

## **Lesson Plan -- Integers, Opposites, Absolute Value**

### **Chapter Resources**

- Lesson 3-1 Integers and the Number Line
- Lesson 3-1 Integers and the Number Line Answers
- Lesson 3-2 Opposites and Absolute Value
- Lesson 3-2 Opposites and Absolute Value Answers
- Lesson 3-3 Compare and Order Integers
- Lesson 3-3 Compare and Order Integers Answers

**LESSON**  
**3-1**

# Integers and the Number Line


**California Standards**

**Gr. 4 NS 1.8:** Use concepts of negative numbers (e.g., on a number line, in counting, in temperature, in "owing").

**Gr. 5 NS 1.5:** Identify and represent on a number line decimals, fractions, mixed numbers, and positive and negative integers.

**Words to Remember**

*Integer:* Any positive whole number, the opposite of any positive whole number, or zero

−18, −5, 0, 4, 122

*Negative integer:* Any integer that is less than 0

−357, −42, −3

*Positive integer:* Any integer greater than 0

1, 39, 422

**Getting Started** Previously you learned what whole numbers are and how to graph them on a number line. You can also place integers on a number line. On a number line positive integers are to the right of 0 and negative integers are to the left of 0.

**EXAMPLE 1**
**Identifying Integers**

Identify the integers in the following list.

3.3, −17, 22,  $72\frac{1}{5}$

**Solution**

3.3 is not an integer since it contains a number after a decimal point.

−17 is an integer since it is the opposite of a positive whole number.

22 is an integer since it is a whole number.

$72\frac{1}{5}$  is not an integer since it contains a fraction, which is not a whole number.

**TRY THIS**

1. Circle the integers in the following list.

92, −100.66,  $\frac{3}{8}$ , 455, −672

2. Circle the negative integers in the following list.

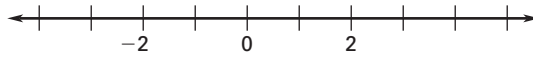
12, −15,  $\frac{5}{9}$ , −2.5, −19, 28.75

**Look Ahead**

For more on opposites, see Lesson 3-2 on page 6.

**EXAMPLE 2****Graphing Integers on a Number Line**

Place the integers  $-3$ ,  $4$ ,  $1$ , and  $-2$  on the number line.



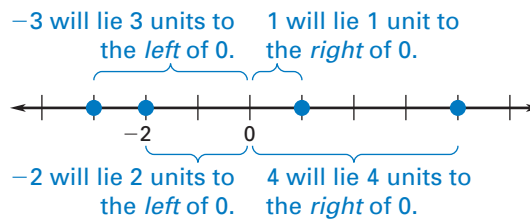
**Solution**

**Step 1 Determine** whether each number lies to the right or to the left of  $0$ .

Negative integers lie to the *left* of  $0$ :  $-3$  and  $-2$ .

Positive integers lie to the *right* of  $0$ :  $4$  and  $1$ .

**Step 2 Place** each integer on the number line.

**EXAMPLE 3****Modeling a Situation**

The high temperature on Monday in San Francisco was  $83^{\circ}\text{F}$ . The high temperature on Tuesday was  $72^{\circ}\text{F}$ . Represent the change in high temperatures from Monday to Tuesday using an integer.

**Solution**

**Step 1 Find** the change in temperature from Monday to Tuesday.  $83 - 72 = 11^{\circ}\text{F}$

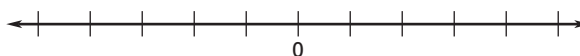
**Step 2 Determine** whether the temperature change should be positive or negative.

Since the temperature decreased, the sign should be *negative*.

**ANSWER** The high temperature change was  $-11^{\circ}\text{F}$ .

**TRY THIS**

3. Place  $-1$ ,  $-4$ , and  $3$  on the number line.



4. Manuel has a piece of ribbon  $63$  inches long. After removing some of the ribbon for a project, the ribbon is now  $44$  inches long. Use an integer to represent the change in the length of the ribbon.

## Summarize

An integer is a positive whole number, the opposite of a positive whole number, or zero.

