Introduction to Integers

Get the Point?

Lesson 7-1 Integers and the Number Line

My Notes

Lesson Targets:

- Use integers to represent quantities in real-world contexts.
- Position and identify integers on a number line.
- Find the opposite of an integer.
- Find the absolute value of an integer.
- Classify whole numbers, integers, and positive rational numbers.

SUGGESTED LEARNING STRATEGIES: Marking the Text, Summarizing, Note Taking, Create Representations, Group Discussion

Ms. Martinez has a point system in her classroom. Students earn points for participation, homework, teamwork, and so forth. However, students lose points for inappropriate behavior or not completing assignments. At the end of each term, students in the group with the most points receive a book or a DVD. She assigns a letter to each student for tracking his or her total points. One student is letter *A*, the next is *B*, and so on.

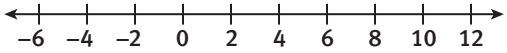
1. This table shows each student's total points at the end of the week. Your teacher will assign you a letter.

A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*
−3	3	8	−1	0	−5	−6	10	7	−4	1	2

M	*N*	*O*	*P*	*Q*	*R*	*S*	*T*	*U*	*V*	*W*	*X*
−3	−2	12	1	−7	2	−1	6	−4	−1	9	3

a. Write the total points and the letter assigned to you on a sticky note and post it on the class number line.

b. Copy the letters from the class number line to this one.



c. What do the numbers to the right of zero on the number line represent?

d. What do the numbers to the left of zero represent?

e. Explain how you knew where to place your number on the number line.

My Notes

f. Student *E* was in class for only 2 days during the week. On the first day, *E* was awarded points. On the second day, *E* lost points. Explain how *E*'s score can be zero.

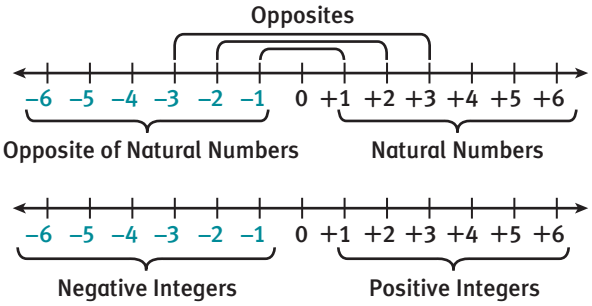
WRITING MATH

Positive integers are written with or without a plus sign. For example, +2 and 2 indicate the same number. Negative integers are written with a negative sign. For example, −2.

WRITING MATH

To indicate the opposite of a number, place a negative sign in front of the number. The opposite of 4 is −4. The opposite of −4 is −(−4) = 4.

The number lines below give visual representations of integers. Notice that zero is the only integer that is neither positive nor negative. **Integers** are the natural numbers (1, 2, 3, . . .), their opposites, and zero. The opposite of 0 is 0.



2. Ms. Martinez uses negative numbers to represent points lost by students. Work with your group to name at least three other uses for negative numbers in real life. As you discuss the uses, ask your group members for clarification of any terms you do not understand.

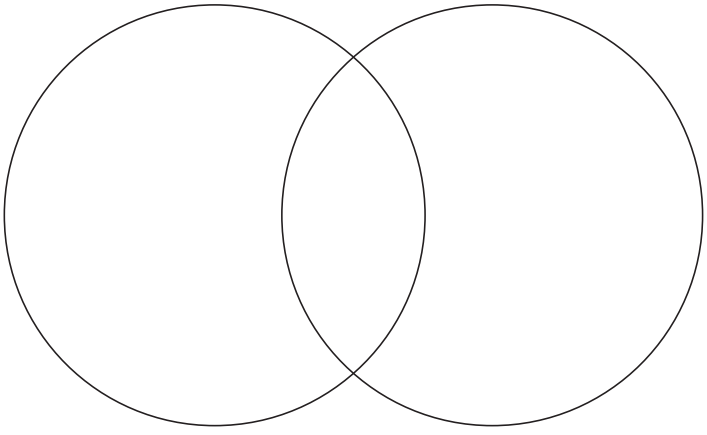
MATH TERMS

The symbol ℤ is often used to represent the set of integers. This is because in German, the word *Zahl* means "number."

