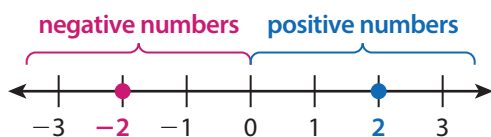


Dear Family,

This week your student is learning about positive and negative numbers.

Positive numbers have a value greater than 0. **Negative numbers** have a value less than 0.

Every positive number and negative number has an opposite. **Opposite numbers** are numbers that are the same distance from 0, but in opposite directions.



The numbers **2** and **-2** are opposites.

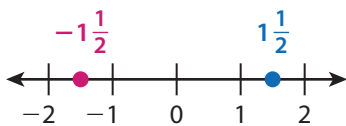
The positive number **2** is sometimes written as **+2**.

All whole numbers and their opposites are called **integers**. Every integer is also a **rational number**, meaning that it can be written as a positive or negative fraction with a whole-number numerator and denominator.

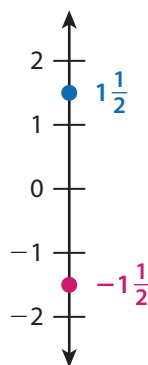
Your student will be modeling rational numbers like the ones below.

Show $1\frac{1}{2}$ and its opposite on a number line.

- ▶ **ONE WAY** to show a number and its opposite is to use a horizontal number line.



- ▶ **ANOTHER WAY** is to use a vertical number line.



Both models show that $1\frac{1}{2}$ and its opposite, $-1\frac{1}{2}$, are the same distance from 0 and in opposite directions.

▶ Use the next page to start a conversation about positive and negative numbers.

Activity Thinking About Positive and Negative Numbers Around You

- ▶ **Do this activity together to investigate positive and negative numbers in the real world.**

Mount Everest is the highest mountain in the world. It reaches a height of about 29,029 feet above sea level. The Dead Sea is the lowest point on land in the world. Its shore is about 1,410 feet below sea level. A point's position above or below a given level, such as sea level, is called its elevation. Positive and negative numbers can be used to represent elevations.

This means that Mount Everest has an elevation of +29,029 feet and the Dead Sea has an elevation of -1,410 feet.



? Where else do you see positive and negative numbers used in the world around you?

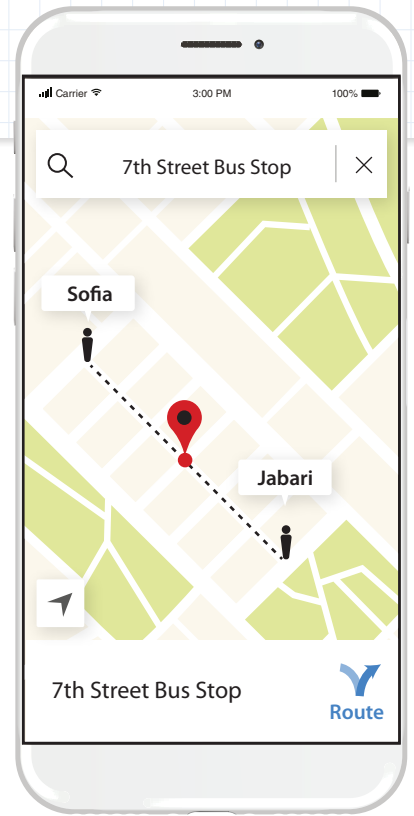
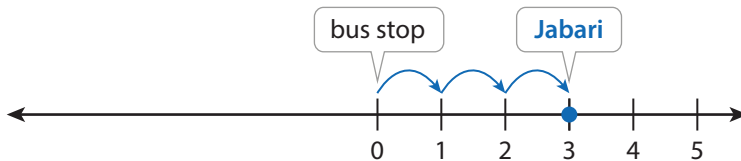
A large rectangular area with a light blue grid pattern, intended for students to write their answers to the question above.

Explore Positive and Negative Numbers

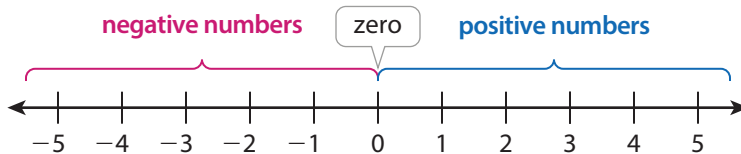
Model It

► Complete the problems about opposite numbers.

- Jabari and Sofia get off the bus at the 7th Street bus stop. Jabari walks 3 blocks to the right and Sofia walks 3 blocks to the left. Think of the bus stop as 0 on the number line. Jabari ends up 3 units to the right of 0. Draw tick marks, arrows, and a point on the number line to show where Sofia ends up.



