

Test 10 - Game Theory

Name _____

Group _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) In the spring of 1994, Northwest Airlines took the independent action of reducing fares on its flights. Other competing airlines quickly matched the fare cuts. These actions might be interpreted as: 1) _____
- A) a cooperative game. B) a competitive game.
 C) a constant sum game. D) a noncooperative game.
- 2) Which of the following are examples of cooperative games? 2) _____
- A) independent action by two firms in a market regarding advertising strategies
 B) team games (such as baseball or basketball).
 C) the bargaining between a buyer and seller over the price of a car
 D) independent pricing strategies by two firms in a market
 E) independent pricing strategies by many firms in a market

Scenario 2:

		ABC Inc.	
		Offer Rebate	No Rebate
XYZ Corp	Offer Rebate	20, 10	30, 0
	No Rebate	12, 16	20, 4

- 3) In the game in Scenario 2, the equilibrium strategies 3) _____
- A) does not exist in pure strategies.
 B) is for ABC to offer a rebate, and XYZ not to offer a rebate.
 C) is for XYZ to offer a rebate, and ABC not to offer a rebate.
 D) are for both firms to offer no rebate.
 E) are for both firms to offer rebates.

Scenario 3

Consider the following game:

		Zport Co.	
		Offer Lo-Profile Tires	Offer Sunroof
Moto Corp.	Offer CD Changer	40, 400	100, 200
	Offer Free Maintenance	0, 300	160, 120

- 4) Which of the following is true for the game in Scenario 3? 4) _____
- A) Zport's dominant strategy is the low-profile tires.
 - B) Neither company has a dominant strategy.
 - C) Zport's dominant strategy is the sun roof.
 - D) Moto's dominant strategy is the free maintenance.
 - E) Moto's dominant strategy is the CD changer.
- 5) In the game in Scenario 3, equilibrium 5) _____
- A) is for Moto to offer free maintenance and Zport to offer low-profile tires.
 - B) is for Moto to offer a CD changer and Zport to offer low-profile tires.
 - C) is for Moto to offer a CD changer and Zport to offer a sun roof.
 - D) is for Moto to offer free maintenance and Zport to offer a sunroof.
 - E) does not exist in pure strategies.

Scenario 5

Consider the following game:

		Bull Meat	
		Expand in the West	Expand in the South
Deer Meat	Expand in the West	10, 60	50, 90
	Expand in the South	20, 80	40, 50

- 6) In the game in Scenario 5, 6) _____
- A) all four outcomes are equilibria.
 - B) there is one equilibrium: for both to expand West.
 - C) there is only a mixed strategies equilibrium.
 - D) there are two equilibria: either can expand in the West, and the other expands in the South.
 - E) there is one equilibrium: for both to expand South.

Scenario 6

Consider the following game: Payoffs are in millions of dollars.

		Lawrence LLP	
		Put Poison Pill In Turbo Tech	Dump Cash Assets of Zamboni Tech
ERS Corporation	Buy Turbo Tech	-\$100, -\$1	\$2, -\$0.5
	Buy Zamboni Tech	\$1, -\$1	-\$0.5, -\$0.5

- 7) In the game in Scenario 6, what is the Nash equilibrium? 7) _____
- A) The strategy pair associated with -\$100, -\$1.
 - B) The strategy pair associated with \$1, -\$1.
 - C) The strategy pair associated with \$2, -\$0.5.
 - D) There is no Nash equilibrium in pure strategies.
 - E) The strategy pair associated with -\$0.5, -\$0.5.
- 8) In the game in Scenario 6, 8) _____
- A) No firm has a dominant strategy.
 - B) "TurboTech" is a dominant strategy for ERS Co.
 - C) "ZamboniTech" is a dominant strategy for ERS Co.
 - D) "Dump" is a dominant strategy for Lawrence LLP.
 - E) "Poison Pill" is a dominant strategy for Lawrence LLP.

Scenario 7:

Consider the game below about funding and construction of a dam to protect a 1,000-person town. Contributions to the Dam Fund, once made, cannot be recovered, and all citizens must contribute \$1000 to the dam in order for it to be built. The dam, if built, is worth \$70,000 to each citizen.

		One Citizen	
		Contribute to Dam	Don't Contribute to Dam
Other 999 Citizens	Contribute to Dam	\$69,000, \$69,000	-\$1,000, \$0
	Don't Contribute to Dam	\$0, -\$1,000	\$0, \$0

- 9) In the game in Scenario 7, the strategy pair that pays 9) _____
- A) \$69,000 to each player is the only equilibrium.
 - B) \$69,000 to each player and the strategy pair that pays \$0 to each player are equilibria.
 - C) (-\$1000, \$0) is the only equilibrium.
 - D) \$0 to each player is the only equilibrium.
 - E) (\$0, -\$1000) is the only equilibrium.

