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SAMPLE

LEARNING



MIGHTY MINDS
Educational Consultants

CCE

←
COMMON CURRICULUM
ELEMENTS

FOR
SENIOR I



SAMPLE

Code: 27054531



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Create & Present

Theta



Reaching a conclusion which is necessarily true provided a given set of assumptions

33

Reaching a conclusion which is consistent with a given set of assumptions



In

35

41



43



Synthesising

45

Judging/evaluating



48

Justifying



Theta θ



ANA

MG



SAMPLE

43.

Analysing

Just a Game

Economics is more than just an array of graphs and statistics. *It is a complex system that, if understood correctly, allows businesses to predict and respond to movement in the market.*



Game Theory



Game Theory is a way of modelling strategic decisions. First explored by John von Neumann and Oskar Morgenstern in 1944, the theory assumes that all agents in the game will act independently of each other and that they understand that their choices will affect the choices of others.

In a game there is always:

- Agents (players)
- A set of possible strategies for each player.
- Rules
- Payoffs of each possible strategy for each player

Consider the following matrix, known as the *Prisoner's Dilemma*, a famous example of a type of Game Theory. In the presented scenario, two prisoners are held in separate rooms. The police have offered each prisoner the following facts to each prisoner; however, they must choose whether to confess or not to confess to their answer:

- If neither prisoner confesses they will both receive 1 year in prison.
- If prisoner *A* confesses and prisoner *B* does not, prisoner *A* will receive 3 years (and prisoner *B* will receive 30 years (and visa versa).
- If they both confess, they will both receive 10 years in prison.

The matrix below shows the possible outcomes for each combination of confession and confession (C).

Payoffs are shown numerically in the matrix, where the first number is the payoff for prisoner *A* and the second number is the payoff for prisoner *B*: (Payoff *A*, Payoff *B*).



(-30,-1)

(-10,-10)

Dominant strategy

A dominant strategy is the strategy that is the best choice for the player, no matter what the other player might choose.

Nash equilibrium

The Nash equilibrium occurs when both players play their dominant strategy and have no motive to deviate.

Just a Game

Q1

Analyse the information provided on the previous page. What is each



Q2

Why do you think that the Nash equilibrium is a *Dilemma*?

the Prisoners'

Q3

In the space provided, write your answer to the question given topic. You should write your answer in the space provided.

...er if writing an analytical essay on the

modern business



Just a Game

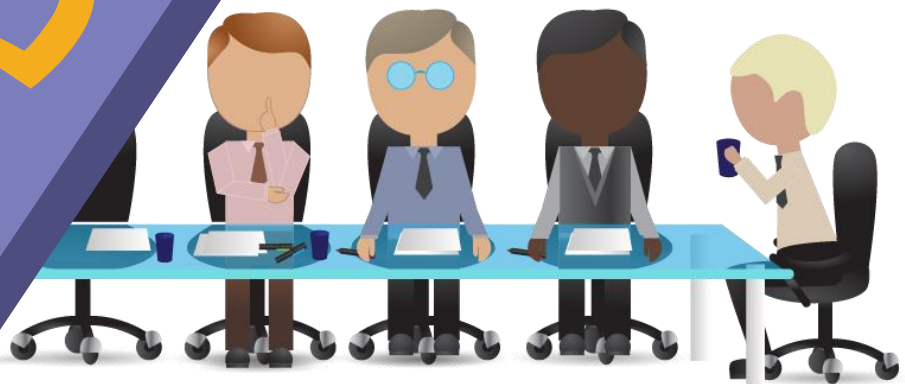
Q4

Using the information you gathered in Question Three, write the introductory paragraph of an essay on the given topic (provided again below for convenience).

The relevance of Game Theory to the modern world



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Just a Game

Q5

Using the information provided in Question One, predict what each of the following payoff matrixes to determine the dominant strategy equilibrium that contains the equilibrium.



		Player A	
		L	R
Player B	U	(4, 5)	(3, 7)
	D	(0, 0)	(2, 1)

Player A's dominant strategy is up.
The dominant strategy for Player B is up.

a)

		Player A	
		L	R
Player B	U	(1, 2)	(2, 3)
	D	(3, 1)	(4, 1)

		Player A	
		L	R
Player B	U	(2, 3)	(3, 1)
	D	(4, 1)	(2, 2)



		Player A	
		L	R
Player B	U	(5, 131)	(50, 25)
	D	(55, 254)	(25, 2)

d)

		Player A	
		L	R
Player B	U	(2, 0)	(50, 25)
	D	(1, 1)	(25, 2)

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COMMON CURRICULUM
ELEMENTS

FOR
SENIOR I

TEACHER RESOURCE



SAMPLE



Code: 27054531



Item Description

Please note: any activity that is not completed during class time may be undertaken at a later date.

'Just a Game'



- **Activity Description:**

- This lesson has been designed to improve students' understanding of information that may be unfamiliar.
 - The activity, 'Just a Game', introduces students to the concept of Game Theory by asking them to analyse the information presented in a game and to explain it in their own words.

