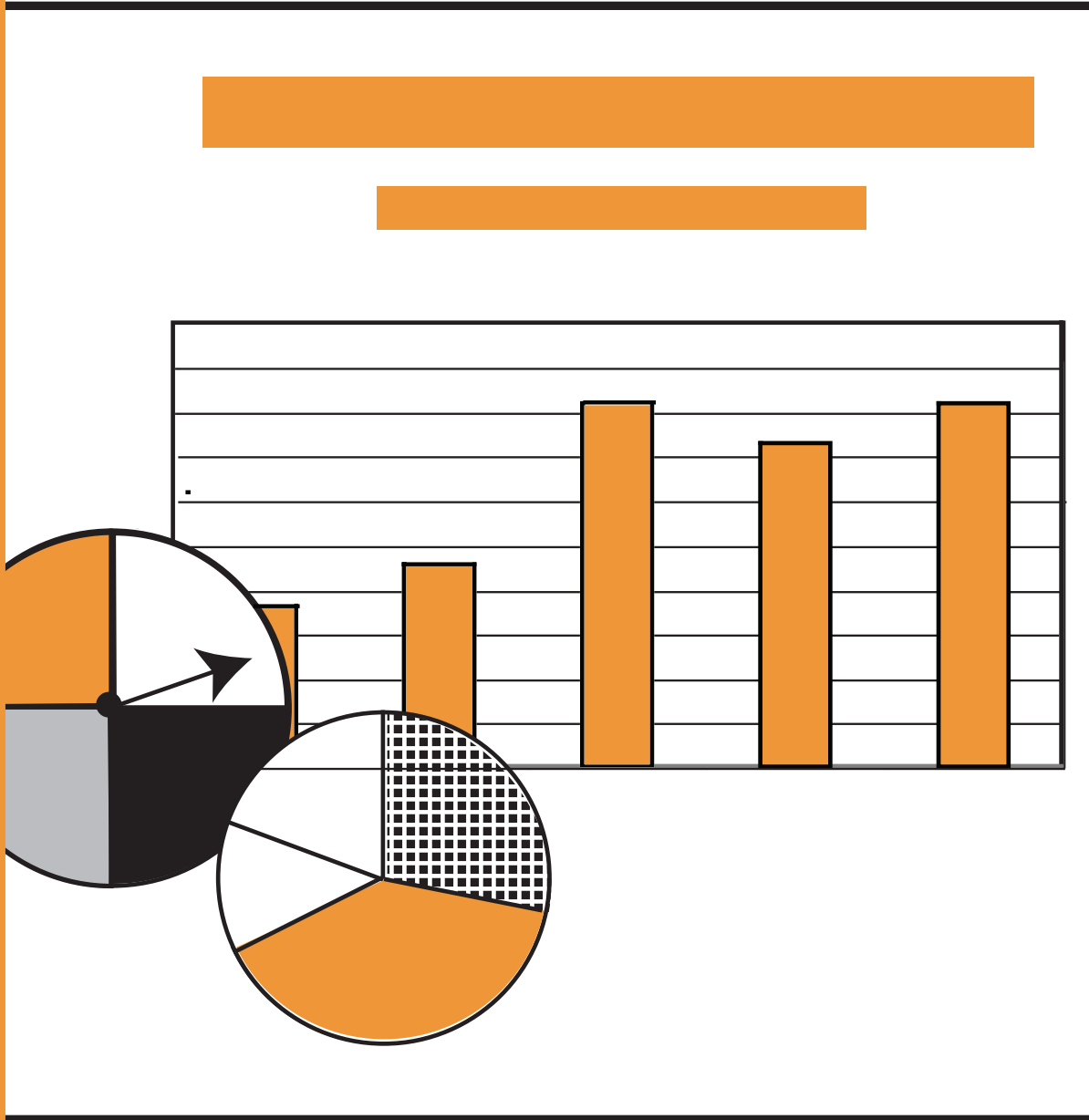


LITERACY FOUNDATIONS MATH



LEVEL 5
STATISTICS AND PROBABILITY

To the Student

This resource covers topics from the British Columbia Ministry of Education’s Literacy Foundations Math Level 5. You may find this resource useful if you’re a Literacy Foundations Math student, or a K-12 student in grades 7 – 9.

