2.7 Solving Rational Equations   # 31

Rational Equation: an eq. (has an =) made up of 1 or more rational expressions

steps -
- find restrictions (why do I have restrictions?)
- Find the LCD
- Multiply each term in eq. by LCD to clear fractions
- solve the equation
- check for extraneous solutions

$$\frac{x+1}{3x-6} = \frac{5x}{6} + \frac{1}{x-2}$$

Restrictions: $x \neq 2$

LCD: $6(x-2)$

$3(x-2)$

$$2\cancel{6(x-2)}\left(\frac{x+1}{3\cancel{(x-2)}}\right) = \cancel{6(x-2)}\left(\frac{5x}{6}\right) + \cancel{6(x-2)}\left(\frac{1}{x-2}\right)$$

$$2(x+1) = 5x(x-2) + 6$$
$$2x+2 = 5x^2 - 10x + 6$$
$$0 = 5x^2 - 10x - 2x + 4$$
$$0 = 5x(x-2) - 2(x-2)$$
$$0 = (x-2)(5x-2)$$

$\downarrow \qquad \downarrow$

$2 \qquad 2/5$

$x = \cancel{2}, 2/5$

$\boxed{x = 2/5}$

$$\frac{x}{1} - \frac{3x}{x+2} = \frac{6}{x+2}$$

R: $x \neq -2$

LCD: $x+2$

$$(x+2)\,x - (x+2)\left(\frac{3x}{x+2}\right) = (x+2)\left(\frac{6}{x+2}\right)$$

$$x(x+2) - 3x = 6$$

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

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

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

$-2 \qquad 3$

$$\boxed{x = 3}$$

(x)

(x) $7^{(x)}$ (x)

$$x - \frac{7}{x} = 6$$

$x(x) - 7 = 6x$

$x^2 - 6x - 7$

$(x-7)(x+1)$

7   -1

$x \neq 0$

LCD: X

$x = 7, -1$

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

(x-1)(x-3)   (x-1)(x-3)   (x-1)(x-3)

$(x-1)(x-3)$

R: 1, 3

LCD: $(x-1)(x-3)$

$2x(x-3) + (x-1) = 2$

$2x^2 - 6x + (x-1) = 2$

$2x^2 - 5x - 1 = 2$

$-2 \quad -2$

$2x^2 - 5x - 3$

$2x^2 - 6x + x - 3$

$2x(x-3) + 1(x-3) = 0$

$(2x+1)(x-3) = 0$

$-\frac{1}{2} \qquad \cancel{3}$

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

Mixture Problems

$$\% = \frac{\text{part}}{\text{whole}}$$

$$\boxed{\text{concentration}} = \frac{\text{acid}}{\text{total liquid}}$$

How much pure acid must be added to 70 mL of a 30% acid solution to reach mixture of 45% acid?

$$(x+70).45 = \frac{x+21}{x+70}(x+70) \quad 30 \times 70$$

$$.45x + 31.5 = x + 21$$
$$\quad -21 \qquad\qquad -21$$

$$.45x + 10.5 = x$$
$$-.45x \qquad\quad -.45x$$

$$\frac{10.5}{.55} = \frac{.55x}{.55}$$

$$19.09mL = x$$

How much pure juice must be added to 100 mL of a 75% juice drink to reach a drink of 95% juice?

You want to put a rectangular pool in your backyard, you have an area of 200 square meters. To decrease costs, find the least perimeter of a rectangle with this area and the dimensions of the pool.
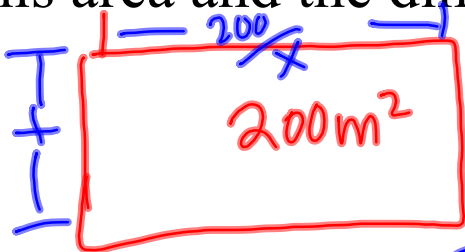
$\frac{200}{x}$

$200m^2$

$200m^2 = lw$

$\frac{200m^2}{x} = \frac{xl}{x}$

$\frac{200}{x} = l$

$P = 2l + 2w$

$P(x) = 2x + 2\left(\frac{200}{x}\right)$

$2x + \frac{400}{x} = P(x)$

P : 56.56
W : 14.14
l : 14.14

$x = 14.14$

$P \rightarrow y = 56.56$