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
$\frac{1}{30}$ and $\frac{1}{20}$	$\frac{1}{30x}$ and $\frac{1}{20x^2}$
Factor: $\frac{1}{30} = \frac{1}{3 \cdot 2 \cdot 5}$ $\frac{1}{20} = \frac{1}{2 \cdot 2 \cdot 5} = \frac{1}{2^2 \cdot 5}$	**Factor:**
Unique prime factors:	**Unique prime factors:**
LCD:	**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:

$(\boldsymbol{A})$

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

$(\boldsymbol{B})$

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

$(\boldsymbol{C})$

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

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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: $\frac{1}{30} \cdot \frac{\quad}{\quad} = \frac{\quad}{\quad}$ $\frac{1}{20} \cdot \frac{\quad}{\quad} = \frac{\quad}{\quad}$	**Rewrite each with LCD:** $\frac{1}{30x} \cdot \frac{\quad}{\quad} = \frac{\quad}{\quad}$ $\frac{1}{20x^2} \cdot \frac{\quad}{\quad} = \frac{\quad}{\quad}$

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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.

$(\boldsymbol{A})$

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

Denominator: $13(n-1)$

$(\boldsymbol{B})$

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

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