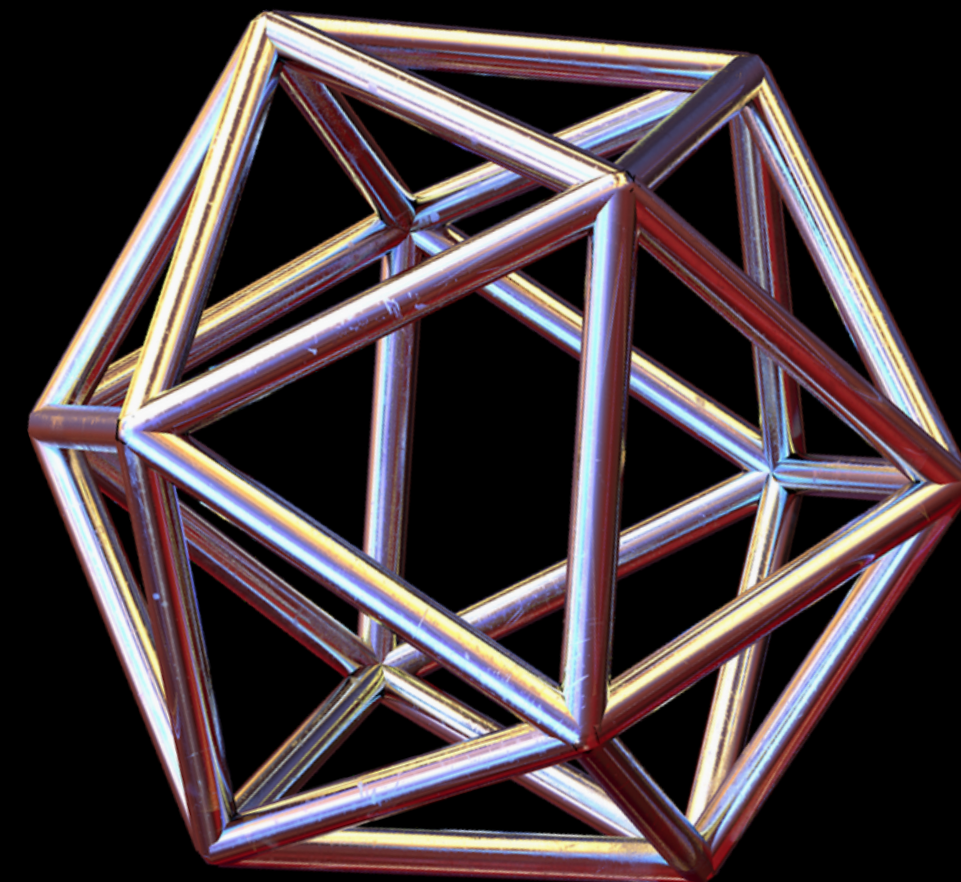
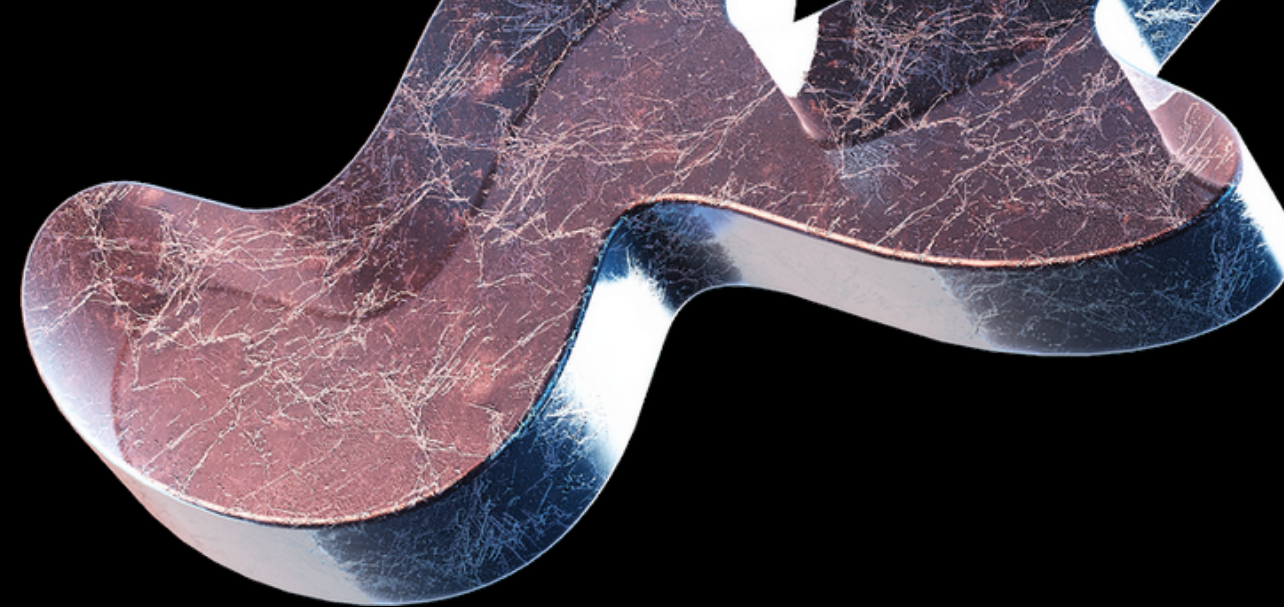




