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RETEACHING

1.2 SOLVING EQUATIONS AND INEQUALITIES

A **variable** is used to represent an unknown value. To find the **solution** of an equation, look for the value(s) that make the equation true.

Use these properties to isolate the variable: These are true for any values of a, b, and c.
Addition Property of Equality: If $a = b$, then $a + c = b + c$.
Subtraction Property of Equality: If $a = b$, then $a - c = b - c$.
Multiplication Property of Equality: If $a = b$, then $a \cdot c = b \cdot c$, for $c \neq 0$.
Division Property of Equality: If $a = b$, then $\frac{a}{c} = \frac{b}{c}$, for $c \neq 0$.

These properties state that both sides of an equation can be added, subtracted, multiplied, or divided by the same number and the equation will remain true.
Note: It may be easier to isolate the variable on one side by adding or subtracting first, and then multiplying or dividing.

EXAMPLE 1 Solve $4x - 2 = 10$. ***SOLUTION***

$$4x - 2 = 10$$
Addition Property of Equality
$$4x - 2 + 2 = 10 + 2$$
Division Property of Equality
$$\frac{4x}{4} = \frac{12}{4}$$
$$x = 3$$

An **inequality** looks like an equation but has a $<$, $>$, $\leq$, or $\geq$ instead of an = sign. Inequalities are solved the same as equations, except that when both sides are multiplied or divided by a negative value, the direction of the inequality symbol changes.

EXAMPLE 2 Solve $-4(x - 3) \geq 20$. ***SOLUTION***

$$-4(x - 3) \geq 20$$
Division Property of Equality
$$\frac{-4(x-3)}{-4} \geq \frac{20}{-4}$$
Reverse the inequality symbol.
$$x - 3 \leq -5$$
Addition Property of Equality
$$x \leq -2$$

EXERCISES

Solve each equation.

1. $3x - 5 = 2(x + 1)$
2. $3 - 10n = 23$
3. $6 + 3b = 7b - 18$
4. $-3(2s + 1) = 21$

Solve each inequality.

5. $3x + 2 > 11$
6. $6 - 2y \leq y + 18$
7. $-5(r - 2) < 20$
8. $7k + 6 \leq -15$

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EXTRA PRACTICE 1.2 SOLVING EQUATIONS AND INEQUALITIES

Solve each equation. Check each solution.

1. $6 - x = 14$

2. $2n - 5 = 7$

3. $0.2(2y + 4) = 6$

4. $\frac{4m - 2}{6} = -2$

5. $-4w + 3 = 2w - 15$

6. $3(a - 1) = 9(2a + 2)$

7. $-7p - 2(p - 1) = 11$

8. $3d - 6 = 9(2 - d)$

Solve each inequality. Check each solution.

9. $\frac{3f + 2}{5} \leq 4$

10. $3b - 5 > 16$

11. $8 - v \leq 4$

12. $-2(r + 3) \leq 16$

13. $-4u + 2 \geq 2u + 26$

14. $3g - 2(g + 1) < 5$

15. $\frac{2k - 1}{2} > -3$

16. $-7h + 10 > 2h - 17$

EXTRA PRACTICE 1.2 SOLVING EQUATIONS AND

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RETEACHING

1.3 ABSOLUTE VALUE EQUATIONS AND INEQUALITIES

The **absolute value** of a number is the distance on a number line that the number is from zero. Because absolute value is distance, it is always positive. When solving absolute value equations, first isolate the absolute value expression. Because there are two values that have the same distance from zero, split the equation into two equations.

EXAMPLE 1

Solve $|x| = 7$.

SOLUTION

There are two numbers that are 7 units from zero; 7 and –7.

Therefore, $x = 7$ or $x = -7$.

EXAMPLE 2

Solve $3 + 2|x - 1| = 9$.

SOLUTION

$2|x - 1| = 6$ Isolate the absolute value expression.

$|x - 1| = 3$ Re-write to consider the two cases, 3 and –3.

$x - 1 = 3$ or $x - 1 = -3$

$x = 4$ or $x = -2$

The solution to **absolute value inequalities** will include a < , >, ≤, or ≥ symbol.

$|x| > 4$ means that the distance x is from zero is greater than 4. So x must be to the right of 4 on the number line or to the left of –4. Write this as $x > 4$ or $x < -4$.

$|x| \leq 3$ means that the distance x is from zero is at most 3. So x must be between –3 and 3. Write this as $-3 < x < 3$.

EXAMPLE 3

Solve $|x - 9| > 2$.

SOLUTION

The distance $x - 9$ is from zero is greater than 2, so:

$x - 9 > 2$ or $x - 9 < -2$

$x > 11$ or $x < 7$

EXAMPLE 4

Solve $|2x - 1| < 5$.

SOLUTION

The distance $2x - 1$ is from zero is less than 5, so:

$$-5 < 2x - 1 < 5$$

$$-5 + 1 < 2x - 1 + 1 < 5 + 1$$

$$-4 < 2x < 6$$

$$-2 < x < 3$$

The answer will be a compound inequality.

EXERCISES

Solve each absolute value equation.

1. $|2x - 3| = 11$

2. $2 + |y + 1| = 5$

Solve each absolute value inequality.

3. $2 + |2n + 5| < 11$

4. $3|b + 6| \geq 12$

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EXTRA PRACTICE 1.3 ABSOLUTE VALUE EQUATIONS AND INEQUALITIES

Solve each equation. Check each solution.

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

2. $3+|p-2|=5$

3. $5+|3n-1|=2$

4. $4|2q-1|=12$

5. $3|m-4|+6=15$

6. $|n-7|=10$

7. $-4+|3+2s|=15$

8. $-4|x-3|=-12$

Solve each inequality.

9. $|u-2|\geq 5$

10. $|3y+1|<5$

11. $|4x+3|\geq 15$

12. $|-2d+5|>7$

13. $3+|2c-1|\geq 1$

14. $3|2m+5|<21$

15. $2|n-7|+5\leq 21$

16. $\frac{1}{2}|k+1|<5$