? ESSENTIAL QUESTION

How do you subtract integers?

EXPLORE ACTIVITY 1   FL 7.NS.1.1

Modeling Integer Subtraction

You can use counters to find the difference of two integers. In some cases, you may need to add zero pairs.

$1 + (-1) = 0$

Model and find each difference using counters.

A Model $-4 - (-3)$.

Start with 4 negative counters to represent -4.

Take away 3 negative counters to represent subtracting -3.

What is left? _____

Find the difference: $-4 - (-3) =$ _____

B Model $6 - (-3)$.

Start with 6 positive counters to represent 6.

You need to take away 3 negative counters, so add 3 zero pairs.

Take away 3 negative counters to represent subtracting -3.

What is left? _____

Find the difference: $6 - (-3) =$ _____

C Model $-2 - (-5)$.

Start with _____ counters.

You need to take away _____ counters, so add _____ zero pairs.

Take away _____ counters.

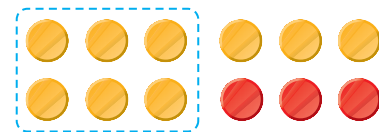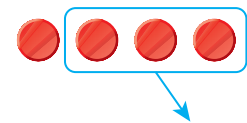What is left? _____

Find the difference: $-2 - (-5) =$ _____

© Houghton Mifflin Harcourt Publishing Company

Reflect

1. **Communicate Mathematical Ideas** Suppose you want to model the difference $-4 - 7$. Do you need to add zero pairs? If so, why? How many should you add? What is the difference?

_____

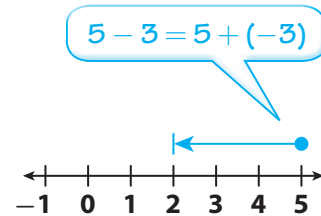_____

_____

EXPLORE ACTIVITY 2   **FL**   **7.NS.1.1, 7.NS.1.1c**

Subtracting on a Number Line

To model the difference $5 - 3$ on a number line, you start at 5 and move 3 units to the left. Notice that you model the sum $5 + (-3)$ in the same way. Subtracting 3 is the same as adding its opposite, -3.

You can use the fact that subtracting a number is the same as adding its opposite to find a difference of two integers.

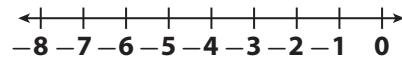$$5 - 3 = 5 + (-3)$$

Find each difference on a number line.

A Find $-1 - 5$ on a number line.

Rewrite subtraction as addition of the opposite.

$$-1 - 5 = -1 + \underline{}$$

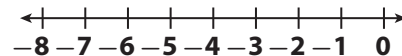Start at _____ and move _____ units to the left.

The difference is _____

B Find $-7 - (-3)$.

Rewrite subtraction as addition of the opposite.

$$-7 - (-3) = -7 + \underline{}$$

Start at _____ and move _____ units to the _____.

The difference is _____

Reflect

2. **Communicate Mathematical Ideas** Describe how to find $5 - (-8)$ on a number line. If you found the difference using counters, would you get the same result? Explain.

_____

_____

_____

_____

_____

Subtracting Integers by Adding the Opposite

You can use the fact that subtracting an integer is the same as adding its opposite to solve problems.

EXAMPLE 1 Real World   FL   7.NS.1.1c, 7.NS.1.1

The temperature on Monday was −5 °C. By Tuesday the temperature rose to −2 °C. Find the change in temperature.

STEP 1   Write a subtraction expression.

final temperature − Monday's temperature = change in temperature

$-2\,°C - (-5\,°C)$

STEP 2   Find the difference.

$-2 - (-5) = -2 + 5$ To subtract −5, add its opposite, 5.

$-2 + 5 = 3$ Use the rule for adding integers.

The temperature increased by 3 °C.

Math Talk
Mathematical Practices

Why does it make sense that the change in temperature is a positive number?

Reflect

3. **What If?** In Example 1, the temperature rose by 3 °C. Suppose it fell from −2 °C to −10 °C. Predict whether the change in temperature would be positive or negative. Then subtract to find the change.

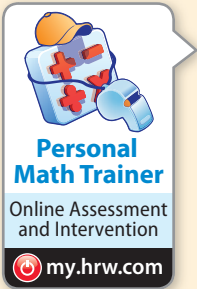_____

_____

Math On the Spot
my.hrw.com

Animated Math
my.hrw.com

YOUR TURN

Find each difference.