We have provided learning material, exercises, and answers for the exercises, which are located at the back of each set of related lessons. We hope you find it helpful.

Literacy Foundations Math Prescribed Learning Outcomes

The Literacy Foundations Math Prescribed Learning Outcomes (PLOs) are grouped into four areas: Number (A), Patterns and Relations (B), Shape and Space (C), and Statistics and Probability (D). For a complete list of the PLOs in Level 5, search for Literacy Foundations Math curriculum on the BC Ministry of Education’s website.

PLOs Represented in This Resource

The PLOs represented in this Level 5 resource are as follows:

Number

All topics, A1 – A12

Patterns and Relations

All topics, B1 – B6

Shape and Space

All topics, C1 – C3

Statistics and Probability

D2

PLOs Not Represented in This Resource

The PLOs for which no material is included in this resource are as follows:

Statistics and Probability

There is no material for D1, line graphs from data sets.

Acknowledgements and Copyright

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Lesson 1

Expressing Probability

Learning Outcomes

By the end of this lesson you will be better able to:

- express and interpret probabilities as ratios, fractions or percents

Understanding probability is like understanding chances. We'll use a story about winning a vacation to give us a better idea of how probability works.

Imagine that you have won an African safari vacation in a raffle at your job.

You go to work and tell all your friends. They are a little jealous, because most of them are doing what they usually do: camping, staying home, or heading to the island to visit relatives, and none of them get to have an extra week of vacation.

You think to yourself, "YES! I am SO lucky!"

Why do you think this? This is probability.

What are the chances that other people around you are going to Africa at the same time as you? You're thinking that:

It is nearly impossible that other people from my work will get to go to Africa the same time as me.

Well, maybe it's not quite impossible, but it's sure not very likely!

Now imagine it is the day you leave. You have your passport and your bags are packed with your new safari gear. Once you are at the airport, does the probability of our original question change?

What are the chances now that other people around you are going to Africa at the same time as you?

There are probably more people at the airport who are going to Africa than at work, so you're wondering:

Is it more likely, or less likely that people at the airport are going to Africa with me?

It's more likely.

You are sitting in your seat, and you hear the announcer say, "Welcome aboard, our flight today to Kenya is on time."

Hmmm, you think. Around you, some people are wearing safari hats, and others are wearing business suits. You peek up to First Class and think that there might even be a celebrity or two.

Now let's go back to our question: What are the chances that other people around you are going to Africa at the same time as you?

What is the probability (or chance) that the people on this plane are going to Africa? It's definitely higher than it was at work. The chances were increased at the airport, but now that you are on the plane, chances have gone up even more that people are going to Africa. Although not everyone is going:

it is more likely that they are.

The big safari resort shuttle bus is there to greet you at the door. Everyone in line is wearing an ID tag given to them by the shuttle bus driver. The chances have changed again. **Everyone** on the bus is going to the safari resort! This is more than at work, more than the airport, and more than the airplane.

On the shuttle bus:

it is certain that everyone is going to Africa!

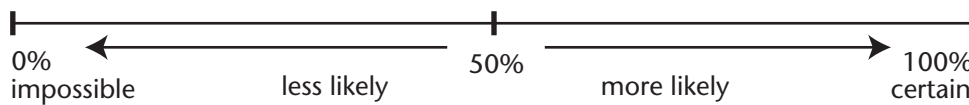
It is safe to say that 100% of the people on the shuttle are in Africa whether they want to or not!

