necessarily non-zero.
c. the game does not have a Nash equilibrium.
d. the sum of the prisoners’ sentences is non-zero.

____ 4. The twin nonconfess strategy choice in the Prisoner’s Dilemma can be described as
a. nonPareto optimal and unstable.
b. Pareto optimal and unstable.
c. nonPareto optimal and stable.
d. Pareto optimal and stable.

____ 5. The Nash equilibrium in a Bertrand game of price setting where all firms have the same marginal cost is
a. efficient because all mutually beneficial transactions will occur.
b. efficient because of the free entry assumption.
c. inefficient because some mutually beneficial transactions will be foregone.
d. inefficient because of the uncertainties inherent in the game.

____ 6. The Nash equilibrium in a Bertrand game of price setting where firms have different marginal costs is
a. efficient because all mutually beneficial transactions will occur.
b. efficient because of the free entry assumption.
c. inefficient because some mutually beneficial transactions will be foregone.
d. inefficient because of the uncertainties inherent in the game.

____ 7. The Nash equilibrium in a Bertrand price setting game in which firms first choose output capacities resembles the equilibrium in
a. the competitive model.
b. the Cournot model.
c. the cartel model.
d. the price leadership model.

____ 8. A price leader in the Stackelberg model is assumed to know
a. the market demand curve.
b. its own cost function.
c. its rival’s reaction function.
d. all of the above.

____ 9. Instability arises in the Stackelberg model of duopoly when
- a. each firm acts as a leader.
- b. each firm acts as a follower.
- c. each firm seeks to maximize profits.
- d. each firm seeks to maximize revenues.

____ 10. Viewed from the perspective of the Stackelberg model, the Cournot solution is not a Nash equilibrium because
- a. each firm is not maximizing profits given the other's output.
- b. each firm has an incentive to take advantage of knowledge of its rival's reaction function.
- c. quantity supplied is not equal to quantity demanded at the prevailing price.
- d. it is not a perfectly competitive outcome.

____ 11. A "credible" threat is a threat of action that a player
- a. makes in a believable way.
- b. commits himself or herself to carry out.
- c. cannot retract.
- d. would be willing to undertake if in a position to do so.

____ 12. A subgame perfect equilibrium is a Nash equilibrium that
- a. cannot persist through several periods.
- b. involves only credible threats.
- c. consists only of dominant strategies.
- d. is unique.

____ 13. A cartel-like collusive solution can be a Nash equilibrium only in games with
- a. infinite replications.
- b. finite replications.
- c. dominant strategies.
- d. more than two players.

____ 14. Whereas entry deterrence can be successful in games of perfect information only with economies of scale, in games of imperfect information it can succeed if a firm can convince its rival that it has
- a. a dominant strategy.
- b. a tough, competitive spirit.
- c. economies of scale.
- d. significant financial assets.

____ 15. A theoretical difficulty with the notion that Standard Oil practiced predatory pricing in the 19th century is that such a strategy was
- a. not profit maximizing.
- b. illegal.
- c. difficult to implement.
- d. not a Nash equilibrium.

____ 16. The basic elements of a game are:
- a. game trees and equilibria.
- b. dominant strategies and credible threats.
- c. the extensive and the normal form.
- d. players, strategies, and payoffs.

____ 17. A pair of strategies (a^*,b^*) is a Nash equilibrium in a two-player game if
a. a^* is an optimal strategy for player A against b^*, and b^* is an optimal strategy for player B against a^*.
b. it leads to the highest possible payoffs for both players.
c. and only if a^* is a dominant strategy for player A and b^* is a dominant strategy for player B.
d. all of the above.

____ 18. The following table reports a payoff matrix for a game. What is the pure-strategy Nash equilibrium of this game?

		B's strategies	
		High	Low
A's strategies	High	5,5	5,4
	Low	4,5	5,5

a. A: High, B: High.
b. A: High, B: Low.
c. A: Low; B: Low.
d. both (a) and (c)

____ 19. The following table reports a payoff matrix for a game. Which strategy is a strictly dominant strategy?

		B's strategies		
		H	M	L
A's strategies	H	7, 7	6, 9	14, 10
	M	11, 5	5, 8	13, 13
	L	10, 9	4, 10	10, 30

a. H for player A.
b. M for player A.
c. L for player B.
d. none of the above.

____ 20. The following table reports a payoff matrix for a game. What is the pure-strategy Nash equilibrium of the game?

		B's strategies		
		H	M	L
A's strategies	H	7, 7	6, 9	14, 10
	M	11, 5	5, 8	13, 13
	L	10, 9	4, 10	10, 30

a. (A:M, B:H).
b. (A:H, B:L).
c. (A:L, B:L).
d. both (a) and (b).

