# Probability: Determining Probabilities
II.A Student Activity Sheet 2: Using Tree Diagrams

A church group in Washington state sells pumpkins every year to raise money for the children of their town. This year's crop, however, produced very small pumpkins. The group decided to construct a corn maze in a field and charge customers to walk through the maze. Customers can only walk forward. If the customers end up at an exit with pumpkins, they win a pumpkin. The church group asked some students to advise it on various possibilities of a customer getting a pumpkin.

Students were shown a simple maze as an example.
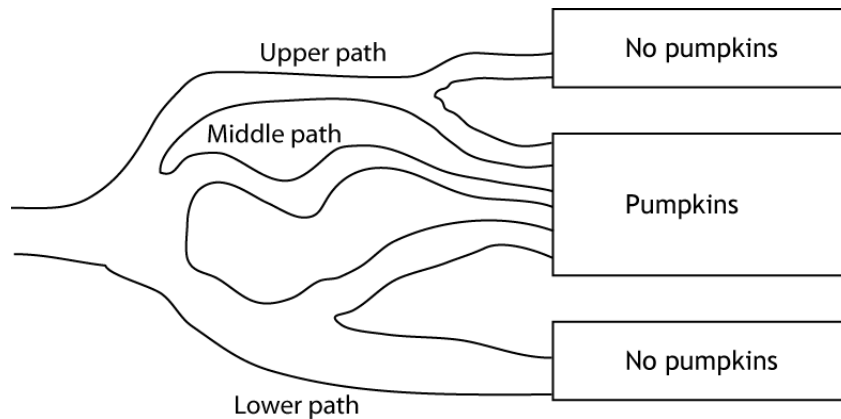
1. Make a tree diagram to show the group the possible paths customers might take, entering the maze on the upper, middle, or lower path and proceeding to an exit with or without a pumpkin.

How is this tree diagram different from others you have worked with before?

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Create-a-Sandwich Menu

Bread	Meat	Cheese
White	Ham	American
Wheat	Turkey	Swiss
	Beef	Provolone
		Muenster

2. Create a tree diagram showing all possible sandwiches.

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Assume that you make all the possible sandwich combinations that you can using one choice from each column of ingredients in the table (bread, meat, cheese). Then someone puts all these different sandwiches in unmarked sacks on the counter. Given this information, answer Questions 3-7?

3. What is the probability you will select a sandwich with white bread? Explain your reasoning.

4. What is the probability you will select a sandwich with American cheese? Explain your reasoning.

5. What is the probability that you will select a sandwich on wheat bread with ham and any cheese? Explain your reasoning.

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6. What is the probability you will select a sandwich on white bread that has either beef or turkey and has Provolone cheese? Explain your reasoning.

7. What is the probability you will select a sandwich with neither beef nor Muenster cheese? Explain your reasoning.

8. REFLECTION: Write three probability questions that can be answered using your tree diagram, and then provide the answers.

