Lesson 1.4.1: Multiplication and Division of Rational Algebraic Expressions

Multiplying Rational Algebraic Expressions: If m, n, p, and q are polynomials, such that $n \neq 0$ and $q \neq 0$, then

$$\frac{m}{n} \cdot \frac{p}{q} = \frac{mp}{nq}$$

How to Multiply Rational Algebraic Expressions:

1. Factor the numerator and denominator completely.
2. Cancel the common factors.
3. Multiply the remaining factors.

Dividing Rational Algebraic Expressions: If m, n, p, and q are polynomials, such that $n \neq 0$, $p \neq 0$, and $q \neq 0$, then

$$\frac{m}{n} \div \frac{p}{q} = \frac{m}{n} \cdot \frac{q}{p} = \frac{mq}{np}$$

How to Divide Rational Algebraic Expressions:

1. Copy the dividend.
2. Change the operation to multiplication.
3. Find the reciprocal of the divisor.
4. Proceed to multiplication.

Practice Exercises 1.4.1

A. Find the product of the following rational algebraic expressions.

1. $\dfrac{10uv^2}{3xy^2} \cdot \dfrac{6x^2y^2}{5u^2v^2}$
2. $\dfrac{a^2-b^2}{2ab} \cdot \dfrac{a^2}{a-b}$
3. $\dfrac{x^2-3x}{x^2+3x-10} \cdot \dfrac{x^2-4}{x^2-x-6}$
4. $\dfrac{x^2+2x+1}{y^2-2y+1} \cdot \dfrac{y^2-1}{x^2-1}$
5. $\dfrac{a^2-2ab+b^2}{a^2-1} \cdot \dfrac{a-1}{a-b}$

B. Find the quotient of the following rational algebraic expressions.

1. $\dfrac{81xz^3}{36y} \div \dfrac{27x^2z^2}{12xy}$
2. $\dfrac{2a+2b}{a^2+ab} \div \dfrac{4}{a}$
3. $\dfrac{16x^2-9}{6-5x-4x^2} \div \dfrac{16x^2+24x+9}{4x^2+11x+6}$
4. $\dfrac{x^2+2x+1}{x^2+4x+3} \div \dfrac{x^2-1}{x^2+2x+1}$
5. $\dfrac{x-1}{x+1} \div \dfrac{1-x}{x^2+2x+1}$

Activity 1.4.1

A. Find the product of the following rational algebraic expressions.

1. $\dfrac{12mn^2}{6xy^2} \cdot \dfrac{9x^2y^2}{4m^2n^2}$
2. $\dfrac{x^2-y^2}{2xy} \cdot \dfrac{y^2}{x+y}$
3. $\dfrac{x^2-2x}{x^2-3x-10} \cdot \dfrac{x^2-4x-5}{x^2-4}$
4. $\dfrac{x^2+4x+4}{x^2+3x+2} \cdot \dfrac{x^2-1}{x^2-4}$
5. $\dfrac{a^2+2ab+b^2}{a^2-b^2} \cdot \dfrac{a-b}{a+b}$

B. Find the quotient of the following rational algebraic expressions.

1. $\dfrac{14x^2}{20y^2} \div \dfrac{56x^2}{y}$
2. $\dfrac{4a-4b}{30a^2} \div \dfrac{a-b}{9a}$
3. $\dfrac{x^2-4}{x^2+4x+4} \div \dfrac{x^2-x-2}{x^2+3x+2}$
4. $\dfrac{x^2-2x-3}{x^2-3x} \div \dfrac{x^2-4}{x^2+2x}$
5. $\dfrac{x^2-4}{x^2+2x} \div \dfrac{x^2+x-6}{2x+4}$

Typeset by Jonathan Rufo Bacolod using LaTeX

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