

EQUATIONS WITH VARIABLES ON BOTH SIDES

Observe equations A and B at the right. What makes equation B different from equation A?

A $5n - 7 = 23$

B $7n - 7 = 2n + 23$

Is there a way to rewrite equation B so that it remains balanced and matches equation A? Explain.

If an equation has variables on both sides of the equal sign, use the following steps to solve:

- STEPS TO SOLVE**
1. Use inverse operations to collect _____ on the same side of the equation
 2. Use inverse operations to collect _____ on the opposite side of the equation
 3. _____ the equation by isolating the variable

Ex. $7n - 7 = 2n + 23$

Solve the following equations with variables on both sides.

<p>1. $8x - 7 = 4x + 21$</p> <p style="text-align: right;">_____</p>	<p>2. $-11x + 9 = -2x + 45$</p> <p style="text-align: right;">_____</p>
<p>3. $13x + 9 = 6x - 12$</p> <p style="text-align: right;">_____</p>	<p>4. $14x + 1 = 8x + 13$</p> <p style="text-align: right;">_____</p>

5. Jane is solving the equation below and plans to first add $12x$ to both sides. Her friend Allie thinks she should instead subtract $8x$ from both sides. Who is correct? Explain.

$8x - 19 = -12x + 61$

In 6-9, find the value of x needed to make the equation true.

6.

$$\frac{1}{4}x + 17 = x - 4$$

7.

$$3(2x + 1) = 5(x - 4)$$

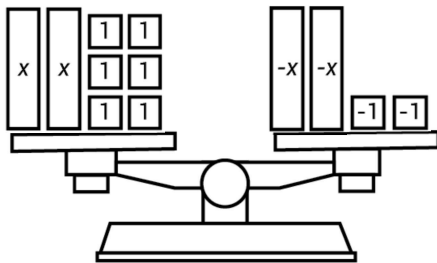
8.

$$6 + 12(x + 3) = 7x + 30 + 6x$$

9.

$$5 + \frac{1}{3}(6x + 9) = -(x - 4)$$

10. Write and solve the equation modeled below.



Equation: _____ Solution: _____

11. Brayden and Ellie each solved an equation as shown below. Circle the name of the student who solved correctly.

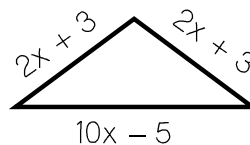
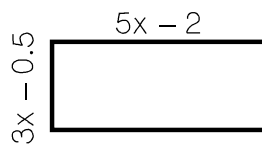
BRAYDEN

$$\begin{aligned} -3x - 4 + x &= -5x + 5 \\ -2x - 4 &= -5x + 5 \\ 3x - 4 &= 5 \\ 3x &= 9 \\ x &= 3 \end{aligned}$$

ELLIE

$$\begin{aligned} 7x - 2 &= -x + 6 \\ 6x - 2 &= 6 \\ 6x &= 4 \\ x &= \frac{2}{3} \end{aligned}$$

12. The perimeters of the rectangle and triangle shown below are equal. Write an equation to represent the situation and solve for x . Then, find the perimeter of each shape.



Equation: _____ $x =$ _____ Perimeter: _____

Summarize today's lesson:

EQUATIONS WITH VARIABLES ON BOTH SIDES

In 1-6, find the value of x needed to make the equation true. Show all work.

<p>1.</p> $22 + 54x = -20 + 60x$ <p style="text-align: center;">_____</p>	<p>2.</p> $-5x - 16 = 8x - 3$ <p style="text-align: center;">_____</p>	<p>3.</p> $2x - 1 = \frac{3}{4}x + 9$ <p style="text-align: center;">_____</p>
<p>4.</p> $22 + 54x = 10(6x - 2)$ <p style="text-align: center;">_____</p>	<p>5.</p> $6 + 8(x - 1) = 2(3x + 4)$ <p style="text-align: center;">_____</p>	<p>6.</p> $\frac{1}{4}(40 - 8x) = 19x + 2 - 5x$ <p style="text-align: center;">_____</p>

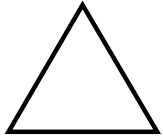
7. The steps at the right show Cam's work in solving an equation. Circle the line where he makes a mistake. Then, find the correct solution to the equation.

$$\begin{aligned}
 -12x + 12 &= -3(5x + 8) \\
 -12x + 12 &= -15x + 24 \\
 3x + 12 &= 24 \\
 3x &= 12 \\
 x &= 4
 \end{aligned}$$

The perimeters of the square and the equilateral triangle shown are equal. Mark each statement below as true or false. If false, rewrite the statement correctly.



$$2.5x - 3$$



$$2x - 2$$

- _____ 8. The situation can be represented by $2.5x - 3 = 2x - 2$.
- _____ 9. The value of $x = 3$.
- _____ 10. The perimeter of each shape is 3 units.