

## Chapter 13 Q and A with Answers

1. Your economics instructor decides to assign a two-student project. We will assume that both students are interested in maximizing their happiness.

Your partner

		Work hard	Work less hard
You	Work hard	Grade = A, but you had to work 10 hours. Happiness = 7/10	Grade = A, and you only worked 5 hours. Happiness = 9/10.
	Work less hard	Grade = A, but you had to work 15 hours. Happiness = 4/10	Grade = B, but you only worked 5 hours. Happiness = 6/10.

What is your dominant strategy?

- A. Work hard
- B. Work hard, only if your partner works hard
- C. Work less hard
- D. Work less hard, only if your partner works less hard

2. Trade agreements encourage countries to curtail tariffs so that goods can flow across international boundaries without restrictions. Using the following payoffs determine the Nash equilibrium for these two countries?

		China	
		Low tariffs	High Tariffs
United States	Low tariffs	China gains \$50 billion U.S. gains \$50 billion	China gains \$100 billion U.S. gains \$10 billion
	High tariffs	China gains \$10 billion U.S. gains \$100 billion	China gains \$25 billion U.S. gains \$25 billion

- A. Low tariff for the U.S., low tariff for China.
  - B. Low tariff for the U.S., high tariff for China.
  - C. High tariff for the U.S., high tariff for China.**
  - D. High tariff for the U.S., low tariff for China.
3. Which is the best example of a zero-sum game?
- A. Playing poker**
  - B. The value meal you buy from Wendy's
  - C. A riot in downtown 6<sup>th</sup> Avenue after a big football win over OU.
  - D. A UT t-shirt you buy at the bookstore.
4. In the prisoner's dilemma which outcome is the dominant strategy?
- A. seek legal advice
  - B. lie to the police and make sure you implicate an innocent third party.
  - C. keep quiet and don't tell the cops anything.
  - D. rat out your partner to avoid jail time.**

5. A small town has only one pizza place, The Pizza Factory. A small competitor, Perfect Pies, is thinking about entering the market. The profits of these two firms depends on whether Perfect Pies enters the market and whether The Pizza Factory – as a price leader – decides to set a high or low price.

		Perfect Pies	
		Enter	Stay out
The Pizza Factory	High price	Perfect Pies makes \$10,000  The Pizza Factory makes \$20,000	Perfect Pies makes \$0  The Pizza Factory makes \$50,000
	Low price	Perfect Pies loses \$10,000  The Pizza Factory makes \$10,000	Perfect Pies makes \$0  The Pizza Factory makes \$25,000

What is the dominant strategy of The Pizza Factory?

- A. keep its price high
- B. keep its price low
- C. keep its price high only if Perfect Pies enters the market
- D. The Pizza Factory does not have a dominant strategy.

6. What is the dominant strategy in Rock, Paper, Scissors?

- A. Always choose rock.
- B. Choose rock when you partner chooses scissors, scissors when they choose paper, and paper when they choose rock.
- C. RPS does not have a dominant strategy.
- D. Try to outguess your opponent.

7. Which of the following outcomes is the NASH equilibrium?

		Freaky Cat	
		Woof	Meow
Mad Dog	Woof	5, 15	15, -5
	Meow	-5, 0	10, 10

- A. Mad Dag and Freaky Cat both woof
- B. Mad Dog and Freaky Cat both meow
- C. Mad Dog woofs and Freaky Cat meows
- D. Freaky Cat woofs and Mad Dog meows

8. Which of the following is the best example of a zero-sum game?

- A. your laptop gets stolen
- B. global warming
- C. you buy a ticket home to see your family

9. Which is the best example of an oligopoly?

- A. The sole gas station at a stop along a rural highway
- B. Coca-Cola and Pepsi
- C. Lettuce growers at a farmers' market
- D. A part-time Uber driver

10. As the owner of a small restaurant should you be more concerned about the cleanliness of your restroom or kitchen?

- A. The dominant strategy is to clean the restrooms more often than the kitchen.
- B. The dominant strategy is to clean the kitchen more often than the restrooms.
- C. The dominant strategy is the clean both the restrooms and the kitchen.
- D. There is no dominant strategy, you should clean the tables, floors, restrooms, kitchen, and maintain a nice outside appearance always in order to attract customers.

