

## Rational Expressions and Equations Lesson #5: Multiplication of Rational Expressions

### Review

#### Multiplication of Rational Numbers

Recall these steps for multiplying rational numbers.

1. Consider the **factors of the numerator** and of the **denominator**.
2. If there are factors **common to the numerator and the denominator**, **reduce by dividing out** the common factors.
3. **Multiply all the numerators together** and multiply all the **denominators together**.

vertically  
or  
diagonally

Note that steps 2 and 3 may be interchanged.



Multiply:

$$\text{a) } \frac{7}{10} \times \frac{1}{5} = \frac{7}{50}$$

$$\text{b) } \frac{\overset{3}{\cancel{10}}}{\underset{2}{\cancel{2}}} \times \frac{\overset{1}{\cancel{5}}}{\underset{2}{\cancel{6}}} = \frac{3}{4}$$

### Review

#### Multiplication of Monomials

The above method can be extended to multiplication of monomials containing variables.

$a, b, c, d \neq 0$



Simplify. State the restrictions on the variables.

$$\text{a) } \frac{12xy}{4z} \times \frac{3xz^2}{y}$$

$$\text{b) } \frac{\overset{1}{\cancel{8}} \overset{1}{\cancel{1}} \overset{3}{\cancel{c}}}{\underset{2}{\cancel{4}} \underset{1}{\cancel{d}}} \times \frac{\overset{5}{\cancel{2}} \overset{1}{\cancel{b}}}{\underset{8}{\cancel{4}} \underset{1}{\cancel{a}}} = \frac{5bc^2}{16ad}$$

### Multiplication of Single Variable Rational Expressions

The method for multiplication of rational expressions is similar to the method described for multiplication of rational numbers. The first step is usually to factor the numerator and denominator of each rational expression.

FRS



Simplify. State the restrictions on the variable.

$$\text{a) } \frac{\overset{1}{\cancel{(x+1)}}}{\underset{1}{\cancel{(x-2)}} \underset{1}{\cancel{(x+3)}}} \times \frac{\overset{1}{\cancel{2}} \overset{1}{\cancel{(x+3)}}}{\underset{1}{\cancel{x}} \underset{1}{\cancel{(x+1)}}}$$

$$\text{b) } \frac{4x+16}{14x-7} \times \frac{2x-1}{(x+4)^2}$$

$x \neq 0, -1, -3, 2$

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



Simplify  $\frac{2m^3 - 4m^2}{3m^2 - 9m} \times \frac{m^2 - m - 6}{m^2 - 4}$ . State the restrictions on the variable.

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Simplify  $\left( \frac{a^2 + 8a + 15}{6a^2 + 21a + 9} \right) \left( \frac{a - 4a^3}{2a^2 + 9a - 5} \right)$ . State the nonpermissible values.

$a \neq \pm \frac{1}{2}, -3, -5$

$$\frac{(a+5)(a+3)}{3(2a^2+7a+3)} \cdot \frac{a(1-4a^2)}{(2a-1)(a+5)}$$

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

Complete Assignment Questions #1 - #8

#1-4 (a,c,e...) 5-7

## Assignment

1. Simplify. State the restrictions on the variables.

a)  $\frac{8a^2b^2c}{12abc^2} \times \frac{12a^2c}{6bc}$

b)  $\frac{9x^4y^3}{12x^5} \times \frac{48x^2y^3}{14y} \times \frac{6x}{27y^4}$