

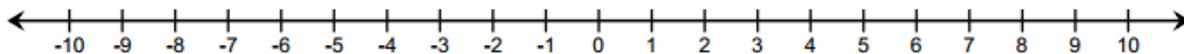
## Lesson 2: Using the Number Line to Model the Addition of Integers

### Classwork

#### Exercise 1: Real-World Introduction to Integer Addition

Answer the questions below.

- Suppose you received \$10 from your grandmother for your birthday. You spent \$4 on snacks. Using addition, how would you write a number sentence to represent this situation?
- How would you model your equation on a number line to show your answer?

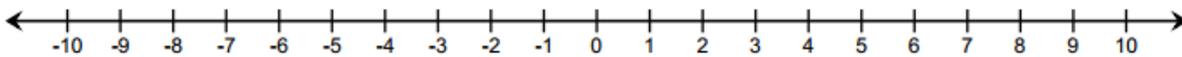


#### Example 1: Modeling Addition on the Number Line

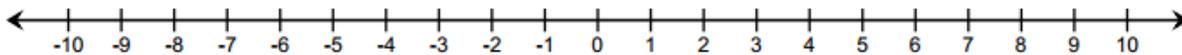
Complete the steps to finding the sum of  $-2 + 3$  by filling in the blanks. Model the number sentence using straight arrows called *vectors* on the number line below.

- Place the tail of the arrow on \_\_\_\_\_.
- Draw the arrow 2 units to the left of 0, and stop at \_\_\_\_\_. The direction of the arrow is to the \_\_\_\_\_ since you are counting down from 0.
- Start the next arrow at the end of the first arrow, or at \_\_\_\_\_.
- Draw the second arrow \_\_\_\_\_ units to the right since you are counting up from  $-2$ .
- Stop at \_\_\_\_\_.

- f. Circle the number at which the second arrow ends to indicate the ending value.



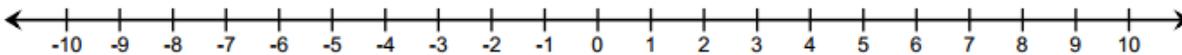
- g. Repeat the process from parts (a)–(f) for the expression  $3 + (-2)$ .



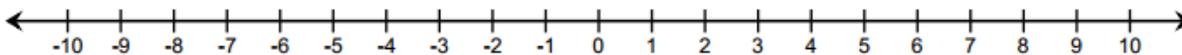
- h. What can you say about the sum of  $-2 + 3$  and  $3 + (-2)$ ? Does order matter when adding numbers? Why or why not?

**Example 2: Expressing Absolute Value as the Length of an Arrow on the Real Number Line**

- a. How does absolute value determine the arrow length for  $-2$ ?



- b. How does the absolute value determine the arrow length for 3?

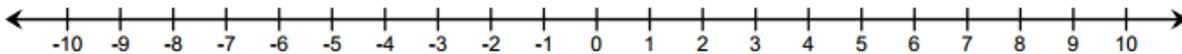


- c. How does absolute value help you to represent  $-10$  on a number line?

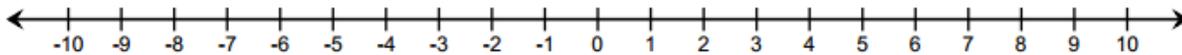
**Exercise 2**

Create a number line model to represent each of the expressions below.

- a.  $-6 + 4$

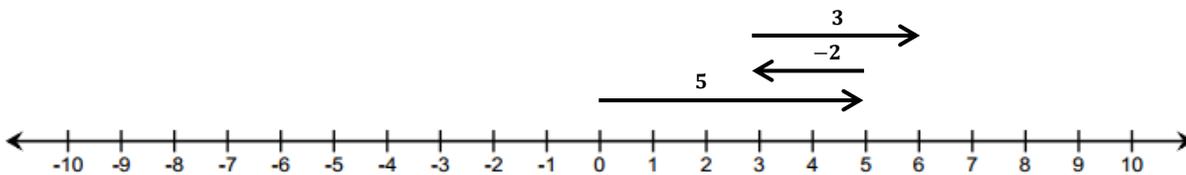


- b.  $3 + (-8)$



**Example 3: Finding Sums on a Real Number Line Model**

Find the sum of the integers represented in the diagram below.



