

TOPIC: LEAST COMMON DENOMINATORS

Least Common Denominators of Rational Expressions

◆ The **Least Common Denominator** (LCD) is the product of *unique prime* factors each raised to its _____ power.

► To find the LCD: 1) **Factor** the denominators, 2) **Identify** the unique prime factors, and 3) **Multiply** them.

Recall	LCD of Rational Numbers	New	LCD of Rational Expressions
	$\frac{1}{30} \quad \text{and} \quad \frac{1}{20}$ Factor: $\frac{1}{30} = \frac{1}{3 \cdot 2 \cdot 5}$ $\frac{1}{20} = \frac{1}{2 \cdot 2 \cdot 5} = \frac{1}{2^2 \cdot 5}$ Unique prime factors: LCD:		$\frac{1}{30x} \quad \text{and} \quad \frac{1}{20x^2}$ Factor: Unique prime factors: LCD:

EXAMPLE

Determine the LCD of the following rational expressions.

$$\frac{2x}{x+5}, \frac{3}{x^2+7x+10}$$

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PRACTICE

Find the LCD of the rational expressions:

(A)

$$\frac{2y^2 + 3y - 5}{y^2 - 4}, \quad \frac{y - 2}{y^2 + y - 6}$$

(B)

$$\frac{3x^2 - 12}{x^2 - x - 6}, \quad \frac{5x + 10}{x^2 - 4x + 3}$$

(C)

$$\frac{2x^2 + 5x - 3}{x^2 - 9}, \quad \frac{4x - 12}{x^2 - x - 6}, \quad \frac{x^2 + x - 2}{x^2 - 4x + 3}$$

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Write Equivalent Expressions with Common Denominators

- ◆ You will need to rewrite multiple rational expressions to have the **same** denominator (the _____).
- To do that, multiply the numerator **AND** denominator of each rational expression by the *missing factor(s)* of the LCD.

Recall	Equivalent Rational #s	New	Equivalent Rational Expressions
	$\frac{1}{30}$ and $\frac{1}{20}$		$\frac{1}{30x}$ and $\frac{1}{20x^2}$
	LCD: $2^2 \cdot 3 \cdot 5 = \mathbf{60}$		LCD: $2^2 \cdot 3 \cdot 5 \cdot x^2 = \mathbf{60x^2}$
	Missing Factors: $30 = 2 \cdot 3 \cdot 5 \rightarrow$ $20 = 2^2 \cdot 5 \rightarrow$		Missing Factors: $30x = 2 \cdot 3 \cdot 5 \cdot x \rightarrow$ $20x^2 = 2^2 \cdot 5 \cdot x^2 \rightarrow$
	Rewrite each with LCD: $\frac{1}{30} \cdot \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$ $\frac{1}{20} \cdot \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$		Rewrite each with LCD: $\frac{1}{30x} \cdot \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$ $\frac{1}{20x^2} \cdot \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$

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PRACTICE

Rewrite the expression $\frac{3}{x+2}$ into an equivalent expression having a denominator of $(x+2)(x+5)$.

PRACTICE

Rewrite the expression $\frac{7x^2+7x}{x^2-1}$ into an equivalent expression having a denominator of $x-1$.

PRACTICE

Rewrite the expression $\frac{2x^2+2x}{-x^2+1}$ into an equivalent expression having a denominator of $x-1$.

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EXAMPLE

Determine the LCD and then convert the expression to an equivalent rational expression with the denominator equal to the LCD.

$$\frac{2}{3x}, \frac{5}{7x^2y}$$

EXAMPLE

Rewrite the following into equivalent rational expressions with the given denominators.

(A)

$$\frac{9n}{13}$$

Denominator: $13(n - 1)$

(B)

$$\frac{10k}{k + 4}$$

Denominator: $k^2 + 9k + 20$