

Multiply
Rational
Expressions

Divide
Rational
Expressions
multiply by reciprocal
"Keep, Change, Flip"

★ Factor everything + cancel common factors

Multiply Rational Expressions

Let $a, b, c,$ and d be polynomials,

$$\frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d}$$

where $b \neq 0$ and $d \neq 0$.

Find the product.

Example 1: all monomials so mult then simplify

$$\frac{3x^2}{4x} \cdot \frac{6x^2}{9x^3} = \frac{18x^4}{36x^4} = \frac{1}{2}$$

Example 2:

$$\frac{(5x^2 - 5x)}{(x^2 - 7x + 10)} \cdot \frac{(x^2 - 3x - 10)}{(8x^2 + 16x)} \quad \text{Factor 1st!}$$

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

$$\frac{5x(x-1)\cancel{(x-5)}\cancel{(x+2)}}{8x\cancel{(x-5)}\cancel{(x-2)}\cancel{(x+2)}} = \frac{5(x-1)}{8(x-2)}$$

Example 3:

$$\frac{x^2 - 9}{5x + 15} \cdot \frac{4x + 4}{x^2 - 7x + 12}$$

$$\frac{\cancel{(x+3)}(x-3)}{5(x+3)} \cdot \frac{4(x+1)}{\cancel{(x-3)}(x-4)}$$

$$\frac{4(x+1)}{5(x-4)}$$

Example 4:

$$\frac{2x}{x^2 - 6x + 8} \cdot \frac{(x-4)}{1}$$

$$\frac{2x}{(x-4)(x-2)} \cdot \frac{(x-4)}{1}$$

$$\frac{2x\cancel{(x-4)}}{(x-4)\cancel{(x-2)}} = \frac{2x}{(x-2)}$$

Keep Change Flip

Divide Rational Expressions

Let $a, b, c,$ and d be polynomials,

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c} = \frac{a \cdot d}{b \cdot c}$$

where $b \neq 0, c \neq 0$ and $d \neq 0$.

Find the quotient.

Example 5:

$$\frac{x^4}{5x} \div \frac{7x^4}{15x^2} = \frac{x^4}{5x} \cdot \frac{15x^2}{7x^4}$$

$$\frac{\cancel{x^4} \times \cancel{x^4}}{\cancel{x^4} \times \cancel{x^4}} \cdot \frac{15x^2}{35x^5} = \frac{3x}{7}$$

Example 6:

$$\frac{x^2 - 2x - 15}{3x - 3} \div \frac{x^2 + 5x + 6}{x - 1}$$

$$\frac{x^2 - 2x - 15}{3x - 3} \cdot \frac{x - 1}{x^2 + 5x + 6}$$

$$\frac{\cancel{(x-5)}(x+3)}{3(x-1)} \cdot \frac{\cancel{(x-1)}}{\cancel{(x+3)}(x+2)} = \frac{(x-5)}{3(x+2)}$$

Example 7:

$$\frac{x^2 - 4x - 5}{5x + 5} \div \frac{x^2 - 25}{2x}$$

$$\frac{x^2 - 4x - 5}{5x + 5} \cdot \frac{2x}{x^2 - 25}$$

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

Example 8:

$$\frac{x^2 + 5x - 14}{2x^2} \div \frac{(x+7)}{1} \leftarrow \text{understood}$$

$$\frac{x^2 + 5x - 14}{2x^2} \cdot \frac{1}{(x+7)}$$

$$\frac{\cancel{(x+7)}(x-2)}{2x^2} \cdot \frac{1}{\cancel{(x+7)}} = \frac{(x-2)}{2x^2}$$