

## **Lesson Plan -- Adding and Subtracting Integers**

### **Chapter Resources**

- Lesson 3-7 Add Integers
- Lesson 3-7 Add Integers Answers
- Lesson 3-8 Subtract Integers
- Lesson 3-8 Subtract Integers Answers

**LESSON**  
**3-7**

# Add Integers



**California Standards**

**Gr. 5 NS 2.1:** Add, subtract, multiply, and divide with decimals; **add with negative integers;** subtract positive integers from negative integers; **and verify the reasonableness of the results.**

**Gr. 6 NS 2.3:** Solve **addition**, subtraction, multiplication, and division **problems**, including those arising in concrete situations, **that use positive and negative integers** and combinations of these operations.

**Also included:** Gr. 7 AF 1.3

**Words to Remember**

*Inverse property of addition:* The sum of a number and its opposite is 0.

$a + (-a) = 0$ $-a + a = 0$
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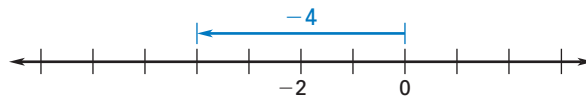
**Getting Started** In Activity 3-6 you learned how to add integers using +1 and -1 cards. You can also use number lines and absolute values to add integers.

**EXAMPLE 1** **Adding Integers Using a Number Line**

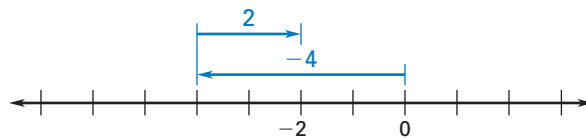
Use a number line to find the sum  $-4 + 2$ .

**Solution**

**Step 1** Begin at 0 and draw an arrow left to 4 units to represent starting at  $-4$ .



**Step 2** Begin at  $-4$  and draw an arrow right 2 units to represent adding 2.



**Step 3** Write the sum.

$-4 + 2 = -2$  since the end of the arrow after adding 2 to  $-4$  is at  $-2$ .

**Adding Opposites** When you add a number and its opposite on a number line, you draw an arrow away from zero (for example, +5 units) and then draw another arrow back in the opposite direction the same number of units (for example, -5 units). The result is 0.

**TRY THIS** Use a number line to find the sum.

1.  $3 + (-2) = \square$



2.  $-5 + 1 = \square$



3.  $4 + (-4) = \square$



4.  $-1 + (-2) = \square$



**EXAMPLE 2****Adding Integers Using Absolute Values**

Use absolute values to find the sum  $-6 + (-5)$ .

**Solution**

**Step 1** Find the absolute value of each term in the expression.

$$|-6| = 6 \text{ and } |-5| = 5$$

**Step 2** Add the absolute values of the integers.

$$6 + 5 = 11$$

**Step 3** Write the sum.

Since both of the original terms in the expression are negative, the sum must also be negative.

$$-6 + (-5)$$

**ANSWER**  $-6 + (-5) = -11$

**TRY THIS** Use absolute values to find the sum.

$$\begin{aligned} 5. \quad -7 + (-8) &= -(|-7| + |-8|) \\ &= -( \square + \square ) \\ &= -( \square ) \\ &= \square \end{aligned}$$

**Adding Integers with Same Sign** Use the sign of the integers in the original expression when using absolute values to add integers with like signs.

**Adding Integers with Different Signs** It is easiest to add integers with opposite signs using a number line, as shown in Example 1. To use absolute values to add integers that have opposite signs, subtract the least absolute value from the greater absolute value. Use the sign of the integer that has the greatest absolute value.

$$\begin{aligned} 3 + (-8) &= -(|-8| - |3|) \\ &= -(8 - 3) \\ &= -5 \end{aligned}$$

$|-8| > |3|$ , so the final result will have the same sign as  $-8$ .

### Summarize

#### Using a Number Line to Add Integers

When an integer is negative, move that many units to the left of 0 or your starting point. When a number is positive, move that many units to the right of zero or your starting point.

#### Using Absolute Values to Add Integers

When the integers have the same sign, begin by finding the absolute values of the integers and then finding their sum. Then use the same sign as the sign of the original integers. When the integers have different signs, subtract the least absolute value from the greater absolute value. Use the sign of the integer with the greater absolute value.

## Practice

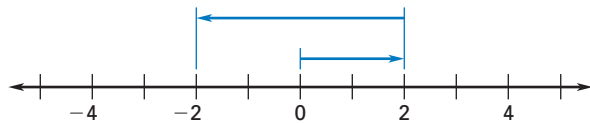
Match each sum with the number line that represents it.

1.  $-4 + 2$  \_\_\_\_\_

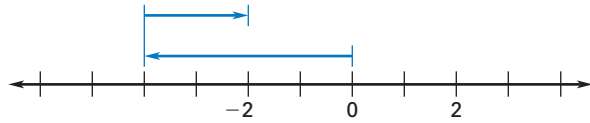
2.  $2 + (-4)$  \_\_\_\_\_

3.  $-2 + 4$  \_\_\_\_\_

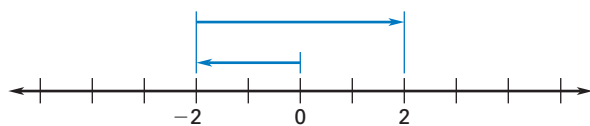
A.



