

# Industrial Economics

## \* Chapter 7 \*

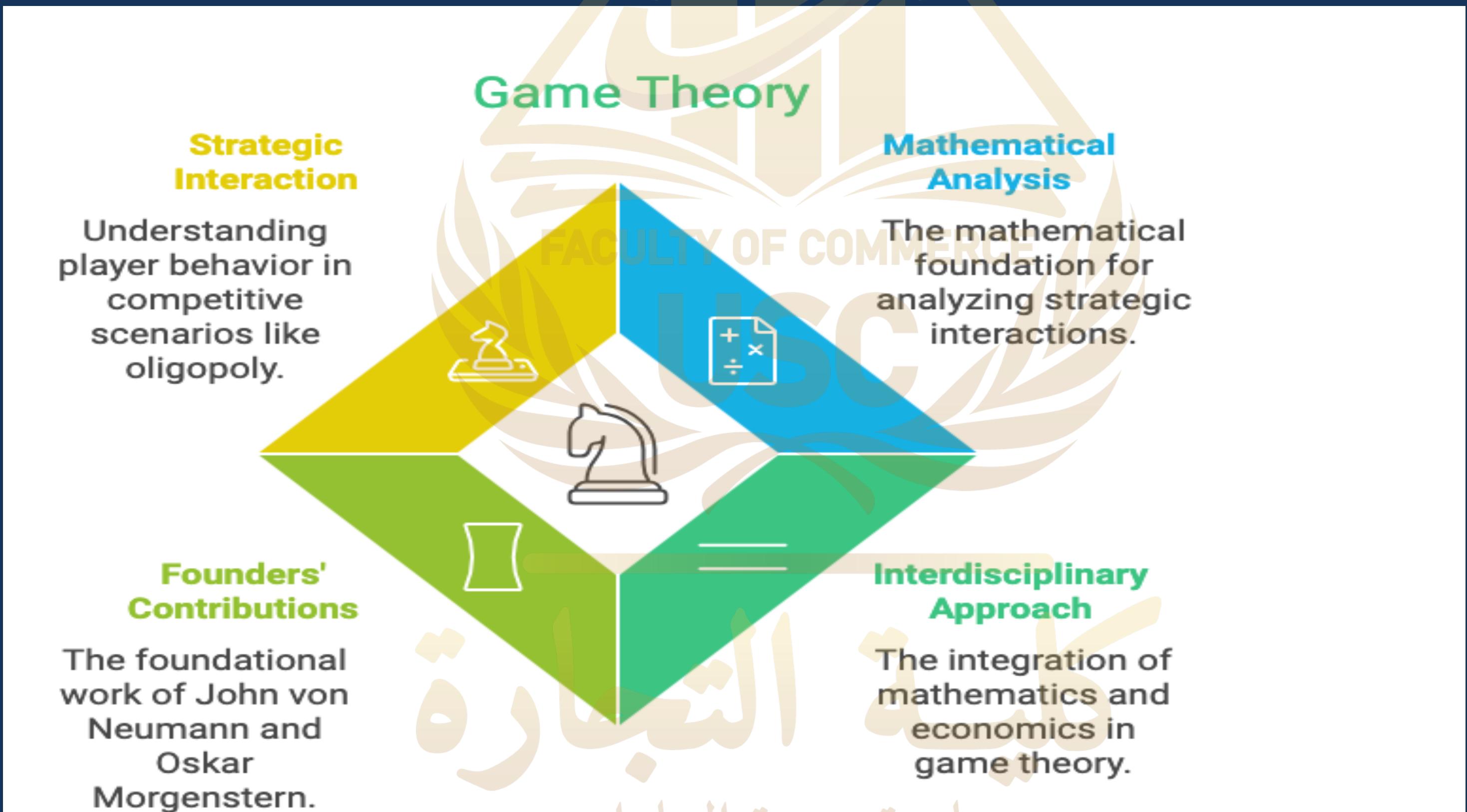
### Game Theory

Section by, Hend Abdelsalam

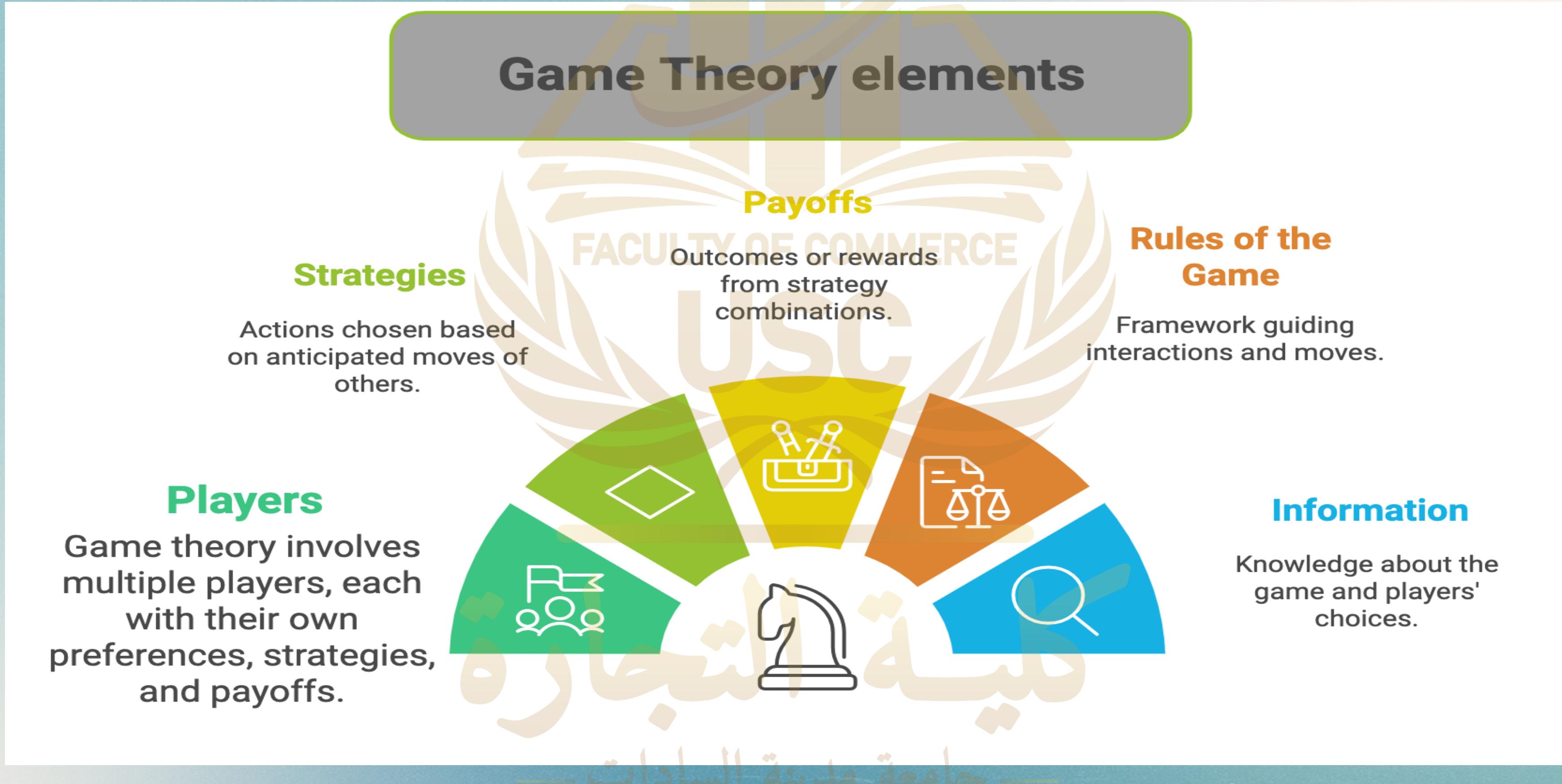
جامعة مدينة السادات —  
كلية التجارة