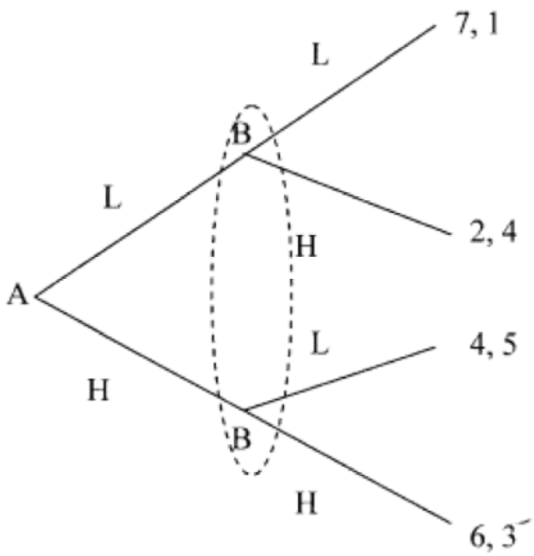
Name: ________________________ **ID: A**

____ 21. The following table reports a payoff matrix for a game. What is the pure-strategy Nash equilibrium of this game?

		B's strategies		
		H	M	L
A's strategies	H	7, 7	6, 9	13, 10
	M	11, 5	5, 13	14, 8
	L	10, 9	4, 10	10, 30

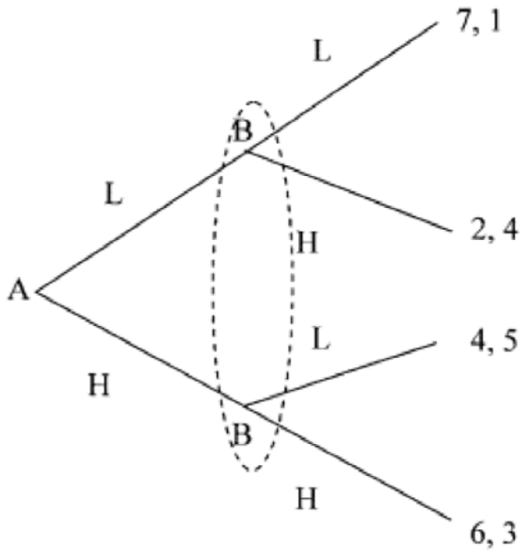
a. (A:L, B:H).
b. (A:M, B:M).
c. (A:M, B:L).
d. there is no pure-strategy Nash equilibrium in this game.

____ 22. The following figure is the extensive form of a game played between players A and B. Each player can choose either H or L. Does B know what A has chosen before choosing its action? How many subgames are there in this game?



a. Yes; 3 subgames.
b. No; 3 subgames.
c. Yes; 1 subgame.
d. No; 1 subgame.

____ 23. The following figure is the extensive form of a game played between players A and B. Each player can choose either H or L. What is the pure-strategy Nash equilibrium in this game?



a. There is no pure-strategy Nash equilibrium in this game.
b. (A: H, B: H).
c. (A: L, B: L).
d. (A: H, B: L).

____ 24. The remarkable game of Prisoner's Dilemma was created by
a. the Canadian mathematician Albert William Tucker.
b. the French economist Auguste Cournot.
c. the Austrian economist Joseph Schumpeter.
d. none of the above.

____ 25. What is the paradox in a prisoner's dilemma game?
a. Even though every player expects the other player to behave rationally, they both end up behaving irrationally.
b. Both prisoners choose to confess even though both would have been better off if none of them confessed.
c. Irrational behaviour brings about a situation in which both players are worse off.
d. All of the above.

____ 26. Consider the prisoner's dilemma game in the following table. Why do the two prisoners choose to confess?

		B's strategies	
		Confess	Not Confess
A's strategies	Confess	-5, -5	0, -15
	Not confess	-15, 0	-1, -1

a. Because they committed a crime and they know they should serve jail time for this.
b. If neither of them confesses, they both go to jail for one year, which is less than the five-year sentence they receive if they both confess. Each of them also knows that if the other prisoner does not confess and she confesses, she does not have to go to jail at all, so they both have an incentive to deviate from the (not confess, not confess) pair of strategies. Since they both deviate and confess, the equilibrium is (confess, confess).
c. The (confess, confess) equilibrium is not stable, because each prisoner has an incentive to deviate from it: If prisoner A knows that B confesses, she will choose not to confess and she will not go to jail. If prisoner B knows that A confesses, she will not confess and thus she will not go to jail at all.
d. All of the above.

____ 27. What type of game can be used to demonstrate the instability of a cartel agreement between two firms?
a. A prisoner's dilemma game.
b. A battle of the sexes game.
c. A zero-sum game.
d. None of the above.

____ 28. Consider the advertising game in the following table. Two firms, A and B, have to decide whether to advertise on television or not. The payoffs from each of their actions are given below. What would each firm do in equilibrium?

		B's strategies	
		Not advertise	Advertise
A's strategies	Not advertise	(40, 40)	(20, 50)
	Advertise	(50, 20)	(25, 25)

a. (A: not advertise; B: advertise).
b. (A: not advertise; B: advertise).
c. (A: advertise; B: not advertise).
d. (A: advertise; B: advertise).

