

Warm-Up^b

Section 3.1 Simplify

Solving
Equations

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

$$\frac{\cancel{p}(p+4)}{\cancel{p}(p-2)}$$

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

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?

Isolate the variable PEMDAS

Combine like terms

Inverse Operations, whatever you do to one side you do to the other.

GOAL: To get 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.

Examples

Section 3.1 Solving Equations

Solve for r:

$$-6 + 7r = -5r$$

$$\quad \quad -7r \quad -7r$$

$$\hline -6 = -12r$$

$$\hline -12 \quad \quad -12$$

$$r = 2$$

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: $-a + br = -cr$

$$\begin{aligned} & \frac{-br}{-a} = \frac{-br}{-cr} \\ & -a = -cr - br \\ & \frac{-a}{-c-b} = \frac{r(-c-b)}{-c-b} \\ & \frac{-a}{-c-b} = r \frac{-a}{-1(c+b)} = r = \frac{a}{c+b} \end{aligned}$$

Examples

Section 3.1 Solving Equations

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

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

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

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

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

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

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

Examples

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Solving
Equations

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

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

$$z = 4$$

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

$$2 \neq -2$$

No Solution

Examples

Section 3.1
Solving
Equations

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

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

$$w+3 = 16$$

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

Examples

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Equations

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

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

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

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

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

$$4 \neq -4$$

No Solution

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Equations

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

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

$$\begin{array}{r} \frac{5}{3}y + \frac{20}{3} = \frac{1}{2} - y \\ + \frac{3}{3}y \qquad \qquad + \frac{3}{3}y \end{array}$$

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

$$\begin{array}{r} \frac{8}{3}y + \frac{20}{3} = \frac{1}{2} \\ - \frac{20}{3} \quad - \frac{20}{3} \end{array}$$

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

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

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

$$\frac{3}{8} \cdot \frac{8}{3}y = -\frac{37}{6} \cdot \frac{8}{2 \cdot 8}$$

$$y = -\frac{37}{16}$$

19. $\frac{1}{1 + \frac{1}{2-x}} = \frac{2}{3 + \frac{1}{2-x}}$

$$2-x \cdot 1 = \frac{1}{2-x} \cdot 2-x$$

$$1\left(3 + \frac{1}{2-x}\right) = 2\left(1 + \frac{1}{2-x}\right) \quad \begin{array}{r} 2-x = 1 \\ -2 \quad -2 \\ \hline \end{array}$$

$$3 + \frac{1}{2-x} = 2 + \frac{2}{2-x}$$

$$\quad -\frac{1}{2-x} \quad \quad -\frac{1}{2-x}$$

$$\begin{array}{r} -x = -1 \\ \hline -1 \quad -1 \end{array}$$

$$(x = 1)$$

$$3 = 2 + \frac{1}{2-x}$$

$$-2 \quad -2 \quad \quad 2-x$$

Examples

Section 3.1 Solving Equations

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

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

Examples

Section 3.1 Solving Equations

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

Examples

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

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Equations

Homework

Section 3.1
Solving
Equations

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#1 - 14, 15 - 25 odd, 26 - 32

$$26. \frac{A}{L} = \frac{L \cdot w}{L}$$
$$\frac{A}{L} = w$$

15. ~~$\frac{3}{x-2} = \frac{2}{x-3}$~~

$$3(x-3) = 2(x-2)$$
$$3x - 9 = 2x - 4$$
$$\begin{array}{r} -2x \quad -2x \\ \hline 1x - 9 = -4 \\ \quad +9 \quad +9 \\ \hline \boxed{x = 5} \end{array}$$

19.

$$\frac{1}{1 + \frac{1}{2-x}} = \frac{2}{3 + \frac{1}{2-x}} \quad 2-x \cdot 1 = \frac{1}{2-x} \cdot 2-x$$

$$3 + \frac{1}{2-x} = 2 \left(1 + \frac{1}{2-x} \right) \quad \begin{matrix} 2-x = 1 \\ -2 \quad -2 \end{matrix}$$

$$3 + \frac{1}{2-x} = 2 + \frac{2}{2-x}$$

$$-\frac{1}{2-x} \quad -\frac{1}{2-x}$$

$$\begin{matrix} -x = -1 \\ -1 \quad -1 \end{matrix}$$

$$\boxed{x = 1}$$

$$\begin{matrix} 3 = 2 + \frac{1}{2-x} \\ -2 \quad -2 \end{matrix}$$

$$31. \quad 3xt + 1 = 2t - 5x$$

$$\quad \quad \quad \underline{-2t \quad -2t}$$

$$3xt - 2t + 1 = -5x$$

$$\quad \quad \quad \underline{-1 \quad -1}$$

$$3xt - 2t = -5x - 1$$

$$\underline{t(3x-2) = -5x-1}$$

$$\quad \quad \quad \underline{3x-2 \quad 3x-2}$$

$$t = -\frac{5x-1}{3x-2}$$