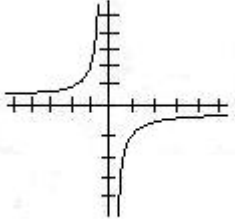


M² = Math Mediator Lesson 44: Multiply & Divide Rational Expressions

<p>Total Recall (Warm-up) (5 minutes approx.)</p>	<p>Total Recall: Exercises based on yesterday's lesson on Graphing Rational Expressions:</p> <p>1. What are the asymptotes for $y = -1/x$? What does the graph look like?</p>  <p style="text-align: center;">Asymptotes are the 'x' and 'y' axes ($x = 0, y = 0$)</p>
<p>Direct Instruction: (7 minutes approx.)</p> <p>CA Std 7.0</p>	<p>Multiplying Rational Expressions: Very similar to multiplying fractions.</p> <p>Example multiplying fractions: $\frac{7}{12} \cdot \frac{3}{7} = \frac{7 \cdot 3}{12 \cdot 7} = \frac{7}{7} \cdot \frac{3}{12} = 1 \cdot \frac{3}{3 \cdot 4} = \frac{1}{4}$</p> <p>Example Rational Expressions: $\frac{2x^2}{5y} \cdot \frac{10y^3}{5x^2} = \frac{2 \cdot x^2 \cdot 10 \cdot y^3}{5 \cdot x^2 \cdot 5 \cdot y} = \frac{4y^2}{5}$</p> <p>Another example: $\frac{xy + 3y}{6x} \cdot \frac{2x^2 - 6x}{x^2 - 9} = \frac{y(x + 3) \cdot 2x(x - 3)}{6x(x + 3)(x - 3)} = \frac{y}{3}$</p>
<p>Practice: (10 minutes approx.)</p>	<p>U-DO: Multiply the following rational expressions:</p> <p>1. $\frac{8}{x} \cdot \frac{x}{9}$ Answer: $\frac{8}{9}$ 2. $\frac{3b}{4b} \cdot \frac{4x^{-1}}{6}$ Answer: $\frac{1}{2x}$</p> <p>3. $\frac{2x + 6}{x^2} \cdot \frac{3x^2}{6x + 18}$ Answer: $\frac{3x^2 \cdot 2(x + 3)}{x^2 \cdot 6(x + 3)} = 1$</p> <p>4. $\frac{(x + 1)^2}{x^3 - x} \cdot \frac{(x - 1)^2}{x}$</p> <p>Answer: $\frac{(x + 1)^2(x - 1)^2}{x(x^2 - 1) \cdot x} = \frac{(x + 1)(x + 1)(x - 1)(x - 1)}{x(x + 1)(x - 1) \cdot x} = \frac{(x + 1)(x - 1)}{x^2}$</p> <p>5. $\frac{b^{-3}}{c^4} \cdot \frac{c^3}{b^4}$ Answer: $\frac{1}{b^3 \cdot b^4 \cdot c} = \frac{1}{b^7 c}$</p>
<p>Direct Instruction: (5 minutes approx.)</p>	<p>Divide Rational Expressions: Same as multiplying by the reciprocal.</p> <p>Example: $\frac{1}{5} \div \frac{3}{5} = \frac{1}{5} \cdot \frac{5}{3} = \frac{1}{3}$</p>

