

WORDS TO KNOW

opposites

additive inverse

Lesson 6

UNDERSTAND RATIONAL NUMBERS

7.NS.A.1, 7.NS.A.1.a, 7.NS.A.1.b

INTRODUCTION

Real-World Connection

Zhen earned money doing landscape work for his neighbors. Last week, he earned \$45 working for the Ramirez family, but he spent \$25 on his equipment and supplies. He also earned \$35 working for the King family. Use rational numbers to show Zhen's earnings and expenses. How much money did Zhen take home last week? Let's practice the skills in the **Guided Instruction** and **Independent Practice** and see how much Zhen earned at the end of the lesson!

What I Am Going to Learn

- How to add rational numbers
- How to identify opposite quantities that combine to make 0

What I May Already Know

6.NS.C.6.a, 6.NS.C.7.a, 6.NS.C.7.c

- I know how to represent integers on a number line.
- I know that opposite numbers are the same distance from 0 on a number line.
- I know how to compare integers.

Vocabulary in Action

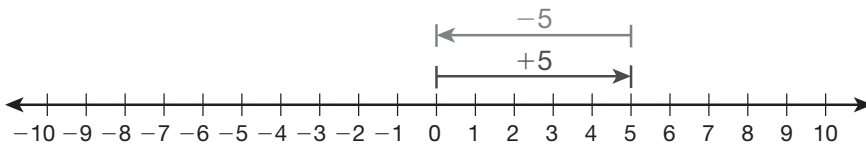
Two rational numbers are **opposites** if they are the same distance from 0 on a number line.

- Opposites are on opposite sides of 0: -8 and 8 are opposites.
- The opposite of a number is its **additive inverse**.
- The sum of a number and its additive inverse is 0: $-8 + 8 = 0$.
- Addition is shown on a number line by moving to the right when adding a positive number, and moving to the left when adding a negative number.



EXAMPLE

Find the sum of 5 and -5 .



Start at 5, and move to the left 5.

$$5 + (-5) = 0$$

TURN AND TALK

Think of numbers in real-world situations that are opposites.

Rational numbers can be used to model real-world situations. For example, money earned is a positive number, while money spent is described with a negative number.

EXAMPLE

Trey is the quarterback of his football team. On the first play of the game, his team gained 8 yards. On the second play, the team lost 8 yards. In other words, on the first play the team moved 8 yards and on the second play the team moved -8 yards. What was the total gain after the two plays?

The total gain on the two plays was $8 + (-8) = 0$.

After the second play, the team had returned to its initial position.

SKETCH IT

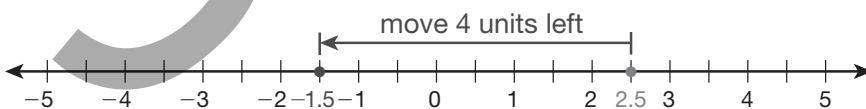
Where would the team be if they had gained 10 yards on the first play, but lost 8 yards on the second play?

To add two integers using a number line, start by locating the first number on the number line. The second number tells how many units to move. If that number is positive, move to the right. If that number is negative, move to the left.

EXAMPLE

Find the sum: $2.5 + (-4)$.

Start at 2.5 and move 4 units to the left on the number line.



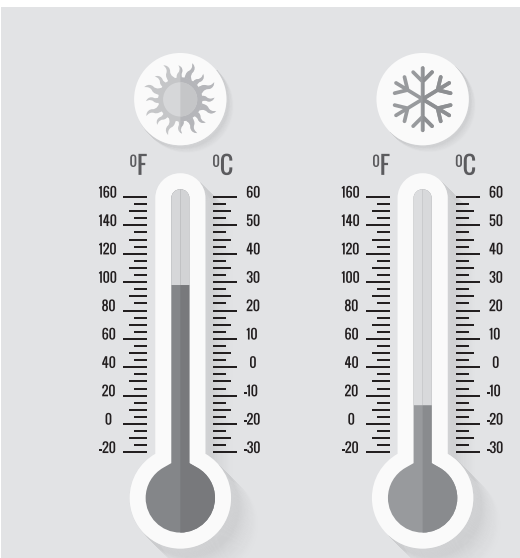
$$2.5 + (-4) = -1.5$$

THINK ABOUT IT

To find where you will end up, you can move the distance to 0 (2.5), then move 1.5 units for a total move of 4 units left.

