Lesson 3: Understanding Addition of Integers

Classwork

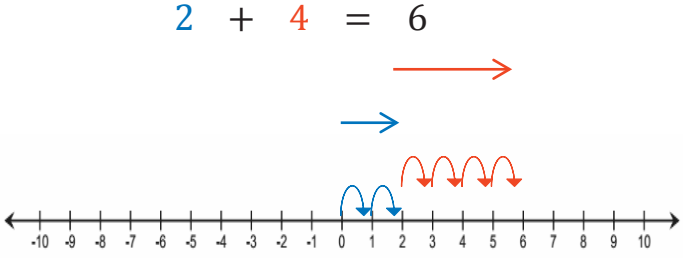
Exercise 1: Addition Using the Integer Game

Play the Integer Game with your group without using a number line.

Example 1: Counting On to Express the Sum as Absolute Value on a Number Line

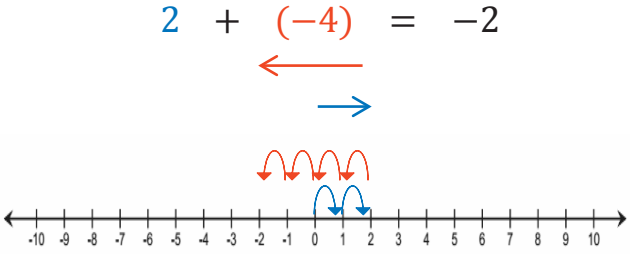
Model of Counting Up

$2 + 4 = 6$



Model of Counting Down

$2 + (-4) = -2$



Counting up -4 is the same as *the opposite of counting up* 4 and also means counting down 4.

a. For each example above, what is the distance between 2 and the sum?

b. Does the sum lie to the right or left of 2 on a horizontal number line? Above or below on a vertical number line?

c. Given the expression $54 + 81$, determine, without finding the sum, the distance between 54 and the sum. Explain.

d. Is the sum to the right or left of 54 on the horizontal number line? Above or below on a vertical number line?

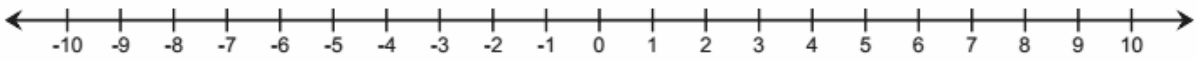
e. Given the expression $14 + (-3)$, determine, without finding the sum, the distance between 14 and the sum. Explain.

f. Is the sum to the right or left of 14 on the number line? Above or below on a vertical number line?

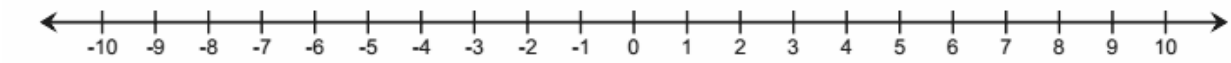
Exercise 2

Work with a partner to create a horizontal number line model to represent each of the following expressions. What is the sum?

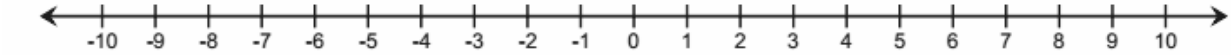
a. $-5 + 3$



b. $-6 + (-2)$



c. $7 + (-8)$

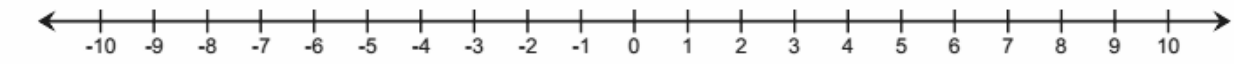


Exercise 3: Writing an Equation Using Verbal Descriptions

Write an equation, and using the number line, create an *arrow diagram* given the following information:

The sum of 6 and a number is 15 units to the left of 6 on the number line.

Equation:

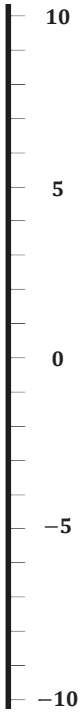


Lesson Summary

- Adding an integer to a number can be represented on a number line as counting up when the integer is positive (just like whole numbers) and counting down when the integer is negative.
- Arrows can be used to represent the sum of two integers on a number line.

Problem Set

1. Below is a table showing the change in temperature from morning to afternoon for one week.
   a. Use the vertical number line to help you complete the table. As an example, the first row is completed for you.



Change in Temperatures from Morning to Afternoon

Morning Temperature	Change	Afternoon Temperature	Equation
$1°C$	Rise of $3°C$	$4°C$	$1 + 3 = 4$
$2°C$	Rise of $8°C$		
$-2°C$	Fall of $6°C$		
$-4°C$	Rise of $7°C$		
$6°C$	Fall of $9°C$		
$-5°C$	Fall of $5°C$		
$7°C$	Fall of $7°C$		

   b. Do you agree or disagree with the following statement: "A rise of $-7°C$" means "a fall of $7°C$"? Explain. (Note: No one would ever say, "A rise of -7 degrees"; however, mathematically speaking, it is an equivalent phrase.)

For Problems 2–3, refer to the Integer Game.

2. Terry selected two cards. The sum of her cards is -10.
   a. Can both cards be positive? Explain why or why not.
   b. Can one of the cards be positive and the other be negative? Explain why or why not.
   c. Can both cards be negative? Explain why or why not.

3. When playing the Integer Game, the first two cards you selected were -8 and -10.
   a. What is the value of your hand? Write an equation to justify your answer.
   b. For part (a), what is the distance of the sum from -8? Does the sum lie to the right or left of -8 on the number line?
   c. If you discarded the -10 and then selected a 10, what would be the value of your hand? Write an equation to justify your answer.

4. Given the expression $67 + (-35)$, can you determine, without finding the sum, the distance between 67 and the sum? Is the sum to the right or left of 67 on the number line?

5. Use the information given below to write an equation. Then create an *arrow diagram* of this equation on the number line provided below.

   The sum of -4 and a number is 12 units to the right of -4 on a number line.