

Pre-Calculus 11 Multiplying Rational Expressions

Rational expressions can be multiplied in a similar way that rational numbers are multiplied.

Review: $\frac{3}{5} \times \frac{2}{3} = \frac{1}{5}$ Use division to simplify first

Steps for Multiplying:

- Factor all expressions GCF, difference of squares, PSF
- State restrictions (what will make denominator equal to 0) (from original expression)
- Divide out any like factors (Divide the numerators and denominators by their common factors)
- Multiply numerators, multiply denominators
- State final answer with restrictions

When asked to simplify an expression, don't forget to state the non-permissible values.

Practice: Simplify each expression

a) $\frac{-4x}{3} \cdot \frac{2y}{5} = \frac{-8xy}{15}$ ← no restrictions, no variable in the denominator

b) $\frac{x^3}{10} \cdot \frac{15}{y} = \frac{3x^3}{2y}$ y ≠ 0

Multiplication

Examples: Simplify each expression and state restrictions.

1. $\frac{3b^2}{5a} \times \frac{2a}{3} = \frac{2b^2}{5}$ a ≠ 0

2. $\frac{2(x+2)}{3x} \times \frac{5(x-4)}{4(x+2)} = \frac{5(x-4)}{12}$ x ≠ -2, 0

* Never divide/cancel through a +/- sign
ie $\frac{(x-4)}{(x+2)}$ does not simplify!

$$3. \frac{x^2+x-6}{x^2+2x-15} \cdot \frac{x-3}{x-2} =$$

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

$x \neq -5, 2, 3$ Bracket binomial factors

$$4. \frac{x^2-x-20}{x^2-6x} \cdot \frac{x^2-12x+36}{x^2+9x+20} =$$

$$\frac{(x-5)(\cancel{x+4})}{x(\cancel{x-6})} \cdot \frac{(\cancel{x-6})(x-6)}{(\cancel{x+4})(x+5)} = \frac{(x-5)(x-6)}{x(x+5)}$$

$x \neq -5, -4, 0, 6$

$$5. \frac{4-x^2}{5x-10} \cdot \frac{x-5}{3x-15} =$$

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

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

$$= \frac{-(2+x)}{15}$$

$x \neq 2, 5$

$$6. \frac{3x^2-5x-2}{6x} \cdot \frac{4x^2-8x}{x^2-4x+4} =$$

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

$x \neq 0, 2$

P -6
S -5
F -6, 1/3