GUIDED INSTRUCTION

A thermometer is a vertical number line. The mercury in it rises when the temperature increases, and drops when the temperature decreases.



- The temperature was -10°F . Find the additive inverse of -10 and write a real-world problem with these numbers, describing their sum.

Step One Find the additive inverse of -10 .

The additive inverse of -10 is 10 .

Step Two Write a real-world problem.

This morning it was -10°F . During the day, the temperature rose 10°F .

What is the temperature now?

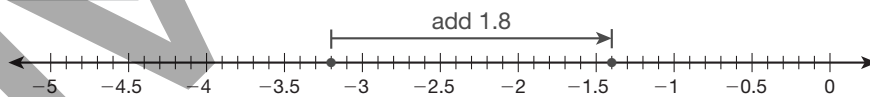
Step Three Describe the sum.

$-10 + 10 =$

The temperature is now.

- Use a number line to find the sum of $-3.2 + 1.8$.

Step One Start at -3.2 . Move to the right 1.8 units.



Step Two Find the ending point.

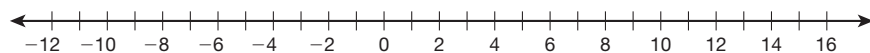
After moving to the right 1.8 units, the ending point is .

Step Three Find the sum.

$-3.2 + 1.8 =$

- Which of the following pairs of numbers have a sum of -4 ? Use the number line to help you add. Select the **three** correct answers.

- (A) 2 and -6
- (B) $-\frac{4}{3}$ and $-\frac{8}{3}$
- (C) -1.2 and 5.2
- (D) 9 and 5
- (E) -11 and 7



THINK ABOUT IT

Notice that $3.2 - 1.8 = 1.4$.
How does this help with adding rational numbers?

HINT, HINT

The order in which you add two numbers does not change the sum. You can check your work by adding the numbers in the reverse order.

How Am I Doing?

What questions do you have?

How is $4 + 5$ different from $4 + (-5)$?

What is an example of an everyday activity where you could represent amounts with positive and negative numbers, then add them?

TURN AND TALK

Work with a partner to solve this problem. The football team is on the 30-yard line and loses 9 yards and then 6 yards on consecutive plays. How would you figure out how many yards the team needs to gain on the next play in order for the team to get back to where they started?

Color in the traffic signal that shows how you are doing with the skill.



INDEPENDENT PRACTICE

Answer the questions.

1. Select the **two** pairs of numbers that are additive inverses.

- (A) -8.3 and 8.3
- (B) 1_2 and 0
- (C) 3 and -2
- (D) -1 and 1

2. Circle the numbers and word that correctly complete the statement.

To find the sum of 7 and -9 , start at and move units to the

left
right

9	9
7	7
5	5
2	2

TIPS AND TRICKS

Opposite values are the same distance from 0 on the number line. They just lie on opposite sides of 0 .

3. What is $12 + (-12)$?

Write your answer in the box.

4. Draw a line to show each sum.

$-5 + 6$
$5 + 6$
$5 + (-6)$
$-5 + (-6)$

-11
-1
1
11

5. Which of these situations can be modeled with additive inverses? Select the **two** correct answers.

- (A) E.J. walks 1 mile to the store. Then he walks 1 mile further to his friend's house.
- (B) A bird is flying 8 feet above the surface of the lake. Then it dives 10 feet to catch a fish.
- (C) Sofia earns \$15 babysitting. Then she pays \$15 for a new T-shirt.
- (D) A commuter train travels 3 miles north from the center of town. Then it travels 3 miles west.
- (E) Malik takes the elevator up 5 floors to his office. At the end of the day, he takes the elevator down 5 floors to go home.