Probability Statements

There were some important words or phrases that were used in the story that are an important part of probability:

- impossible
- less likely
- more likely
- certain

Using these phrases to describe the chances of an event is called a probability statement. We can determine these statements by looking at this continuum.



Think back to the story. We know that on the shuttle bus in Africa, 100% of the people were in Africa. But what about the other places: work, the airport, or the airplane?

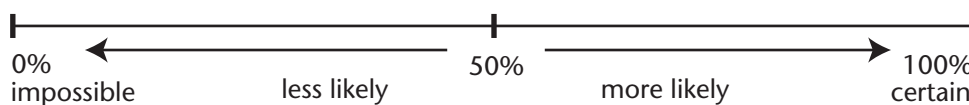
Probability

Probability is the likelihood or chance of an event occurring. It can be represented as a fraction or a percent. Let's use the Africa example to practise finding probability and to create some probability statements.

Using the data given in the chart on the next page, find the probability of people going to Africa in each setting. We will use the work setting as an example. Say you work with 250 other co-workers.

$$\text{Probability} = \frac{\text{favourable outcome}}{\text{possible outcomes}} = \frac{\text{going to Africa}}{\text{total number of co-workers}} = \frac{1(\text{you!})}{250}$$

The probability of a co-worker from work going to Africa would be $\frac{1}{250}$ or 1:250. Expressing this ratio as a percent would look like this: 0.4 %. This is a very small amount.

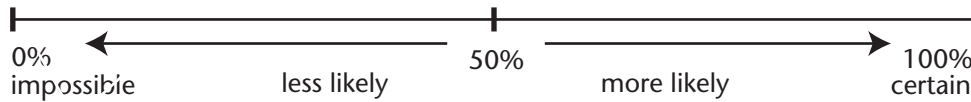


It would be **nearly impossible** for a co-worker to take an extra week off and go to Africa!

See if you can find the probability of people going to Africa for the rest of the trip. The data for each place is given in the table below. For example, the total number of passengers on the shuttle bus in Africa is 35 people.

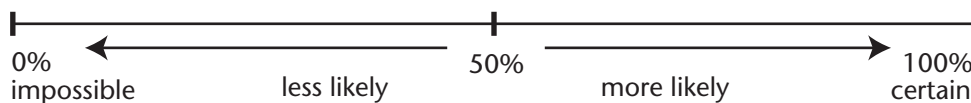
Place the locations on the continuum after you have found their probability percentage.

Location	Favourable Outcome	Possible Outcome	Probability			
	People Going to Africa	Total Number of People	Ratio	Fraction	Percentage	Probability Statement
work	1	250	1:250	$\frac{1}{250}$	0.4%	near impossible
airport at 5:45 am	421	2300				
your air-plane to Africa	199	348				
shuttle bus in Africa	35	35				



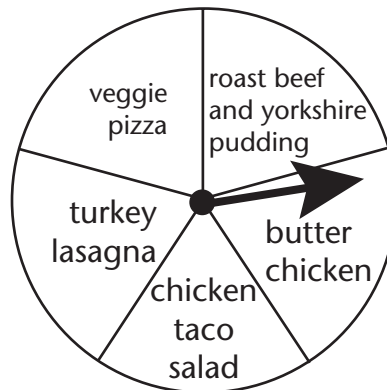
Compare your results to the solutions below.

Location	People Going to Africa	Total Number of People	Ratio	Fraction	Percentage	Probability Statement
work	1	250	1:250	$\frac{1}{250}$	0.4%	near impossible
airport at 5:45 am	421	2300	421:2300	$\frac{421}{2300}$	18%	Less likely
your airplane to Africa	199	348	199:348	$\frac{199}{348}$	57%	More likely
shuttle bus in Africa	35	35	35:35	1	100%	Certain



Representing Probabilities

Jeannette made a spinner that helps her decide what's for dinner. The sections are all labeled with her family's favourite food.



For each question we will express the probability in three ways: as a ratio, as a fraction, and as a percentage. Then we will write a probability statement for each answer.

