

Warm-Up

Section 3.1

Solving
Equations

Simplify

$$\frac{p^2+4p}{p^2-2p} * \frac{3p-6}{3p+12}$$

$$\frac{\cancel{p}(p+4)}{\cancel{p}(p-2)} * \frac{\cancel{3}(p-2)}{\cancel{3}(p+4)} = \frac{1}{1} = 1$$

KEY POINTS

Section 3.1 Solving Equations

- Using operations of arithmetic to solve equations
- Equations with constants represented by letters
- Raising both sides of an equation to a power
- Equations with fractional expressions

Discussion

Section 3.1 Solving Equations

What are the rules for solving equations?

Whatever operation we do to one side needs to be done to the other.

Keeping things balanced

Inverse operations

PEMDAS

GOAL: Get the variable by itself!

When we are solving equations, we are using variables to represent an unknown value and we are working to solve for that unknown.

$$3(2x-5) - 5(x-4)$$

$$6x - 15 - 5x + 20$$

$$1x + 5$$

Examples

Section 3.1 Solving Equations

Solve for r:

$$\begin{array}{r} -6 + 7r = -5r \\ +5r \quad +5r \end{array}$$

$$\begin{array}{r} -6 \quad 12r = 0 \\ +6 \quad +6 \end{array}$$

$$\frac{12r}{12} = \frac{6}{12} = .5 \quad \frac{1}{2} = r$$

$$\begin{array}{r} -6 + 7r = -5r \\ -7r \quad -7r \end{array}$$

$$\begin{array}{r} -6 = -12r \\ -12 \quad -12 \end{array}$$

$$\frac{6}{12} = r$$

Examples

Section 3.1 Solving Equations

What happens if there are no numeric values and we are asked to solve the equation? Here is a situation that has no numeric values.

Solve for r: $-a + br = -cr$

$$\begin{array}{r|l} -br & -br \\ \hline -a & -cr - br \\ -a & = r(-c-b) \\ \hline -c-b & -c-b \end{array}$$

$$\frac{-a}{-c-b} = r$$

Solve for h: $A = \frac{1}{2}bh$ $\frac{1}{2} \cdot \frac{b}{1} \cdot \frac{h}{1} = \frac{bh}{2}$

$$2 \cdot A = \frac{bh}{2} \cdot 2$$

$$\frac{2A}{\cancel{b}} = \frac{\cancel{b}h}{\cancel{b}}$$

$$\frac{2A}{b} = h$$

Examples

Section 3.1 Solving Equations

What do you think would happen if we had the following situation?

Solve for a: $\frac{3a}{a+b} = 5$

$$\cancel{a+b} \cdot \frac{3a}{\cancel{a+b}} = 5(a+b)$$

$$3a = 5(a+b)$$

$$3a = 5a + 5b$$

$$\begin{array}{r} -5a - 5a \\ \hline -2a = 5b \\ \hline -2 \quad -2 \end{array}$$

$$a = \frac{5b}{-2}$$

$$a = -\frac{5}{2}b$$

$$a = -\frac{5b}{2}$$

Examples

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$$\sqrt{z} = -2$$

$$(\sqrt{z})^2 = (-2)^2$$

$$z = 4$$

$$\sqrt{4} = -2$$

$$2 = -2$$

No Solution

Examples

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$$\sqrt{w+3} = 4$$

$$(\sqrt{w+3})^2 = (4)^2$$

$$\begin{array}{r} w+3 = 16 \\ -3 \quad -3 \\ \hline \end{array}$$

$$\boxed{w = 13}$$

$$\sqrt{13+3} = 4$$

$$\sqrt{16} = 4$$

$$\boxed{4 = 4}$$

Examples

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$$\sqrt{w+3} = -4$$

$$(\sqrt{w+3})^2 = (-4)^2$$

$$\begin{array}{r} w+3=16 \\ -3 \quad -3 \\ \hline \boxed{w=13} \end{array}$$

$$\sqrt{13+3} = -4$$

$$\sqrt{16} = -4$$

$$4 \neq -4$$

No Solution

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$$\frac{5}{3}(y+4) = \frac{1}{2} - y$$

$$1y = \frac{3y}{3}$$

$$\frac{5y}{3} + \frac{20}{3} = \frac{1}{2} - y$$
$$+ \frac{3y}{3} \quad + \frac{3y}{3}$$

$$\frac{8y}{3} + \frac{20}{3} = \frac{1}{2}$$
$$- \frac{20}{3} \quad - \frac{20}{3}$$

$$\frac{8y}{3} = \left(\frac{1}{2} - \frac{20}{3}\right)$$

$$\frac{8y}{3} = \frac{3}{6} - \frac{40}{6}$$

$$\frac{8y}{3} = \frac{-37}{6} \cdot \frac{3}{8}$$
$$y = \frac{-111}{48}$$

Examples

Section 3.1 Solving Equations

Another area where students struggle is in the area of solving equations that have fractions.

Solve for z: $\frac{4}{z+3} = \frac{5}{7-z}$

$$\frac{\cancel{(z+3)}(7-z)4}{\cancel{z+3}} = \frac{5}{\cancel{7-z}} \cancel{(z+3)(7-z)}$$

$$4(7-z) = 5(z+3)$$

$$\begin{array}{r} 28 - 4z = 5z + 15 \\ -15 \quad \quad -15 \hline \end{array}$$

$$\begin{array}{r} 13 - 4z = 5z \\ +4z \quad +4z \hline 13 = 9z \end{array}$$

$$\frac{13}{9} = \frac{9z}{9}$$
$$\frac{13}{9} = z$$

Examples

Section 3.1 Solving Equations

Solve for z : $t = \frac{b}{z+1}$, if $t \neq 0$ and $b \neq 0$

$$\frac{t}{1} = \frac{b}{z+1}$$

$$1b = t(z+1)$$

$$\begin{array}{r} b = tz + t \\ -t \quad -t \end{array}$$

$$\frac{b-t}{t} = \frac{tz}{t}$$

$$\frac{b-t}{t} = z$$

Examples

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15-25 odd

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$$\frac{2}{2-x} - \frac{3}{x-5} = 0$$

$$\frac{x-5}{x-5} \left(\frac{2}{2-x} \right) - \left(\frac{3}{x-5} \right) \frac{2-x}{2-x} = 0$$

$$\frac{2(x-5) - (3(2-x))}{(x-5)(2-x)} = 0$$

$$2(x-5) - (3(2-x)) = 0$$

$$2x - 10 - (6 - 3x) = 0$$

$$2x - 10 - 6 + 3x = 0$$

$$5x - 16 = 0$$

$$\begin{array}{r} 5x - 16 = 0 \\ +16 +16 \\ \hline \end{array}$$

$$\begin{array}{r} 5x = 16 \\ \hline 5 \quad 5 \end{array}$$

$$x = 16/5$$

Homework

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