Numbers may belong to more than one category or set.

- All whole numbers are also integers.
- All whole numbers are also positive rational numbers.
- Some integers are positive rational numbers.
- Some positive rational numbers are integers.

3. Model with mathematics. Place the following on the Venn diagram below to show how they are related: Whole Numbers; Integers; Positive Rational Numbers.



My Notes

Numbers that are the same distance from zero but are on different sides of zero on a number line are **opposites**.

4. Recall that the table shows each student's total points at the end of the week.

A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*
−3	3	8	−1	0	−5	−6	10	7	−4	1	2

M	*N*	*O*	*P*	*Q*	*R*	*S*	*T*	*U*	*V*	*W*	*X*
−3	−2	12	1	−7	2	−1	6	−4	−1	9	3

Find three pairs of students with scores that are opposites. Explain your reasoning.

5. Look at the points for Students *A* and *B*.

a. How many points does *A* need to *earn* to have a total of 0? Explain.

b. How many points does *B* need to *lose* to have a total of 0? Explain.

c. What do you notice about both student *A*'s and student *B*'s point distance from zero?

The **absolute value** of a number is the distance of the number from zero on a number line. Absolute value is always positive, because distance is always positive. The symbol for absolute value is a vertical bar on each side of a number. For example, $|3| = 3$ and $|-3| = 3$.

6. Why is distance always positive? Use an example in your explanation.

READING MATH

Read $|6| = 6$ as the absolute value of 6 is 6. Read $|-6| = 6$ as the absolute value of negative 6 is 6.

7. From the ground floor of the school, Ms. Martinez goes down 1 flight of stairs to get to the basement.

a. Write an integer to represent the situation.

b. What is the opposite of the situation above? What integer represents this situation?

c. Explain what 0 represents in this situation.

d. Explain what the absolute value | 1 | represents in this situation.

My Notes

Check Your Understanding

8. The football team loses 5 yards on first down.
- **a.** Write an integer to represent this situation.
- **b.** Write an integer to represent the opposite of the situation in part a.
- **c.** What does 0 mean in this situation?

9. Write the opposite of each integer.
a. 9 **b.** 0 **c.** −12

10. Write each absolute value.
a. $|10|$ **b.** $|-8|$ **c.** $|0|$

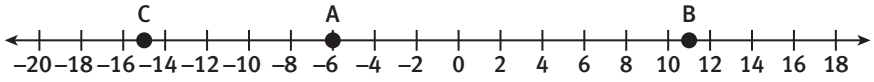
11. Reason quantitatively. What values can x have if $|x| = 8$?

LESSON 7-1 PRACTICE

For Items 12–14, locate each integer on a number line.

12. −4 **13.** 7 **14.** −9

For Items 15–17, identify the integer for each point.



15. *A* **16.** *B* **17.** *C*

For Items 18–20, write the opposite of each integer.

18. 23 **19.** −41 **20.** −78

For Items 21–23, write an integer to represent each situation. Explain the opposite of the situation and write an integer to represent the opposite. Then explain what 0 means in each situation.

21. temperature of 7 degrees below 0

22. a gain of 3 pounds

23. a withdrawal of $15

For Items 24–26, write each absolute value.

24. $|9|$ **25.** $|-3|$ **26.** $|-46|$

27. Model with mathematics. The lowest elevation of Death Valley is about −282 feet. Find the absolute value of the lowest elevation of Death Valley. Explain what this absolute value means.

28. Make sense of problems. The height of an iceberg above the water is 38 meters. The bottom of the iceberg is 21 meters below sea level. Write integers to represent the height and depth of the iceberg. Explain what 0 means in the situation.

29. The counting, or natural, numbers are 1, 2, 3,... How could you add counting numbers to the Venn diagram on page 84?