- In problem 1, Jabari and Sofia walk in opposite directions from the bus stop. **Opposite numbers** are the same distance from 0 on the number line, but on opposite sides of 0.
 - Are numbers to the right of 0 on the number line *less than 0* or *greater than 0*?
 - Numbers greater than 0 are **positive numbers**. Numbers less than 0 are **negative numbers**. The number 0 is neither positive nor negative. Look at the number line. How are negative numbers similar to positive numbers? How are they different?



DISCUSS IT

Ask: How do you know that 1 and -1 are opposites?

Share: I would label Sofia's position on the number line as -3 because ...

Learning Targets SMP 2, SMP 3, SMP 7

- Understand that positive and negative numbers describe quantities having opposite directions or values.
- Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself and that 0 is its own opposite.
- Find and position integers and other rational numbers on a horizontal or vertical number line diagram.

Model It

► Complete the problems about positive and negative numbers.

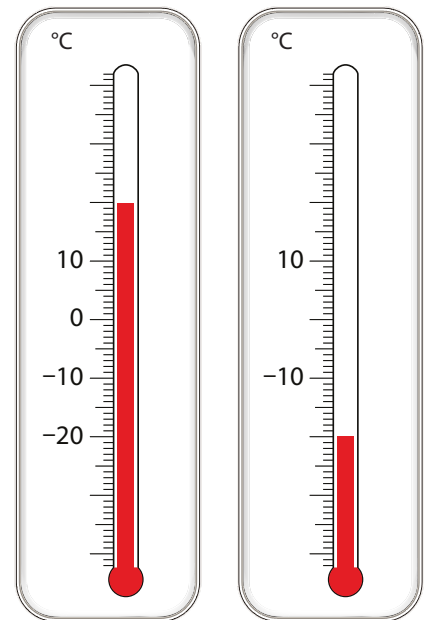
- 3 You can write a positive number two ways. You can write a positive sign (+) in front of the number, or you can write the number without the sign.
- +3 means _____.
 - What are two ways to write *positive 40*?
- 4 To indicate the opposite of a number, use a negative sign (−). For example, −2 means *the opposite of 2* or *negative 2*.
- Use a negative sign to write *negative 3*.
 - −3 means the opposite of _____.
 - −(−5) means *the opposite of −5*. So, −(−5) is _____.
- 5 On a vertical number line, positive numbers are above 0 and negative numbers are below 0. A thermometer is like a vertical number line.

DISCUSS IT

Ask: Why is 8 the opposite of −8?

Share: Zero is its own opposite because ...

- Complete the scale on each thermometer.
- On a Celsius thermometer, 0° represents the freezing point of water. Does the thermometer on the left show a temperature *less than* or *greater than* the freezing point of water?
- Does the thermometer on the right show a temperature *less than* or *greater than* the freezing point of water?
- Why do 20°C and -20°C represent opposite temperatures?



- 6 **Reflect** Is −25 a positive number or a negative number? Explain how you know. Find the opposite of −25 and explain how you found your answer.

Prepare for Understanding Positive and Negative Numbers

- 1 Think about what you know about whole numbers. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.

The diagram consists of a central oval labeled "whole numbers". Four lines radiate from this central oval to four rectangular boxes arranged in a square pattern around it. The boxes are labeled as follows:

- Top-left box: **In My Own Words**
- Top-right box: **My Illustrations**
- Bottom-left box: **Examples**
- Bottom-right box: **Non-Examples**

- 2 Circle the whole numbers. Explain your reasoning.

9

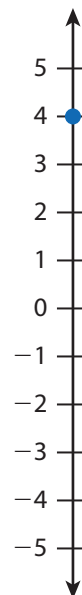
 $\frac{4}{4}$

1.00000

► Complete problems 3–5.

3 Look at the point at 4 on the number line.

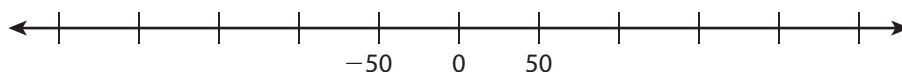
- a. How many units is 4 from 0?
- b. Is 4 located above or below 0?
- c. Plot a point at the opposite of 4 on the number line. Explain how you know it is the opposite.



- 4
- a. -10 means the opposite of _____ or _____ 10.
 - b. How would you write the opposite of 7?
 - c. $+12$ means _____.
 - d. What are two ways to write positive 9?

5 Ethan is playing a video game. On each turn, he can earn positive points, negative points, or zero points. He starts with zero points.

- a. After the first round, Ethan has -150 points. Label the tick marks and place a point at -150 .



- b. Next to each description, write one of these numbers: -100 , 50 , 0 .

A score greater than 0: _____

A score at the start of the game: _____

A score less than 0: _____

- c. What is the opposite of -150 ? Where is this value on the number line? Explain how you know.