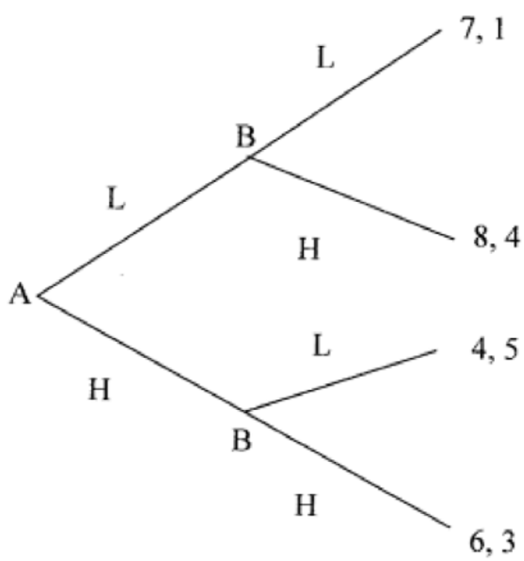
____ 29. Two newspaper vendors, A and B, have to decide where to locate their stands on Váci Utca in Budapest. This busy pedestrian street is 1 km long and buyers are uniformly distributed along the closed unit interval [0, 1]. Calculate A and B's market shares if A locates at 0.3 and B locates at 0.6.
a. A has 30% and B has 70%
b. A has 45% and B has 55%.
c. A has 50% and B has 50%
d. A has 40% and B has 60%.

____ 30. Two newspaper vendors have to decide where to locate their stands on Váci Utca in Budapest. This busy pedestrian street is 1 km long and buyers are uniformly distributed along the closed unit interval [0, 1]. Where should the two stands be located?
a. one vendor should locate his stand at 0, and the other vendor should locate his stand at 1.
b. both vendors should locate their stands at 0.
c. both vendors should locate their stands at the mid point of the street (at 0.5).
d. one vendor should locate at 0.25 and the other vendor should locate at 0.75.

____ 31. Four outdoor equipment stores (A, B, C, D) have to decide where to locate on a 10 km street (or on a [0, 10] interval), given that consumers are uniformly distributed along this street. The equilibrium locations are:
- a. A locates at 1, B at 4, C at 6 and D at 9.
- b. A and B are adjacent at 2.5, C and D are adjacent at 7.5.
- c. A locates at 0, B at 3.3, C at 6.6 and D at 10.
- d. all four stores locate at 5.

____ 32. Assume two political parties compete during an electoral campaign. Voters' preferences are uniformly distributed along a unit interval political spectrum, with extreme "left" at 0 and extreme "right" at 1. Where would these two parties choose to locate their political platforms?
- a. There will be one extreme left party and one extreme right party.
- b. Both parties would position themselves at the centre.
- c. There will be one left-wing party located at 0.25 and one right-wing party located at 0.75.
- d. Any of the above.

____ 33. Consider the following figure, a game in sequential form. How many subgames does this game have? What are the Nash equilibria of this game (both credible and noncredible)? What is the subgame perfect equilibrium of the game?



- a. 3 subgames; Nash equilibria: (1) A: L, B: (H, L), (2) A: L, B: (H, H); subgame perfect Nash equilibrium: A: L, B: (H, L)
- b. 3 subgames; Nash equilibria: (1) A: L, B: (H, L), (2) A: H, B: (H, H); subgame perfect Nash equilibrium: A: L, B: (H, L)
- c. 2 subgames; Nash equilibria: (1) A: L, B: (H, L), (2) A: L, B: (H, H); subgame perfect Nash equilibrium: A: L, B: (H, L)
- d. 2 subgames; Nash equilibria: (1) A: L, B: (H, L), (2) A: L, B: (H, H); subgame perfect Nash equilibrium: A: L, B: (H, H)

____ 34. Suppose there are two firms, A and B, each producing an identical good at a constant marginal cost, c. The two firms compete in prices. What is the Bertrand paradox?
- a. The Nash equilibrium price in this Bertrand game is the same as the Cournot equilibrium price.
- b. The two firms will choose a price higher than the marginal cost.
- c. Even though there are only two firms on the market, the Nash equilibrium is $P_A = P_B = c$.
- d. None of the above.

____ 35. Suppose there are two firms, A and B, each producing an identical good at a constant marginal cost, c. The two firms play a Bertrand game, competing in prices. Is tacit collusion possible if the game is repeated 20 times?

a. Yes, because the game is repeated enough times for the firms to realize that it is not profit-maximizing to choose a price equal to the marginal cost.
b. No, because charging a price higher than the marginal cost in the last period is not credible, and the same is true for any periods prior to the last one.
c. Yes, because if one firm does not collude during one period, the other firm can easily punish it and make it choose the collusive price in the next period.
d. None of the above.