# Q1: What do we mean by the game theory?



## Q2: What are the elements of game theory?



# Q3: List some examples for game theory?

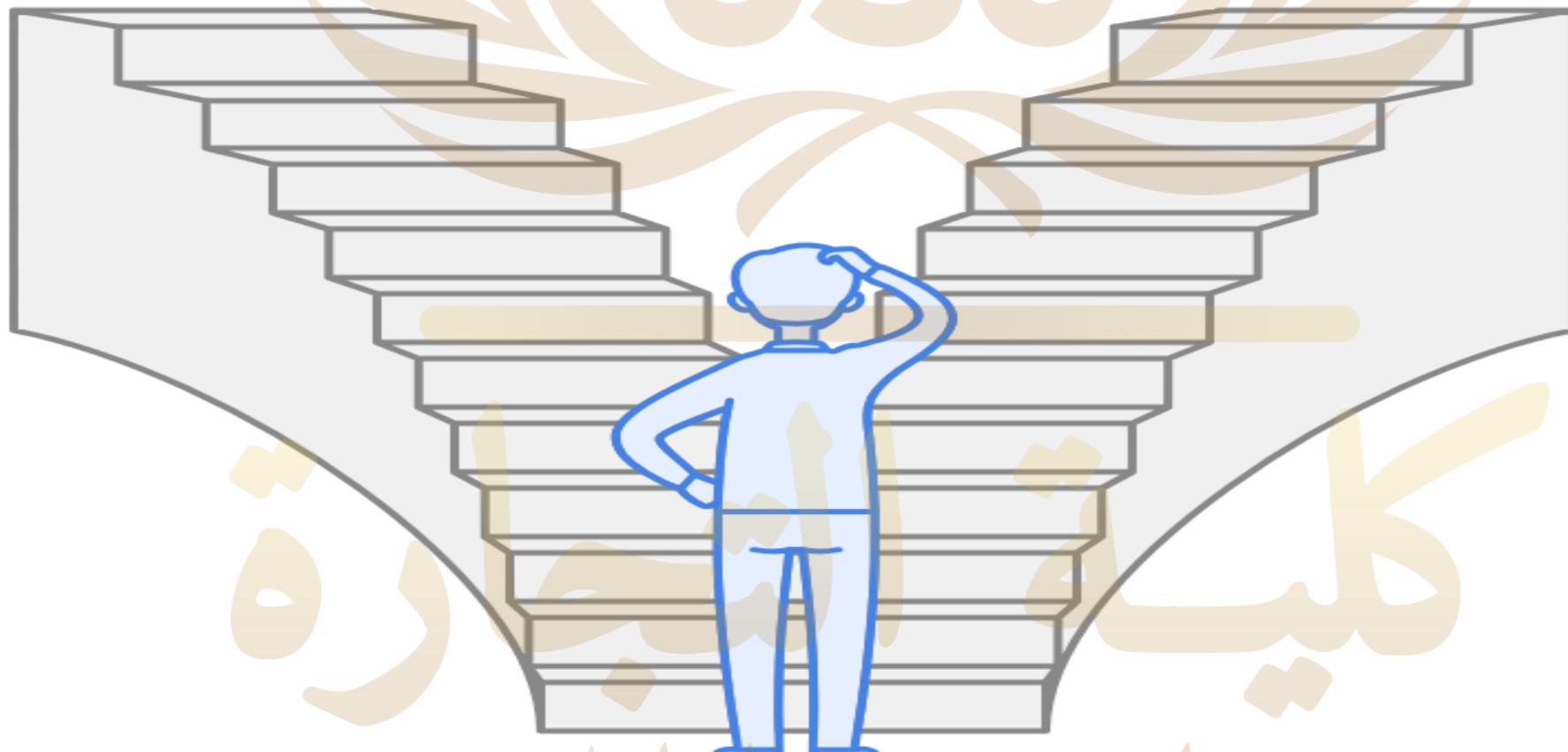
## Examples for game theory

### Prisoners' Dilemma

Highlights the conflict between individual rationality and collective benefit.

### Competition between Firms

Focuses on strategic decision-making in a competitive market.