- **Purpose of Lesson:**

- To enhance students' understanding of the concept of Game Theory and its application in unfamiliar situations.

- **KLAs:**

- Economics

- **CCEs:**

- Analytical Skills

- **Suggested Time Allocation:**

- This lesson is designed to be completed within 45 minutes to complete.

- **Teaching Notes:**

- The activity is designed to improve students' analytical skills.
 - Students should be encouraged to use the internet for research.
 - Students should work in small groups to consolidate their understanding of the concept.
 - Students should be encouraged to continue on with their essay, if they are interested.

- **Reflection Questions:**

- What are the assumptions that need to be made in order for Game Theory to be accurate?
- What are the limitations of Game Theory?
- How do you think Game Theory might be useful?



Just a Game

Economics is more than just an array of graphs and statistics. *It is a complex system that, if understood correctly, allows businesses to predict and respond to movement in the market.*



Game Theory



Game Theory is a way of modelling strategic decisions. First explored by John von Neumann and Oskar Morgenstern in 1944, the theory assumes that all agents in the game will act independently of each other and that they understand that their choices will affect the choices of the other players.

In a game there is always:

- Agents (players)
- A set of possible strategies for each player.
- Rules
- Payoffs of each possible strategy for each player

Consider the following matrix, known as the *Prisoner's Dilemma*, which is a continuous example of a type of Game Theory. In the presented scenario, two prisoners are held in separate rooms. The police have offered each prisoner the following facts to each prisoner; however, they have not told them the other's answer:

- If neither prisoner confesses they will both receive 1 year in prison.
- If prisoner *A* confesses and prisoner *B* does not, prisoner *A* will receive 3 years (and prisoner *B* will receive 30 years (and visa versa)).
- If they both confess, they will both receive 10 years in prison.

The matrix below shows the possible outcomes for each combination of confession and confession (C).

Payoffs are shown numerically in the matrix, where the first number is the payoff for prisoner *A* and the second number is the payoff for prisoner *B*: (Payoff *A*, Payoff *B*).



(-30, -1)

(-10, -10)

Dominant strategy

A dominant strategy is the strategy that is the best choice for the player, no matter what the other player might choose.

Nash Equilibrium

The Nash equilibrium occurs when both players play their dominant strategy and have no motive to deviate.

Just a Game

Q1

Analyse the information provided on the previous page. What is each



Both prisoners *A* and *B* are going to play their dominant strategy. As they are

of action for them is to confess. This is because confession will either

sentence; however, remaining silent has the possibility of resulting

Q2

Why do you think that the Nash equilibrium is not a solution to the Prisoners' Dilemma?

the Prisoners'

The Nash equilibrium, in the case of the prisoner

the problem with this,

however, is that a joint confession will result

as if they both remained

silent they would only receive five years in

Q3

In the space provided, write a short paragraph on the given topic. You should write at least 100 words.

Consider if writing an analytical essay on the

modern business

History of
Game Theory

The relevance of Game
Theory to the modern
business.

Topic Two: The evolution of
the business world

Just a Game

Q4

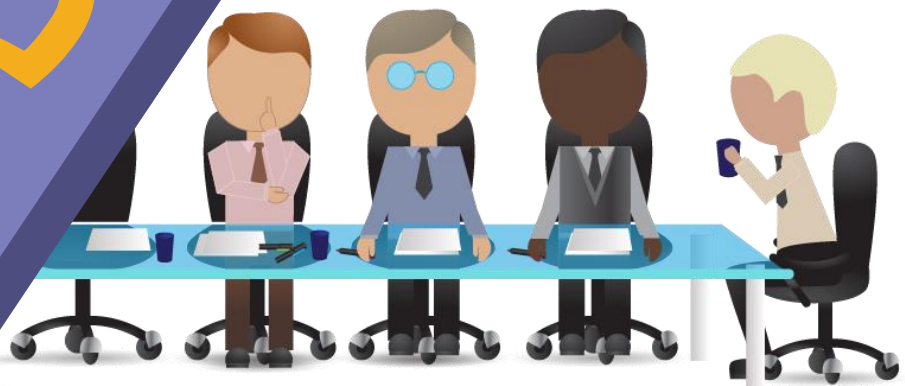
Using the information you gathered in Question Three, write the introductory paragraph on the given topic (provided again below for convenience).

The relevance of Game Theory to the modern business world



Despite the fact that Game Theory has been in use for thousands of years, it is only in the modern business world. Dating back to even before 500AD, this theory has been a part of the business world today. With technology becoming a fundamental and critical part of the business world, it has transitioned from being a simple idea to an umbrella term that encompasses a wide range of concepts. Game Theory allows businesses to predict, and respond to, their interactions with their competitors.

SAMPLE



Just a Game

Q5

Using the information provided in Question One, predict what each of the following payoff matrixes to determine the dominant strategy equilibrium that contains the equilibrium.