____ 36. Firms A and B produce the same good and they compete over quantities. Both firms operate at a constant marginal cost of $10. The market demand curve is P = 130 – Q, where P is the price of the good and $Q = q_A + q_B$, with q_A and q_B being the quantities produced by firms A and B. Determine the two firms' reaction functions and the Cournot equilibrium.

a. $q_A = \frac{120 - q_B}{2}$; $q_B = \frac{120 - q_A}{2}$; $q_A^* = q_B^* = 40, P^* = \$50$.
b. $q_A = 130 - q_B - P$; $q_B = 130 - q_A - P$; $q_A^* = q_B^* = 40, P^* = \$50$.
c. $q_A = \frac{120 - q_B}{2}$; $q_B = \frac{120 - q_A}{2}$; $q_A^* = q_B^* = 30, P^* = \$70$
d. None of the above.

____ 37. A monopolist operates at a constant marginal cost of $10. The market demand curve is P = 130 – Q, where P is the price of the good and Q is the quantity demanded. The monopolist will choose to produce Q_M =____ units and sell them at P_M = $____.

a. $Q_M = 80$. $P_M = \$50$.
b. $Q_M = 70$. $P_M = \$60$.
c. $Q_M = 60$. $P_M = \$70$.
d. $Q_M = 50$. $P_M = \$80$.

____ 38. Firms A and B produce the same good and their marginal cost is constant and equal to $10. They have to choose how much to produce each period, given that the market demand they face each period is P = 130 – Q. The stage game is repeated forever. $Q_M = 60$ is the cartel output, and $q_A^C = q_B^C = 40$ are the Cournot quantities. Each firm adopts a trigger strategy. For firm A, this strategy is:

1. produce $q_A = \frac{Q_M}{2} = 30$ every period, provided that firm B has never previously produced more than 30 units per period.
2. produce $q_A = q_A^C = 40$ if firm B has cheated in any prior stage of the game.

Firm B's strategy is symmetric. For what interest rates do these trigger strategies constitute a subgame perfect Nash equilibrium?

a. any r < 1.
b. any r < 0.88.
c. any r < 0.25.
d. any r > 1.

____ 39. One of the differences between the Canadian and the U.S. competition laws is that
- a. Conspiratorial anticompetitive behaviour is *per se* illegal in the U.S., while Canada adopted a *rule of reason* approach.
- b. The U.S. Sherman Act adopted a *rule of reason* approach towards conspiratorial anticompetitive behaviour, while in Canada this type of behaviour is *per se* illegal.
- c. Canada has had greater success than the United States in prosecuting collusive behaviour in the market place.
- d. None of the above.

____ 40. The U.S. competition law is called ____, and the Canadian competition law is called ____.
- a. the Combines Investigation Act; the Sherman Antitrust Act.
- b. the Competition Act; the Sherman Antitrust Act.
- c. the Federal Trade Commission; the Supreme Court of Canada.
- d. the Sherman Antitrust Act; the Competition Act.

____ 41. Consider two firms, A and B, operating at a constant marginal cost of $10. The market demand for their product is Q = 130 – P. Firm A has the option of choosing its output before firm B. Firms B chooses its output after observing firm A’s choice. By how much does being a first mover increase A’s profits compared to the Cournot duopoly profit?
- a. $0.
- b. $200.
- c. $400.
- d. $600.

____ 42. A monopolist is said to have a limit pricing strategy if
- a. it chooses a price low enough to keep a rival firm out of the market.
- b. it chooses a price high enough to keep a rival firm out of the market.
- c. it chooses a quantity high enough to keep a rival firm out of the market.
- d. none of the above.

____ 43. The viability of predatory pricing strategies depends crucially on:
- a. having only two firms in the market.
- b. having a constant marginal cost of production.
- c. the nature of information in the market.
- d. all of the above.

____ 44. Which of the following statements is true?
- a. An incumbent firm will always find it profitable to deter entry on its market.
- b. An incumbent firm will deter entry on its market only if the profit from doing so is larger than the profit from accommodating entry.
- c. A limit pricing strategy always yields maximum profits.
- d. Both (b) and (c).

____ 45. What factors contribute to the stability of a cartel (coalition)?
- a. information costs.
- b. enforcement costs.
- c. monitoring costs.
- d. all of the above

Econ8500_Game_Theory
Answer Section

MULTIPLE CHOICE

1. ANS: D
The identity of the players is irrelevant to the play of the game: only the payoffs players receive from certain actions matter.

PTS: 1 REF: 393

2. ANS: A
In a zero-sum game the sum of all winnings and losses is equal to zero. If one player gains $10 the other player loses $10. If the sum of each player's winnings when the game is played many times is zero, the game is a zero-sum game, but this is not a necessary condition (it is not a "must") for the game to be a zero-sum game.

PTS: 1 REF: 394

3. ANS: A
The prisoner's dilemma is not a constant-sum game because the sum of the prisoners' sentences if both confess is higher than the sum of their sentences if none of them confesses. This happens because some outcomes are better than others for both players: both players are better off when none of them confesses.