11. The Nash equilibrium occurs when

- a. Neither player has an incentive to switch their strategy given what the other player is doing.
- b. Both players earn the largest possible payoffs.
- c. Both players experience a prisoner's dilemma
- d. When the combined profits are maximized.

12. Because consumers have \_\_\_\_\_ about products this leads oligopolies to compare their products to more highly rated brands.

- a. mutual interdependence
- b. incomplete information
- c. high barriers
- d. monopoly power

13. Which of the following is an example of the prisoner's dilemma in everyday life?

- a. Not making up your bed
- b. Not paying back a loan from your parents
- c. Not leaving a tip at an out-of-town restaurant.
- d. Not earning enough money to afford to pay your rent.

14. If you want to encourage someone to cooperate with you in the long run you should

- a. find the Nash equilibrium.
- b. deploy the dominant strategy.
- c. use tit-for-tat.
- d. be cooperative.

15. Suppose that Lance and Eddy are the two top cyclists in the world. Both are scheduled to compete in an upcoming cycling competition in which the winner will receive \$100,000 in prize money while the rest of the competitors will receive nothing. Both cyclists are very talented, but they can increase their chances of winning by doping (i.e. taking performance enhancing drugs). The cost to each of doping is \$25,000 (this includes both the health costs and the expected damage to their reputation if they are caught). If both cyclists dope or if both cyclists don't dope, then each has a 50 percent change of winning the race. On the other hand, if only one of them dopes, then the one who dopes will win the race for sure.

- a. Write down the expected payoff matrix for this game, if both Lance and Eddy make their decisions to dope simultaneously.
- b. Are there any dominant strategies? If so, which?
- c. What is the Nash equilibrium of this game?
- d. Is this game a prisoner's dilemma? Explain.

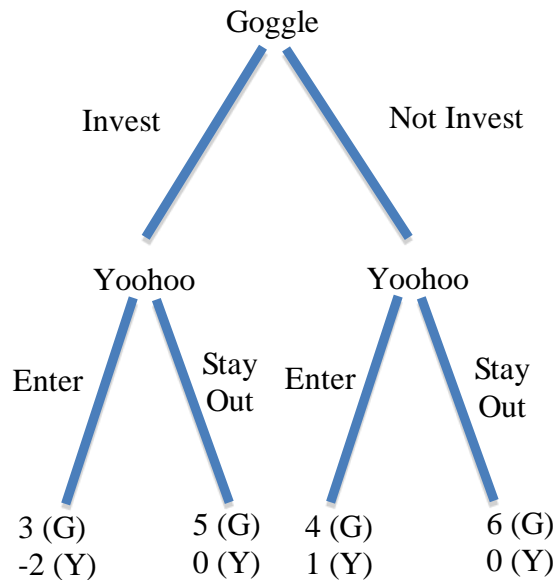
a.

		Lance	
		Don't Dope	Dope
Eddy	Don't Dope	50,000 (E) 50,000 (L)	0 (E) 75,000 (L)
	Dope	75,000 (E) 0 (L)	25,000 (E) 25,000 (L)

- b. Dope.
- c. The Nash equilibrium is for them both to dope.

- d. Yes, this is a prisoner's dilemma. The socially optimal outcome is for them both not to dope, but this strategy is dominated by dope.

16. Suppose that Goggle is the only firm that provides internet search services, but a second firm, Yoohoo, is considering entering the market. Prior to Yoohoo's decision about whether to enter the market, suppose Goggle must decide whether to make a costly investment to improve the quality of its own product. Suppose the decision tree for this game can be written as follows:



- What is the equilibrium outcome of this game?
  - If Yoohoo could make a credible commitment to either Enter or Stay Out when its turn comes, what would it do?
- a. Goggle will invest, and Yoohoo will stay out.  
b. It would commit to Enter. In that case, Goggle would Not Invest.

17. Suppose Ishmael and Santiago are the only two fishermen who fish in Lake Hardin. Both men must choose between either fishing for 20 hours a week or 40 hours per week. If both men choose to fish for 20 hours a week, then they can each catch \$3000 worth of fish per week. If both men choose to fish for 40 hours a week, then they can each catch \$2000 worth of fish per week. If Santiago fishes for 40 hours a week and Ishmael fishes for 20 hours a week, then Santiago can catch \$4000 worth of fish per week and Ismael can catch \$1000 worth of fish per week. If Ishmael fishes for 40 hours a week and Santiago fishes for 20 hours a week, then Ishmael can catch \$4000 worth of fish per week and Santiago can catch \$1000 worth of fish per week.