Finance & Economics Club

Game Theory



Presented By

Daksh Arora

6280095170 ; daksh.arora@iitg.ac.in

Divyam Jain

6280109478 ; j.divyam@iitg.ac.in

Divyansh Chandak

9634024866 ; c.divyansh@iitg.ac.in

Ayush Lohia

7380542746 ; l.ayush@iitg.ac.in

Introduction

This is a research-based project to explore strategic decision-making, where players navigate complex scenarios, anticipate opponents' moves, and seek optimal outcomes in this intellectually stimulating gaming experience.



Auction



What is an Auction?

An auction is a sale in which buyers compete for an asset by placing bids.

Types of Auction

We will be looking into two types of Auction bids

1. First-price, sealed-bid auction
2. Second-price, sealed-bid (Vickrey) auction



Theory of Auctions



✦ First-price, sealed-bid auction

It is also known as blind auction.

In this type of auction, all bidders simultaneously submit sealed bids so that no bidder knows the bid of any other participant.



The highest bidder wins and pays the price that was submitted



◆ **Second-price, sealed-bid (Vickrey) auction**

In this type of Auction, bidders submit written bids without knowing the bid of the other people in the auction.

The highest bidder wins but the price paid is the second-highest bid.

This type of auction is strategically similar to an English Auction and gives bidders an incentive to bid their true value



Game 1



Based on : First-price, sealed-bid auction



Game Rules



- The number of players are fixed to be 6 and number of rounds are 8
- Each player can submit 1 bid per round
- The bidding amount can be between \$100 and \$1000
- The deciding round will be calculated by taking the ceil function of fractional part of mean value of all the (8*6) 48 bids times 8

$$\lceil \{\bar{X}\} * \text{rounds} \rceil ; \bar{X} = \Sigma (\text{bids}) / \text{rounds}$$

- The person with the highest bid in the deciding round will win the game
- In case of a tie, the player with higher mean of all the bids submitted by him will be declared as the winner
- The Payoff will be mean of all the bids submitted by the winner in each round