B.



C.



Find the sum using a number line.

4.  $3 + (-6) =$



5.  $-7 + 6 =$



6.  $7 + (-2) =$



Find the sum using absolute values.

7.  $-4 + (-8) =$

8.  $-12 + (-11) =$

9.  $-9 + (-9) =$

10.  $-15 + (-10) =$

11.  $13 + (-6) + (-12) =$

12.  $-70 + (-60) + (-28) =$

13.  $-37 + (-4) + 18 =$

14.  $17 + (-22) + 5 =$

**Write a sum expression to represent the situation and state whether you would use a *number line* or *absolute values* to find the answer. Then solve the problem. Explain what your answer means.**

- 15.** Yoko and Sheila are digging a hole for a fence post. The bottom of their hole is currently **10** inches below the surface of the ground. Yoko digs the hole **5** inches deeper and Sheila digs the hole **8** inches deeper. What is the elevation (in inches) of the bottom of the hole after Sheila is finished?

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- 16.** Jasmine and Harley are planting flowers in their flower box. Jasmine fills a watering can with **3** gallons of water. Harley poured **1** gallon of water onto the flowers. How much water is in the watering can after Harley waters the flowers?




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### DID YOU GET IT?

- 17. Fill in the missing words.** To add two integers with opposite signs use a(n) \_\_\_\_\_. When a number in the sum is negative, then the arrow should move \_\_\_\_\_. When a number in the sum is positive, then the arrow should move \_\_\_\_\_.

- 18. Explain your reasoning.** When is it usually easiest to use absolute values to add integers?

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# Answer Key

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## Lesson 3-7, pp. 26–29

### Try this:

1. Check students' drawings; 1
2. Check students' drawings;  $-4$
3. Check students' drawings; 0
4. Check students' drawings;  $-3$
5. 7; 8; 15;  $-15$

### Practice:

1. B
2. A
3. C
4. Check students' drawings;  $-3$
5. Check students' drawings;  $-1$
6. Check students' drawings; 5
7.  $-12$
8.  $-23$
9.  $-18$
10.  $-25$
11.  $-5$
12.  $-158$
13.  $-23$
14. 0
15.  $-10 + (-5) + (-8)$ ; absolute values;  $-23$  in.; *Sample answer:* The hole is currently 23 inches below the surface of the ground.
16.  $3 + (-1)$ ; number line; 2; *Sample answer:* There are 2 gallons of water left in the can after Harley waters the flowers.
17. number line; left; right
18. *Sample answer:* It is easiest to use absolute values when all of the integers in the sum have the same sign.

**LESSON**  
**3-8**

# Subtract Integers



**California Standards**

**Gr. 5 NS 2.1:** Add, subtract, multiply, and divide with decimals; add with negative integers; **subtract positive integers from negative integers; and verify the reasonableness of the results.**

**Gr. 6 NS 2.3:** Solve addition, **subtraction**, multiplication, and division **problems**, including those arising in concrete situations, **that use positive and negative integers** and combinations of these operations.

### Words to Remember

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

**3 and -3 are opposites.**

**8 and -8 are opposites.**

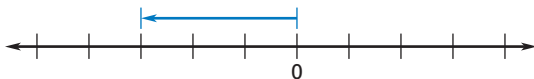
**Subtraction Rule:** To subtract an integer, add its opposite.

$$5 - 8 = 5 + (-8) = -3$$

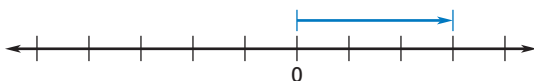
$$2 - (-3) = 2 + (3) = 5$$

**Getting Started** In Lesson 3-7 you added integers. Now you will subtract integers using a number line or the subtraction rule.

**Using a Number Line** When subtracting a *positive integer* using a number line, move to the left of the starting point.



When you are subtracting a *negative integer*, move instead to the right. Because you move to the left when you subtract a positive integer, you move in the opposite direction (to the right) when you subtract a negative integer.



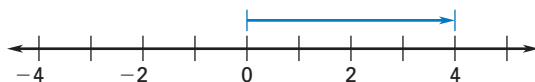
### EXAMPLE 1

### Subtracting a Positive Integer

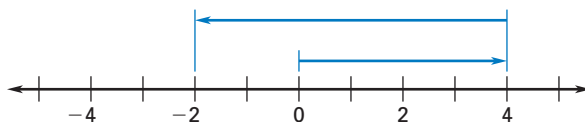
Find the difference  $4 - 6$  using a number line.

**Solution**

**Step 1** Move 4 units to the right of 0.



**Step 2** Move 6 units to the left of 4.



The final position is  $-2$ , so  $4 - 6 = -2$ .

**Step 3** Use the subtraction rule of adding the opposite to check your answer.

$$4 - 6 = 4 + (-6) = -2$$

**Remember**

When subtracting a positive number, move to the left on the number line.

