Using Probability Language

1. Make a check mark under the probability word that would apply for each sentence. For some sentences, more than one probability word may apply. Explain the reason for your choice.

   a) Today is Wednesday.
   b) It will rain today.
   c) The teacher is in the classroom.
   d) The temperature is 1°C and it might snow.
   e) People go on vacation in the summer.
   f) You can travel to another planet in a rocket.

<table>
<thead>
<tr>
<th></th>
<th>Impossible</th>
<th>Less probable</th>
<th>More probable</th>
<th>Certain</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td>It depends on day of the week.</td>
</tr>
<tr>
<td>b)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>It depends on weather forecast today.</td>
</tr>
<tr>
<td>c)</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>My teacher is in the classroom teaching us math.</td>
</tr>
<tr>
<td>d)</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td>It usually snows when the temperature is close to 0°C.</td>
</tr>
<tr>
<td>e)</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td>Families usually go on vacation in the summer because children are not in school.</td>
</tr>
<tr>
<td>f)</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td>No human has landed on another planet yet.</td>
</tr>
</tbody>
</table>

2. Which event from Question 1 did you find most difficult to decide the probability? Explain.

   Suggested answer: Part d) because it may rain or snow if the temperature is 1°C.

3. Give an example of an event that would fit each probability word.

   a) impossible  **Suggested answer:** It snows when the temperature is 20°C.
   b) more probable  **Suggested answer:** I will eat my lunch today.
   c) certain  **Suggested answer:** I am in Grade 5.
   d) less probable  **Suggested answer:** I chew my food 20 times before swallowing.
Predicting Probabilities

**Goal**

Predict the probability of events and test your predictions.

### Letters

<table>
<thead>
<tr>
<th>Letters</th>
<th>Value of each letter</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEIOU</td>
<td>1</td>
</tr>
<tr>
<td>LNRS</td>
<td>2</td>
</tr>
<tr>
<td>BCDFGHKMPVWY</td>
<td>3</td>
</tr>
<tr>
<td>JQXZ</td>
<td>4</td>
</tr>
</tbody>
</table>

1. Use the information in the table above. Predict how likely each event is.

   a) picking three letters and getting a value of 12  
      very unlikely, but possible
   
   b) picking a 3-point letter before picking a 1-point letter  
      very likely
   
   c) picking four consonants before picking any vowels  
      likely, but not very likely

2. Test each prediction in Question 1. Explain your results.

   a) The only way to get a value of 12 with three letters is to pick three 4-point letters. 
      Since there are only four 4-point letters, picking three of them is very unlikely.
   
   b) It is easier to pick 3-point letters because there are 12 of them. 
      There are only five 1-point letters.
   
   c) Although there are far fewer vowels than consonants, it is still possible to pick 
      at least 1 vowel because the picking is random.

3. Write the letters from your first and last name on separate pieces of paper. Place them into the same bag or container. Predict how likely each event is. Test your predictions. Remember to place each letter back into the bag after each draw. Explain what you found out.

   a) on the first draw, picking a vowel instead of a consonant 
      Suggested answer: likely, but not very likely
      You are more likely to pick a consonant because most names have fewer vowels than consonants.
   
   b) on two draws, picking the first letter of your name before any other letter 
      Suggested answer: very unlikely, but possible
      It is harder to choose the same letter on two draws.
You rolled two dice 10 times and recorded the sum of the numbers you got on each roll.

<table>
<thead>
<tr>
<th>My rolls</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>9</td>
</tr>
</tbody>
</table>

1. Write the probability of each event as a fraction.
   a) getting 5 \( \frac{3}{10} \)
   b) getting an even number \( \frac{4}{10} \) or \( \frac{2}{5} \)
   c) getting a number below 7 \( \frac{5}{10} \) or \( \frac{1}{2} \)
   d) getting a number above 9 \( \frac{3}{10} \)

2. a) Write the names of 6 different sports on separate pieces of paper. Place them in a bag or container.
   