## **Dominant strategy:**

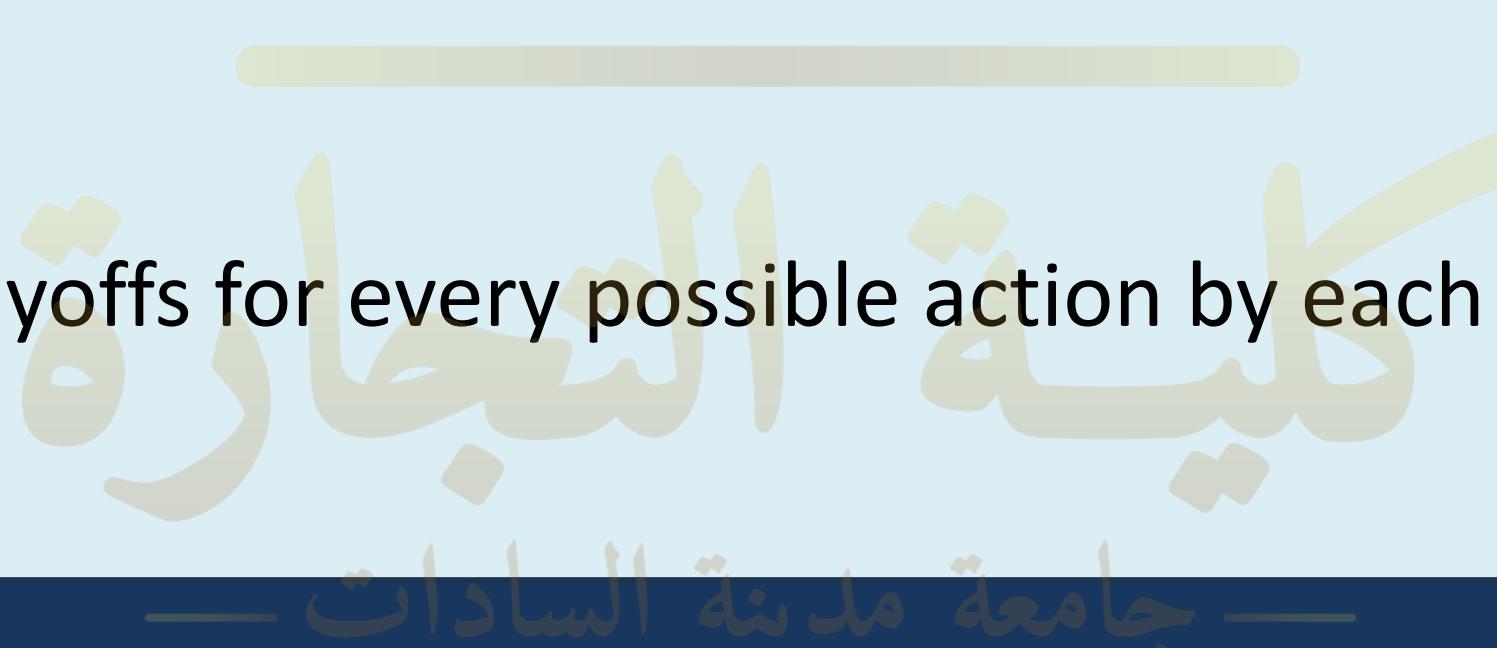
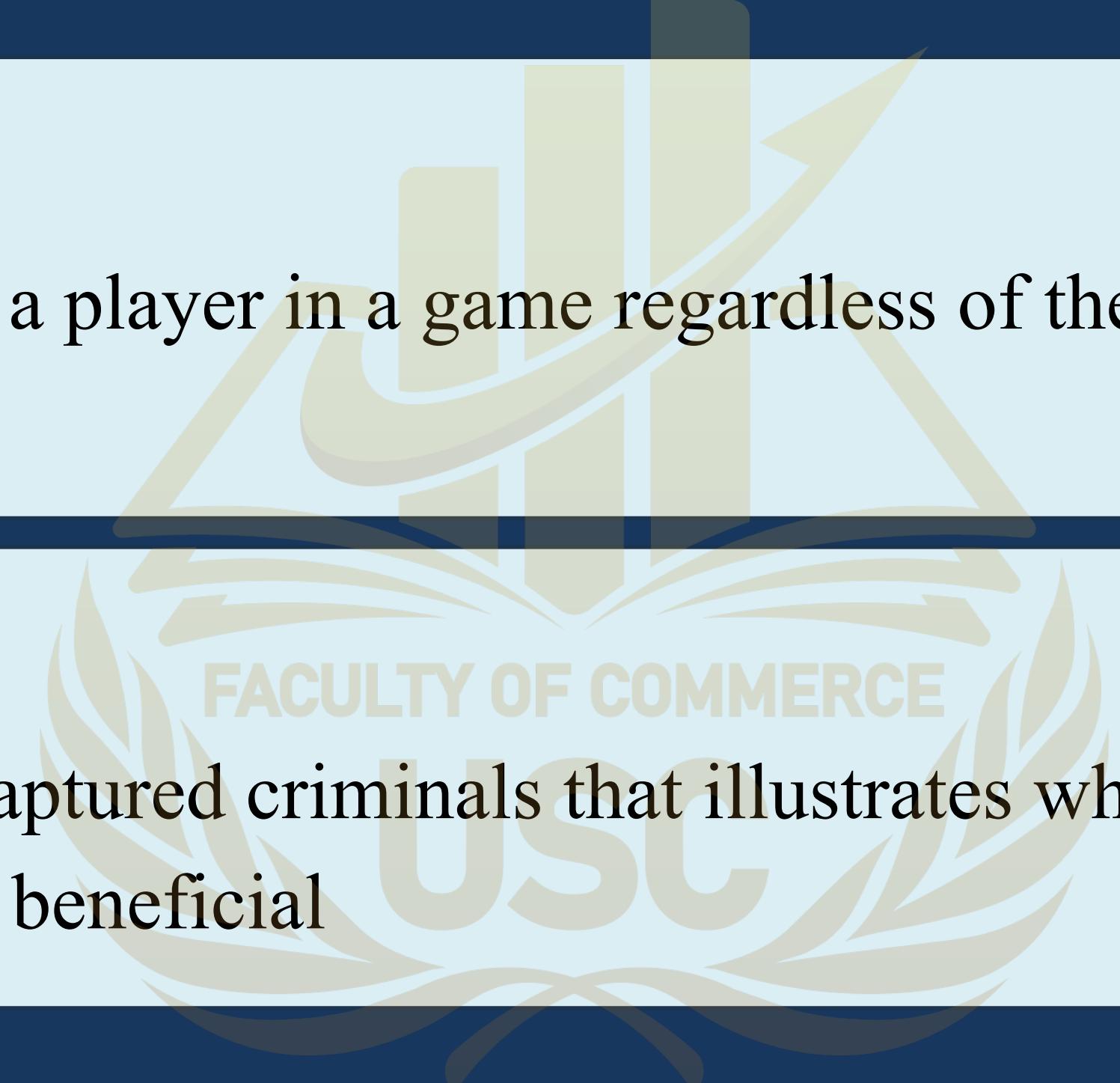
a strategy that is best for a player in a game regardless of the strategies chosen by the other players

