CHAPTER 13
1

Using Probability Language

Goal **Use probability language to describe predictions.**

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.

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

At-Home Help

Probability words are used to describe how likely it is that an event will happen.

Examples of probability words are
- certain
- likely
- more probable
- less probable
- impossible

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.

CHAPTER 13
2

Predicting Probabilities

Goal **Predict the probability of events and test your predictions.**

Letters	Value of each letter
AEIOU	1
LNRST	2
BCDFGHKMPVWY	3
JQXZ	4

At-Home Help

It is possible to predict the probability of an event by repeating an experiment several times.

The results of the experiment can help you think about why the results happened. You can also use the results to predict the probability of other events that are related.

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.

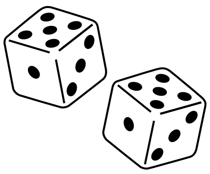
b) on two draws, picking the first letter of your name before any other letter
Suggested answer: very unlikely, but possible
It is harder to choose the same letter on two draws.

CHAPTER 13
3

Probabilities as Fractions

Goal **Express the likelihood of an event as a fraction.**

You rolled two dice 10 times and recorded the sum of the numbers you got on each roll.



My rolls
12
4
5
10
5
3
7
10
5
9

At-Home Help

When probabilities are written as fractions, the numerator represents the number of likely events, and the denominator represents the total number of events.

For example, if you rolled a die 10 times and you got a 4 three times, the total number of events would be 10, because the die was rolled 10 times. The number of likely events in this case would be 3, because you got a 4 three times. So the probability of you rolling a 4 was $\frac{3}{10}$.

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
4

Modelling Probability Problems

Goal **Conduct probability experiments.**

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: 5 heads out of 10 flips

Fraction: $\frac{5}{10}$ or $\frac{1}{2}$

Reason: 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.

Flip of coin	Heads	Tails
1	✓	
2		✓
3	✓	
4	✓	
5	✓	
6	✓	
7		✓
8	✓	
9	✓	
10		✓

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

At-Home Help

It is possible to predict the probability that an event will happen. To test the prediction, you can do an experiment and record the results in a table.

The results of the experiment can be written as fractions to show probabilities.

Sometimes the results do not match the predictions.

For example, there is a 1 in 2 chance of getting heads when flipping a coin. So the predicted probability is $\frac{1}{2}$.

If you flipped the coin 10 times and got heads 6 times, then the probability of getting heads in the experiment was $\frac{6}{10}$ or $\frac{3}{5}$.

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
5

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:

I choose	Partner chooses	Results
Rock	Rock	I tie
	Paper	I partner wins
	Scissors	I I win
Paper	Rock	I I win
	Paper	
	Scissors	
Scissors	Rock	I partner wins
	Paper	I I win
	Scissors	

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	Toppings
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.

1 topping, $\frac{4}{6}$. There are 6 possible pizzas in total and 4 of them have one topping and 2 have two toppings.

At-Home Help

Tree diagrams are pictures that show all possible combinations for a particular choice.

For example:
A bag has two sizes of marbles. Each size of marble comes in three colours: red, green, and black. There is only one marble of each size and colour. If you were to pick a marble, the choices would be

Size	**Colour**
Large	Red
	Green
	Black
Small	Red
	Green
	Black

The total number of marbles is 6, and two marbles are red. So the probability of picking a marble that is red is $\frac{2}{6}$ or $\frac{1}{3}$.

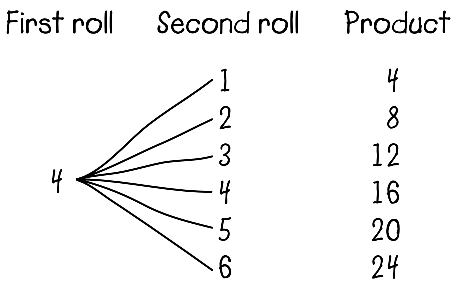
CHAPTER 13
6

Solve Problems by Considering All Possibilities

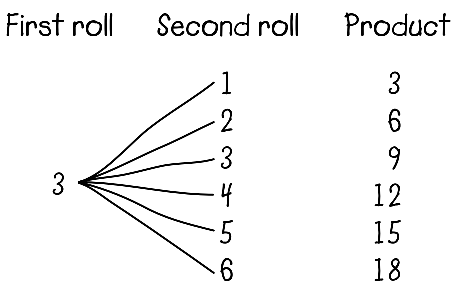
Goal **Think about all of the possibilities when solving a problem.**

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.



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



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

At-Home Help

To solve a probability problem, start by listing all possibilities. It is easier if you organize the possibilities in a tree diagram or chart.

Look at your diagram and decide what predictions are reasonable.

You can test your predictions by doing an experiment.

CHAPTER 13

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?

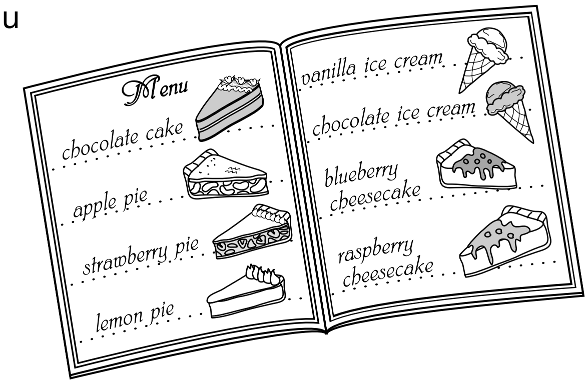
   A. $\frac{6}{10}$ **B.** $\frac{4}{10}$ **C.** $\frac{5}{10}$ **D.** $\frac{7}{10}$

Test Yourself Page 2

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
  - Blueberry
  - 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