PTS: 1 REF: 398

4. ANS: B
The twin nonconfess strategy is Pareto optimal because, by choosing another strategy, none of the players could be made better off without making the other player worse off. This strategy is unstable because both players have an incentive to deviate from it: each player would be better off if he confessed while the other player chose not to confess.

PTS: 1 REF: 398

5. ANS: A
The Nash equilibrium price in a Bertrand game of price setting where all firms have the same marginal cost is P = MC. No deadweight loss is generated at this price level, which means that all mutually beneficial transactions occur and the equilibrium is economically efficient.

PTS: 1 REF: 406

6. ANS: C
The Nash equilibrium price in a Bertrand game of price setting where firms have different marginal costs falls short of the monopoly price but exceeds marginal cost. If price exceeds marginal cost some mutually beneficial transactions will not occur and the equilibrium is not efficient.

PTS: 1 REF: 407

7. ANS: B
A two-stage game in which firms choose capacity first and then price is formally identical to the Cournot analysis.

PTS: 1 REF: 407

8. ANS: D
The price leader (A) is aware of the market demand curve and of its own cost function. It also knows that its rival (B) maximizes profits given what A has done, which means that A knows B's reaction function.

PTS: 1 REF: 415

9. ANS: A
The equilibrium is stable in a Stackelberg model of duopoly when one of the firms acts as a leader and the other firm acts as a follower. Since both firms make their choices so that profits are maximized (which is the same as maximizing revenues when costs are zero), (c) and (d) are false. If each firm acts as a follower the equilibrium is stable: each firm will choose to produce at the intersection of their reaction functions and (b) is false. Now assume both firms decide to act as leaders. If one firm acts as a leader, the other firm's optimal strategy is to act as a follower, so the situation when both firms act as leaders is unstable.

PTS: 1 REF: 415

10. ANS: B
The leader has an advantage in the Stackelberg model, and it is not optimal for it to choose the Cournot solution and not benefit from its first-mover advantage.

PTS: 1 REF: 415

11. ANS: D
Player A will undertake an action only if this maximizes its payoff. If not, the threat of taking this action is not credible.

PTS: 1 REF: 405

12. ANS: B
The actions from a subgame perfect Nash equilibrium strategy are Nash equilibria in every subgame. This condition ensures the elimination of all noncredible threats, so (b) is true. It is not necessary for this strategy to be a dominant strategy, so (c) is false. It is possible for a Nash equilibrium to persist through several periods and for a game to have multiple subgame perfect equilibria, so (a) and (d) are false.

PTS: 1 REF: 405

13. ANS: A
Results are the same if a game is played once or if the players know that the game will be played for finite number of times. Thus playing a game for a finite number of times does not facilitate collusion, nor does the presence of dominant strategies or having more than two players. Thus (b), (c) and (d) are false. When the stage game is repeated forever, there is always a future in which a firm can retaliate or punish its rival's past transgression or in which it can reward and positively reinforce its rival's cooperation or collusion.

PTS: 1 REF: 410

14. ANS: C
If firm A can convince firm B that it has economies of scale, or a low cost, firm B will stay out of the market.

PTS: 1 REF: 418

15. ANS: A
A firm practicing predatory pricing must operate with relatively large losses for some time in the hope that the smaller losses this may cause rivals will eventually prompt them to give up. This strategy is inferior to the strategy of buying smaller rivals in the market place. This is equivalent to saying that a predatory pricing strategy is not profit maximizing.

PTS: 1 REF: 419

16. ANS: D
All games have three basic elements: players, strategies, and payoffs.

PTS: 1 REF: 392

17. ANS: A
A Nash equilibrium pair of strategies does not necessarily lead to the highest possible payoffs for both players: see a prisoner's dilemma game. Even though it is sufficient, it is not necessary for a strategy to be dominant to be part of a Nash equilibrium. If a^* is an optimal strategy for player A against b^*, and b^* is an optimal strategy for player B against a^*, no player has an incentive to deviate from these strategies – we call this a Nash equilibrium pair of strategies. Thus (b), (c), (d) are false and (a) is true.

PTS: 1 REF: 394

18. ANS: D

		B's strategies	
		High	Low
A's strategies	High	$\underline{5},\underline{5}$	$\underline{5}$,4
	Low	4,$\underline{5}$	$\underline{5},\underline{5}$

If A plays "High", B finds it optimal to play "High" as well and obtain a payoff of 5, instead of 4 (which can be obtained by playing "Low" when A plays "High".
If A plays "Low" B is indifferent between playing "High" or "Low" because his payoff from these two actions is the same.
If B plays "High" A plays "High".
If B plays "Low" A is indifferent between playing "High" or "Low".
The game has two Nash equilibria:
1. playing "High" is A's best response to B's "High" and vice versa, so (High, High) is a Nash equilibrium.
2. playing "Low" is A's best response to B's "Low" and vice versa, so (Low, Low) is also a Nash equilibrium.

