Solving Rational Equations

WE DO!

Learning Targets

I can solve rational equations in one variable.

I can solve a word problem involving fractional equations (i.e., resistance in physics, work problems, etc.).

$$d = rt$$

$$* \frac{d}{r} = t * \quad \frac{\text{distance } w/\text{ help}}{\text{rate} + \text{help}} + \frac{\text{distance } w/o \text{ help}}{\text{rate} - \text{help}} = \text{time}$$

3. Sandra is rowing a canoe on Stanhope Lake. Her rate in still water is 6 miles per hour. It takes Sandra 3 hours to travel 10 miles round trip. Assuming that Sandra rowed at a constant rate of speed, determine the rate of the current.

x = rate of current

$$(6+x)(6-x)\left[\frac{5(6-x)}{(6+x)} + \frac{5(6+x)}{(6-x)} = \frac{3}{1}\right]$$

LCD: $(6+x)(6-x)$

$$\rightarrow 3(36-x^2)$$

$$30 - 5x + 30 + 5x = 108 - 3x^2$$

$$60 = 108 - 3x^2$$

$$-108 \quad -108$$

$$-48 = -3x^2$$

$$\frac{-48}{-3} = \frac{-3x^2}{-3}$$

$$16 = x^2$$

$$\pm\sqrt{16} = x$$

$$x = \pm 4$$

The rate of the current is 4 mph.

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4. The speed of the wind is 20 miles per hour. If it takes a plane 7 hours to fly 2368 miles round trip, determine the plane's speed in still air.

x = plane's speed in still air

$$\left[\frac{1184}{(x+20)} + \frac{1184}{(x-20)} = \frac{7}{1}\right](x+20)(x-20)$$

$$1184(x-20) + 1184(x+20) = 7(x+20)(x-20)$$

$$7(x^2 - 400)$$

$$1184x - 23680 + 1184x + 23680 = 7x^2 - 2800$$

$$2368x = 7x^2 - 2800$$

$$0 = 7x^2 - 2368x - 2800$$

Use Quadratic

The plane's speed in still air is 339.5 mph

Variation Functions

Obj: Solve a problem involving direct, inverse, or joint variation.

Obj: Compare direct, inverse, and joint variation & identify the type of variation present in a problem.

Direct, Joint, and Inverse Variation

$y = kx$

Direct Variation: "y varies directly as x" if there is some nonzero "constant k" such that "$y = kx$".

As one quantity increases, the other increases.

Constant of Variation: "k" (number)

$$y_1 = kx_1 \qquad y_2 = kx_2$$

***You will use this twice to find the missing x or y.**

Variation Functions

Obj: Solve a problem involving direct, inverse, or joint variation.

Obj: Compare direct, inverse, and joint variation & identify the type of variation present in a problem.

$y = k \times z$

Joint Variation: "y varies jointly as x and z" if there is some number "k" such that $y = kxz$ where $k \neq 0$, $x \neq 0$, and $z \neq 0$.

when one quantity varies directly as the product of two or more quantities

(three variables)

$$y_1 = kx_1z_1 \qquad y_2 = kx_2z_2$$

***You will use this twice to find the missing x, y, or z.**

Variation Functions

Obj: Solve a problem involving direct, inverse, or joint variation.

Obj: Compare direct, inverse, and joint variation & identify the type of variation present in a problem.

$y = \frac{k}{x}$

Inverse Variation: "y varies inversely as x" if there is some nonzero constant "k" such that

$xy = k$ or $y = \frac{k}{x}$

As one quantity increases, the other decreases.

☆ $y_1 = \frac{k}{x_1}$ $y_2 = \frac{k}{x_2}$

***You will use this twice to find the missing x or y.**

Variation Functions

Obj: Solve a problem involving direct, inverse, or joint variation.

Obj: Compare direct, inverse, and joint variation & identify the type of variation present in a problem.

$y = kx$

1) If y varies directly as x and y = - 15 when x = 5, find y when x = 3.

$y = kx$

$-\frac{15}{5} = \frac{k(5)}{5}$

$-3 = k$

$y = -3x$

$y = -3(3)$

$y = -9$

$y = kxz$

2) Suppose y varies jointly as x and z. Find y when x = 10 and z = 5, if y =12 when z=8 and x = 3.

$12 = k(3)(8)$

$\frac{12}{24} = \frac{24k}{24}$

$\frac{1}{2} = k$

$y = \frac{1}{2}xz$

$y = \frac{1}{2}(10)(5)$

$y = 25$

Variation Functions

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Obj: Compare direct, inverse, and joint variation & identify the type of variation present in a problem.

$y = \frac{k}{x} \rightarrow a = \frac{k}{b}$

3) If *a* varies inversely as b and a = -6 when b = 2, find a when b = -7.

$a = \frac{k}{b}$

$2 \cdot -6 = \frac{k}{2} \cdot 2$

$k = -12$

$a = \frac{-12}{b}$

$a = \frac{-12}{-7}$

$a = \frac{12}{7}$

$y = kx$

4) If y varies directly as x and y = 35 when x = 7, find y when x = 11.

$\frac{35}{7} = \frac{k(7)}{7}$

$5 = k$

$y = 5x$

$y = 5(11)$

$y = 55$

YOU TRY #5 AND #6!

Variation Functions

Obj: Solve a problem involving direct, inverse, or joint variation.

Obj: Compare direct, inverse, and joint variation & identify the type of variation present in a problem.

5) If y varies jointly as x and z and y = 18 when x = 2 and z = 3, find y when x = 5 and z = 6.

$y = 90$

$y = \frac{k}{x}$

6) If y varies inversely as x and y = 3 when x = 14, find x when y = 6.

$14 \cdot 3 = \frac{k}{14} \cdot 14$

$42 = k$

$y = \frac{42}{x}$

$x \cdot 6 = \frac{42}{x} \cdot x$

$\frac{6x}{6} = \frac{42}{6}$

$x = 7$

$x = 7$

Variation Functions

Obj: Solve a problem involving direct, inverse, or joint variation.

Obj: Compare direct, inverse, and joint variation & identify the type of variation present in a problem.

7) State whether each equation represents a direct, joint, or inverse variation. Then name the constant of variation.

find k

a) $ab = 20$

$\frac{ab}{b} = \frac{20}{b}$

$a = \frac{20}{b}$

inverse

$k = 20$

b) $x \cdot \frac{y}{x} = -0.5 \cdot x$

$y = -0.5x$

direct

$k = -0.5$

c) $A = \frac{1}{2}bh$

joint

$k = \frac{1}{2}$