

Multiplication and Division of Rational Expressions

Multiplication of Rational Expressions

Multiplication of Rational Expressions is primarily the same as multiplication with numerical fractions.

Examples:

$$\frac{2}{3} \cdot \frac{9x}{10x} = \frac{2 \cdot 9x}{3 \cdot 10x} = \frac{18x}{30x} = \frac{\cancel{3} \cdot \cancel{6} \cdot x}{5 \cdot \cancel{6} \cdot \cancel{x}} = \frac{3}{5}$$

$$\frac{3a^2}{4b^2} \cdot \frac{2b}{9a} = \frac{3a^2 \cdot 2b}{4b^2 \cdot 9a} = \frac{6a^2b}{36ab^2} = \frac{\cancel{6}ab \cdot a}{\cancel{6}ab \cdot 6b} = \frac{a}{6b}$$

$$\frac{3r+12}{8} \cdot \frac{4r}{9r+36} = \frac{3(\cancel{r+4}) \cdot 4r}{8 \cdot 9(\cancel{r+4})} = \frac{12r}{72} = \frac{r}{6}$$

$$\frac{4t+12}{2t-10} \cdot \frac{t^2-t-20}{t^2-9} = \frac{4(\cancel{t+3}) \cdot (\cancel{t-5})(t+4)}{2(\cancel{t-5}) \cdot (\cancel{t+5})(t-3)} = \frac{4(t+4)}{2(t-3)} = \frac{2(t+4)}{t-3} = \frac{2t+8}{t-3}$$

Division of Rational Expressions

Division of Rational Expressions involves using the old adage “flip the last guy and multiply” – Invert and Multiply

Examples:

$$\frac{4}{25} \div \frac{3t}{7t} = \frac{4}{25} \cdot \frac{7t}{3t} = \frac{28t}{75t} = \frac{28}{75}$$

Note the inverting

$$\frac{16a^3}{5b^3} \div \frac{8a}{25b^2} = \frac{16a^3}{5b^3} \cdot \frac{25b^2}{8a} = \frac{400a^3b^2}{40ab^3} = \frac{10a^2}{b}$$

$$\frac{x^2+x}{18y} \div \frac{2x^2-2}{3y} = \frac{x^2+x}{18y} \cdot \frac{3y}{2x^2-2} = \frac{\cancel{3} \cdot x \cdot (\cancel{x+1})}{36 \cdot \cancel{(x+1)}(x-1)} = \frac{x}{12(x-1)}$$

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