4. $-7 - 2 =$ _____

5. $-1 - (-3) =$ _____

6. $3 - 5 =$ _____

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

Guided Practice

Explain how to find each difference using counters. (Explore Activity 1)

1. $5 - 8 =$ _____

_____

_____

_____

_____

2. $-5 - (-3) =$ _____

_____

_____

_____

_____

Use a number line to find each difference. (Explore Activity 2)

3. $-4 - 5 = -4 +$ _____ $=$ _____

$-9\ -8\ -7\ -6\ -5\ -4\ -3\ -2\ -1\ \ \ 0$

4. $1 - 4 = 1 +$ _____ $=$ _____

$-4\ -3\ -2\ -1\ \ \ 0\ \ \ 1\ \ \ 2\ \ \ 3\ \ \ 4$
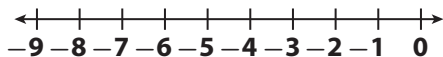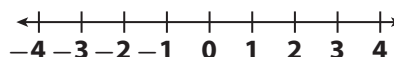
Solve. (Example 1)

5. $8 - 11 =$ _____

6. $-3 - (-5) =$ _____

7. $15 - 21 =$ _____

8. $-17 - 1 =$ _____

9. $0 - (-5) =$ _____

10. $1 - (-18) =$ _____

11. $15 - 1 =$ _____

12. $-3 - (-45) =$ _____

13. $19 - (-19) =$ _____

14. $-87 - (-87) =$ _____

❓ ESSENTIAL QUESTION CHECK-IN

15. How do you subtract an integer from another integer without using a number line or counters? Give an example.

_____

_____

17.3 Independent Practice

Personal Math Trainer
Online Assessment and Intervention
my.hrw.com

16. Theo had a balance of $-\$4$ in his savings account. After making a deposit, he has $25 in his account. What is the overall change to his account?

_____

17. As shown, Suzi starts her hike at an elevation below sea level. When she reaches the end of the hike, she is still below sea level at -127 feet. What was the change in elevation from the beginning of Suzi's hike to the end of the hike?

Current Elevation:
−225 feet

_____

18. The record high January temperature in Austin, Texas, is 90 °F. The record low January temperature is -2 °F. Find the difference between the high and low temperatures.

_____

19. Cheyenne is playing a board game. Her score was -275 at the start of her turn, and at the end of her turn her score was -425. What was the change in Cheyenne's score from the start of her turn to the end of her turn?

_____

20. A scientist conducts three experiments in which she records the temperature of some gases that are being heated. The table shows the initial temperature and the final temperature for each gas.

Gas	Initial Temperature	Final Temperature
A	−21 °C	−8 °C
B	−12 °C	12 °C
C	−19 °C	−15 °C

a. Write a difference of integers to find the overall temperature change for each gas.

Gas A: _____

_____

Gas B: _____

_____

Gas C: _____

_____

b. **What If?** Suppose the scientist performs an experiment in which she cools the three gases. Will the changes in temperature be positive or negative for this experiment? Why?

_____

_____

_____

_____

_____

_____

_____

21. Analyze Relationships For two months, Nell feeds her cat Diet Chow brand cat food. Then for the next two months, she feeds her cat Kitty Diet brand cat food. The table shows the cat's change in weight over 4 months.

	Cat's Weight Change (oz)
Diet Chow, Month 1	−8
Diet Chow, Month 2	−18
Kitty Diet, Month 3	3
Kitty Diet, Month 4	−19

Which brand of cat food resulted in the greatest weight loss for Nell's cat? Explain.

_____

_____

H.O.T. FOCUS ON HIGHER ORDER THINKING

22. Represent Real-World Problems Write and solve a word problem that can be modeled by the difference $-4 - 10$.

_____

_____

_____

23. Explain the Error When Tom found the difference $-11 - (-4)$, he got -15. What might Tom have done wrong?

_____

_____

_____

24. Draw Conclusions When you subtract one negative integer from another, will your answer be greater than or less than the integer you started with? Explain your reasoning and give an example.

_____

_____

_____

_____

25. Look for a Pattern Find the next three terms in the pattern 9, 4, −1, −6, −11, … . Then describe the pattern.

_____