

# Unit 4 Lesson 6

## Rational Equations

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1.  $\frac{7}{7} \cdot \frac{6}{x} = \frac{3}{7} \cdot \frac{x}{x}$  LCD:  $7x$

$$\frac{42}{7x} = \frac{3x}{7x}$$
$$\frac{42}{3} = \frac{3x}{3}$$
$$14 = x$$

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$$2. \frac{x}{x} \cdot \frac{4}{(x-7)} = \frac{6}{x} \cdot \frac{(x-7)}{(x-7)}$$

LCD:  $x(x-7)$

$$\frac{4x}{x(x-7)} = \frac{6x-42}{x(x-7)}$$

$$\begin{array}{r} 4x = 6x - 42 \\ -6x \quad -6x \end{array}$$

$$\begin{array}{r} -2x = -42 \\ -2 \quad -2 \end{array}$$

$$x = 21$$

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$$3. \quad \frac{-5}{x+4} = \frac{1}{x+4}$$

LCD:  $x+4$ 

$$-5 = 1$$

 ~~$\emptyset$~~ 

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

$$-5 = -5$$

$$\mathbb{R}, x \neq -4$$

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$$4 \cdot \frac{6}{6} \cdot \frac{4}{(x+5)} = \frac{x}{6} \cdot \frac{(x+5)}{(x+5)}$$

LCD:  $6(x+5)$ 

$$\frac{24}{6(x+5)} = \frac{x^2 + 5x}{6(x+5)}$$

$$24 = x^2 + 5x$$

$$\begin{array}{r} -24 \qquad \qquad \qquad -24 \\ 24 = x^2 + 5x \end{array}$$

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

$$(x+8)(x-3)$$

$$x = -8 \quad x = 3$$

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$$5. \quad \frac{x-4}{4} + \frac{x}{3} = \frac{6}{1}$$

LCD: 12

$$\frac{3 \cdot (x-4)}{3 \cdot 4} + \frac{x \cdot 4}{3 \cdot 4} = \frac{6 \cdot 12}{1 \cdot 12}$$

$$\frac{3x-12}{12} + \frac{4x}{12} = \frac{72}{12}$$

$$3x-12+4x=72$$

$$7x-12=72$$

$$7x=84$$

$$x=12$$

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

$$\text{LCD: } 2x(x+1)$$

$$-2 \cdot (2x^2 + 2x)$$

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

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

$$\frac{3}{-1} = \frac{-7x}{-1}$$

$$\begin{array}{r} 3x+3-4x^2 = -4x^2-4x \\ -3x \quad +4x^2 \quad +4x^2-3x \end{array}$$

$$3 = -7x$$

$$x = -3/7$$

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$$7. \quad \frac{6}{x} = \frac{1}{4} + \frac{9}{x-1}$$

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

$$\frac{4(x-1)}{4(x-1)} \cdot \frac{6}{x} = \frac{1}{4} \cdot \frac{4x(x-1)}{4x(x-1)} + \frac{9}{(x-1)} \cdot \frac{4x}{4x}$$

$$\frac{(4x-4)6}{4(x-1)(x)} = \frac{x^2 - \cancel{x}}{4x(x-1)} + \frac{36x}{4x(x-1)}$$

$$\frac{24x-24}{4x(x-1)} = \frac{x^2 - x}{4x(x-1)} + \frac{36x}{4x(x-1)}$$

$$24x-24 = x^2 - x + 36x$$

$$24x-24 = x^2 + 35x$$

$$\begin{array}{r} -24x + 24 \\ -24x + 24 \end{array}$$

$$0 = x^2 + 11x + 24$$

$$0 = (x+8)(x+3)$$

$$x = -8 \quad x = -3$$

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8)  $\frac{(x+1)}{(x+1)} \cdot \frac{2x}{x-1} + \frac{x-5}{(x-1)(x+1)} = \frac{1}{1} \cdot \frac{(x+1)(x-1)}{(x+1)(x-1)}$  LCD:  $(x-1)(x+1)$


$$\frac{2x^2 + 2x}{(x+1)(x-1)} + \frac{x-5}{(x-1)(x+1)} = \frac{x^2 - 1}{(x+1)(x-1)}$$

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

$$\begin{array}{r} 2x^2 + 2x + x - 5 \\ -x^2 \phantom{+ 2x} + 1 \\ \hline x^2 + 3x - 4 = 0 \end{array}$$

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

$x = -4$   ~~$x = 1$~~

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$$7) \frac{4x}{3x-2} \cdot \frac{(3x+2)}{(3x+2)} + \frac{2x}{3x+2} \cdot \frac{(3x-2)}{(3x-2)} = \frac{2}{1} \cdot \frac{(3x-2)(3x+2)}{(3x-2)(3x+2)} \text{ LCD: } (3x-2)(3x+2)$$

$$\frac{12x^2 + 8x}{(3x-2)(3x+2)} + \frac{6x^2 - 4x}{(3x-2)(3x+2)} = \frac{2(9x^2 - 4)}{(3x+2)(3x-2)}$$

$$12x^2 + 8x + 6x^2 - 4x = 18x^2 - 8$$

$$\begin{array}{r} 18x^2 + 4x = 18x^2 - 8 \\ -18x^2 \quad -18x^2 \end{array}$$

$$\frac{4x}{4} = \frac{-8}{4}$$

$$x = -2$$

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$$8) \frac{5}{5-x} - \frac{x^2}{5-x} = -\frac{2}{1} + \frac{(5-x)}{(5-x)} \quad \text{LCD: } (5-x)$$

$$\begin{array}{r} 5 - x^2 = -10 + 2x \\ -5 + x^2 \quad -5 \quad + x^2 \end{array}$$

$$\begin{aligned} 0 &= x^2 + 2x - 15 \\ 0 &= (x+5)(x-3) \end{aligned}$$

$$x = -5 \quad x = 3$$

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$$9) \frac{(x+2)}{(x+2)} \cdot \frac{2x-5}{x-2} - \frac{2}{1} \cdot \frac{(x-2)(x+2)}{(x-2)(x+2)} - \frac{3}{x+2} \cdot \frac{(x-2)}{x-2} \quad \text{LCD: } (x-2)(x+2)$$

$$\frac{2x^2 - 1x - 10}{(x+2)(x-2)} - \frac{2(x^2 - 4)}{(x-2)(x+2)} = \frac{3x - 6}{(x+2)(x-2)}$$

$$2x^2 - 1x - 10 - (2x^2 - 4) = 3x - 6$$

$$\cancel{2x^2} - 1x - 10 - \cancel{2x^2} + 4 = 3x - 6$$

$$-1x - 2 = 3x - 6$$

$$\begin{array}{r} +1x \\ -2 = 4x - 6 \\ +6 \quad +6 \end{array}$$

$$4 = 4x$$

$x = 1$

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$$\frac{4}{(x-2)(x-6)} = \frac{x}{x-2} \cdot \frac{(x-6)}{(x-6)} + \frac{1}{x-6} \cdot \frac{(x-2)}{(x-2)} \quad L(0:(x-2)(x-6)$$

$$4 = x^2 - 6x + x - 2$$

$$0 = x^2 - 5x - 6$$

$$0 = (x-6)(x+1)$$

~~$$x=6$$~~

$$x=-1$$

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