## **Prisoners' dilemma:**

a “game” between two captured criminals that illustrates why cooperation is difficult even when it is mutually beneficial

## **A payoff matrix :**

is a table that shows the payoffs for every possible action by each player given every possible action by the other player.



## Q4: Discuss Nash equilibrium?

### Nash Equilibrium

Definition: A Nash Equilibrium occurs when each player chooses a strategy that gives him/her the highest payoff, given the strategy chosen by the other player(s) in the game. ("rational self-interest")

## Example 1

According to the following table  
determine the following:

1- Nash equilibrium.

2- Identify the dominant strategy

for both firms A and B.

3- If the two companies could

cooperate, what strategy would

maximize their combined profits?

		Firm B	
		sets a high price	sets a lower price
Firm A	sets a high price	A: 40\$ , B: 40\$	A: 10\$ , B: 60\$
	sets a lower price	A: 60\$ , B: 10\$	A: 15\$ , B: 15\$

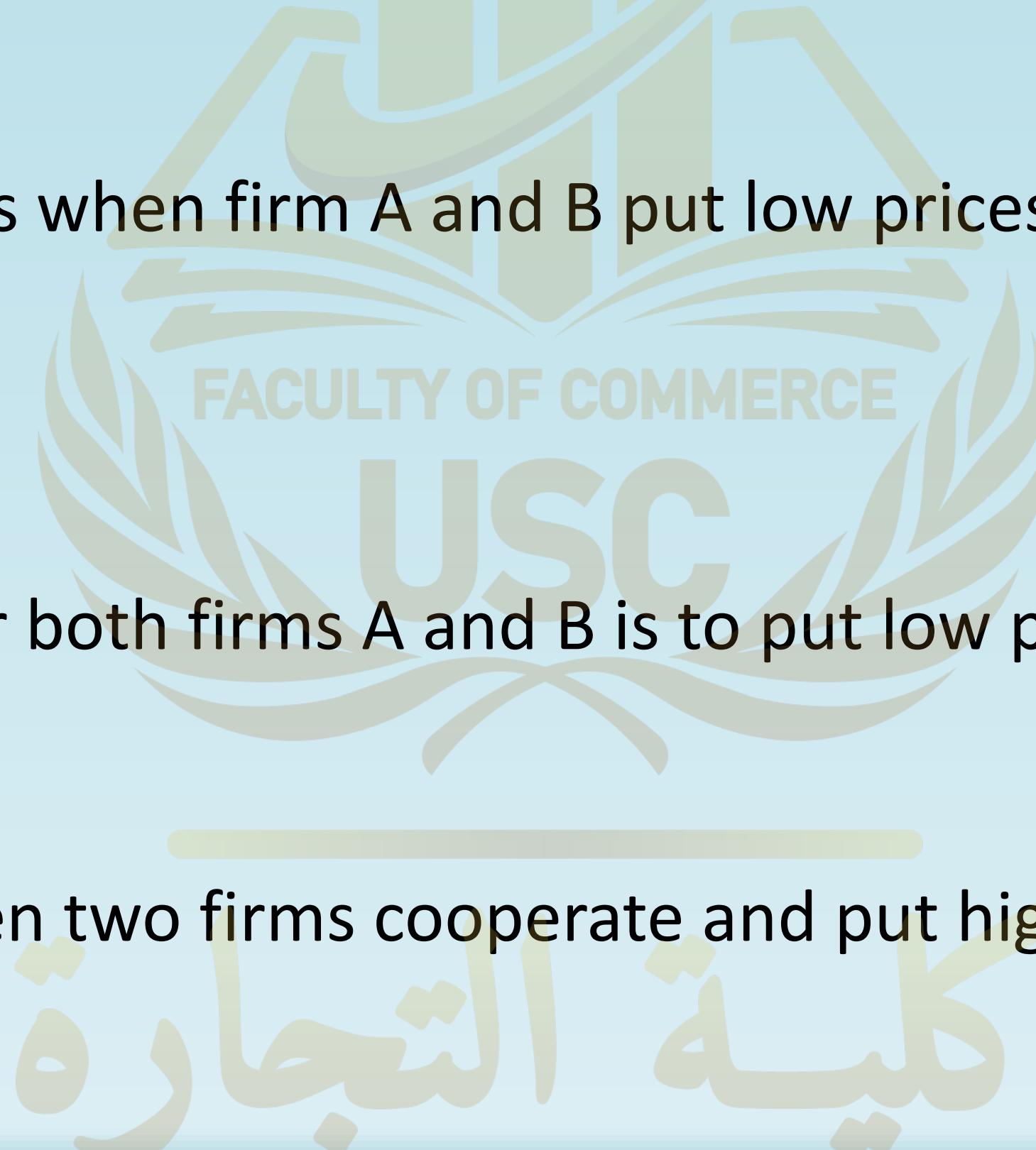
## Solution

### 1- Nash equilibrium:

Nash equilibrium occurs when firm A and B put low prices and achieve 15 dollar for both firms.

### 2- Dominant strategy for both firms A and B is to put low price.

### 3- The best strategy when two firms cooperate and put high prices then achieve 40 dollar.



## Example 2

According to the following table  
determine the following:

1- Nash equilibrium.

2- Identify the dominant strategy

for both Airlines A and B.

3- If the two Airlines could cooperate, what strategy would maximize their combined profits?

		Airline B	
		High price	Lower price
Airline A	High price	A: \$20M, B: \$20M	A: \$5M, B: \$30M
	Lower price	A: \$30M, B: \$5M	A: \$10M, B: \$10M

## Solution

### 1- Nash equilibrium:

Nash equilibrium occurs when Airline A and Airline B put low prices and achieve 10 million dollar.

### 2- Dominant strategy

- For Airline A when it decide to put low prices.
- For Airline B when it decide to put low prices.

### 3- The best strategy when two firms cooperate and put high prices then achieve 20 million dollar, But its illegal (Called Collusion).

## Example 3

According to the following table  
determine the following:

1- Nash equilibrium.

2- Identify the dominant strategy

for Fatima and Jac.

3- If both cooperate, which strategy would maximize their combined profits?

		Fatima	
		Left	Right
Jac	Left	J: \$100, F: \$100	J: \$0, F: \$0
	Right	J: \$0, F: \$0	J: \$50, F: \$50

## Solution

### 1- Nash equilibrium:

Nash equilibrium occurs at **two** points

- when Fatima and Jac walk left and achieve \$100 for each firm.
- when Fatima and Jac walk right and achieve \$50 for each firm.

### 2- Dominant strategy

There are no Dominant strategy for both Fatima and Jac.

### 3- The best strategy when they cooperate

The best strategy will be at Nash equilibrium.