Vocabulary
opposite numbers
 numbers that are the same distance from 0 on the number line but in opposite directions. Opposite numbers have the same numeral, but opposite signs.

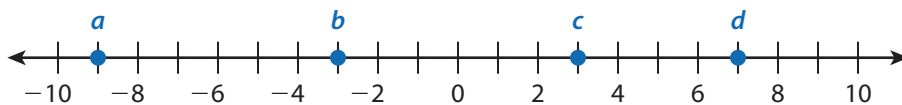
Develop Understanding of Positive and Negative Numbers

Model It: Horizontal Number Lines

► Try these two problems about positive and negative numbers.

1 All the whole numbers and their opposites are called **integers**.

a. Identify the value of each integer a , b , c , and d on the number line.

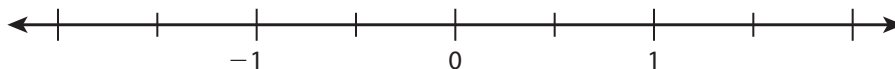


b. Which of the integers a , b , c , and d are opposite numbers? Explain.

c. Which of the integers a , b , c , and d are less than 0? Explain.

2 Like whole numbers, fractions also have opposites. Fractions that are quotients of whole numbers are called **rational numbers**. Opposites of these fractions are also rational numbers.

a. Plot points at $-\frac{3}{2}$ and its opposite on the number line. How do you know where to locate the points?



b. Lupita wants to place points at 0.75 and its opposite on the number line in problem 2a. Explain how Lupita can place each point.

DISCUSS IT

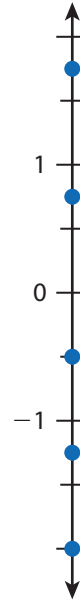
Ask: Why are whole numbers also rational numbers?

Share: I think decimals like 0.75 and -1.5 are rational numbers because ...

Model It: Vertical Number Lines

► Try these two problems about rational numbers on a vertical number line.

- 3 a. Use a rational number to label each point on the number line.
 b. What is the opposite of each number you wrote on the number line?
- c. Plot points at -1.75 and $-\frac{3}{4}$.
- 4 a. What is the opposite of 1.5 ?
 b. What is the opposite of the opposite of 1.5 ? Explain.



DISCUSS IT

Ask: How is a fraction like its opposite? How is it different?

Share: I know the opposite of the opposite of a number is always ... because ...

CONNECT IT

► Complete the problems below.

- 5 How is locating -2.5 on a horizontal number line similar to locating it on a vertical number line? How is it different?
- 6 Is the opposite of $1\frac{1}{4}$ less than 0 or greater than 0? Explain how you know. Show both numbers on a number line in your response.

Practice Locating Positive and Negative Numbers

- Study how the Example shows locating positive and negative numbers on a number line. Then solve problems 1–6.

Example

Plot each rational number as a point on the number line.

$1\frac{1}{2}$

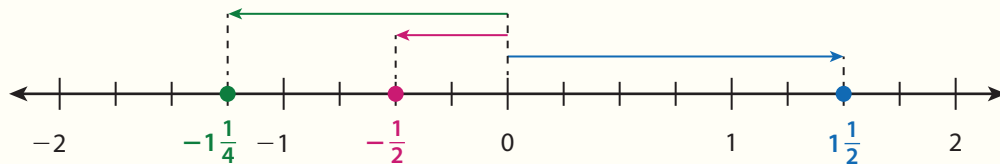
$-1\frac{1}{4}$

$-\frac{1}{2}$

The positive number $1\frac{1}{2}$ is located $1\frac{1}{2}$ units to the right of 0.

The negative number $-\frac{1}{2}$ is located $\frac{1}{2}$ unit to the left of 0.

The negative number $-1\frac{1}{4}$ is located $1\frac{1}{4}$ units to the left of 0.



- 1 Draw a horizontal number line in the space below. Plot and label a point for the opposite of each number in the Example.

- 2
 - a. What is the opposite of -26 ? How many units away from 0 is its location on a horizontal number line, and in which direction?

 - b. What is the opposite of 26? How many units away from 0 is its location on a horizontal number line, and in which direction?

 - c. What number is the opposite of the opposite of -26 ? Explain.

Vocabulary

integers

the set of whole numbers and their opposites.

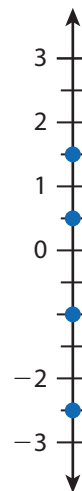
rational number

a number that can be expressed as the fraction $\frac{a}{b}$ or the opposite of $\frac{a}{b}$ where a and b are whole numbers and $b \neq 0$.