		Player A	
		L	R
Player B	U	(4, 5)	(3, 7)
	D	(0, 0)	(2, 1)

Player A's dominant strategy is up.
The dominant strategy for Player B is up.

a)

		Player A	
		L	R
Player B	U	(1, 2)	(2, 1)
	D	(3, 4)	(4, 3)

		Player A	
		L	R
Player B	U	(2, 3)	(3, 1)
	D	(4, 1)	(2, 2)

d)

		Player A	
		L	R
Player B	U	(2, 0)	(50, 25)
	D	(1, 1)	(25, 2)



		Player A	
		L	R
Player B	U	(5, 131)	(131, 5)
	D	(55, 254)	(254, 55)



Just a Game

Question One:

Before the commencement of Question One, students should have read the *Prisoner's Dilemma* Game Theory. Students were required to identify what each prisoner would do in the case of the *Prisoner's Dilemma*. Students should have referred to the model response to this question. The model response is provided below.

Model Response:

Both prisoners A and B are going to play their game. If they both confess, the sentence will be a ten-year sentence. If they both remain silent, the sentence will be a one-year sentence. If one confesses and the other remains silent, the one who confesses will receive a thirty-year sentence, while the one who remains silent will receive a one-year sentence. The best course of action for both prisoners is to confess, as this will result in a ten-year sentence for both, which is the best possible outcome for both.

Question Two:

Students were required to identify what the *Prisoner's Dilemma* is considered to be inefficient. Students may have referred to the model response to answer this question. A model response is provided below.

Model Response:

The Nash equilibrium in the *Prisoner's Dilemma*, would be that they both confess. The problem with the *Prisoner's Dilemma* is that it is a non-cooperative game. If both prisoners confess, they will both receive a ten-year sentence. If both remain silent, they will both receive a one-year sentence. If one confesses and the other remains silent, the one who confesses will receive a thirty-year sentence, while the one who remains silent will receive a one-year sentence. The best outcome for both prisoners is to remain silent, but this is not the Nash equilibrium.

Question Three:

Students were required to identify what they would make in an analytical essay responding to the *Prisoner's Dilemma* and the modern business. Students could have presented their response to the *Prisoner's Dilemma* and the modern business. A model response is provided on the following page.



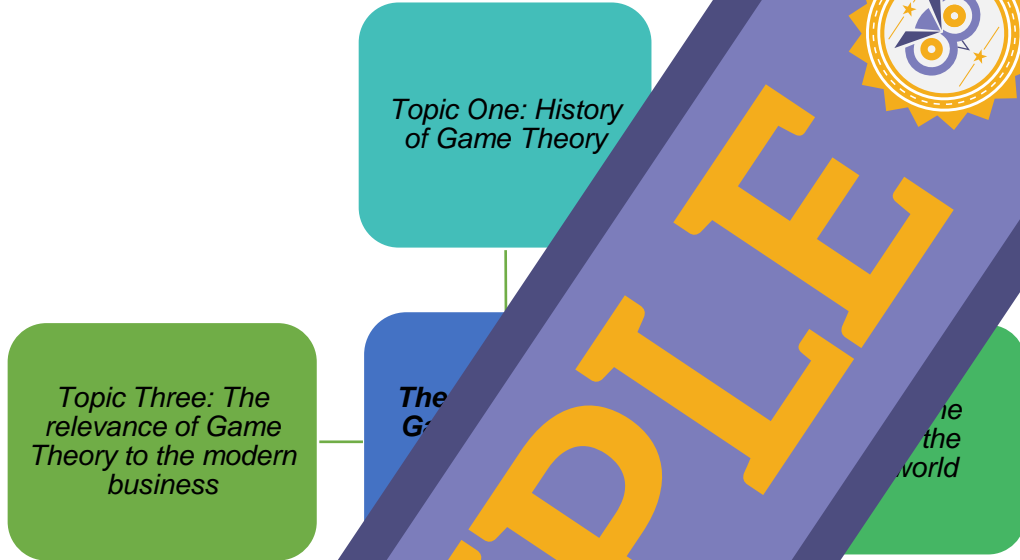
TEACHER'S ANSWER SHEET



...This teacher's answer guide is continued from the previous page.

Question Three (cont'd):

Example Response:



Question Four:

Students were required to write an analytical essay on the topic: *The relevance of Game Theory to the modern business*. They should have mentioned the points they identified in Question Three.

Model Response:

Despite its long history of use for thousands of years, its relevance can still be seen in the modern world. Dating back to even before 500AD, this theory of decision-making has shaped the modern business world today. With technology becoming a major part of our lives, Game Theory has transitioned from being a simple concept to a complex one that encompasses many facets of decision science. Game Theory is used to predict, and respond to, their internal and external environment.



This teacher's answer guide is continued on the next page...

TEACHER'S ANSWER SHEET



...This teacher's answer guide is continued from the previous page.

Question Five:

Students were required to identify the dominant strategy equilibrium matrixes. An example was provided to help students. Students should have been able to identify the dominant strategy equilibrium by looking at the outcomes and remembering that the outcomes were listed (A, B). The correct

Correct Response:

a)

		Player A	
		L	R
Player B	U	(10, 3)	(5, 1)
	D	(5, 2)	(2, 1)

c)

		Player A	
		L	R
Player B	U	(2, 0)	(50, 25)
	D	(1, 1)	(25, 2)

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