- When Fatima and Jac walk left and achieve \$100 for each firm.
- When Fatima and Jac walk right and achieve \$50 for each firm.

## Example 4

According to the following table  
determine the following:

1- Nash equilibrium.

2- Identify the dominant strategy

for both firms A and B.

		Firm B		
		S	M	L
Firm A	S	A: \$6, B: \$4	A: \$4, B: \$6	A: \$1, B: \$0
	M	A: \$2, B: \$3	A: \$5, B: \$3	A: \$3, B: \$6
	L	A: \$12, B: \$9	A: \$10, B: \$11	A: \$4, B: \$5

## Solution:

### 1- Nash equilibrium:

Nash equilibrium occurs when firm A produce (L) then achieve \$10 and For firm B to produce (M) then achieve \$11.

### 2- Dominant strategy

Dominant strategy for firm A when producing at (L).

## Example 5

According to the following table  
determine the following:

1- Nash equilibrium.

2- Identify the dominant strategy

for both Companies A and B.

3- If the two companies could

cooperate, what strategy would

maximize their combined profits?

		Company B	
		High Price	Low Price
Company A	High Price	A: \$20, B: \$20	A: \$0, B: \$40
	Low Price	A: \$40, B: \$0	A: \$10, B: \$10

## Solution:

### 1- Nash equilibrium:

Nash equilibrium occurs when both company A and company B sell at low prices, then achieve \$10

### 2- Dominant strategy for company A and company B is when selling at low prices.

### 3- The best strategy:

The best strategy for company A and B is when they sell at high prices, then achieve \$20, But its illegal (Called Collusion).

## Example 6

According to the following table  
determine the following:

1- Nash equilibrium.

2- Identify the dominant strategy

for both Farmers X and Y.

3- If the two Firms could cooperate, what strategy would

maximize their combined profits?

		Farmer Y	
		Wheat	Corn
Farmer X	Wheat	X: \$10, Y: \$10	X: \$30, Y: \$20
	Corn	X: \$20, Y: \$30	X: \$15, Y: \$15

## Solution:

### 1- Nash equilibrium:

There are two Nash equilibriums:

- Nash equilibrium occurs when Farmer X sell wheat, then achieve \$30 and Farmer Y sell corn, then achieve \$20.
- Nash equilibrium occurs when Farmer X sell corn, then achieve \$20 and Farmer Y sell wheat, then achieve \$30.

### 2- Dominant strategy

There are no dominant strategies

### 3- The best strategy:

At the two Nash equilibriums.

