

Solve & Discuss It!

A library database shows the total number of books checked out at any given time as a negative number. What are the possible numbers of books that were checked out and checked in on Monday? Explain.

MONDAY
Morning (-37)
Evening (-45)

Make Sense and Persevere How can you use the data to understand what happened during the day?

Lesson 1-4

Subtract Integers

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I can...
subtract integers.

Focus on math practices

Reasoning Suppose the library database showed 0 for Monday evening. What do you know about the number of books checked out and checked in that day?

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Essential Question

How is subtracting integers related to adding integers?

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EXAMPLE 1

Subtract Positive Integers

A football team gains 3 yards on first down. On second down, they lose 8 yards. What is the total change in yards after the first two downs?

Look for Relationships You can use what you know about adding integers to subtract integers.

Change of -8
Change of 3

The team's final position represents a 5-yard loss.

0 represents the team's starting position.

1st down
3-yard gain

2nd down
8-yard loss

Use a subtraction expression to represent the team's change in yards.

$$3 - 8$$

$$= 3 + (-8)$$

Now add.

$$|3| = 3 \text{ and } |-8| = 8$$

$$8 - 3 = 5$$

$$3 - 8 = -5$$

The total change in yards after the first two downs is represented by -5.

Try It!

On the next play, the team gained 5 yards and then lost 6 yards. What is the total change in yards?

5 =

= 5 +

=

The total change in yards is , so they had a total loss of yard.

Convince Me! Is the additive inverse of an integer always negative? Explain.

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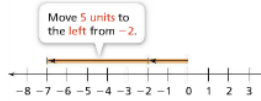
EXAMPLE 2 Subtract Integers with Different Signs

Ian's football team lost 2 yards on a running play. Then they received a 5-yard penalty. What is the team's total change in yards?

Write a subtraction expression to represent the change in yards.

$-2 - 5$
 $= (-2) + (-5)$ Write an equivalent addition expression.

Add.
 $| -2 | = 2$ and $| -5 | = 5$
 $2 + 5 = 7$
 $(-2) + (-5) = -7$
 $-2 - 5 = -7$



The team's total change in yards is represented by -7 , so they lost 7 yards.

EXAMPLE 3 Subtract Negative Integers

Find $-7 - (-8)$.

Write $-7 - (-8)$ as an equivalent addition expression. Then add.

$-7 + (8)$
 $| -7 | = 7$ and $| 8 | = 8$
 $8 - 7 = 1$
 $-7 + (8) = 1$
 $-7 - (-8) = 1$

The signs of the addends are different, so find the difference of the absolute values. The sum has the same sign as the greater absolute value.

Subtracting -8 is the same as adding the opposite of -8 , or $+8$.



Try It!

Subtract. Use a number line to help you find the answer.



- a. $-4 - 6$
- b. $-6 - (-4)$
- c. $4 - (-6)$
- d. $6 - 4$
- e. $4 - 6$
- f. $-4 - (-6)$

KEY CONCEPT

When subtracting integers, such as $a - b$, you can use the additive inverse to write subtraction as an equivalent addition expression.

Subtracting b is the same as adding the opposite of b .

$a - b = a + (-b)$

subtraction → "add the opposite" or "add a line, change the sign"

Do You Understand?

1. **Essential Question** How is subtracting integers related to adding integers?

2. **Reasoning** Explain how to simplify the expression $-98 - 31$ using the additive inverse.

3. **Model with Math** How can you use a number line to represent the subtraction between two integers?

Do You Know How?

4. It was 12°C when Preston got home from school. The weather report shows a storm front moving in that will drop the temperature by 17°C . What is the expected temperature?

5. Complete the equation.
 $-67 - \square = 0$

6. Find the difference.
 a. $41 - 275$
 b. $-15 - 47$
 c. $-72 - (-151)$
 d. $612 - (-144)$

"keep, change, change"
 ex) $-7 + 4$
 then follow addition rules
 (-11)

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

$-72 + (+151)$
 $\begin{array}{r} 151 \\ -72 \\ \hline +79 \end{array}$

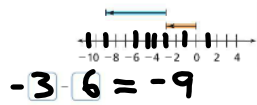
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Practice & Problem Solving

Leveled Practice In 7-8, fill in the boxes to solve.

7. What subtraction expression does the number line model show?



8. What is the value of the expression $-9 - (-5)$?

$-9 - (-5)$
 $= -9 + 5$
 $= \boxed{}$

9. The temperature at the beginning of the day was 6°F . The temperature dropped 9°F by the end of the day. Use the number line to find the temperature at the end of the day.



10. Murphy and Naryam do their math homework together. When they find $9 - (-8)$, they get different answers. Murphy claims the difference is 17. Naryam claims the difference is -1 .

- a. Who is correct?
- b. What error likely led to the incorrect answer?

11. The news reports that today's high temperature is 16°F colder than yesterday's high temperature. Yesterday's high temperature was -2°F .

- a. Write an expression to represent today's high temperature.
- b. **Reasoning** Is today's high temperature positive or negative? Why?

12. Max sprints forward 10 feet and then stops and sprints back 15 feet. Use subtraction to explain where Max is relative to where he started.

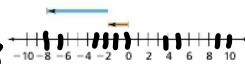


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13. **Higher Order Thinking** Use the number line at the right.

a. What subtraction equation does the number line represent?

$-2 - 6 = -8$



$-2 + 6 = -8$

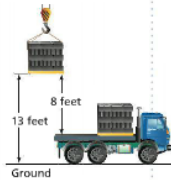
b. Use the number line to represent a different subtraction equation that has the same difference shown in the number line. Write the subtraction equation.



answer to subtraction problem

$-3 - 5 = -8$ or $-8 - 0 = -8$

14. A crane lifts a pallet of concrete blocks 8 feet from the back of a truck. The truck drives away and the crane lowers the pallet 13 feet. What is the final position of the pallet relative to where it started in the back of the truck?



15. **Make Sense and Persevere** At its highest point, the elevation of a county is 5,762 feet above sea level. At its lowest point, the elevation of the county is 9 feet below sea level.

- a. Write an expression using integers to represent the difference between the elevations.
- b. Will the answer be written as a positive or negative integer?
- c. What is the difference between the highest and lowest points of the county?

$-4 - 4 = -8$

Assessment Practice

16. Which number line model shows the subtraction $2 - 4$?