Positive integers are positive whole numbers and are found to the right of zero on a number line.

Negative integers are opposites of positive whole numbers and are found to the left of zero on a number line.

## Modeling Situations with Integers

Real-world situations can be modeled by integers. When the situation represents a decrease, use a negative integer to describe it. When the situation represents an increase, use a positive integer to describe it.

## Practice

Match the description with the integer that represents it.

- |                                   |               |
|-----------------------------------|---------------|
| 1. An increase of 11 points _____ | A. -30 ft     |
| 2. A decrease of 11 points _____  | B. 11 points  |
| 3. A decrease of 30 feet _____    | C. -11 points |
| 4. An increase of 30 feet _____   | D. 30 ft      |

Circle the integers.

- |   |   |
|---|---|
| 5. $-\frac{4}{5}$ , 99, 122.55, -37, 14 | 6. 100.1, 0.5, $45\frac{6}{7}$ , -1055, 7         |
| 7. 676, -932.9, 12, $\frac{17}{43}$     | 8. -15, $-68\frac{33}{51}$ , 55.17, $\frac{3}{4}$ |
| 9. -722.1, -1434, $222\frac{3}{4}$ , 0  | 10. 10,922, 3.46, -5                              |

Place the integers on a number line.

11. -1, 0, 2, -5



13. -2, 3, 5, 6



15. 12, 5, 0, -2



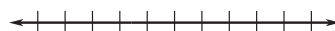
12. -6, -1, 1, -4



14. -10, 4, 6, -4



16. -13, 12, 8, -4

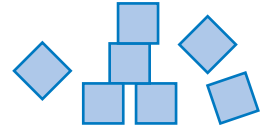


**Tell if the situation represents an *increase* or a *decrease*. Then represent the amount of the increase or decrease by an integer.**

- 17.** Karla has \$20 to spend at a jewelry store. After buying a bracelet she has \$6 remaining.

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- 18.** Hannah is building a tower of blocks with her younger brother. They currently have 14 blocks stacked in their tower. After her younger brother knocks over the tower there are 4 blocks left standing.




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- 19.** Jesse is filling an empty bucket with water. After he fills the bucket there are 3 gallons of water in it.

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- 20.** You and a friend order a pizza that has 10 slices in it. After you and your friend finish eating, there are 4 slices remaining.

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### DID YOU GET IT?

- 21. Fill in the missing words.** To place integers on a number line, graph \_\_\_\_\_ to the right of zero and graph \_\_\_\_\_ to the left of zero.

- 22. Explain your reasoning.** What kinds of numbers are integers?

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- 23. Describe.** Give an example of a real-life increase and an example of a real-life decrease that can be described by integers. Explain your thinking.

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# Answer Key

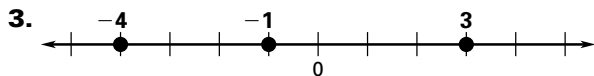
## Answers to Book 3 Integers and Rational Numbers

### Lesson 3-1, pp. 2-5

Try this:

1. 92, 455, -672

2. -15, -19



4. -19 in.

Practice:

1. B

2. C

3. A

4. D

5. 99, -37, 14

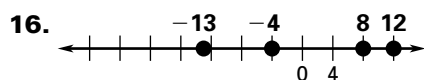
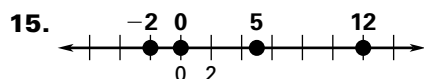
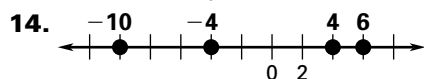
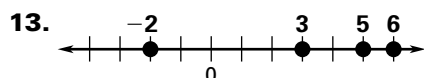
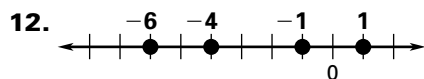
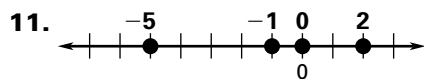
6. -1055, 7

7. 676, 12

8. -15

9. -1434, 0

10. 10,922, -5



17. decrease; -\$14

18. decrease; -10 blocks

19. increase; 3 gal

## *Answer Key*

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**20.** decrease;  $-6$  slices

**21.** positive integers; negative integers

**22.** *Sample answer:* A number is an integer if it is a positive whole number, the opposite of a positive whole number, or zero.

