

Vocabulary

inverse operations,
p. 91

Solving Equations Using Addition *or* Subtraction

BEFORE

You solved equations
using mental math.

▶ Now

You'll solve equations using
addition or subtraction.

WHY?

So you can determine the size of
a star, as in Ex. 30.

Inverse operations are two operations that undo each other, such as addition and subtraction. When you perform the same inverse operation on each side of an equation, you obtain an *equivalent equation*. **Equivalent equations** have the same solution.

Subtraction Property of Equality

Words Subtracting the same number from each side of an equation produces an equivalent equation.

Numbers If $x + 3 = 5$, then $x + 3 - 3 = 5 - 3$, or $x = 2$.

Algebra If $x + a = b$, then $x + a - a = b - a$, or $x = b - a$.

$$\cancel{-7} + x + \cancel{7} = 15 - 7$$
$$x = 8$$

Addition Property Just as you can use the subtraction property of equality to solve an equation involving addition, you can use the *addition property of equality* to solve an equation involving subtraction.

Addition Property of Equality

Words Adding the same number to each side of an equation produces an equivalent equation.

Numbers If $x - 3 = 5$, then $x - 3 + 3 = 5 + 3$, or $x = 8$.

Algebra If $x - a = b$, then $x - a + a = b + a$, or $x = b + a$.

LESSON

2.5

Name _____ Date _____

Practice A

For use with pages 90-95

Solve the equation. Check your solution.

1. $a + 5 = 7$

2. $z + 4 = 2$

3. $g + 3 = -8$

$$\begin{aligned}x + G + x &= -8 + 3 \\G &= -11\end{aligned}$$

4. $12 = b + 9$

5. $-3 = c + 7$

6. $-10 = f + 6$

$$\begin{aligned} -7 + -3 &= c + 7 + 7 \\ -10 &= c \end{aligned}$$

7. $d - 8 = 4$

8. $h - 1 = -16$

9. $k - 5 = 9$

$$d - 8 + 8 = 4 + 8$$
$$d = 12$$

$$h + 1 = -16 + 1$$
$$h = -15$$

10. $14 = m - 7$

11. $-18 = w - 2$

12. $-21 = y - 6$

13. $-24 = j + 16$

14. $x - 11 = 3$

15. $17 = u - 10$

$$11 + X - 11 = 3 + 11$$

$$X = 14$$

16. The advertised price of a video game system is \$100 after a \$40 mail-in rebate. Using the verbal model below, write and solve an equation to find the price of the video game system before the rebate is applied.

| | | | | |
|------------------------|---|------------------|---|-----------------------|
| Price before rebate | - | Rebate amount | = | Price after rebate |
|------------------------|---|------------------|---|-----------------------|

$$x - 40 = 100 + 40$$

$$x = 140$$

$$-7 + 18 = G + 7 + 7$$

$$11 = G$$

$$G = 11$$

- 17.** From 1994 to 2004, the population of a town increased by 310 people. The population in 2004 was 5614 people. Write and solve an equation to find the population in 1994.

$$x + 310 = 5614$$

$$x = 5304$$

Solve the equation. Check your solution.

18. $4 + 9 + m = 13$

19. $11 - r + 5 = 8$

20. $t + 2 + 10 = 17$

$$4 + 9 + m = 13$$

$$-13 + 13 + m = 13 - 13$$

$$m = 0$$

$$\begin{aligned} 11 - r + 5 &= 8 \\ -16 + 16 - r &= 8 - 16 \\ -r &= -8 \end{aligned}$$

$$\begin{aligned} -1 \cdot -r &= -8 : 1 \\ r &= 8 \end{aligned}$$

$$t + 2 + 10 = 17$$

$$\begin{aligned} -12 + t + 12 &= 17 - 12 \\ t &= 5 \end{aligned}$$

$$\begin{aligned} 11 - r &= 8 - r \\ 8 - r &= 8 - r + r + 0 \\ 8 &= 8 \\ r &= 8 \end{aligned}$$

21. $-16 = a + 3 - 7$

22. $z - 6 - 12 = -14$

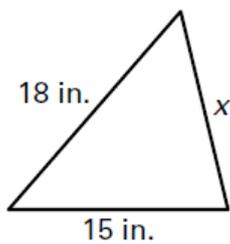
23. $1 = 5 + 15 - d$

$$z + 6 + 12 = -14$$

$$18 + z + -18 = -14 + 18$$

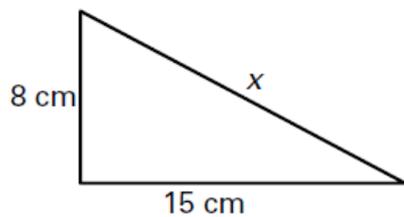
$$z = 4$$

24. The triangle shown has a perimeter of 47 inches. Write an equation to find the value of x in the triangle. Then solve the equation.



$$\begin{aligned} 18 + 15 + x &= 47 \\ -33 \quad -33 & \quad -33 \\ \hline 33 + x &= 47 \quad -33 \\ x &= 14 \end{aligned}$$

25. The triangle shown has a perimeter of 40 centimeters. Write an equation to find the value of x in the triangle. Then solve the equation.



$$15 + 8 + x = 40$$
$$-23 \quad -23 \quad +x = 40 \quad -23$$
$$x = 17$$