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	<p>Example: $\frac{x^2 - 9}{4x} \div \frac{3x + 9}{2x} = \frac{x^2 - 9}{4x} \cdot \frac{2x}{3x + 9} = \frac{(x + 3)(x - 3)2x}{4x \cdot 3(x + 3)} = \frac{x - 3}{6}$</p>
<p>Practice (8 minutes approx.)</p>	<p>U-DO: Divide the following Rational Expressions:</p> <p>1. $\frac{y}{2} \div \frac{y}{3}$ Answer: $\frac{y}{2} \cdot \frac{3}{y} = \frac{3}{2}$</p> <p>2. $\frac{1}{ab} \div \frac{1}{ab^2}$ Answer: $\frac{1}{ab} \cdot \frac{ab^2}{1} = b$</p> <p>3. $\frac{3k - 3}{k} \div \frac{12k - 12}{4k^2}$ Answer: $\frac{3(k - 1) \cdot 4k^2}{k \cdot 12(k - 1)} = k$</p> <p>4. $\frac{x^2 - 25}{x^2 + 7x} \div \frac{x^2 + 7x + 10}{x^2 + 9x + 14}$ Answer:</p> $\frac{(x + 5)(x - 5) \cdot (x + 7)(x + 2)}{x(x + 7) \cdot (x + 5)(x + 2)} = \frac{x - 5}{x}$
<p>Direct Instruction & Practice (5 minutes approx.)</p>	<p>U-DO:</p> <p>1. Perform the division: $\frac{x - 2}{4m} \div (2 - x)$ Answer: Multiply by the reciprocal, except the reciprocal is multiplied by -1 to make it equal to the $x - 2$ in the numerator. $\frac{(x - 2)}{4m \cdot (-1)(x - 2)} = \frac{1}{-4m} = \frac{-1}{4m}$</p> <p>**However, there is an issue with this example, that in the unsimplified stage of the exercise, there is division by $(x - 2)$ and we know that any zero in the denominator is undefined. Therefore, even though the $(x - 2)$ in the denominator factors out, it is part of the original expression and must still be considered. Therefore, the solution of $-1/4m$ is valid except for $m = 0$ and $x = 2$.</p> <p>2. Negative exponents in the denominator: Try this rational expression multiplication: $\frac{a^{-2}}{a^2 - b^2} \cdot \frac{ab^2 + b^3}{b^{-3}}$ Answer:</p> $\frac{b^3 \cdot b^2(a + b)}{a^2(a + b)(a - b)} = \frac{b^5}{a^2(a - b)}$
<p>Practice (13 minutes approx.)</p>	<p>U-DO:</p> <p>1. If the side of a square measures: $\frac{(x + 1)}{(x + 2)}$, then what is the area of this square? Answer: Area of a square is side squared, so the area would be: $\frac{(x + 1)}{(x + 2)} \cdot \frac{(x + 1)}{(x + 2)} = \frac{(x + 1)^2}{(x + 2)^2}$</p>

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	<p>2. The product: $\frac{x^2 - 100}{x - 2} \cdot \frac{x - 2}{5x - 50} = \frac{x + 10}{5}$ is true for all rational values of 'x' where: a) $x \neq 2$; b) $x \neq 10$; c) $x \neq 2$ & $x \neq 10$; d) $x \neq 2, 5, 10$ Answer: c</p> <p>3. Find the solution if $x = 12$ for: $\frac{3x^2 + 21x}{12x^2} \cdot \frac{4x^2 - 28x}{x^2 - 49}$ Choices are: a) 1; b) 0; c) 12; d) 1/12 ? Answer: $\frac{3x(x+7) \cdot 4x(x-7)}{12x^2(x+7)(x-7)} = 1$ which is for all values of x, except $x = 0, 7, -7$.</p> <p>4. Divide and simplify: $\frac{(2x)^2}{(3y)^3} \div \frac{2x^2}{3y^3}$ Answer: $\frac{4x^2 \cdot 3y^3}{27y^3 \cdot 2x^2} = \frac{2}{9}$</p> <p>5. Divide and simplify: $\frac{x-2}{x-1} \div \frac{x-2}{x-1} = 1$ for all rational values of 'x' except which: a) $x = 1$; b) $x = 2$; c) $x = 1, 2$; d) $x = 0, 1, 2$ Answer: c</p> <p>6. If $\frac{x^2 - 49}{2x + 6}$ is the area of a rectangle with a length that measures $\frac{x+7}{x+3}$ find the width? Answer: $\frac{x^2 - 49}{2x + 6} \div \frac{x + 7}{x + 3} = \frac{(x + 7)(x - 7) \cdot (x + 3)}{2(x + 3) \cdot (x + 7)} = \frac{(x - 7)}{2}$</p> <p>7. Evaluate: $\frac{9 - 2x}{x - 7} \div \frac{2x^2 - 9x}{x^2 - 7x}$ for the following values: a) $x = 1$; b) $x = 10$; and c) $x = 78$ Answer: $\frac{(9 - 2x) \cdot x(x - 7)}{(x - 7) \cdot x(2x - 9)} = \frac{9 - 2x}{2x - 9} = \frac{-1(2x - 9)}{(2x - 9)} = -1$ for all values of 'x' except 7, 0, and 9/2.</p>
Wrap-up (2 minutes approx.)	Wrap up closing comments and housekeeping.