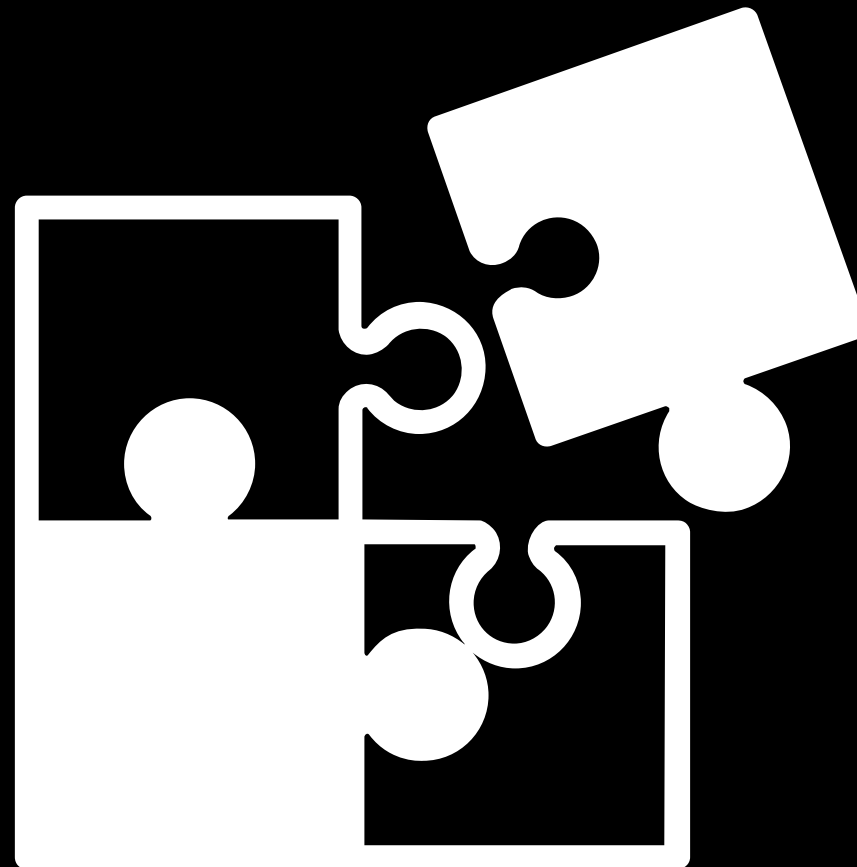
	A	B	C	D	E	F
1	743	168	532	965	314	887
2	251	596	785	442	168	729
3	459	833	711	215	585	138
4	387	472	765	256	312	603
5	624	190	598	906	389	527
6	672	741	325	102	892	420
7	958	764	136	385	473	719
8	146	857	542	305	764	289

- The mean value of all bids in all rounds is **521.66**.
- The fractional part of mean is **0.66**.
- Multiplying this with number of rounds gives **5.33**.
- The ceil value of 5.33 is 6 so we decide the winner through round numbered **Six**.
- In round 6 , highest bidder is **E** so the **winner is E**.
- E pays an amount equal to **mean of all bids placed by E in all rounds** which is equal to **487**.

Game 2



Based on : Second-price, sealed-bid auction



Game Rules



- The number of players are fixed to be 6 and number of rounds are 7
- Each player can submit 1 bid per round
- The bidding amount can be between \$1000 and \$5000.
- Winner of each round would be the one whose bid is second nearest to the value calculated by the given formula.

$$\sqrt{\sum x^2 * \frac{maxbid - minbid}{totalbids * maxbid}}$$

- The player who wins the maximum number of rounds wins the game.
- In case of a tie, the one with the highest average of his/her winning bids would be declared as the winner.
- Payoff will be the lowest of the amounts that the winner had paid for winning.

	A	B	C	D	E	F	Winner
1	2564	4655	2231	3448	1410	4991	D
2	3730	1633	2120	1763	2011	2633	B
3	2715	1227	2961	2299	2126	3535	D
4	2665	1767	1318	3993	2344	3284	A
5	3182	4461	2873	3261	2460	3213	C
6	1652	1748	2521	3161	1310	3461	A
7	4575	1332	2418	4310	3457	1135	E

- We found the winner of each round by finding the **second nearest number** to the **value calculated by the formula**.
- Since **D** and **A** are the ones with **highest wins**; we'll take the average of each's winning bid, i.e **2873.5 for D & 2145 for A**.
- Thus **D is the winner** and he needs to pay his **lowest winning bid**, i.e, **\$2299**.

Link to Game Codes



➤ Game 1 Code Snippet

➤ Game 2 Code Snippet



Thank You !