Fair Division Project

You are tasked to use the methods of fair division to divide the goods in five different situations. In the first two situations, you can ask any classmate to be a player in your scenario, however, you must do the last two situations with your assigned group. This project is due March 16th (A-day) and March 15th (B-day). It is worth 100 points.

**Scenario 1 – Lone divider**

Draw a picture of a cake with three distinct flavors on it. Using lines, divide the goods into five slices and label them s1 – s5. Ask five different people how much they would pay for each slice (bids). Make sure they put their bid on a sheet of paper and give it to you so they do not see the other bids.

Picture of Goods.

<table>
<thead>
<tr>
<th>Player</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>Total value</th>
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Decide on the fair division of your goods. Use the space below to show your calculations. Then fill in the table showing how the goods were divided.

<table>
<thead>
<tr>
<th>Player</th>
<th>Slice</th>
<th>Value (%)</th>
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<tbody>
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</table>
**Scenario 2 – Sealed Bids**

Create an Estate of 4 possessions. Ask 5 people to bid on the items on sticky notes and submit to you. **Organize the data into a table**, then describe the fair division of the estate, including any money that is received or collected from the players. Attach your Estate (picture and details) to this packet before turning in.
**Scenario 3 – Lone Chooser**

This game is to be played with the pizza assigned to you by Mrs. Kennedy. If there are four in your group, then get two pizzas and play the game twice, so everyone gets a turn (one person sitting out each time). Before you get started assign a value to each flavor of the pizza. Also, make sure to randomly decide who will be the first divider, second divider and chooser. For your specific pizza, answer the following. The dividers will use a knife to actually divide the pizza.

1. How did you decide on the order of players for your game? List the players and their order and/or role.

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2. Draw a picture of your pizza which identifies the toppings and portions. Then assign a value to each portion.

3. Describe the game. (play by play)

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4. Was everyone satisfied with their share? Justify by first, copying down everyone’s initial value of the pizza. Then calculate their fair share and compare it to what they got in the end.

Scenario 4 – Method of Markers

Send one person from the group to get a bag of candy and Post it Notes from Mrs. Kennedy. Don’t open the bag until you have done the following!

1. Decide as a group how the candy will be lined up. This should be some type of random method. Describe, using complete sentences, the method for lining up the candy.

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2. Make sure not to voice any opinions of your preferences. Draw the layout of the order of candy below. Make a key or write out the different types of candy.

3. How much do value each type of candy?
4. Using your value system, place three division marks on your paper of how you think it should be fairly divided.

5. Cut your post-it-note into three sections and place them on the actual candy line up according to what you put on your paper. Indicate where everyone put their markers on the layout in questions #2.

6. Once everybody is done, use method of markers to decide the fair division of the candy. Divide and enjoy! Describe which portion you received, what was done with any leftover candy, and your opinion if you felt like you received a fair share or not.

Scenario 5 – Last Diminisher

Jill, Karl and Lance are dividing the half meatball, half vegetarian sub sandwich shown below using last diminisher. Jill likes the vegetarian part and the meatball part equally. Karl is a vegetarian and will not eat any of the meatball part. Lance likes the vegetarian part three times as much as the meatball part. Assume all players make their cuts perpendicular to the length of the sandwich.

![Sub Sandwich](image)

**Figure 3-20**

1. Suppose Jill goes first, Lance second and Karl last.
   a. What fraction of the vegetarian half is Jared going to cut. (Show cut on picture above)
   b. Which player is the last diminisher in round 1 and why?
c. Continue playing the game. Describe each of the players share of the sandwich at the end of the game.

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Conclusion and Reflections

In a paragraph or two describe what you learned by doing the project. Make sure to address which games were more clear or confusing after playing them instead of just doing textbook problems. Also discuss what you liked and disliked about the project and if there are any ways in which you think this project can be improved upon.

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