PTS: 1 REF: 396

19. ANS: C
A strategy is strictly dominant if it is optimal regardless of the strategy chosen by the an opponent. This strategy is always a best-response strategy. M is A's best response if B plays H, H is A's best response if B plays M and L. Thus (a) and (b) are false, since player A does not have a strictly dominant strategy. L is B's best response for any strategy A plays, so L is B's strictly dominant strategy and (c) is correct.

PTS: 1 REF: 396

20. ANS: B
The underlined payoffs correspond to a player's best response to the other player's strategy. For a pair of strategies to be a Nash equilibrium it has to contain mutually best-response strategies.

		B's strategies		
		H	M	L
A's strategies	H	7, 7	$\underline{6}$, 9	$\underline{14}$, $\underline{10}$
	M	$\underline{11}$, 5	5, 8	13, $\underline{13}$
	L	10, 9	4, 10	10, $\underline{30}$

We can see that the only Nash equilibrium in this game is (A:H, B:L): H is A's best response when B chooses L, and L is B's best response when A chooses H.

PTS: 1 REF: 396

21. ANS: D
The underlined figures correspond to a player's best response to the other player's strategy. For a pair of strategies to be a Nash equilibrium it has to contain mutually best-response strategies.

		B's strategies		
		H	M	L
A's strategies	H	7, 7	$\underline{6}$, 9	13, $\underline{10}$
	M	$\underline{11}$, 5	5, $\underline{13}$	$\underline{14}$, 8
	L	10, 9	4, 10	10, $\underline{30}$

We can see from the above table that no pair of strategies contains mutually best-response strategies. For example, H is A's best response if B chooses M, but M is not B's best response if A chooses H. Instead, B would respond by choosing L when A chooses H. We can construct similar arguments for all pairs of strategies, which leads to the conclusion that there is no pure - strategy Nash equilibrium in this game.

PTS: 1 REF: 396

22. ANS: D
The fact that B's nodes are in a dashed oval means that player B does not know whether A has chosen L or H. In fact, the two players make simultaneous choices in this game. This tells us that the game has only one subgame: the game itself.

PTS: 1 REF: 395 | 405

23. ANS: A
We can re-write this game in a normal form:

		B's strategies	
		H	L
A's strategies	H	$\underline{6}$, 3	4, $\underline{5}$
	L	2, $\underline{4}$	$\underline{7}$, 1

We can see that there is no pair of strategies that would constitute mutual best responses. If A choose H, B chooses L, but if B chooses L, A chooses L. If A chooses L, B chooses H and if B chooses H, A chooses H. None of the four pairs of strategies is a Nash equilibrium.

PTS: 1 REF: 395

24. ANS: A
The Prisoner's Dilemma game was created by the Canadian mathematician Albert William Tucker.

PTS: 1 REF: 398

25. ANS: B
Both players behave in a rational manner by choosing to confess, which is the dominant strategy for both of them. The problem is that they are both worse off after choosing to confess than if they could coordinate their behaviour and not confess. If prisoner A knows that prisoner B will not confess, he would be better off confessing. The same is true for prisoner B, and in equilibrium they both confess. Even though they are trying to avoid a long sentence, they both go to jail for more years than if none of them had confessed.

PTS: 1 REF: 399

26. ANS: B
The only equilibrium is (confess, confess): if A confesses, B's best response is to confess and if B confesses, A's best response is to confess as well. "Confess" is a dominant strategy for both players, even though they would both be better off by cooperating and not confessing.

PTS: 1 REF: 399

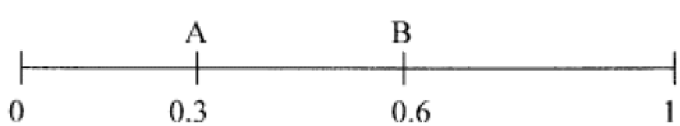
27. ANS: A
A prisoner's dilemma game can be used to demonstrate the instability of a cartel agreement between two firms. Both firms would be better off charging a high price, but each of them has an incentive to deviate from this strategy, charge a low price and increase its revenues at the expense of its rival. The equilibrium strategy is for both firms to charge a low price, and thus a cartel agreement is not sustainable.

PTS: 1 REF: 399

28. ANS: D
The dominant strategy for both companies is to advertise, and the Nash equilibrium of the game is (A: advertise; B: advertise), since "advertise" is A's best response when B advertises, and "advertise" is also B's best response when A advertises. They would both be better off if they could agree not to advertise, but this solution is not stable since each of them has an incentive to deviate from it and advertise.

PTS: 1 REF: 399

29. ANS: B
The situation is described by the segment below. All consumers located to the left of A buy from A and all consumers situated to the right of B buy from B. Each vendor gets half of the consumers located between A and B. Thus A's market share is 0.3 + (0.6 – 0.3)/2 = 4.5 = 45% and B's market share is (0.6 – 0.3) / 2 + 0.4 = 5.5 = 55%.