**23.** *Sample answer:* Real-life increase: Adding 8 songs to your MP3 player can be described with the positive integer 8. Real-life decrease: A penalty in football means that a team loses yardage. Getting a 15 yard penalty in a football game can be described with the negative integer  $-15$ .

**LESSON**  
**3-2**

# Opposites and Absolute Value



**California Standards**

**Gr. 7 NS 2.5:** Understand the meaning of the absolute value of a number; interpret the absolute value as the distance of the number from zero on a number line; and determine the absolute value of real numbers.

**Algebra 1 2.0:** Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents.

**Words to Remember**

*Opposites:* Two numbers that are the same distance from **0** on a number line, but on opposite sides of **0**

**7 and -7 are opposites.**  
**9 and -9 are opposites.**

*Absolute value of a number:* The distance a number is from **0** on a number line.

Remember that distance is always a positive quantity (or zero). Show absolute value with vertical bars on each side of the number, for example  $|17|$ .

**Getting Started** In Lesson 3-1 you learned how to place integers on a number line. Now you will find the distance between a point and zero on the number line to find the *opposite* of a number or the *absolute value* of a number.

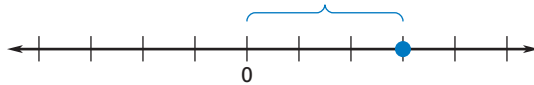
**EXAMPLE 1**

**Finding the Opposite of an Integer**

Use a number line to find the opposite of 3.

**Solution**

**Step 1** Place 3 on a number line.



**Step 2** Determine how far 3 is from 0. **3**

**Step 3** Find the opposite of 3. The opposite of a number must be the same distance from **0** as the original number, but in the opposite direction. So, the opposite of 3 must be 3 units to the left of **0**, or at **-3**.

**ANSWER** The opposite of 3 is **-3**.

**TRY THIS**

Use a number line to find the opposite of the number.

1. 4



2. -2





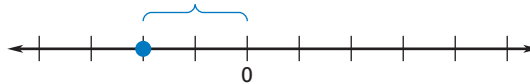
**EXAMPLE 2****Finding the Absolute Value of an Integer**

Use a number line to find  $|-2|$

**Solution**

The absolute value of a number is the distance the number is from 0.

**Step 1** Graph  $-2$  on a number line.



**Step 2** Determine how far  $-2$  is from 0.  $-2$

**ANSWER** The absolute value of  $-2$  must be 2 because distances are always positive (or 0).

**EXAMPLE 3****Finding the Opposite and Absolute Value of an Integer**

Use a number line to find the opposite of 4 and to find  $|4|$ .

**Solution**

**Step 1** Place 4 on a number line.



**Step 2** Determine how far 4 is from 0. 4

**Step 3** The opposite of 4 must be the same distance from 0 but in the opposite direction. So, the opposite of 4 is  $-4$ . The absolute value of 4 must be 4 because distances are always positive (or 0).

**ANSWER** The opposite of 4 is  $-4$ , and  $|4| = 4$ .

**TRY THIS** Use a number line to evaluate the expression.

3.  $|7| = \square$



4. The opposite of  $-6 = \square$  and  $|-6| = \square$ .



**Summarize****Opposite**

The *opposite* of a number is a number that is the same distance from zero on a number line as the given number, but on the opposite side of zero.

**Absolute Value**

The *absolute value* of a number is the distance between 0 and the number on a number line. Remember that distance is always a positive quantity (or zero). Absolute value is shown by vertical bars on each side of the number.

**Practice**

Match the description with the number that represents it. You may use some answer choices more than once or not at all.

- |                    |       |        |
|--------------------|-------|--------|
| 1. Opposite of 19  | _____ | A. -19 |
| 2. $ 91 $          | _____ | B. 19  |
| 3. $ -19 $         | _____ | C. -91 |
| 4. Opposite of -91 | _____ | D. 91  |

Evaluate the expression.

