

HAT  
Solving Rational Equations  
1/8/18

Warm Up: Solve  $\left( \frac{2x+1}{3} - x = \frac{3}{4} \right) \times 12$

$$2x+1-3x = \frac{9}{4}$$

$$\begin{array}{r} -x+1 = \frac{9}{4} \\ -1 \quad 4 \\ \hline \end{array}$$

$$-x = \frac{5}{4}$$

$$x = -\frac{5}{4}$$

$$\frac{-x+1}{3} = \frac{3}{4}$$

$$\begin{array}{r} -4x+4 = 9 \\ -4 \quad -4 \\ \hline \end{array}$$

$$-4x = 5$$

$$x = -\frac{5}{4}$$

$$4(2x+1) - 12x = 9$$

$$8x+4-12x = 9$$

$$-4x = 5$$

$$x = -\frac{5}{4}$$

To "clear an equation of fractions", multiply each side of the equation by the **least common denominator** of all the fractions in the equation.

Ex#1: Solve  $\frac{5}{24} + \frac{2}{3-x} = \frac{1}{4}$

LCD:  $24(3-x)$

$$\cancel{24(3-x)} \cdot \frac{5}{\cancel{24}} + \cancel{24(3-x)} \cdot \frac{2}{\cancel{3-x}} = \cancel{24(3-x)} \cdot \frac{1}{\cancel{4}}$$

$$15 - 5x + 48 = 18 - 6x$$

$+6x$   $+6x$

$$x + 63 = 18$$

$$-63 \quad -63$$

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$$x = -45$$

Ex#2: Solve  $\frac{x}{x-2} + \frac{1}{x-4} = \frac{2}{x^2 - 6x + 8}$

LCD:  $(x-2)(x-4)$

$(x-4)(x-2)$

$$\cancel{(x-2)(x-4)} \cdot \frac{x}{\cancel{x-2}} + \cancel{(x-4)(x-2)} \cdot \frac{1}{\cancel{x-4}} = \frac{\cancel{(x-4)(x-2)} \cdot 2}{\cancel{(x-4)(x-2)}}$$

$$x^2 - 4x + x - 2 = 2$$

$$x^2 - 3x - 4 = 0$$

$$(x-4)(x+1) = 0$$

$$\cancel{x=4}$$

$$x = -1$$

Ex#3: Solve  $\frac{3a-5}{a-1} - 2 = \frac{2a}{1-a} - 1(a-1)$

LCD:  $a-1$

$$\frac{3a-5}{a-1} - 2 = \frac{-2a}{a-1}$$

$$\cancel{a-1} \cdot \frac{3a-5}{\cancel{a-1}} - \frac{(a-1) \cdot 2}{-2(a-1)} = \cancel{(a-1)} \cdot \frac{-2a}{\cancel{a-1}}$$

$$3a-5 - \cancel{2a} + 2 = -\cancel{2a}$$

$$3a - 3 = 0$$

$$3a = 3$$

$$\cancel{a} = 1$$

NO SOLUTION

Ex#4:

Lilia swims for 5 hours in a stream that has a current of 1 mile per hour. She leaves her dock, swims upstream for 2 miles and then swims back to her dock.

What is her swimming speed in still water?

→ upstream

← downstream

$$R = \frac{D}{T}$$

$$D = R \cdot T$$

$$T = \frac{D}{R}$$

$$T_{\text{upstream}} + T_{\text{downstream}} = 5$$

$$(R+1)(R-1) \left( \frac{2}{R-1} + \frac{2}{R+1} = 5 \right)$$

$$2(R+1) + 2(R-1) = 5(R+1)(R-1)$$

$$2R + 2 + 2R - 2 = 5(R^2 - 1)$$

$$4R = 5R^2 - 5$$

$$0 = 5R^2 - 4R - 5$$

$$R = 1.477 \text{ mph}$$

OR

$$R = -0.677$$

$$R = \frac{4}{2(5)} \pm \frac{\sqrt{(-4)^2 - 4(5)(-5)}}{2(5)}$$

$$R = \frac{2}{5} + \frac{\sqrt{116}}{10} = 1.077$$

Assignment: page 576 #5, 10, 17, 21, 35, 37



January 8, 2018