PTS: 1 REF: 401

30. ANS: C

This situation can be analyzed using a Hotelling model. The only stable equilibrium is for both vendors to locate their stands at the mid point of the street, since each of them would get half of the market and would have no incentive to change his location. If vendor A moves at 0.4 and B stays at 0.5, A has 0.4 + (0.5 – 0.4)/2 = 45% of the market while B has 55% of the market, so this change of location is not profitable. We can develop arguments for why vendors have incentives to deviate from the locations suggested at (a), (b) and (d). If vendor A is located at 0 and B is located at 1, each of them has an incentive to move towards the interior of the interval: if A moves at 0.10 and B stays at 1 A would have 0.1 + (1-0.1)/2 = 55% of the market and B would have 45% of the market. Find similar examples to show why the two vendors would not choose to locate at 0 or at 0.25 and 0.75.

PTS: 1 REF: 401

31. ANS: B

(a), (c) and (d) are not equilibrium locations because firms have an incentive to re-locate and increase their market share. Let us analyze the situation when A locates at 1, B at 4, C at 6 and D at 9. If B, C, D remain where they are and A moves at 2, A’s market share increases from 1 + (4 – 1)/2 = 2.5 = 25% to 2 + (4 – 2)/2 = 3 = 30%, so the initial situation is not an equilibrium. We can construct similar arguments for (c) and (d). If A and B are adjacent at 2.5, C and D are adjacent at 7.5 none of the firms has an incentive to re-locate. Each firm has 25% of the market.

PTS: 1 REF: 401

32. ANS: B

The two parties will try to have almost identical political platforms and position themselves at the centre. Each will attempt to secure a majority by gaining the support of the voter with the median preference. Conceptually, this situation is identical with the one of Hotelling’s ice-cream sellers on the beach.

PTS: 1 REF: 401

33. ANS: A

This game has three subgames: the game itself, and the two games player B can play: one if A plays L, and one if A plays H. It is useful to re-write this game in a normal form to find the Nash equilibria. B’s strategies have to show both what he would choose if A chose L and if A chose H. For example, (H, L) means that B chooses H when A chooses L, and B chooses L when A chooses H.

	B’s strategies				
A’s strategies		L, L	L, H	H, L	H, H
	L	$\underline{7}$, 1	$\underline{7}$, 1	$\underline{8}$, $\underline{4}$	$\underline{8}$, $\underline{4}$
	H	4, $\underline{5}$	6, 3	4, $\underline{5}$	6, 3

The Nash equilibria of the game are: (1) A: L, B: (H, L); (2) A: L, B: (H, H). B’s strategy from the second Nash equilibrium is not credible. If A chooses L, B’s best response is to choose H, but if A chooses H, B’s best response is to choose L, not H, so (H, H) is a noncredible strategy for B, which leaves us with a single subgame perfect Nash equilibrium, A: L, B: (H, L).

PTS: 1 REF: 404

34. ANS: C
The paradox in such a Bertrand game is the fact that, even though there are only two firms on the market, it is not profitable for either of them to charge a price higher than the marginal cost. If firm A charges more than c, B will have an incentive to undercut it and still charge more than c. Even though there are only two firms on the market, the Nash equilibrium is $P_A = P_B = c$.

PTS: 1 REF: 406

35. ANS: B
Any strategy in which firm A chooses $P_A > c$ during the final period offers firm B the possibility of earning profits by setting $P_A > P_B > c$. The threat of charging $P_A > c$ in the last period is therefore not credible. Because a similar argument applies also to any period prior to the last one, we can conclude that the only Nash equilibrium is the one in which firms charge the perfectly competitive price in every period. This shows that tacit collusion is not possible within a finite time horizon.

PTS: 1 REF: 409

36. ANS: A
The market demand can be written as $P = 130 - q_A - q_B$. The marginal revenue curve corresponding to a linear demand curve is twice as steep as the demand curve itself. Both firms choose how much to produce by setting their marginal revenue equal to the marginal cost.
The profit-maximizing condition for firm A is: $MR(q_A) = 130 - 2q_A - q_B = MC = 10$. This tells us that firm A's reaction function is $q_A = \frac{120 - q_B}{2}$.
The profit-maximizing condition for firm B is: $MR(q_B) = 130 - q_A - 2q_B = MC = 10$. This tells us that firm A's reaction function is $q_B = \frac{120 - q_A}{2}$.
The Cournot equilibrium is given by the intersection of the two reaction functions:

$$q_A = \frac{120 - \frac{120 - q_A}{2}}{2} \Rightarrow q_A^* = q_B^* = 40, P^* = 130 - 40 - 40 = \$50.$$

PTS: 1 REF: 414

37. ANS: C
The profit-maximizing condition is $MR(Q) = MC$, which can be written as $130 - 2Q = 10$, so $Q_M = 60$ and $P_M = 130 - 60 = \$70$.

PTS: 1 REF: 415

38. ANS: B

We need to compare A's profits from choosing to produce half of the cartel output every period and its profits from cheating in one period and producing the Cournot output thereafter.

