

Lesson 2-2

Adding Integers



Interactive Study Guide

See pages 31–32 for:

- Getting Started
- Real-World Link
- Notes



Essential Question

What happens when you add, subtract, multiply, and divide integers?



Common Core State Standards

Content Standards

7.NS.1, 7.NS.1a,
7.NS.1b, 7.NS.1d,
7.NS.3, 7.EE.3

Mathematical Practices

1, 2, 3, 4



Vocabulary

additive inverse

What You'll Learn

- Add two integers.
- Add more than two integers.



Real-World Link

Financial Literacy The money you earn can be represented by a positive integer while the money you spend or borrow can be represented by a negative integer. Every time you find the total amount of money you have after earning or spending it, you are adding integers.



Add Integers

The equation $-2 + (-3) = -5$ is an example of adding two integers with the same sign. Notice the sign of the sum is the same as the sign of the addends.

Key Concept Add Integers with the Same Sign

Words To add integers with the same sign, add their absolute values. The sum is:

- positive if both integers are positive.
- negative if both integers are negative.

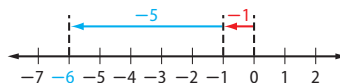
Examples $-2 + (-4) = -6$ $8 + 1 = 9$

Example 1



Find $-1 + (-5)$.

Use a number line.



Step 1 Start at zero.

Step 2 Move 1 unit to the left.

Step 3 From there, move 5 more units to the left.

So, $-1 + (-5) = -6$.

Got It? Do these problems to find out.

Find each sum.

1a. $-3 + (-4)$ **-7**

1b. $-6 + (-14)$ **-20**

1c. $-7 + (-2)$ **-9**

Example 2



Find $-3 + (-6)$.

$-3 + (-6) = -9$ Add $|-3|$ and $|-6|$. Both numbers are negative, so the sum is negative.

Got It? Do these problems to find out.

Find each sum.

2a. $-8 + (-2)$ **-10**

2b. $-1 + (-12)$ **-13**

Key Concept Add Integers with Different Signs

Words To add integers with different signs, subtract their absolute values. The sum is:

- positive if the positive integer's absolute value is greater.
- negative if the negative integer's absolute value is greater.

Examples $9 + (-4) = 5$ $-9 + 4 = -5$

Adding Integers on a Number Line

The sum of p and q is located a distance $|q|$ from p on a number line. The sum is left of p if q is negative and right of p if q is positive.

To add integers with different signs you can also use a number line. Start at zero. Move right to model a positive integer. Move left to model a negative integer.

Example 3



Find each sum.

a. $-3 + 6$

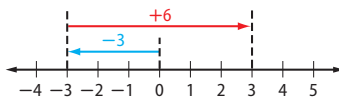
Use a number line.

Step 1 Start at zero.

Step 2 Move 3 units to the left.

Step 3 From there, move 6 units to the right. The sum, 3, is 6 units to the right of -3 .

So, $-3 + 6 = 3$.



b. $1 + (-4)$

Use a number line.

Step 1 Start at zero.

Step 2 Move 1 unit to the right.

Step 3 From there, move 4 units to the left. The sum, -3 , is 4 units to the left of 1.

So, $1 + (-4) = -3$.



Parentheses

Use parentheses around negative numbers that come after operation symbols. So, write $1 + (-4)$, not $1 + -4$.

Got It? Do these problems to find out.

3a. $5 + (-2)$ **3**

3b. $4 + (-8)$ **-4**

Example 4

Find each sum.

a. $12 + (-6)$

$$12 + (-6) = 6$$

To find $12 + (-6)$, subtract $|-6|$ from $|12|$.
The sum is positive because $|12| > |-6|$.

b. $-7 + 5$

$$-7 + 5 = -2$$

To find $-7 + 5$, subtract $|5|$ from $|-7|$.
The sum is negative because $|-7| > |5|$.



Watch Out!

Check the sign of the sum. The sign should be the same as the addend with the greater absolute value. A positive sum does not need a sign.

Got It? Do these problems to find out.

4a. $-20 + 4$ **-16**

4b. $16 + (-5)$ **11**



Example 5



A blue whale was at a depth of 275 feet below the surface of the water. After 10 minutes, it rose 194 feet. What is the current depth of the blue whale? Write an addition equation and then solve. Interpret the sum.

Words

Beginning depth plus increase after 10 minutes = current depth



Variable

Let d = the current depth.



Equation

$$-275 + 194 = d$$

Solve the equation.

Estimate $-275 + 200 = -75$.

$$-275 + 194 = d$$

To find the sum, subtract 194 from $|-275|$.

$$-81 = d$$

The sum is negative because $|-275| > |194|$.

The current depth is -81 feet

or 81 feet below the surface. **Check for Reasonableness** $-81 \approx -75$ ✓

Got It? Do this problem to find out.

5. A scuba diver is 120 feet below the water's surface. She then ascends 83 feet. What is her current depth? Write an addition equation and then solve. Interpret the sum.
 $-120 + 83 = x$; -37 ft; Her current depth is -37 ft or 37 ft below the surface.

Add More than Two Integers

The integers -4 and 4 are opposites. Opposites have the same absolute value but different signs. An integer and its opposite are also called **additive inverses**. The Additive Inverse Property is useful when adding integers.

Key Concept Additive Inverse Property

Words

The sum of any number and its additive inverse is zero.

Examples

$$2 + (-2) = 0$$

Symbols

$$a + (-a) = 0$$



Example 6

Find each sum.

a. $-6 + (-15) + 6$

$$\begin{aligned}
 -6 + (-15) + 6 &= -6 + 6 + (-15) \\
 &= 0 + (-15) \\
 &= -15
 \end{aligned}$$

Commutative Property

Additive Inverse Property

Identity Property of Addition

b. $7 + (-1) + 26 + (-13)$

$$\begin{aligned}
 7 + (-1) + 26 + (-13) &= 7 + 26 + (-1) + (-13) \\
 &= (7 + 26) + [-1 + (-13)] \\
 &= 33 + (-14) \text{ or } 19
 \end{aligned}$$

Commutative Property

Associative Property

Simplify.

Got It? Do these problems to find out.

6a. $4 + (-2) + (-7)$ **-5**

6b. $-10 + 3 + (-7) + 12$ **-2**

6c. $-9 + 12 + (-11)$ **-8**

6d. $-8 + 4 + (-1) + 6$ **-3**

Adding Mentally

- One way to add a group of integers mentally is to look for addends that are opposites.
- Another way is to group the positive addends together and the negative addends together. Then add.

Guided Practice



Find each sum. (Examples 1–4)

1. $-5 + (-6)$ **-11**

2. $14 + (-5)$ **9**

3. $-18 + 11$ **-7**

4. $16 + (-13)$ **3**



Reason Abstractly Write and solve an addition equation. Then interpret the sum. (Example 5)

- A football team gained 6 yards on a play. It then lost 10 yards on the next play. What was the total change of yardage for the team? $6 + (-10) = x$; **-4 yd; The team lost a total of 4 yards.**
- The temperature in Rockford, Illinois, was -3°F . The temperature rose 3 degrees. What is the current temperature? $-3 + 3 = t$; **0°F ; The current temperature is 0°F .**

Find each sum. (Example 6)

7. $-7 + 14 + 7$ **14**

8. $11 + (-2) + (-10)$ **-1**

9. $-5 + 4 + (-5) + 3$ **-3**