- |                     |                          |                     |                          |                     |                          |
|---------------------|--------------------------|---------------------|--------------------------|---------------------|--------------------------|
| 5. Opposite of -7   | <input type="checkbox"/> | 6. Opposite of 6    | <input type="checkbox"/> | 7. $ -9 $           | <input type="checkbox"/> |
| 8. Opposite of -2   | <input type="checkbox"/> | 9. $ 1 $            | <input type="checkbox"/> | 10. Opposite of 28  | <input type="checkbox"/> |
| 11. Opposite of 44  | <input type="checkbox"/> | 12. $ -199 $        | <input type="checkbox"/> | 13. Opposite of -50 | <input type="checkbox"/> |
| 14. $ 0 $           | <input type="checkbox"/> | 15. $ -762 $        | <input type="checkbox"/> | 16. Opposite of 10  | <input type="checkbox"/> |
| 17. $ 78 $          | <input type="checkbox"/> | 18. Opposite of 92  | <input type="checkbox"/> | 19. Opposite of -31 | <input type="checkbox"/> |
| 20. Opposite of -74 | <input type="checkbox"/> | 21. Opposite of 936 | <input type="checkbox"/> | 22. $ -302 $        | <input type="checkbox"/> |
| 23. $ -4002 $       | <input type="checkbox"/> | 24. Opposite of 76  | <input type="checkbox"/> | 25. $- 668 $        | <input type="checkbox"/> |
| 26. Opposite of 65  | <input type="checkbox"/> | 27. Opposite of -32 | <input type="checkbox"/> | 28. $- -8701 $      | <input type="checkbox"/> |

**Read and solve the problem. Then explain your answer.**

- 29.** Simone told you that she placed a point on a number line that had an absolute value of 15. At what two numbers could she have graphed her point?

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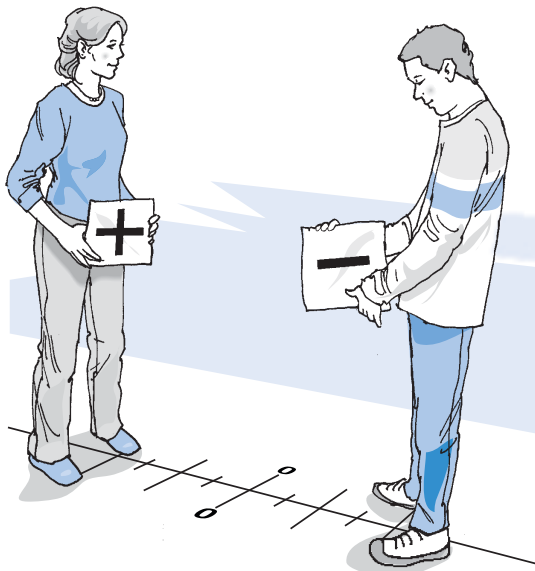


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- 30.** Julia and Roberto are each holding cards with integers on them. One has a positive integer and the other has a negative integer. The teacher has put a number line on the floor using tape and asks Julia and Roberto to stand on the points that represent their numbers. How can they determine if their numbers are opposites without showing each other their cards?




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**DID YOU GET IT?**

- 31. Fill in the missing words.** The \_\_\_\_\_ of a number is the distance between \_\_\_\_\_ and the number on a number line.

- 32. Explain your reasoning.** What is the opposite of the opposite of  $-3$ ?

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- 33. Explain your reasoning.** How are the opposite of a number and the absolute value of a number alike? How are they different?

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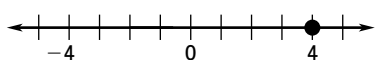
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# Answer Key

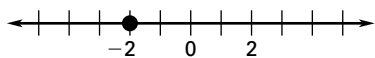
## Lesson 3-2, pp. 6-9

Try this:

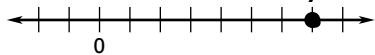
1. ② so, 4 units to the left ; -4  
① 4 units to the right



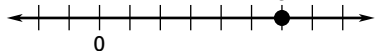
2. ① 2 units to the left ; 2  
② so, 2 units to the right



