

TOPIC: MULTIPLYING AND DIVIDING RATIONAL EXPRESSIONS

Multiplying Rational Expressions

◆ Recall: Multiply rational *numbers* by multiplying numerators and multiplying denominators:

Recall
$\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$

► Multiply rational *expressions* the same way.

Recall	Multiply Rational <i>Numbers</i>	New	Multiply Rational <i>Expressions</i>
	$\frac{10}{4} \cdot \frac{3}{6}$		$\frac{10x^2y}{4} \cdot \frac{3}{6xy}$
	Multiply across top & bottom: $\frac{10 \cdot 3}{4 \cdot 6}$		Multiply across top & bottom:
	Factor: $\frac{5 \cdot 2 \cdot 3}{2 \cdot 2 \cdot 3 \cdot 2}$		Factor:
	Simplify: $\frac{5 \cdot \cancel{2} \cdot \cancel{3}}{2 \cdot \cancel{2} \cdot \cancel{3} \cdot 2} = \frac{5}{4}$		Simplify:

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PRACTICE

Multiply the expressions and simplify.

(A)

$$\frac{x}{3} \cdot \frac{2}{y}$$

(B)

$$\frac{x}{x+2} \cdot \frac{x+2}{3}$$

(C)

$$\frac{3x+6}{y} \cdot \frac{xy+2y}{3}$$

EXAMPLE

Multiply the expressions and simplify.

$$\frac{x^2 - 9}{x^2 - x - 6} \cdot \frac{x^2 - 4}{x^2 + 2x}$$

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Dividing Rational Expressions

Recall

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

◆ Recall: Divide rational *numbers* by multiplying 1st fraction by reciprocal of 2nd fraction:

► Divide rational *expressions* the same way.

Recall	Divide Rational <i>Numbers</i>	New	Divide Rational <i>Expressions</i>
	$\frac{1}{3} \div \frac{4}{9}$		$\frac{(t+1)}{3} \div \frac{t^2-1}{9}$
	Multiply by reciprocal: $\frac{1}{3} \cdot \frac{9}{4} = \frac{9}{12}$	 Keep Change Flip	Multiply by reciprocal:
	Simplify: $\frac{\cancel{3} \cdot 3}{\cancel{3} \cdot 4} = \frac{3}{4}$		Simplify:

◆ Recall: A way to remember this is **Keep** (the first fraction), **Change** (to multiplication), **Flip** (the second fraction).

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PRACTICE

Divide each expression and write the quotient in its simplest form.

(A)
$$\frac{8x^3}{(2x)^5} \div \frac{4x^4}{16x^2}$$

(B)
$$\frac{5p+5}{8-10p} \div \frac{3p+3}{2(8-10p)}$$

(C)
$$\frac{\frac{y-1}{y+2}}{\frac{y-1}{3(y+2)}}$$

EXAMPLE

Perform the indicated operations.

$$\frac{x}{x+2} \div \frac{3}{2x+4} \cdot \frac{3}{x}$$