6. Which shows the sum of $-6 + 2$?

- (A) -8
- (B) -4
- (C) 4
- (D) 8

7. Part A

Find the sum: $-3 + (-4)$

Write your answer in the box.

★ Part B

Explain how you can use a number line to find $-3 + (-4)$.

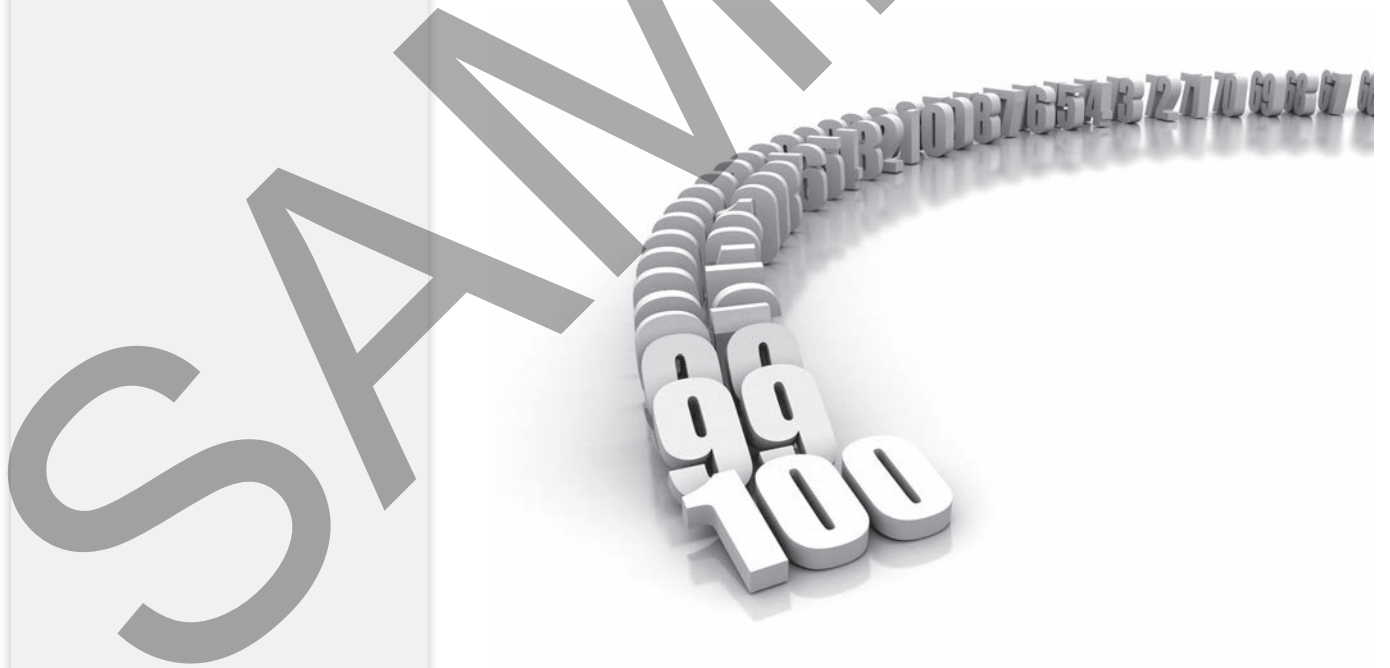
◀ HINT, HINT

The first addend is negative and the second addend is also negative. First decide whether the sum will be positive or negative.

WORK SPACE

8. How is $6 + 5$ related to $-6 + (-5)$?

Explain how they are the same and how they are different, and why.



EXIT TICKET

7.NS.A.1, 7.NS.A.1.a, 7.NS.A.1.b

Now that you have mastered adding rational numbers, let's solve the problem in the **Real-World Connection**.

Zhen earned money doing landscape work for his neighbors. Last week, he earned \$45 working for the Ramirez family, but he spent \$25 on his equipment and supplies. He also earned \$35 working for the King family. Use rational numbers to show Zhen's earnings and expenses. How much money did Zhen take home last week?

SAMPLE