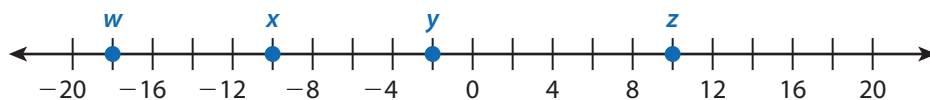
3 a. Use a rational number to label each point on the number line.

b. What is the opposite of each number you wrote on the number line?

c. Plot points at -0.5 and -1.5 .



4 Look at the points on the number line.



a. Identify the value of each integer w , x , y , and z .

b. Which of the integers w , x , y , and z are opposites? Explain.

c. Which of the integers w , x , y , and z are less than 0? Explain.

5 Use a horizontal or vertical number line. Plot points at $\frac{7}{10}$ and its opposite. Label each point with its value.

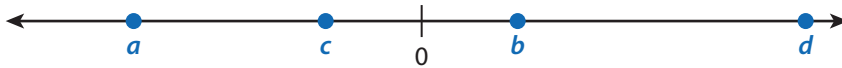
6 Akio says -4 has the same value as 4 because they are both 4 units away from 0. Explain why Akio is incorrect.

Refine Ideas About Positive and Negative Numbers

Apply It  **Math Toolkit** number lines

► Complete problems 1–5.

1 Identify On the number line, the letters a , b , c , and d represent integers.

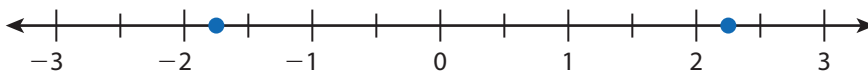


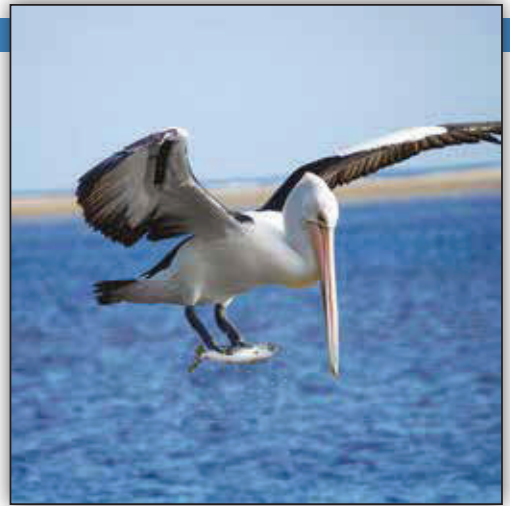
- Which letters represent negative integers? How do you know?
- Which letters appear to represent opposite integers? Explain your reasoning.

2 Interpret To complete the table, write a number to represent each situation. Write the number’s opposite and tell what it means. Explain the meaning of 0.

Situation	Number	Opposite	Meaning of Opposite	Meaning of 0
a. You owe \$25.		25		You do not owe or earn any money.
b. A team gains 20 yards in a football game.			A team loses 20 yards in a football game.	
c. A stock price falls 4.26 points.				A stock price stays the same.

3 Critique Estela says she plotted two points that represent opposite numbers. Describe Estela’s error. How could she correct her graph by moving one point?





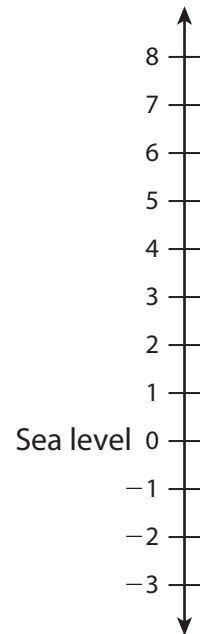
4 *Elevation* describes a location above or below a given point, such as sea level. Positive and negative numbers are used to represent elevations. In this problem, you can think of the surface of the water as representing sea level.

- A pelican is flying 7 ft above sea level.
- Then the pelican dives into the water and grabs a fish at an elevation of $-1\frac{1}{2}$ ft.
- Then the pelican floats on the water while it eats the fish.

PART A Plot and label three points on the number line to show the pelican’s elevation when *flying*, *diving*, and *floating*.

PART B Why does it makes sense to let 0 represent sea level?

PART C You can describe the elevation of the fish as $-1\frac{1}{2}$ ft or as $1\frac{1}{2}$ ft below sea level. Explain why one description uses a negative number and the other description uses a positive number.



5 **Math Journal** You can use positive and negative numbers to represent gaining and losing points in a game. Plot a point on a number line to represent a loss of 9 points. Then plot a point at the opposite of that number. Label each point with its value. What does the opposite number mean in this situation?

End of Lesson Checklist

- INTERACTIVE GLOSSARY** Find the entry for *negative numbers*. Give three examples of when you would use negative numbers.