   Suggested answer: cycling, soccer, swimming, basketball, baseball, and hockey

   b) What is the probability of choosing a sport beginning with letter S? Carry out an experiment. Pick one sport from the bag and record your results. Repeat the experiment 10 times. Write the probability as a fraction.
   
   Suggested answer: \( \frac{2}{10} \)

   c) Carry out another experiment to find the probability of choosing a sport that has only two syllables. Repeat the experiment 10 times. Write the probability as a fraction.
   
   Suggested answer: \( \frac{6}{10} \) or \( \frac{3}{5} \)
CHAPTER 13

Modelling Probability Problems

1. Stefan performed an experiment. He flipped a coin 20 times. The first 10 times he saw heads.

   a) Predict the results of the last 10 flips. Write a fraction for your prediction. Explain your prediction.

   Prediction | Fraction | Reason
   5 heads out of 10 flips | \( \frac{5}{10} = \frac{1}{2} \) | Stefan is just as likely to get a head as a tail.

   b) Now flip a coin 10 times and record your results in the table. Write your results as a fraction.

   \[
   \begin{array}{|c|c|c|}
   \hline
   \text{Flip of coin} & \text{Heads} & \text{Tails} \\
   \hline
   1 & \checkmark & \n \\
   2 & \checkmark & \checkmark \\
   3 & \checkmark & \n \\
   4 & \checkmark & \n \\
   5 & \checkmark & \n \\
   6 & \checkmark & \n \\
   7 & \checkmark & \checkmark \\
   8 & \checkmark & \n \\
   9 & \checkmark & \n \\
   10 & \checkmark & \n \\
   \hline
   \end{array}
   \]

   Suggested answer: (heads) \( \frac{7}{10} \), (tails) \( \frac{3}{10} \)

2. Write the names of girls and boys on small pieces of paper. Make sure there are 8 names in total. Place the names in a bag or container. Conduct 2 experiments for each part. How many names of girls and boys might give you these results?

   a) picking a girl’s name is more probable

   Suggested answer: 5 girls’ names and 3 boys’ names

   b) picking a boy’s name is very probable

   Suggested answer: 6 boys’ names and 2 girls’ names

   c) picking a girl’s name is very improbable but not impossible

   Suggested answer: 7 boys’ names and 1 girl’s name
CHAPTER 13

Using Tree Diagrams

**Goal**

Use tree diagrams to record the outcomes of an experiment.

1. Play the game Rock, Paper, Scissors 6 times with a partner at home.
   Keep a tally of the results using a tree diagram.
   Suggested answer:
<table>
<thead>
<tr>
<th>I choose</th>
<th>Partner chooses</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rock</td>
<td>Paper</td>
<td>tie</td>
</tr>
<tr>
<td>Rock</td>
<td>Scissors</td>
<td>partner wins</td>
</tr>
<tr>
<td>Paper</td>
<td>Rock</td>
<td>I win</td>
</tr>
<tr>
<td>Paper</td>
<td>Scissors</td>
<td>I win</td>
</tr>
<tr>
<td>Scissors</td>
<td>Rock</td>
<td>partner wins</td>
</tr>
<tr>
<td>Scissors</td>
<td>Paper</td>
<td>I win</td>
</tr>
</tbody>
</table>

2. Students choose their pizza slices to eat for lunch. The cost depends upon the type of crust and the number of toppings.
   **Crust:** thin, thick
   **Toppings:** pepperoni, mushroom

   a) Draw a tree diagram to show all possible pizza slice combinations.

   **Crust**
   - Thin
     - Pepperoni
     - Mushroom
     - Pepperoni and mushroom
   - Thick
     - Pepperoni
     - Mushroom
     - Pepperoni and mushroom

   b) How many different types of pizza slices could you buy? 6

   c) Imagine that only one slice is left of each type of pizza, and that you choose a slice by pointing with your eyes closed. Which event is more probable, you choosing a pizza slice with one topping or a slice with two toppings? Record your answer as a fraction. Explain.