1. What is the probability of spinning lasagna for dinner?

$$\text{Probability} = \frac{\text{favourable outcomes}}{\text{possible outcomes}}$$

Favourable outcome: One of the spaces on the spinner says lasagna. There is 1 favourable outcome.

Possible outcomes: There are 5 possible dinners to choose from. There are 5 possible outcomes.

The probability of choosing lasagna for dinner is $\frac{1}{5}$.

Ratio: 1:5

Fraction: $\frac{1}{5}$

Percent: 20%

The P (probability) of choosing lasagna is “less likely” than spinning a dinner that is not lasagna.

2. What is the probability of spinning a dinner involving meat?

Fill in the blanks and work out the probability as a ratio, a fraction, and a percent.

Favourable: _____.

There is/are _____.

Possible: _____

$$P = \frac{\text{favourable}}{\text{possible}}$$

P =

Ratio:

Fraction:

Percent:

Did you get 4:5? $\frac{4}{5}$? 80%? If not, go back and check through your solution. There are four dinners with meat out of a total of five possible dinners on the spinner.

The probability of choosing a dinner with meat is “more likely” than choosing a dinner without meat.

3. What is the probability of spinning macaroni and cheese for dinner?

Favourable: macaroni and cheese. There is no macaroni and cheese dinner on the spinner. There are 0 favourable outcomes.

Possible: There are 5 possible dinners.

$$P = \frac{\text{favourable}}{\text{possible}}$$

$$P = \frac{0}{5}$$

Ratio: 0:5

Fraction: $\frac{0}{5}$

Percent: 0%

The probability of choosing a dinner with macaroni and cheese is impossible.

4. What is the probability of the family spinning a favourite dinner?

Favourable: favorite dinner, they are all favorites.

There are 5 favourable outcomes.

Possible: There are 5 possible dinners.

$$P = \frac{\text{favourable}}{\text{possible}}$$

$$P = \frac{5}{5}$$

Fraction: $\frac{5}{5}$

Percent: 100%

The probability of choosing a dinner that is a family favourite is certain.

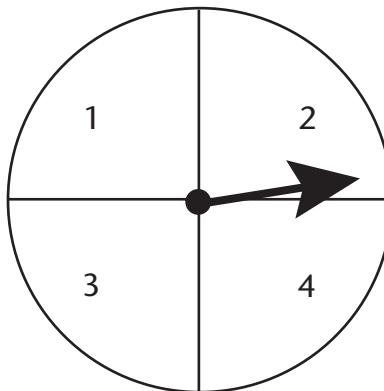
Exercise 1

1. Determine the probability of a die to roll:
 - a. an even number
 - b. a 2
 - c. a 3 or a 6

Record each probability as a fraction, ratio, and a percent.

Determine the probability statement of each event.

2. The numbered spinner below has equal probability that the spinner will land on any section.



Write the probability of the following events as a fraction and a percent:

- a. spinning 2

b. spinning 4

c. spinning a 1 or a 3



Turn to the Answer Key at the end of the module to check your work.

Answer Key

Lesson 1: Probability

Exercises 1.1

1. The possible rolls of a die are 1, 2, 3, 4, 5, and 6. There are 6 possible outcomes.

a. 2, 4, and 6 are even numbers. There are 3 favourable outcomes.

$$\text{fraction: } P = \frac{3}{6} = \frac{1}{2}$$

ratio: 1:2

percent: 50%

b. There is 1 favourable outcome.

$$\text{fraction: } P = \frac{1}{6}$$

ratio: 1:6

percent: 17%

c. There are 2 favourable outcomes.

$$\text{fraction: } P = \frac{2}{6} = \frac{1}{3}$$

ratio: 1:3

percent: 33%

2. a. $\frac{1}{4}$, 25%

b. $\frac{1}{4}$, 25%

c. $\frac{2}{4} = \frac{1}{2}$, 50%