3.3

Solving Equations Using Addition or Subtraction

Essential Question How can you use algebra tiles to solve

addition or subtraction equations?

ACTIVITY: Solving Equations

Work with a partner. Use algebra tiles to model and solve the equation.



ACTIVITY: Solving Equations 2

Work with a partner. Use algebra tiles to model and solve the equation.

a. -5 = n + 2



Solving Equations In this lesson, you will

- write simple equations.
- solve equations using addition or subtraction.
- solve real-life problems. Learning Standard 7.EE.4a

Remove the tiles on the right side tiles to each side. by adding How many zero pairs can you remove from

Model the equation -5 = n + 2.

the right side? Circle them.

The remaining tiles show the value of *n*.



c. 7 + b = -1**b.** v + 10 = -5



d. 8 = 12 + z

Math Practice 3 ACTIVITY: Writing and Solving Equations

Interpret Results

How can you add tiles to make zero pairs? Explain how this helps you solve the equation.



4 ACTIVITY: Using a Different Method to Find a Solution



Work with a partner. The *melting point* of a solid is the temperature at which the solid melts to become a liquid. The melting point of the element bromine is about 19°F. This is about 57°F more than the melting point of mercury.

a. Which of the following equations can you use to find the melting point of mercury? What is the melting point of mercury?

$$x + 57 = 19 \qquad x - 57 = 19 \qquad x + 19 = 57 \qquad x + 19 = -57$$

b. CHOOSE TOOLS How can you solve this problem without using an equation? Explain. How are these two methods related?

-What Is Your Answer?

- **5. IN YOUR OWN WORDS** How can you use algebra tiles to solve addition or subtraction equations? Give an example of each.
- 6. **STRUCTURE** Explain how you could use inverse operations to solve addition or subtraction equations without using algebra tiles.
- 7. What makes the cartoon funny?
- 8. The word *variable* comes from the word *vary*. For example, the temperature in Maine varies a lot from winter to summer.



"Dear Sir: Yesterday you said x = 2. Today you are saying x = 3. Please make up your mind."

Write two other English sentences that use the word vary.



Use what you learned about solving addition or subtraction equations to complete Exercises 5–8 on page 100.

3.3 Lesson







EXAMPLE 2 Wri

Writing an Equation

A company has a profit of \$750 this week. This profit is \$900 more than the profit *P* last week. Which equation can be used to find *P*?

A 750 =	= 900 <i>- P</i>	B	750 = P + 90	00
C 900 =	= <i>P</i> - 750	D	900 = P + 75	50
Words	The profit this week <mark>is</mark>	s <mark>\$900</mark> 1	more than the	e profit last week.
Equation	750 =	= P	+	<mark>900</mark>
• The eq	uation is $750 = P + 90$	0. The	correct answ	er is B .

) On Your Own



4. A company has a profit of \$120.50 today. This profit is \$145.25 less than the profit *P* yesterday. Write an equation that can be used to find *P*.

EXAMPLE 3 Real-Life Application



The line graph shows the scoring while you and your friend played a video game. Write and solve an equation to find your score after Level 4.

You can determine the following from the graph.

Words	Your fri	end's sc	ore <mark>is 33</mark>	points	less than	your score
Variable Let <i>s</i> be your score after Level 4.						
Equation	I	-8	=	S	-	<mark>33</mark>
-8 =	s – 33	Wr	ite equati	on.		
+ 33	+ 33	Ado	dition Pro	perty of I	Equality	
25 =	S	Sim	plify.			

• Your score after Level 4 is 25 points.

Reasonable? From the graph, your score after Level 4 is between 20 points and 30 points. So, 25 points is a reasonable answer.

🕨 On Your Own

5. WHAT IF? You have -12 points after Level 1. Your score is 27 points less than your friend's score. What is your friend's score?