3. ; 7



4. ; 6; 6



Practice:

1. A
2. D
3. B
4. D
5. 7
6. -6
7. 9
8. 2
9. 1
10. -28
11. -44
12. 199
13. 50
14. 0
15. 762
16. -10
17. 78
18. -92
19. 31

## *Answer Key*

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**20.** 74

**21.**  $-936$

**22.** 302

**23.** 4002

**24.**  $-76$

**25.**  $-668$

**26.**  $-65$

**27.** 32

**28.**  $-8701$

**29.**  $-15$  or  $15$ ; *Sample answer:* Both  $-15$  and  $15$  are the same distance from 0 on a number line, so each of them has an absolute value of 15.

**30.** *Sample answer:* They must each determine how far from zero they are. Since they are on opposite sides of 0, then if their distances from zero are the same they are holding cards with opposite numbers on them.

**31.** absolute value; 0

**32.**  $-3$ ; *Sample answer:* The opposite of  $-3$  is 3, and the opposite of 3 is  $-3$ .

**33.** *Sample answer:* Both the absolute value and opposite of a number have to do with distance from 0 on a number line. They are different in that the absolute value of a number is always positive, while opposites can be either positive or negative.

**LESSON**  
**3-3**

# Compare and Order Integers


**California Standards**

**Gr. 5 NS 1.5:** Identify and represent on a number line decimals, fractions, mixed numbers, and **positive and negative integers**.

**Gr. 6 NS 1.0:** Students compare and order positive and negative fractions, decimals, and mixed numbers. Students solve problems involving fractions, ratios, proportions, and percentages.

## Words to Remember

**Compare:** To relate two or more numbers based on their sizes

$$-9 < 0; -4 > -5$$

**Order:** To write a group of numbers in a particular way based on their sizes

From least to greatest, the numbers  $-3$ ,  $6$ , and  $-12$  are  $-12$ ,  $-3$ , and  $6$ .

**Getting Started** In Lesson 3-2 you learned how to find the absolute value of an integer. Now you will learn how to order several integers based on their values.

### EXAMPLE 1

## Comparing Integers

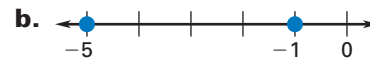
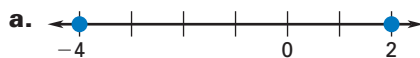
Complete the statements with  $<$ ,  $>$ , or  $=$ .

a.  $-4$    $2$

b.  $-1$    $-5$

### Solution

**Step 1** Place the points on a number line.



**Step 2** Find the integers farthest to the right.

a.  $2$  is greater than  $-4$

b.  $-1$  is greater than  $-5$

**Step 3** Insert the correct inequality sign.

The inequality symbol should open towards the greater integer.

a.  $-4$    $2$

b.  $-1$    $-5$

**TRY THIS** Complete the statement with  $<$ ,  $>$ , or  $=$ .

1.  $4$    $-4$

2.  $-7$    $0$

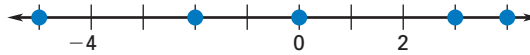
**EXAMPLE 2****Ordering Integers Using a Number Line**

Use a number line to order the integers from least to greatest.

4, -5, 3, 0, -2

**Solution**

**Step 1** Place the points on a number line.



**Step 2** Order the integers. Least to greatest is left to right.

-5, -2, 0, 3, 4

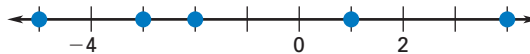
**EXAMPLE 3****Ordering Integers**

Order the integers from greatest to least.

-3, -5, 1, 4, -2

**Solution**

**Step 1** Place the points on a number line.



**Step 2** Order the integers. Greatest to least is right to left.

4, 1, -2, -3, -5

**TRY THIS** Order the integers.

3. Least to greatest: 3, -7, 8, -1

4. Greatest to least: -6, 8, 4, -3

**Summarize****Ordering Integers from Least to Greatest**

Begin by placing the integers on a number line. Then order the points as they appear on the number line. From *left to right* is the order of the integers from *least to greatest*.