**EXAMPLE 2****Subtracting a Negative Integer**

Use the rule for subtraction to find the difference  $2 - (-3)$ .

**Solution**

**Step 1** Rewrite as adding the opposite.

$$2 - (-3) = 2 + (+3)$$

**Step 2** Add.

$$2 + 3 = 5$$

**Look Back**

See Lesson 3-7 for help with adding integers.

**EXAMPLE 3****Subtracting a Negative Integer**

Use the rule for subtraction to find the difference  $-4 - (-2)$ .

**Solution**

**Step 1** Rewrite as adding the opposite.

$$-4 - (-2) = -4 + (+2)$$

**Step 2** Add.

$$-4 + 2 = -2$$

**EXAMPLE 4****Subtracting a Positive Integer**

Use the rule for subtraction to find the difference  $-6 - 1$ .

**Solution**

**Step 1** Rewrite as adding the opposite.

$$-6 - 1 = -6 + (-1)$$

**Step 2** Add.

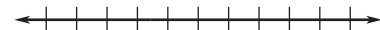
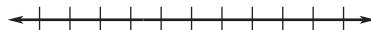
$$-6 + (-1) = -7$$

**TRY THIS**

Use a number line to find the difference.

1.  $3 - 6 =$

2.  $1 - 5 =$



Use the subtraction rule to find the difference.

3.  $3 - (-5) =$

4.  $-5 - 6 =$



### Summarize

#### Subtracting Integers Using a Number Line

To subtract a positive integer, move to the left. To subtract a negative integer, move to the right.

#### Subtracting Integers Using the Subtraction Rule

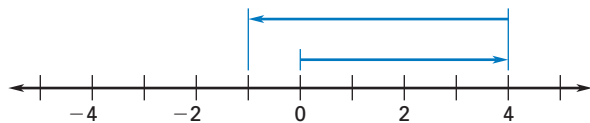
To subtract an integer, add its opposite.

## Practice

Match each difference with the number line that represents it.

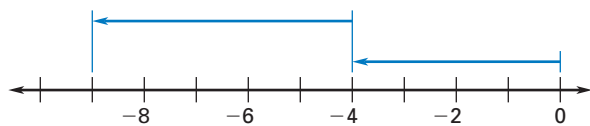
1.  $-4 - 5$  \_\_\_\_\_

A.



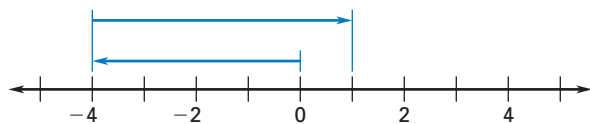
2.  $-4 - (-5)$  \_\_\_\_\_

B.



3.  $4 - 5$  \_\_\_\_\_

C.



Find the difference using a number line.

4.  $3 - 7 =$



5.  $-1 - 2 =$



6.  $-2 - (-2) =$



Find the difference using the subtraction rule.

7.  $-4 - (-8) =$

8.  $2 - (-11) =$

9.  $-9 - (-9) =$

10.  $-15 - 10 =$

11.  $3 - 10 =$

12.  $12 - (-11) =$

13.  $-13 - 13 =$

14.  $-85 - (-20) =$

**Write a difference expression to represent the situation. Then solve the problem and explain what your answer means.**

- 15.** At noon the temperature was  $84^{\circ}\text{F}$ . Eight hours later the temperature had dropped  $14^{\circ}\text{F}$ . What was the temperature at **8:00 P.M.**?

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- 16.** Brandon is saving money to buy a bike that costs **\$185**. He currently has **\$120** in his savings account. How much more does Brandon need to save so he can buy the bike?




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- 17.** An elevator is stopped at a floor **20** feet below ground. It descends to another floor **65** feet below ground. What is the change in elevation of the elevator?

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### DID YOU GET IT?

- 18. Fill in the missing words.** To subtract a positive integer, move to the \_\_\_\_\_ on a number line. To subtract a negative integer, move to the \_\_\_\_\_ on a number line.

- 19. Describe a process.** Describe how to use the subtraction rule.

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# Answer Key

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## Lesson 3-8, pp. 30–33

### Try this:

1. Check students' drawings;  $-3$
2. Check students' drawings;  $-4$
3. 8
4.  $-11$

### Practice:

1. B
2. C
3. A
4. Check students' drawings;  $-4$
5. Check students' drawings;  $-3$
6. Check students' drawings; 0
7. 4
8. 13
9. 0
10.  $-25$
11.  $-7$
12. 23
13.  $-26$
14.  $-65$
15.  $84 - 14$ ; 70; *Sample answer:* The temperature at 8:00 P.M. was  $70^{\circ}\text{F}$ .
16.  $185 - 120$ ; 65; *Sample answer:* Brandon needs to save \$65 more for the bike.
17.  $-65 - (-20)$ ;  $-45$ ; *Sample answer:* The change in elevation of the elevator was  $-45$  feet.
18. left; right
19. *Sample answer:* When subtracting integers, add the opposite of the integer being subtracted.