3.3 Exercises



Vocabulary and Concept Check

- **1. VOCABULARY** What property would you use to solve m + 6 = -4?
- 2. VOCABULARY Name two inverse operations.
- **3.** WRITING Are the equations m + 3 = -5 and m = -2 equivalent? Explain.
- **4. WHICH ONE DOESN'T BELONG?** Which equation does *not* belong with the other three? Explain your reasoning.



Practice and Problem Solving

Solve the equation. Check your solution.

5. $a - 6 = 13$	6. $-3 = z - 8$	7. $-14 = k + 6$	8. $x + 4 = -14$
9. $c - 7.6 = -4$	10. $-10.1 = w + 5.3$	11. $\frac{1}{2} = q + \frac{2}{3}$	12. $p - 3\frac{1}{6} = -2\frac{1}{2}$
13. $g - 9 = -19$	14. $-9.3 = d - 3.4$	15. $4.58 + y = 2.5$	16. $x - 5.2 = -18.73$
17. $q + \frac{5}{9} = \frac{1}{6}$	18. $-2\frac{1}{4} = r - \frac{4}{5}$	19. $w + 3\frac{3}{8} = 1\frac{5}{6}$	20. $4\frac{2}{5} + k = -3\frac{2}{11}$

21. ERROR ANALYSIS Describe and correct the error in finding the solution.



Write the word sentence as an equation. Then solve.

2 22. 4 less than a number *n* is -15.

23. 10 more than a number *c* is 3.

- **24.** The sum of a number y and -3 is -8.
- **25.** The difference between a number p and 6 is -14.

In Exercises 26–28, write an equation. Then solve.

- **26. DRY ICE** The temperature of dry ice is -109.3° F. This is 184.9°F less than the outside temperature. What is the outside temperature?
- **27. PROFIT** A company makes a profit of \$1.38 million. This is \$2.54 million more than last year. What was the profit last year?
- **28. HELICOPTER** The difference in elevation of a helicopter and a submarine is $18\frac{1}{2}$ meters. The elevation of the submarine is $-7\frac{3}{4}$ meters. What is the elevation of the helicopter?

GEOMETRY Write and solve an equation to find the unknown side length.

29. Perimeter = 12 cm
 30. Perimeter = 24.2 in.
 31. Perimeter = 34.6 ft

 ? 3 cm
 ? 8.3 in.
 ?

 5 cm
 ? 3.8 in.
 5.2 ft
 6.4 ft

 11.1 ft
 11.1 ft
 11.1 ft

In Exercises 32–36, write an equation. Then solve.

305 ft

- **32. STATUE OF LIBERTY** The total height of the Statue of Liberty and its pedestal is 153 feet more than the height of the statue. What is the height of the statue?
- **33. BUNGEE JUMPING** Your first jump is $50\frac{1}{6}$ feet higher than your second jump. Your first jump reaches $-200\frac{2}{5}$ feet. What is the height of your second jump?
- **34.** TRAVEL Boatesville is $65\frac{3}{5}$ kilometers from Stanton. A bus traveling from Stanton is $24\frac{1}{2}$ kilometers from Boatesville. How far has the bus traveled?
- **35. GEOMETRY** The sum of the measures of the angles of a triangle equals 180°. What is the measure of the missing angle?



40. |x| + 5 = 18

30.3°

m

40.8

36. SKATEBOARDING The table shows your scores in a skateboarding competition. The leader has 311.62 points. What score do you need in the fourth round to win?

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37.	CRITICAL THINKING	Find the value of $2x - 1$ when $x + 6 = 2$.

- Find the values of *x*. **38.** |x| = 2 **39.** |x| - 2 = 4

Fair Game Review What you learned in previous grades & lessons

Multiply or divide. (Section 1.4 and Section 1.5)

41. -7×8 **42.** $6 \times (-12)$ **43.** $18 \div (-2)$ **44.** $-26 \div 4$

45. MULTIPLE CHOICE A class of 144 students voted for a class president. Three-fourths of the students voted for you. Of the students who voted for you, $\frac{5}{9}$ are female. How many female students voted for you? (Section 2.4)

(A 50 **(B)** 60 **(C)** 80 **(D)** 108