## 1- What is the primary focus of game theory?

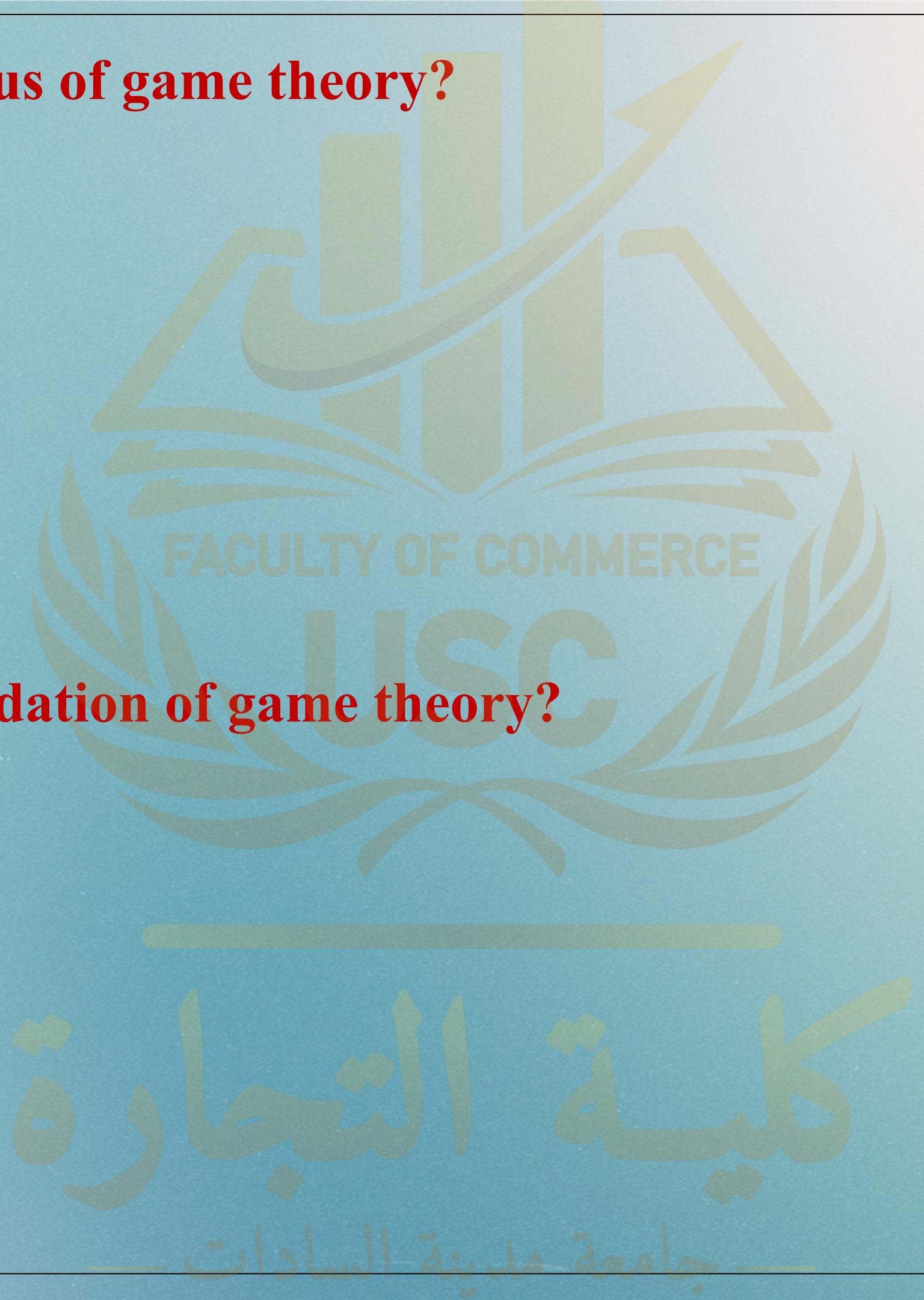
- a) Financial accounting
- b) Strategic interactions
- c) Genetic evolution
- d) Natural disasters

**Answer: B**

## 2. Who developed the foundation of game theory?

- a) John von Neumann
- b) Adam Smith
- c) Alfred Nobel
- d) Nikola Tesla

**Answer: A**



### **3-What is a Nash Equilibrium?**

- a) A point where all players win
- b) A situation where no player can improve their outcome by changing their strategy alone
- c) A random event in a game
- d) A penalty for losing

**Answer: B**

### **4. What is a dominant strategy?**

- a) A strategy chosen by the majority
- b) A strategy that is best regardless of others' choices
- c) A random strategy
- d) A strategy based on chance

**Answer: B**

## 5. What is a payoff in game theory?

- a) A fixed cost
- b) The reward or outcome for a player's strategy
- c) The number of moves in a game
- d) The time taken to decide

**Answer: B**

## 6. What happens in a price war in game theory?

- a) Both firms maximize profits
- b) Both firms reduce profits
- c) One firm exits the market
- d) No impact on profits

**Answer: B**

## **7. What is collusion in an economic context?**

- a) Cooperation between firms to raise competition
- b) Agreement among firms to limit competition
- c) Random strategy in pricing
- d) A natural market outcome

**Answer: B**

## **8. What does a player consider in strategic decision-making?**

- a) Only their own outcomes
- b) How others will respond to their actions
- c) Random factors
- d) Their opponents' physical strengths

**Answer: B**

## 9. What does non-cooperation in a price-setting game often lead to?

- a) Price stability
- b) Price wars
- c) Collusion
- d) Monopoly

**Answer: B**

## 10. What is the goal of anti-trust laws?

- a) Encourage collusion
- b) Prevent cooperation
- c) Promote competition
- d) Protect monopolies

**Answer: C**



## **11. What is the outcome if both firms cooperate in an oligopoly?**

- a) Reduced profits
- b) Maximized joint profits
- c) No impact on profits
- d) Monopoly for one firm

**Answer:** B

## **12. What is a payoff matrix?**

- a) A table showing all payoffs for all player strategies
- b) A summary of costs
- c) A list of dominant strategies
- d) A probability table

**Answer:** A





Thank you!

كلية التجارة  
— جامعة مدينة السادات —