

Bellwork 2.5B Algebraic Proofs

1. Solve and graph: $-4 < -2(x + 5) \leq 12$

2. A company charges between \$100 and \$200 for a visit to your house. They charge a \$25 flat fee and \$15 per hour. Write and solve a compound inequality to find how many hours they will work at your house.

$$\begin{aligned} \textcircled{1} \quad & -4 < -2(x+5) \leq 12 \\ & -4 < -2x - 10 \leq 12 \\ & +10 \quad +10 \quad +10 \\ \hline & 6 < -2x \leq -2 \\ & \frac{6}{-2} < \frac{-2x}{-2} \leq \frac{-2}{-2} \end{aligned}$$

$$\boxed{-3 > x \geq 1}$$

$$\begin{aligned} \textcircled{2} \quad & 100 \leq 15x + 25 \leq 200 \\ & -25 \quad -25 \quad -25 \\ \hline & 75 \leq 15x \leq 175 \\ & \frac{75}{15} \leq \frac{15x}{15} \leq \frac{175}{15} \end{aligned}$$

$$\boxed{5 \leq x \leq 11.67 \text{ hrs}}$$

Properties of Equality

Commutative: $3x + 4 = 4 + 3x$ (the order is flipped)

Associative: $2 + (3 + 4) = (2 + 3) + 4$ (order of operations changes)

Distributive: $4(x - 2) = 4x - 4(2) = 4x - 8$
(multiply into the parenthesis)

Properties of Equality cont.

Addition POE: If you add to one side of your equal sign, you must add to the other

Subtraction POE: If you subtract to one side of your equal sign, you must subtract to the other

Multiplication POE: If you multiply to one side of your equal sign, you must multiply to the other

Division POE: If you divide to one side of your equal sign, you must divide to the other

Now we are going to give the justification for each step as we do it using either an math operation (+, -, x, ÷) or one of our properties (commutative, associative, distributive)

$$1) 4x - 4 = 52$$

Statement (Work)	Reason (Justification)
$ \begin{array}{r} 4x - 4 = 52 \\ + 4 \quad + 4 \\ \hline 4x = 56 \\ \frac{4}{4} \quad \frac{4}{4} \\ \hline \boxed{x = 14} \end{array} $	Given Add POE Simplify DIV POE Simplify

Solve each equation. Justify each step.

$$15 = 2x + 5$$

Statement (Work)	Reason (Justification)
$\begin{array}{r} 15 = 2x + 5 \\ -5 \quad \quad -5 \\ \hline \end{array}$	Given
$\frac{10}{2} = \frac{2x}{2}$	Subt. POE
$5 = x$	Simplify
$\boxed{x = 5}$	Div POE
	Simplify
	Symm. POE

Solve each equation. Justify each step.

$$2 + x = 9 - x$$

Statement (Work)	Reason (Justification)
$\begin{array}{r} 2 + x = 9 - x \\ +x \quad \quad +x \\ \hline \end{array}$	Given
$2 + 2x = 9$	Add POE
$\begin{array}{r} 2 + 2x = 9 \\ -2 \quad \quad -2 \\ \hline \end{array}$	Simplify
$\frac{2x}{2} = \frac{7}{2}$	Subt. POE
$\boxed{x = \frac{7}{2}}$	Simplify
	Div POE
	Simplify

Solve each equation. Justify each step.

$$6(x - 4) = 48$$

Statement (Work)	Reason (Justification)
$6(x - 4) = 48$	Given
$6x - 24 = 48$	DIST. POE
$\begin{array}{r} 6x - 24 = 48 \\ +24 \quad +24 \\ \hline \end{array}$	Add POE
$\frac{6x}{6} = \frac{72}{6}$	Simplify Div POE
$\boxed{x = 12}$	Simplify

Homework

WS 2.5B Algebra Proofs