Lesson 3: Understanding Addition of Integers
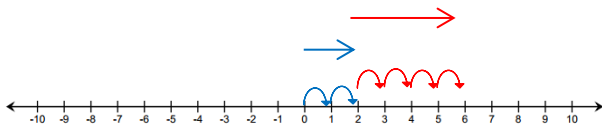
Classwork

Exercise 1: Addition Using the Integer Game

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

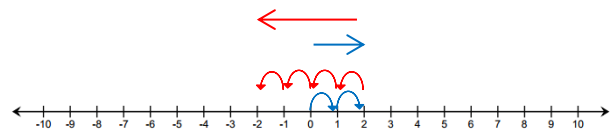**Example 1: "Counting On" to Express the Sum as Absolute Value on a Number Line**

Model of Counting Up	Model of Counting Down
$2 + 4 = 6$	$2 + (-4) = -2$

Remember that 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? Vertical number line?

c. Given the expression $54 + 81$, can you determine, without finding the sum, the distance between 54 and the sum? Why?

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

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

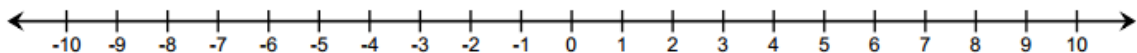f. Is the sum to the right or left of 14 on the number line? On a vertical number line?

Exercise 2

Work with a partner to create a horizontal number line model to represent each of the following expressions. Describe the sum using distance from the p-value along the number line.
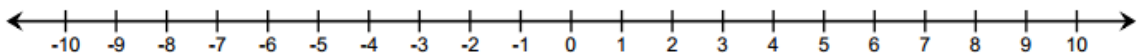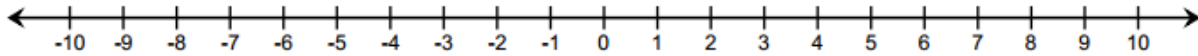
1. $-5 + 3$
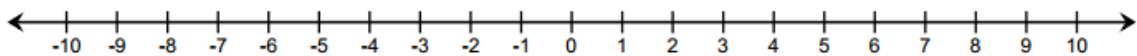
2. $-6 + (-2)$

3. $7 + (-8)$

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 p-value is 6, and the sum lies 15 units to the left of the p-value."

Equation:

Lesson Summary

- Addition of integers is represented on a number line as "counting up", where counting up a negative number of times is the same as "counting down."

- Arrows show the sum of two integers on a number line.

- The sum is the distance $|q|$ from the *p-value (the first addend)* to the right if q is positive and to the left if q is negative.

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	Number Sentence
1 ℃	rise of 3 ℃	4 ℃	$1 + 3 = 4$
2 ℃	rise of 8 ℃		
−2 ℃	fall of 6 ℃		
−4 ℃	rise of 7 ℃		
6 ℃	fall of 9 ℃		
−5 ℃	fall of 5 ℃		
7 ℃	fall of 7 ℃		

10

5

0

-5

-10

   b. Do you agree or disagree with the 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 Questions 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 p-value is – 4, and the sum lies 12 *units to the right of the p-value."*