6.6 Multiplication and Division of Fractions

To multiply two rational numbers,
multiply the numerator and multiply the denominator

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

To divide one rational number by another,
multiply the first by the reciprocal of the second

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

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

We want to factor before we multiply or divide.

$$\frac{4}{5} \times \frac{6}{11} = \frac{24}{55}$$

$$\frac{2}{3} \div \frac{3}{4} = \frac{2}{3} \times \frac{4}{3} = \frac{8}{9}$$

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

To multiply two rational numbers,
multiply the numerator and multiply the denominator

We want to factor before we multiply.

$$\left(\frac{4x^3}{y}\right)\left(\frac{3x^5}{7y^4}\right) = \frac{12x^8}{7y^5}$$

$$\frac{3wx^2y^3}{7axyz} \cdot \frac{4a^3xz}{6aw^2y} = \frac{12a^3wx^3y^3z}{42a^2w^2xy^2z} = \frac{2ax^2y}{7w}$$

$$\frac{\frac{x^2+3x+2}{x^2+4x+4}}{\frac{x^2-1}{x^2+x-2}} \cdot \frac{(x+1)(x-1)}{(x+2)(x-1)} = \frac{(x+1)(x+2)(x+1)(x-1)}{(x+2)(x+2)(x+2)(x-1)} = \frac{(x+1)^2}{(x+2)^2}$$

Perform the indicated operation. Write your answer in simplest form.

$$\frac{a^3-b^3}{a^3+b^3} \cdot \frac{a^2-ab+b^2}{a-b}$$

$$\frac{(a-b)(a^2+ab+b^2)}{(a+b)(a^2-ab+b^2)} \cdot \frac{a^2-ab+b^2}{a-b}$$

$$\frac{a^2+ab+b^2}{a+b}$$

$$\frac{y^3-8}{y^2+y-6} \cdot \frac{y^2+3y}{y^3+2y^2+4y}$$

$$\frac{(y-2)(y^2+2y+4)}{y^2+y-6} \cdot \frac{y(y+3)}{y(y^2+2y+4)}$$

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

$= 1$

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

To divide one rational number by another,
multiply the first by the reciprocal of the second

We want to factor before we multiply.

$$\frac{12}{a^2-4a+3} \div \frac{3}{a^2-5a+4}$$

change divide to multiply and flip the second fraction

$$\frac{4}{\frac{12}{a^2-4a+3}} \times \frac{(a-1)(a-4)}{\frac{a^2-5a+4}{3}} = \frac{4(a-4)}{a-3}$$

$$(a-1)(a-3)$$

$$\frac{(x+3)}{(x+4)} \div \frac{(x+2)}{(x+1)}$$

$$\frac{x+3}{x+4} \times \frac{(x+1)}{(x+2)}$$

$$= \frac{x^2+4x+3}{x^2+6x+8}$$

Perform the indicated operation. Write your answer in simplest form.

$$\frac{a^2-a}{3a+9} \div \frac{a^2-2a+1}{a^2-9}$$

$$\frac{a^2-a}{3a+9} \times \frac{a^2-9}{a^2-2a+1} = \frac{a(a-1)}{3(a+3)} \times \frac{(a-3)(a+3)}{(a-1)(a-1)}$$

$$= \frac{a^2-3a}{3a-3}$$

$$\frac{6x^2+13xy+6y^2}{4x^2-9y^2} \div \frac{3x^2-xy-2y^2}{2x^2+xy-3y^2}$$

$$\frac{(2x+3y)(3x+2y)}{(2x-3y)(2x+3y)} \times \frac{(2x+3y)(x-y)}{(3x+2y)(x-y)}$$

$$\frac{2x+3y}{2x-3y}$$