- a. Write an equation to express the sum.
- b. What three cards are represented in this model? How did you know?

- c. In what ways does this model differ from the ones we used in Lesson 1?
- d. Can you make a connection between the sum of 6 and where the third arrow ends on the number line?
- e. Would the sum change if we changed the order in which we add the numbers, for example,  $(-2) + 3 + 5$ ?
- f. Would the diagram change? If so, how?

### Exercise 3

Play the Integer Game with your group. Use a number line to practice “counting on”.

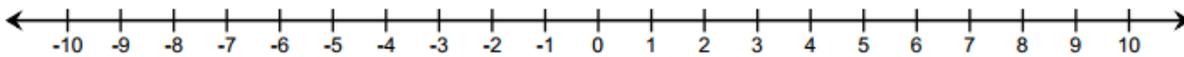
**Lesson Summary**

- On a number line, arrows are used to represent integers; they show length and direction.
- The length of an arrow on the number line is the absolute value of the integer.
- Adding several arrows is the same as combining integers in the Integer Game.
- The sum of several arrows is the final position of the last arrow.

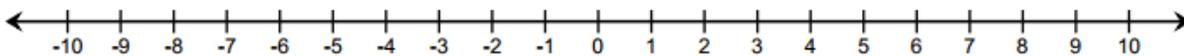
**Problem Set**

For Questions 1–3, represent each of the following problems using both a number line diagram and an equation.

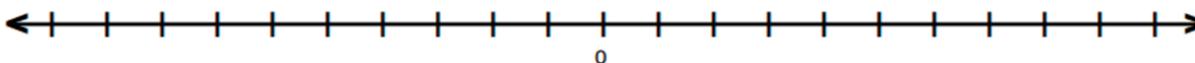
1. David and Victoria are playing the Integer Card Game. David drew three cards,  $-6$ ,  $12$ , and  $-4$ . What is the sum of the cards in his hand? Model your answer on the number line below.



2. In the Integer Card Game, you drew the cards,  $2$ ,  $8$ , and  $-11$ . Your partner gave you a  $7$  from his hand.  
 a. What is your total? Model your answer on the number line below.



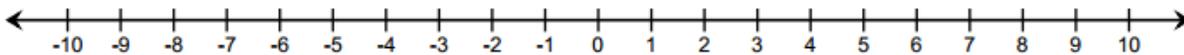
- b. What card(s) would you need to get your score back to zero? Explain. Use and explain the term “additive inverse” in your answer.
3. If a football player gains  $40$  yards on a play, but on the next play, he loses  $10$  yards, what would his total yards be for the game if he ran for another  $60$  yards? What did you count by to label the units on your number line?



4. Find the sums.

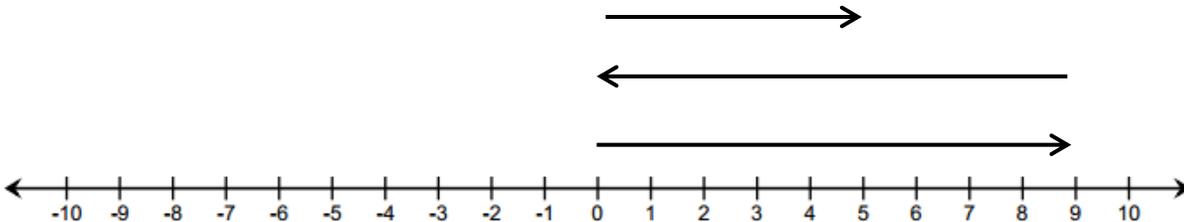
- a.  $-2 + 9$
- b.  $-8 + -8$
- c.  $-4 + (-6) + 10$
- d.  $5 + 7 + (-11)$

5. Mark an integer between 1 and 5 on a number line, and label it point  $Z$ . Then, locate and label each of the following points by finding the sums.



- a. Point  $A$ :  $Z + 5$
- b. Point  $B$ :  $Z + (-3)$
- c. Point  $C$ :  $(-4) + (-2) + Z$
- d. Point  $D$ :  $-3 + Z + 1$

6. Write a story problem that would model the sum of the arrows in the number diagram below.



7. Do the arrows correctly represent the equation  $4 + (-7) + 5 = 2$ ? If not, draw a correct model below.