Scenario 8

Consider the following game:

		IVY Corp	
		Business Plan Y	Business Plan Z
SAC Group	Business Plan A	\$1, \$10	\$1, -\$5,000
	Business Plan B	\$2, \$0	\$2, \$2

- 10) In game in Scenario 8, what is the Nash equilibrium? 10) _____
- A) The strategy pair associated with \$1, -\$5000.
 - B) The strategy pair associated with \$2, \$0.
 - C) The strategy pair associated with \$1, \$10.
 - D) There is no Nash equilibrium in pure strategies.
 - E) The strategy pair associated with \$2, \$2.
- 11) In game in Scenario 8, what will occur if IVY Corp. plays a maximin strategy? 11) _____
- A) \$2, \$0
 - B) \$1, -\$5000
 - C) \$2, \$2
 - D) There is a .25 chance of each outcome in that case.
 - E) \$1, \$10

Scenario 9

Consider the following game:

It costs each firm lakeside \$1,500 per period to use filters that avoid polluting the lake. However, each firm must use the lake's water in production, so it is also costly to have a polluted lake. The cost to each firm of dealing with water from a polluted lake is \$1000 times the number of polluting firms.

		Nessie, Corp.	
		Pollute	Don't Pollute
Lago, Inc.	Pollute	-\$2,000, -\$2,000	-\$1,000, -\$2,500
	Don't Pollute	-\$2,500, -\$1,000	-\$1,500, -\$1,500

- 12) What is true about dominant strategies in the game in Scenario 9? 12) _____
- A) "Pollute" is a dominant strategy for Lago only.
 - B) "Don't Pollute" is a dominant strategy for both firms.
 - C) "Pollute" is a dominant strategy for both firms.
 - D) "Don't Pollute" is a dominant strategy for Lago only.
 - E) There are no dominant strategies.

- 13) In a Nash equilibrium, 13) _____
- A) the player with the dominant strategy will win.
 - B) at least one player has a dominant strategy.
 - C) no players have a dominant strategy.
 - D) each player has a dominant strategy.
 - E) players may or may not have dominant strategies.

Scenario 10

Consider the game below:

		Moma's Pop	
		Have a Sweepstakes	Create a Diet Soda
Weasel's Pop	Use More Caffeine	-5, 5	10, -10
	Use Animal-Shaped Bottles	8, -8	0, 0

- 14) In the game in Scenario 10, there is 14) _____
- A) a mixed strategy and four pure strategy equilibrium.
 - B) a mixed strategy equilibrium, and no other.
 - C) a mixed strategy and a pure strategy equilibrium.
 - D) a mixed strategy and two pure strategy equilibria.
 - E) no equilibrium in either mixed or pure strategies.
- 15) What is true about dominant strategies in the game in Scenario 10? 15) _____
- A) There are no dominant strategies.
 - B) "Use more caffeine" and "have a sweepstakes" are dominant strategies.
 - C) "Make animal-shaped bottles" and "create a diet soda" are dominant strategies.
 - D) "Use more caffeine" and "create a diet soda" are dominant strategies.
 - E) "Make animal-shaped bottles" and "have a sweepstakes" are dominant strategies.
- 16) A "mixed strategy" equilibrium means that 16) _____
- A) the equilibrium strategy involves alternating between a dominant strategy and a Nash strategy.
 - B) the strategies chosen by the players represent different behaviors.
 - C) one player has a pure strategy, and one does not.
 - D) one player has a dominant strategy, and one does not.
 - E) the equilibrium strategy is an assignment of probabilities to pure strategies.

Scenario 11

Consider the game below:

		Player C	
		Strategy C1	Strategy C2
Player R	Strategy R1	600, 600	100, 1000
	Strategy R2	1000, 100	200, 200

- 17) In the game in Scenario 11, equilibrium is 17) _____
- A) R1, C1.
 - B) R1, C2.
 - C) a mixed strategy based on all four pure strategies.
 - D) R2, C1.
 - E) R2, C2.

- 18) It can be rational to play tit-for-tat in a repeated Prisoner's Dilemma game 18) _____
- A) only if the game is played a finite number of times, and that number is known by all the players in advance.
 - B) only if the game is played an infinite number of times.
 - C) at no time; tit-for-tat is an irrational strategy in this situation.
 - D) for n-1 of the n periods it will be played, if n is known in advance.
 - E) if the game is played an infinite number of times, or if it is uncertain how many times it will be played.

Scenario 13

Consider the game below:

		Player C	
		Strategy C1	Strategy C2
Player R	Strategy R1	50, 50	800, 800
	Strategy R2	1000, 1000	100, 100

- 19) What kind of game is shown in Scenario 13? 19) _____
- A) Prisoner's Dilemma.
 - B) The Product Choice game.
 - C) Matching Pennies.
 - D) It is not possible to tell what kind of game it is because the strategies have not been identified.
 - E) Battle of the Sexes.