**Ordering Integers from Greatest to Least**

Begin by placing the numbers on a number line. Then order the points as they appear on the number line. From *right to left* is the order of the integers from *greatest to least*.

**Practice**

Use the number line to order the integers from greatest to least.

1. 9, -7, 4, 1, -2



2. 3, 10, -7, 6, -8



3. -12, -6, 4, 0, 1



4. 10, 5, -3, -5, 11



5. -2, -14, -8, -1, -6



6. 0, -13, -25, -11, -22



Use the number line to order the integers from least to greatest.

7. 8, -2, 0, -4, 3



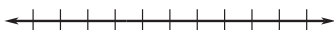
8. -3, 4, 10, -10, 0



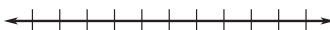
9. 8, -8, 0, 7, -7



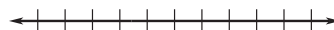
10. -4, -2, -10, 8, 4



11. 0, -15, -22, 19, -14



12. -18, -20, -2, -30, -13





**Read the problem and answer the questions.**

- 13.** Morgan and Mackenzie are comparing their hair length to their friend Jenna's hair length. Morgan states that her hair is  $+3$  inches compared to Jenna's hair and Mackenzie states that her hair is  $-2$  inches compared to Jenna's hair. Who has the shortest hair? Write the girls' names in order of their hair length from shortest to longest.

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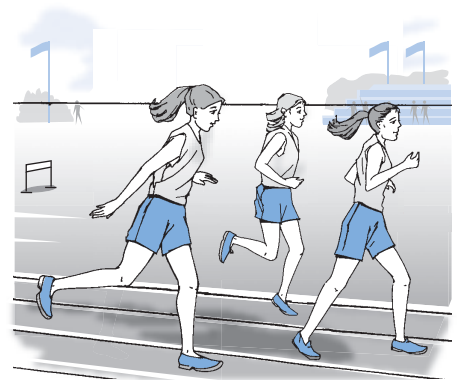
- 14.** The average temperatures during the winter months in a city are  $-12^{\circ}\text{F}$ ,  $10^{\circ}\text{F}$ ,  $-2^{\circ}\text{F}$ ,  $5^{\circ}\text{F}$ , and  $-3^{\circ}\text{F}$ . What is the order of the temperatures from greatest to least?

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- 15.** Paige, Amber, and Bailey are running around a track to see how their times compare with the school record. Paige ran  $-2$  seconds as compared to the record, Amber ran  $+6$  seconds as compared to the school record, and Bailey ran  $+4$  seconds as compared to the school record. Who had the fastest time? Write the girls' names in order from fastest to slowest.




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**DID YOU GET IT?**

- 16. Fill in the missing words.** To order integers from greatest to least using a number line, the greatest integer appears farthest to the \_\_\_\_\_ and the least integer appears farthest to the \_\_\_\_\_.
- 17. Compare.** How can you compare a positive integer to a negative integer?

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# Answer Key

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## Lesson 3-3, pp. 10–13

### Try this:

1.  $>$
2.  $<$
3.  $-7, -1, 3, 8$
4.  $8, 4, -3, -6$

### Practice:

#### 1–12. Check students' drawings.

1.  $9, 4, 1, -2, -7$
2.  $10, 6, 3, -7, -8$
3.  $4, 1, 0, -6, -12$
4.  $11, 10, 5, -3, -5$
5.  $-1, -2, -6, -8, -14$
6.  $0, -11, -13, -22, -25$
7.  $-4, -2, 0, 3, 8$
8.  $-10, -3, 0, 4, 10$
9.  $-8, -7, 0, 7, 8$
10.  $-10, -4, -2, 4, 8$
11.  $-22, -15, -14, 0, 19$
12.  $-30, -20, -18, -13, -2$
13. Mackenzie; Mackenzie, Jenna, Morgan
14.  $10^{\circ}\text{F}, 5^{\circ}\text{F}, -2^{\circ}\text{F}, -3^{\circ}\text{F}, -12^{\circ}\text{F}$
15. Paige; Paige, Bailey, Amber
16. right; left
17. *Sample answer:* Any positive integer is always greater than any negative integer.