Rational Equations

1. Multiply by the LCD.

HOW DO I SOLVE A RATIONAL EQUATION?

STEPS:

1) **Identify the Excluded Values.**
2) **Find the LCD. Place it over 1.**
3) **Multiply the LCD by all fractions in the equation.**
4) **Cross-Cancel and Cross-Simplify.**
5) **Solve for x.**

- Check your solution against the excluded values.

$$\frac{2}{3} = \frac{4}{(x-4)}$$

EVs: $x \neq 4$

LCD: $\frac{3(x-4)}{1}$

$$\frac{2(x-4)}{1} \cdot \frac{2}{3} = \frac{3(x-4)}{1} \cdot \frac{4}{(x-4)}$$

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

$$2x - 8 = 12$$

$$+8 \quad +8$$

$$\frac{2x}{2} = \frac{20}{2}$$

$$x = 10$$

SOLVE these Examples (don't forget to check answers)

1. $\frac{x}{2} = \frac{x+2}{6}$

2. $\frac{3}{5} = \frac{m+1}{2m}$

x=1

m=5

SOLVE these Examples (don't forget to check answers)

1. $\frac{x}{2} = \frac{(x+2)}{6}$

EVs: NONE
LCD: 6

$\frac{3}{6} \cdot \frac{x}{2} = \frac{6}{1} \cdot \frac{(x+2)}{6}$

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

2. $\frac{3}{5} = \frac{(m+1)}{2m}$

EVs: $m \neq 0$
LCD: $10m$

$\frac{2}{10m} \cdot \frac{3}{5} = \frac{10m}{1} \cdot \frac{(m+1)}{2m}$

$6m = 5(m+1)$
$6m = 5m + 5$
$-5m \quad -5m$
$m = 5$

SOLVE

3. $\frac{y}{5} = \frac{6}{y+7}$

y=3, -10

SOLVE

3. $\frac{y}{5} = \frac{6}{(y+7)}$

EVs: $y \neq -7$

LD: $\frac{5(y+7)}{1}$

$\frac{5(y+7)}{1} \cdot \frac{y}{5} = \frac{5(y+7)}{1} \cdot \frac{6}{(y+7)}$

$y(y+7) = 30$

$y^2 + 7y = 30$

$-30 \quad -30$

$y^2 + 7y - 30 = 0$

$(y+10)(y-3) = 0$

$y+10=0$

$-10 \quad -10$

$y = -10$

$y-3=0$

$+3 \quad +3$

$y = 3$

$$\frac{-3}{15} + \frac{1}{x} = \frac{2}{5x}$$

x=3

$$\frac{-3}{15}+\frac{1}{x}=\frac{2}{5x}$$

EVs: $x \neq 0$

LCD: $\frac{15x}{1}$

$\frac{15x}{1}\cdot\frac{-3}{15}+\frac{15x}{1}\cdot\frac{1}{x}=\frac{15x}{1}\cdot\frac{2}{5x}$

$-3x+15=6$

$-15 \quad -15$

$-3x=-9$

$\frac{-3x}{-3}=\frac{-9}{-3}$

$x=3$

SOLVE

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

x=4

SOLVE

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

EVs: $x \neq 0$

LCD: $\frac{4x}{1}$

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

$12 + x = 16$

$-12 \quad -12$

$x = 4$

SOLVE

5. $\frac{1}{n+1}+\frac{1}{n}=\frac{11}{n^2+n}$

Factor first, then multiply by the LCD.

x=5

SOLVE

5. $\dfrac{1}{n+1}+\dfrac{1}{n}=\dfrac{11}{n^2+n}$

Factor first, then multiply by the LCD.

$n \neq 0$, $n \neq -1$

LCD: $n(n+1)$

$$\frac{1}{(n+1)}+\frac{1}{n}=\frac{11}{n(n+1)}$$

$$\frac{n(n+1)}{1}\cdot\frac{1}{(n+1)}+\frac{n(n+1)}{1}\cdot\frac{1}{n}=\frac{n(n+1)}{1}\cdot\frac{11}{n(n+1)}$$

$$n+n+1=11$$

$$2n+1=11$$

$$-1 \quad -1$$

$$2n=10$$

$$\frac{2n}{2}=\frac{10}{2}$$

$$n=5$$

SOLVE

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

x=-21

SOLVE

6. $\dfrac{4}{(x-3)} + \dfrac{x}{(x+3)} = \dfrac{1}{1}$

EVS: $x \neq 3$, $x \neq -3$

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

$\dfrac{(x-3)(x+3)}{1} \cdot \dfrac{4}{(x-3)} + \dfrac{(x-3)(x+3)}{1} \cdot \dfrac{x}{(x+3)} = \dfrac{(x-3)(x+3)}{1} \cdot \dfrac{1}{1}$

$4(x+3) + x(x-3) = (x-3)(x+3)$

$4x + 12 + x^2 - 3x = x^2 - 9$

$x^2 + x + 12 = x^2 - 9$

$-x^2 + 9 \quad -x^2 + 9$

$x + 21 = 0$

$-21 \quad -21$

$x = -21$