- 20) Relative to a simultaneous-move situation, the gain to firm R from being able to move first in the game in Scenario 14, would be 20) _____
- A) 40.
 - B) 5.
 - C) 3.
 - D) 37.
 - E) 32.

Scenario 14

Consider the game below:

		Player C		
		Q=50	Q=100	Q=150
Player R	Q=50	37, 37	30, 40	20, 37
	Q=100	40, 30	32, 32	15, 25
	Q=150	37, 20	25, 15	0, 0

- 21) When, in the game in Scenario 14, the strategy that would not be chosen under any circumstances is removed, what is left is a 21) _____
- A) Battle of the Sexes game.
 - B) constant-sum game.
 - C) Prisoner's Dilemma game.
 - D) Beach Location game.
 - E) Matching Pennies game.
- 22) An oligopolistic situation involving the possible creation of barriers to entry would probably best be modeled by a 22) _____
- A) cooperative game.
 - B) sequential game.
 - C) Prisoner's Dilemma game.
 - D) Battle of the Sexes game.
 - E) repeated game.
- 23) What does it mean to say that a game is in "extensive form"? 23) _____
- A) The game is presented as a matrix.
 - B) The game is written out as often as the situation calls for it to be played.
 - C) The game is presented as a decision tree.
 - D) All payoffs are shown.
 - E) Strategies are described, rather than just numbered.

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

- 24) BuyRight is a chain of grocery stores operating in small cities throughout the southwestern United States. BuyRight's major competition comes from another chain, Acme Food Stores. Both firms are currently contemplating their advertising strategy for the region. The possible outcomes are illustrated by the payoff matrix below.

		Acme Foods	
		Increase Advertising	Don't Increase Advertising
Buy-right	Increase Advertising	20, 15	35, -5
	Don't Increase Advertising	2, 30	25, 25

Entries in the payoff matrix are profits. BuyRight's profit is before the comma, Acme's is after the comma.

- Describe what is meant by a dominant strategy.
 - Given the payoff matrix above, does each firm have a dominant strategy?
 - Under what circumstances would there be no dominant strategy for one or both firms?
- 25) The widget market is controlled by two firms: Acme Widget Company and Widgetway Manufacturing. The structure of the market makes secret price cutting impossible. Each firm announces a price at the beginning of the time period and sells widgets at the price for the duration of the period. There is very little brand loyalty among widget buyers so that each firm's demand is highly elastic. Each firm's prices are thus very sensitive to inter-firm price differentials. The two firms must choose between a high and low price strategy for the coming period. Profits (measured in thousands of dollars) for the two firms under each price strategy are given in the payoff matrix below. Widgetway's profit is before the comma, Acme's is after the comma.

		Acme	
		Low Price	High Price
Widgetway	Low Price	60, 60	250, -20
	High Price	-20, 250	130, 130

- Does either firm have a dominant strategy? What strategy should each firm follow?
- Assume that the game is to be played an infinite number of times. (Or, equivalently, imagine that neither firm knows for certain when rounds of the game will end, so there is always a positive chance that another round is to be played after the present one.) Would the tit-for-tat strategy would be a reasonable choice? Explain this strategy.
- Assume that the game is to be played a very large (but finite) number of times. What is the appropriate strategy if both firms are always rational?

Answer Key

Testname: GAME THEORY

- 1) D
- 2) C
- 3) E
- 4) A
- 5) B
- 6) D
- 7) C
- 8) D
- 9) B
- 10) E
- 11) A
- 12) C
- 13) E
- 14) B
- 15) A
- 16) E
- 17) E
- 18) E
- 19) B
- 20) B
- 21) C
- 22) B
- 23) C
- 24) *a.*

A dominant strategy is one that is optimal regardless of the rival strategy.

b.

For both firms, the dominant strategy is to increase advertising.

If Acme increases advertising, Buy-Right earns 20 by increasing, 2 by not increasing. Profit is higher for Buy-Right by increasing, regardless of Acme's choice. The same can be shown to be true for Acme.

c.

Either or both firms would not have a dominant strategy if their best choice depended on the choice of their rival.

25) *a.*

Each firm's dominant strategy is the low price. This follows from the realization that each player is better off with the low price strategy regardless of the opponent's strategy.

b.

With an infinite number of trials, a tit-for-tat strategy is appropriate. Under tit-for-tat, each player chooses the high price so long as his rival cooperates by also choosing the high price. Once the rival cuts prices, the other player retaliates. If the rival raises price back to the high price, the firm follows suit.

c.

A finite number of periods implies a low price for every period. The process begins when each player realizes its opponent cannot retaliate after the last period so that the low price is rational for the last period. This in turn makes the low price rational for the next to last period and so on.