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As president of the high school band, Catrina needs to pick a committee of 2 to accompany her each time she visits middle schools. The director told her that each committee had to consist of 1 boy and 1 girl; 5 boys and 4 girls volunteered to go. To be fair, Catrina makes a spinner with the boys' names and a spinner with the girls' names. Each time she schedules a visit, Catrina spins each spinner once to determine who goes with her. If a spinner lands on a line, she spins again.
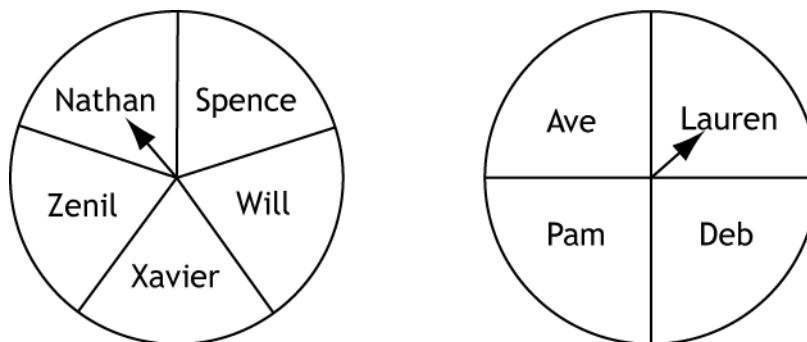
9. Draw a tree diagram to show all the possible combinations of volunteers who might go with Catrina. How many outcomes are in the sample space?
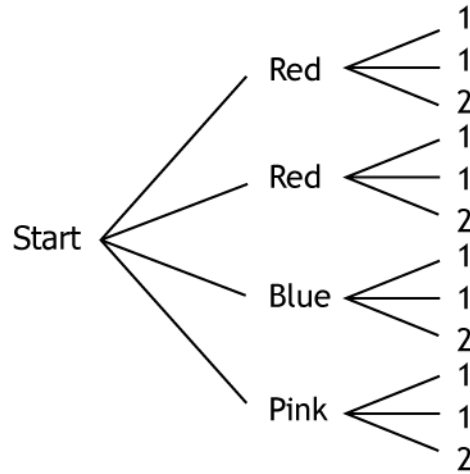
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10. Are all the outcomes equally likely? What would make the outcomes not equally likely?

11. What is the probability that Nathan will be selected? Explain your reasoning. List the possible outcomes for 2-person committees that include Nathan.

12. If Ave decides she cannot go on a visit she is scheduled for, how does this change the probability for other boys or other girls to be selected? Explain your reasoning.

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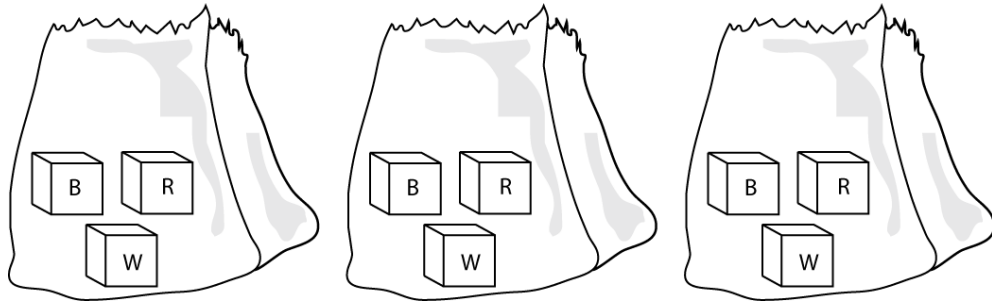II.A Student Activity Sheet 2: Using Tree Diagrams

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13. **EXTENSION:** Create a scenario for the tree diagram below. Write three probability problems that can be answered using the tree diagram, and then provide the answers.

```
                              1
                    Red <     1
                              2
                              1
                    Red <     1
Start <                       2
                              1
                    Blue <    1
                              2
                              1
                    Pink <    1
                              2
```

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14. **EXTENSION:** Mr. Silvas surprises his students with a probability challenge that will determine whether they will take a quiz. He puts three cubes in each of three paper bags: a red cube, a white cube, and a blue cube. He divides the class into four groups of students and tells them that each group will draw one cube from each bag. Each group is challenged to come up with a rule to determine whether they will take the quiz based on if their selection of cubes matches or does not match a criteria they identify in advance. Two groups establish a rule for a cube combination that leads to the outcome of taking the test, and the other two groups establish a rule for a cube combination that leads to the outcome of not taking the test.

   a. Draw a tree diagram to show the sample space.

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 b. Evaluate each group's decisions. Determine the probability that the outcome chosen by each group will occur.

  Group 1: If the group ends up with a red cube, a white cube, and a blue cube (order does not matter), its members take the test.

  Group 2: If the group ends up with at least two red cubes, its members take the test.

  Group 3: If the second cube selected is white, the group does not take the test.

  Group 4: If the group ends up with two cubes of the same color, its members do not take the test.

 c. Suggest another outcome. What is the probability that your outcome will occur?

 d. Which group would you join if you got to choose? Why?

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