2-6 Solve Absolute-Value Equations

Name _____ Date _____

Solve: $3|x + 1| = 12$

$\frac{3|x + 1|}{3} = \frac{12}{3}$ ← Divide by 3 to isolate the absolute-value expression.

$|x + 1| = 4$

$x + 1 = 4$ or $x + 1 = -4$ ← Consider two cases.

$x + 1 - 1 = 4 - 1$ $x + 1 - 1 = -4 - 1$ ← Solve each equation.

$x = 3$ $x = -5$

Check: $3|x + 1| = 12$

$3|\mathbf{3} + 1| \stackrel{?}{=} 12$ and $3|\mathbf{-5} + 1| \stackrel{?}{=} 12$

$3|\mathbf{4}| \stackrel{?}{=} 12$ $3|\mathbf{-4}| \stackrel{?}{=} 12$

$3(\mathbf{4}) \stackrel{?}{=} 12$ $3(4) \stackrel{?}{=} 12$

$12 = 12$ **True** $12 = 12$ **True**

Solution set: $\{-5, 3\}$

Find the solution for each equation. Then check your solutions.

1. $|b| = 2$

b = 2 or b = –2

Check: |b| = 2

|2| ≟ 2 AND |–2| ≟ 2

2 = 2 True 2 = 2 True

{−2, 2}

2. $|d| = 11$

3. $|r| = 9.1$

4. $|v| = 15.4$

5. $|p| = \frac{5}{8}$

6. $|w| = \frac{4}{5}$

7. $|f + 7| = 13$

8. $|k + 9| = 22$

9. $|m - 5| = 34$

10. $|t - 14| = 47$

11. $|7x| = 28$

12. $|5y| = 95$

13. $-|2u| = -16$

14. $-|7w| = -98$

15. $|v + 1.2| = 3.7$

16. $|t + 7.3| = 4.8$

17. $\left|g + \frac{1}{2}\right| = \frac{3}{4}$

18. $\left|h + \frac{3}{8}\right| = \frac{1}{2}$

19. $|11w| = -88$

20. $-|2n| = 16$

Find the solution set for each equation. Then check your solutions.

21. $|k + 5| - 2 = 23$

$|k + 5| - 2 = 23$
$|k + 5| = 25$
$k + 5 = 25$ or $k + 5 = -25$
$k = 20$ $\quad k = -30$
$\{-30, 20\}$
Check: $|-30 + 5| - 2 \stackrel{?}{=} 23$
True $\longrightarrow 23 = 23$
$|20 + 5| - 2 \stackrel{?}{=} 23$
True $\longrightarrow 23 = 23$

22. $|j + 7| - 4 = 15$

23. $|j - 4| + 8 = 8$

24. $|q - 2| + 11 = 11$

25. $3|n + 1| = 18$

26. $4|m + 3| = 40$

27. $-5|n + 1| = 25$

28. $2|a + 23| = -12$

29. $6|z - 2| + 4 = 40$

Write and solve an equation for each problem. Check your solutions.

30. Twelve more than the absolute value of a number decreased by 7 is 19. What are the possible values for the number?

31. Kyle wants to score within 4.5% of 94% on his next test. What are the maximum and minimum scores he is aiming for?

CRITICAL THINKING

32. Why does the equation $|x - 4| = -2$ have no solution? (*Hint:* Use the concept that the absolute value of two numbers is the distance between them.)