

## Game Theory Activity (2020)

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1. The diagram below shows an example of a matrix game with players Row (R) and Column (C).

	Column I	Column II
Row 1	(3, -3)	(-2, 2)
Row 2	(6, -6)	(2, -2)

Figure 1

The game is played as follows. Row gets to choose between Row 1 or Row 2 to "play," while Column gets to play either Column I or Column II. Row and Column make their choices without consulting each other. The entries in the matrix (table) give the payoffs to the players, and the entries are known to both players. For simplicity we will assume the payoffs are in money - pennies. Thus, if Row plays Row 2 and Column plays Column II then Row wins 2 pennies and Column loses 2 pennies. Row's payoff is the first entry in the pair shown in the matrix and Column's payoff is the second entry. In this game the sum of the entries in each pair adds to zero, so the game is known as a zero-sum game. We will think of Row's gains as coming at Column's expense and Column's gains as coming at Row's expense. Thus, the sum of the payoffs to the two players adds to zero, which is why games of this kind are known as zero-sum games.

Play this game 6 times against someone where you are Row and your

opponent is Column. Then play the game again 6 times where you interchange the roles of playing Row and Column. What do you learn by playing this game? Would you rather be Row or Column?

2. The diagram below shows an example of a matrix game with players Row (R) and Column (C), where the rules of play are similar to the prior example.

	Column I	Column II
Row 1	(3, -3)	(-1, +1)
Row 2	(-9 +9)	(+3, -3)

Figure 2

Play this game 6 times against someone where you are Row and your opponent is Column. Then play the game again 6 times where you interchange the roles of playing Row and Column. What do you learn by playing this game? Would you rather be Row or Column?

Comment: These games are known as *matrix games* and are called 2x2 games because Row and Column can each choose two actions.

Some things to think about:

- When are games such as those above fair?
- Can you generalize what you learned from the game in Figure 1?
- Can you generalize what you learned from the game in Figure 2?
- What does the role of the number of times the game is played have in the analysis of games of this kind?
- What advice would you give to Row and Column about how to play the game in Figure 1?
- What advice would you give to Row and Column about how to play the game in Figure 2?