- Construct the payoff matrix for this situation. Within each cell, be sure to indicate to whom each payoff refers.
- What is the Nash equilibrium of this game?
- Is this game a prisoner's dilemma? Why or why not?
- Give one possible explanation for why Santiago's payoff declines by \$2000 when Ishmael goes from fishing 20 hours per week to 40 hours per week
- Suppose Ishmael and Santiago play this game repeatedly every week. Describe a strategy that might be able to sustain the socially optimal outcome.

- See below.
- Both players will fish for 40 hours per week.
- Yes. Both players have a dominant strategy (40 hours per week), and when both play it, their payoffs are lower than if both had played their dominated strategy (20 hours per week).
- When Ishmael fishes for more hours, there are fewer fish available for Santiago to catch.
- Each player would pick 20 hours per week the first time the game is played. Then, in every subsequent round, each player would do whatever the other did in the previous round.

		Ishmael	
		20 hours	40 hours
Santiago	20 hours	3000 (S) 3000 (I)	1000 (S) 4000 (I)
	40 hours	4000 (S) 1000 (I)	2000 (S) 2000 (I)

18. Consider a market with demand curve given by  $P = 35 - Q$ . The marginal cost of production is constant and equal to the average total cost of production  $MC = ATC = \$5$ .
- What must be true about the firm's fixed costs? Explain.
  - If the market is monopolized by one firm, how many units will be sold? What price will the monopolist charge? What will be the monopolist's profit?
  - Explain why this outcome isn't efficient.
  - If the monopolist can perfectly price discriminate, how many units will be sold and at what price will he sell the last unit?
  - If another identical firm were to enter the market and the two firms were able to successfully collude, what would be the profit maximizing level of output for each firm if they each agreed to produce half the total quantity

demand? What price would they charge? How much profit would each firm make?

- f. How much profit would each firm make if one of them continues to charge the price agreed upon in part e while the other charges \$1 less than the price agreed upon in part e?
  - g. Assuming that each firm would produce half the total quantity demanded in the market, how much profit would each firm make if they both decided to charge \$1 less than the price agreed upon in part e?
  - h. Suppose firms have two strategies available to them. They can either charge the price agreed upon in part e or they can charge \$1 less than this price. Is charging \$1 less than the price agreed upon in part e a dominant strategy? Explain.
  - i. In the long run, what would you expect the price in this market to be?
- a. Fixed costs must be zero otherwise ATC would be decreasing as Q increases.
  - b.  $MR=MC \Rightarrow 35-2Q=5$  Why? Is it now  $35-2Q$ ? Recall that slope of the MR is twice as steep as the demand curve  $\Rightarrow Q^*=15, P^*=\$20$ .  $\pi = TR-TC = \$20 \times 15 - \$5 \times 15 = \$225$ .
  - c. The marginal benefit to consumers of the last unit produced (\$20) is greater than the marginal cost of producing the last unit (\$5).
  - d.  $P=MC \Rightarrow 35-Q=5 \Rightarrow Q^*=30, P^*=\$5$ .
  - e.  $Q^*=7.5$  (each),  $P^*=\$20$ , each would earn \$112.50.
  - f. If one of them charged \$19, they would capture the entire market. From the demand curve, we can see that at that price, the quantity demanded would be 16. Thus, the firm that charges \$19 would earn  $\pi = TR-TC = \$19 \times 16 - \$5 \times 16 = \$224$ . The other firm would earn \$0.
  - g. If they both charge \$19, the total quantity demanded will be 16. Assuming they each produce half of this quantity; they will each earn  $\pi = TR-TC = \$19 \times 8 - \$5 \times 8 = \$112$ .
  - h. Firms can charge either \$20 or \$19. If the rival firm charges \$20, the other can do better by charging \$19 (because  $\$224 > \$112.50$ ). If the rival firm charges \$19, the other can do better than charging \$19 (because  $\$114 > \$0$ ). Thus charging \$19 is a dominant strategy.
  - i. Each will continue to undercut each until price is equal to MC (\$5).

