

## 11.8 Rational Equations and Functions

Assignment:

Solving rational equations by cross-multiplying:  $\frac{a}{b} = \frac{c}{d}$

$$ad = bc, \text{ Solve}$$

Solving rational equations by multiplying by the LCD:

1) Find LCD

2) Mult LCD to each Rad exp.

3) Simplify (Denominator will cancel)

Examples

4) Solve

Part A

1. Solve the equation by cross-multiplying.

a.  $\frac{15}{2} = \frac{x}{5}$

$$\frac{15}{2} = \frac{x}{5} \implies 75 = \frac{x}{2} \implies x = \frac{75}{2}$$

b.  $\frac{4}{x} = \frac{x}{16}$

$$\frac{4}{x} = \frac{x}{16} \implies x^2 = 64 = 0 \implies (x+8)(x-8) = 0 \implies x = \pm 8$$

$$\frac{4}{8} = \frac{8}{16} \implies 64 = 64 \checkmark$$

c.  $\frac{5}{x+4} = \frac{5}{3(x+1)}$

$$\frac{5}{4\frac{1}{2}} = \frac{5}{4\frac{1}{2}} \implies 15x + 15 = 5x + 20 \implies 10x = 5 \implies x = \frac{1}{2}$$

d.  $\frac{x}{3} = \frac{4}{x-4}$

$$x(x-4) = 12 \implies x^2 - 4x = 12 \implies x^2 - 4x - 12 = 0$$

$$\frac{6}{3} = \frac{4}{2} \implies 2 = 2 \checkmark$$

$$\frac{-2}{3} = \frac{4}{-6} \implies -\frac{2}{3} = -\frac{2}{3} \checkmark$$

$$x^2 - 4x - 12 = 0 \implies (x-6)(x+2) = 0 \implies x-6=0 \implies x+2=0 \implies x=6 \text{ or } x=-2$$

Part B

2. Solve the equation by multiplying by the LCD

LCD = 15x a.  $\frac{2}{5x} = \frac{-3}{15} + \frac{1}{x}$   $\frac{2}{5x} (15x) = \frac{-3}{15} (15x) + \frac{1}{x} (15x)$

$$\frac{2}{15} = \frac{-3}{15} + \frac{1}{3}$$

$$\frac{2}{15} = \frac{-3}{15} + \frac{5}{15}$$

$$\frac{2}{15} = \frac{2}{15} \checkmark$$

$$\begin{array}{r} 6 = -3x + 15 \\ -15 \quad -15 \\ \hline -9 = -3x \\ \frac{-9}{-3} = \frac{-3x}{-3} \quad x = 3 \end{array}$$

LCD =  $(x-7)(x+2)$  b.  $\frac{3}{x-7} + 1 = \frac{8}{x^2-9x+14}$   $\frac{3}{x-7} + \frac{1}{1} = \frac{8}{(x-7)(x-2)}$

$$\frac{3(x-7)(x-2)}{x-7} + \frac{1(x-7)(x-2)}{1} = \frac{8(x-7)(x-2)}{(x-7)(x-2)}$$

$$3(x-2) + x^2 - 9x + 14 = 8$$

$$3x - 6 + x^2 - 9x + 14 = 8$$

$$x^2 - 6x + 8 = 0$$

$$x(x-6) = 0$$

$$x = 0 \quad x = 6$$

$$-2 = -2 \checkmark$$

$$\frac{3}{-1} + 1 = \frac{8}{-1}$$

$$-\frac{6}{14} + \frac{14}{14} = \frac{8}{14}$$

$$\frac{8}{14} = \frac{8}{14} \checkmark$$

LCD  $(x-1)(x+5)$  c.  $\frac{x}{x-1} - \frac{3x}{x+5} = \frac{-24}{x^2+4x-5}$   $\frac{x}{x-1} - \frac{3x}{x+5} = \frac{-24}{(x-1)(x+5)}$

$$\frac{x(x-1)(x+5)}{x-1} - \frac{3x(x-1)(x+5)}{x+5} = \frac{-24(x-1)(x+5)}{(x-1)(x+5)}$$

$$x(x+5) - 3x(x-1) = -24$$

$$x^2 + 5x - 3x^2 + 3x + 24 = 0$$

$$-2x^2 + 8x + 24 = 0$$

$$-2(x^2 - 4x - 12) = 0$$

$$-2(x-6)(x+2) = 0$$

$$\begin{array}{l} x = 6 \\ x = -2 \end{array}$$

$$\frac{6}{5} - \frac{18}{11} = \frac{-24}{55}$$

$$\frac{66}{55} - \frac{90}{55} = \frac{-24}{55}$$

$$\frac{-24}{55} = \frac{-24}{55}$$

3. A college alumni association solicits donations by phone. In 495 calls, 290 alumni have pledged donations. How many consecutive alumni will have to pledge to make the percentage of alumni donating pass 60%?