

1 Analyzing a Payoff Matrix

Suppose you and a classmate have a final project to complete. Half of this project is to be completed individually, while the other half of the project is to be completed jointly. You have to decide which part of the project you will prioritize over the next week, and you are not able to discuss your decision with your partner. Your decision has the following payoffs:

- If you both work on the joint project, you will earn $\frac{50}{50}$ for that portion, but only $\frac{30}{50}$ for the individual portion. That is, your total grade will be 80%.
- If one of you works on the joint project, but and the other works on the individual project, then the partner working on the individual project will earn $\frac{50}{50}$ for the individual portion, and the partner working on the joint project will earn $\frac{20}{50}$ for the individual portion. You both would earn $\frac{35}{50}$ on the joint portion. So the partner working on the individual portion would earn an 85%, while the partner working on the joint portion would earn a 55%.
- If you both work on your individual projects, then you both will earn $\frac{50}{50}$ for that portion, but only $\frac{25}{50}$ for the joint portion. That is, your total grade will be 75%.

Take a moment in your group to verify that this information is organized accurately in the following payoff matrix for this game.

Table 1.1

Partner Project	B works on joint project	B works on individual project
A works on joint project	(80, 80)	(55, 85)
A works on individual project	(85, 55)	(75, 75)

1. Use [Table 1.1](#) to answer the following questions in your group.

1. Looking at the game as an outsider, what decisions should be made to achieve an outcome that is the best possible for both partners?

✚ Solution (click to open)

2. Suppose you are partner A. If partner B chooses to work on the joint project, what should you choose to work on, considering only your own individual gain? Why?

✚ Solution (click to open)

3. Suppose you are partner A. If partner B chooses to work on the individual project, what should you choose to work on, considering only your own individual gain? Why?

✚ Solution (click to open)

4. Suppose you are partner A. Even though you can't know what partner B will choose, what is your best choice, considering only individual gain? Why?

✚ Solution (click to open)

5. What grade do you think both partners will end up with, assuming they both make decisions based only on their own individual gain?

✚ Solution (click to open)



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2 The Prisoner's Dilemma

Answer the following questions in your group.

1. What would the best outcome be for both prisoners?


✚ Solution (click to open)

2. What is the dominant choice for both prisoners?

✚ Solution (click to open)

3. What will the outcome of this game be?

✚ Solution (click to open)





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3 Dominant Choices

Now we will practice more determining when a player in a game has a dominant choice, and using this to predict the outcome of the game. Two players can play a red card or blue card. The payoff matrix below shows the monetary payoff for every choice.

Color Game	B Plays Red	B Plays Blue
A Plays Red	(67, 96)	(99, 93)
A Plays Blue	(70, 76)	(102, 73)

Which player has a dominant choice?

The outcome of the game will be that player A earns \$ and player B earns \$.

[← Check Work](#) [New Variation](#)



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1. Choose new variations of the payoff matrix with the “New Variation” button. Before moving on, get at least 3 correct in a row, and write down an explanation for how to determine when a player has a dominant choice as if you were explaining it to someone new.

4 Nash Equilibria

Suppose country A and country B share three polluted reservoirs. They each can make a decision as to which reservoir to clean up and maintain. The payoff in terms of quality of life for each choice is given in Table 4.1. A higher number means a higher quality of life.

Table 4.1

Shared Pollution 1	B cleans reservoir 1	B cleans reservoir 2	B cleans reservoir 3
A cleans reservoir 1	(45, 35)	(30, 25)	(25, 50)
A cleans reservoir 2	(50, 40)	(25, 30)	(40, 35)
A cleans reservoir 3	(40, 30)	(20, 50)	(60, 40)

- Complete the table of best responses for this game, and use it to answer the questions that follow.

If A chooses...	B's best response is...
to clean reservoir 1...	<input type="text"/>
to clean reservoir 2...	<input type="text"/>
to clean reservoir 3...	<input type="text"/>

If B chooses...	A's best response is...
to clean reservoir 1...	<input type="text"/>
to clean reservoir 2...	<input type="text"/>
to clean reservoir 3...	<input type="text"/>

[Check Work](#)

- Does either country have a dominant choice? How can you tell from the tables?
- Is there a Nash equilibrium in this game? How can you tell from the tables?
- What will the outcome of this game be?



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