Let's see what happens if firm A deviates from the cartel output. Firm A assumes that firm B will produce 30 units (half of the cartel output). A's best response to this output is given by its reaction function: $MR(q_A) = 130 - 2q_A - q_B = MC = 10 \Rightarrow q_A = \frac{120 - q_B}{2} = \frac{120-30}{2} = 45$. If firm A produces 45 units and firm B produces 30, the market price is P = 130 – 75 = \$55. Firm A's profit this period is (\$55 - \$10)45 = \$2025. A Cournot game will be played in every subsequent period. The Cournot price is \$50, so this will bring a profit of (\$50 - \$10)40 = \$1600 every period.

If firm A does not cheat and produces half of the cartel output, the market price is \$70 and the firm's profit is (\$70 - \$10)30 = \$1800 every period.

The present value of firm A's profits from cheating is:

$$\Pi^{cheat} = \$2025 + \frac{\$1600}{1+r} + \frac{\$1600}{(1+r)^2} + \frac{\$1600}{(1+r)^3} + ... = \$2025 + \frac{\$1600}{r}$$

The present value of firm A's profits from producing half of the cartel output is:

$$\Pi^{collude} = \$1800 + \frac{\$1800}{1+r} + \frac{\$1800}{(1+r)^2} + \frac{\$1800}{(1+r)^3} + ... = \$1800 + \frac{\$1800}{r}$$

Firm A will not cheat if

$$\Pi^{cheat} < \Pi^{collude} \Leftrightarrow \$2025 + \frac{\$1600}{r} < \$1800 + \frac{\$1800}{r} \Leftrightarrow \$225 < \frac{\$200}{r} \Leftrightarrow r < \frac{200}{225} \Leftrightarrow r < 0.88$$

We have thus shown that these trigger strategies constitute a subgame perfect Nash equilibrium if $r < 0.88$, or $r < 88\%$.

PTS: 1 REF: 410

39. ANS: A

Every conspiracy in restraint of trade is *per se* illegal in the United States, while Canada adopted a *rule of reason* approach. Historically, the United States has had greater success than Canada in prosecuting collusive behaviour in the marketplace.

PTS: 1 REF: 412

40. ANS: D

The U.S. legislators passed the Sherman Antitrust Act in 1890. The Competition Act is Canada's competition law.

PTS: 1 REF: 412

41. ANS: B

This is a Stackelberg model. Let q_A be firm A's output and q_B be firm B's output. As shown above, firm A's reaction function is $q_A = \frac{120 - q_B}{2}$ and firm B's reaction function is $q_B = \frac{120 - q_A}{2}$. The Cournot equilibrium is $q_A = \frac{120 - \frac{120 - q_A}{2}}{2} \Rightarrow q_A = q_B = 40, P = 130 - 80 = \$50, \Pi_A = (\$50 - \$10)40 = \$1600$.

Now we need to find A's Stackelberg profits. Firm A knows firm B's reaction function, and we can use this information to determine firm A's net demand function:

$$q_A = 130 - q_B - P = 130 - \frac{120 - q_A}{2} - P = \frac{140 + q_A - 2P}{2} \Rightarrow q_A = 140 - 2P .$$

This demand function can also be written as $P = 70 - \frac{1}{2}q_A$. Since the marginal revenue function is twice as steep as this inverse demand function, and firm A's profit maximizing condition is $MR(q_A) = MC$, we have: $MR(q_A) = 70 - q_A = 10 \Rightarrow q_A = 60$. When firm A has a first-mover advantage, it chooses to produce 60 units instead of 40. Firm B will respond with $q_B = \frac{120 - 60}{2} = 30$, and the Stackelberg equilibrium price will be P = 130 – 60 – 30 = \$40. Firm A's profits are now $\Pi_A = (\$40 - \$10)60 = \$1800$, \$200 larger than A's profits in a Cournot game without a first-mover advantage.

PTS: 1 REF: 415

42. ANS: A

A monopoly has a limit pricing strategy if it chooses a price low enough to deter entry into its market.

PTS: 1 REF: 417

43. ANS: C

The nature of information is crucial: a predatory strategy will succeed only if a firm can take advantage of its better information (the market is characterized by incomplete or asymmetric information).

PTS: 1 REF: 421

44. ANS: B

It is not always profitable to deter the entry of a rival on the market, since the losses incurred by doing so might be greater than the winnings. A firm will only deter entry if the profit from doing so is larger than the profit from accommodating entry. Thus (a) is false and (b) is true. It is not always profitable for a firm to implement a limit pricing strategy, since entry deterrence might be less profitable than accommodation in certain situations. Since (c) is false, (d) is also false.

PTS: 1 REF: 417

45. ANS: D
The likelihood of forming successful coalitions is influenced by information costs, enforcement costs and monitoring costs. For example, if it is very expensive to monitor the activities of coalition members, some firms will find ways to cheat and unilaterally increase their profits to the detriment of other firms in the coalition.

PTS: 1 REF: 421