19. Rachel and Joey are two students who are dating. Before they left for class this morning, they decided to meet for dinner in the evening. After their last class, they go home and get ready for their date. Unfortunately, although they both remember the time—7:00 p.m.—neither of them can remember where they agreed to meet: Clementine or Beyond. Also, there is no way for them to contact each other before 7:00 p.m.

Where should they go? Let's assume that Joey prefers Clementine to Beyond, but Rachel prefers Beyond to Clementine. Joey loves Rachel, however, so he would rather be with her at Beyond than by himself at Clementine. Rachel loves Joey, so she would rather be with him at Clementine than by herself at Beyond. The figure below is the payoff matrix,



where the payoffs are measured in utils (happy points).

		Rachel	
		Beyond	Clementine
Joey	Beyond	5, 3	1, 0
	Clementine	1, 1	3, 5

What is Joey's dominant strategy?

**Answer:** Joey does not have a dominant strategy. If Rachel goes to Beyond, he would want to do the same, because he would get 5 utils instead of the 1 util he would get if he ended up at Clementine by himself. However, if Rachel goes to Clementine, he would want to do the same also, because he would get 3 utils instead of the 0 utils he would get if he ended up at Beyond by himself.

What is Rachel's dominant strategy?

**Answer:** Using the same logic as in the first question, you can see that Rachel does not have a dominant strategy. If Joey goes to Beyond, she would want to do the same, because she would get 3 utils instead of the 0 utils she would get if she ended up at Clementine by herself. However, if Joey goes to Clementine, she would want to do the same also, because she would get 5 utils instead of the 1 utils she would get if she ended up at Beyond by herself.

What is the Nash equilibrium?

**Answer:** Given the above discussion, you should be able to see that there are two Nash equilibria in this game: both go to Beyond, and both go to Clementine. Remember that an outcome is a **Nash equilibrium** if neither Rachel nor Joey has an incentive to change his/her choice given the choice made by the other.

If they are both at Beyond, neither can do better by changing his/her choice. Joey's payoff would fall from 5 to 1 utils if he switched to Clementine, given Rachel is at Beyond. Likewise, Rachel's payoff would fall from 3 to 0 utils if she switched to Clementine, given Joey is at Beyond.

If they are both at Clementine, neither can do better by changing his/her choice. Joey's payoff would fall from 3 to 0 utils if he switched to Beyond, given Rachel is at Clementine. Likewise, Rachel's payoff would fall from 5 to 1 utils if she switched to Beyond, given Joey is at Clementine.

20. Use the matrix below to answer the following questions:

		Larry	
		Confess	Keep quiet
Keisha	Confess	12 years in jail	32 years in jail
	Keep quiet	Goes free	1.5 years in jail

a. What is Keisha's dominant strategy? Explain

**Answer:** The dominant strategy for Keisha is to confess. Regardless of what Larry does, Keisha is better off by confessing.

If Larry confesses, Keisha will get 12 years in jail if she confesses or 32 years if she keeps quiet. Confess is better.

If Larry keeps quiet, Keisha goes free if she confesses or 1.5 years if she keeps quiet. Confess is better.

b. What is Larry's dominant strategy? Explain

**Answer:** The dominant strategy for Larry is to confess. Regardless of what Keisha does, Larry is better off by confessing.

If Keisha confesses, Larry will get 12 years in jail if he confesses or 32 years if he keeps quiet. Confess is better.

If Keisha keeps quiet, Larry goes free if he confesses or 1.5 years if he keeps quiet. Confess is better.

c. What is the Nash equilibrium in this situation? Explain.

**Answer:** A Nash equilibrium occurs when economic decision makers choose the best-possible strategy after taking into account the decisions of others. This means that if each player is playing the strategy according to the Nash equilibrium, neither player would want to deviate unilaterally by playing any other strategy. In this case, confessing is a dominant strategy for both players. It is better for each player to confess, no matter what the other player does. Therefore, the Nash equilibrium occurs when both players play their dominant strategies, that is, confess, confess, and both players get 12 years in jail.

d) Is the Nash equilibrium Pareto optimal? Why/why not?

**Answer:** The Nash equilibrium of the game is NOT Pareto Optimal because there is another outcome (both keeping quiet) in which both players would be better off by spending only 1.5 year in jail.