   There are 6 possible pizzas in total and 4 of them have one topping
   and 2 have two toppings.
Solve Problems by Considering All Possibilities

Think about all of the possibilities when solving a problem.

You roll a die and get a number. Then you roll the die again and multiply the first number by the second number. You get 2 bonus points if you make a correct prediction about the product before rolling the die the second time.

1. a) You play one game and roll a 4 on the first roll. Use a tree diagram to list all possible products.

<table>
<thead>
<tr>
<th>First roll</th>
<th>Second roll</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

b) You play another game and roll a 3 on the first roll. Use a tree diagram to list all possible products.

<table>
<thead>
<tr>
<th>First roll</th>
<th>Second roll</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

c) Based on your tree diagrams in Parts a) and b), which prediction should you make? Explain.

Suggested answer: The product will likely be an even number.

9 out of 12 products are even numbers, or 3 out of 4.

2. Imagine you roll a die 10 times, and record the number you get on each roll. If you were to multiply each number you got by 3, which numbers must you roll to always get a product that is an even number?

2, 4, or 6
Test Yourself

Circle the correct answer.

1. What is the correct order in which to place these probability words?
   A. certain, less probable, impossible, likely, more probable, unlikely
   B. less probable, more probable, likely, unlikely, certain, impossible
   C. impossible, unlikely, less probable, likely, more probable, certain
   D. certain, likely, more probable, less probable, unlikely, impossible

2. Which event is impossible?
   A. It will rain tomorrow.
   B. In Canada, winter is warmer than summer.
   C. We will have a test in math soon.
   D. The school year ends in June.

3. Which event is certain?
   A. I will go to a movie soon.
   B. I will sleep 8 hours tonight.
   C. Earth orbits around the sun.
   D. All trees will grow this season.

4. Which probability word would best describe this event?
   It will rain 1 out of 7 days this week.
   A. certain
   B. less probable
   C. more probable
   D. impossible

5. Which probability word would best describe this event?
   All students in a class are boys.
   A. certain
   B. less probable
   C. more probable
   D. impossible

6. When Twyla rolled a pair of dice 10 times, these numbers appeared: 10, 6, 9, 10, 5, 3, 6, 4, 6, and 9. What was the probability of Twyla rolling a 6?
   A. \( \frac{4}{10} \)
   B. \( \frac{4}{6} \)
   C. \( \frac{3}{6} \)
   D. \( \frac{3}{10} \)

7. Look at Question 6. What was the probability of Twyla rolling an even number?
   A. \( \frac{6}{10} \)
   B. \( \frac{4}{10} \)
   C. \( \frac{5}{10} \)
   D. \( \frac{7}{10} \)
8. Look at Question 6. What was the probability of Twyla rolling a number below 5?

A. \( \frac{2}{5} \)  
B. \( \frac{1}{4} \)  
C. \( \frac{1}{5} \)  
D. \( \frac{5}{10} \)

9. Imagine that all the dessert choices on the menu were written on separate pieces of paper, and these papers were put in a bag. You choose one dessert choice from the bag without looking. What would be the probability of choosing a dessert with chocolate?

A. \( \frac{1}{4} \)  
B. \( \frac{3}{8} \)  
C. \( \frac{6}{10} \)  
D. \( \frac{6}{15} \)

10. Which tree diagram represents the dessert choices in Question 9?

A. Type | Flavour
-----|-----
Cake | Chocolate, Apple, Blueberry
Ice cream | Vanilla, Chocolate
Pie | Lemon, Strawberry, Apple

B. Type | Flavour
-----|-----
Cake | Chocolate, Raspberry
Ice cream | Vanilla, Chocolate, Blueberry
Pie | Strawberry, Lemon, Apple

C. Type | Flavour
-----|-----
Cake | Chocolate, Raspberry
Ice cream | Vanilla, Chocolate
Pie | Strawberry, Lemon, Apple

D. Type | Flavour
-----|-----
Cake | Blueberry, Chocolate, Raspberry
Ice cream | Vanilla, Chocolate
Pie | Strawberry, Lemon, Apple