$$|x+5| = |2x+1|$$

$$x+5 = 2x+1 \quad \text{or} \quad x+5 = -(2x+1)$$

$$x+5-x = 2x+1-x \qquad x+5 = -2x-1$$

$$5 = x+1 \qquad x+5+2x = -2x-1+2x$$

$$5-1 = x+1-1 \qquad 3x+5 = -1$$

$$4 = x \qquad 3x+5-5 = -1-5$$

$$3x = -6$$

$$\frac{3x}{3} = \frac{-6}{3}$$

$$x = -2$$

Note the use of parentheses. We want the opposite of the entire expression $(2x+1)$.

Make sure to check that both 4 and -2 satisfy the original equation.

Now work margin exercise 2.

Margin Exercise Answers

1. a. $x = -8, 8$ **b.** $x = -\frac{6}{5}, 2$ **c.** no solution **d.** $x = -2, \frac{3}{2}$ **2.** $x = -11, 3$

9.9 Exercises

Concept Check

Fill-in-the-Blank. Complete each sentence using information found in this section.

1. If an absolute value expression is isolated on one side of an equation, the equation is in _____ form.

2. If two numbers have the same absolute value, then either they are _____ or they are _____ of each other.

3. The absolute value of a number is its _____ from 0 on the number line.

4. The absolute value of any number must be _____ or 0.

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

5. Equations involving absolute value can only have one solution.

6. If two numbers have the same absolute value, they must be equal to each other.

7. There is no number that has a negative absolute value.

8. If $|a| = |b|$, we can only rewrite it as $a = b$.

Practice

Solve each absolute value equation. See Examples 1 and 2.

1. $|x| = 8$

2. $|x| = 6$

3. $|z| = -\frac{1}{5}$

4. $|z| = \frac{1}{5}$

5. $|x+3| = 2$

6. $|y+5| = -7$

7. $|6x-1| = 9$

8. $|3x+1| = 8$

9. $|6n+4| = 8$

10. $|3x-5| = 10$

11. $|3x+4| = -9$

12. $|-2x+1| = -3$

13. $|-5x+10| = 0$

14. $|6y+4| = 0$

15. $|-4x+1| = 7$

16. $|-3x+4| = 7$

17. $|5x-2|+4 = 7$

18. $|2x-7|-1 = 0$

19. $|-3x+4|-2 = 3$

20. $|-x+5|+1 = 9$

21. $\left|\frac{1}{4}x - \frac{1}{2}\right| = 6$

22. $\left|\frac{1}{5}y - \frac{2}{3}\right| = \frac{2}{3}$

23. $5\left|\frac{x}{2}+1\right|-7 = 8$

24. $6\left|\frac{x}{5}-2\right|+5 = 11$

25. $3\left|\frac{x}{3}+1\right|-5 = -2$

26. $2\left|\frac{x}{4}-3\right|+6 = 10$

27. $|2x-1| = |x+2|$

28. $|2x-5| = |x-3|$

29. $|x+3| = |x-5|$

30. $|x-8| = |x+4|$

31. $|3x+1| = |4-x|$

32. $|5x+4| = |1-3x|$

33. $\left|\frac{3x}{2}+2\right| = \left|\frac{x}{4}+3\right|$

34. $\left|\frac{x}{3}-4\right| = \left|\frac{5x}{6}+1\right|$

35. $\left|\frac{2x}{5}-3\right| = \left|\frac{x}{2}-1\right|$

36. $\left|\frac{4x}{3}+7\right| = \left|\frac{x}{4}+2\right|$