

# Multiplying Rational Expressions

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**PRE-CALCULUS 11**  
**RATIONAL EXPRESSIONS**  
**MULTIPLYING RATIONAL EXPRESSIONS**

**A. Multiplying Fractions**

1) Simplify the following.

a)  $\frac{2}{3} \times \frac{1}{5}$   
 $\xrightarrow{5 \rightarrow 1}$   
 $\xrightarrow{3 \rightarrow 5}$   
 $= \boxed{\frac{2}{15}}$

b)  $\frac{60}{75} \times \frac{25}{12}$   
 $\xrightarrow{5 \rightarrow 1}$   
 $\xrightarrow{3 \rightarrow 1}$   
 $= \boxed{\frac{5}{3}}$

**B. Multiplying Rational Expressions**

1) State the non-permissible values then simplify.

a)  $\frac{c^2}{10} \times \frac{5d}{2c}$        $c \neq 0$   
 $\xrightarrow{c \rightarrow 1d}$   
 $\xrightarrow{2 \rightarrow 2}$   
 $= \boxed{\frac{cd}{4}}$

b)  $\frac{2m^3}{5n} \times \frac{4n}{3m}$        $m \neq 0, n \neq 0$   
 $\xrightarrow{2m^3 \rightarrow 4}$   
 $\xrightarrow{5 \rightarrow 3}$   
 $= \boxed{\frac{8m^2}{15}}$

c)  $\frac{12}{5n^3} \times \frac{25n^2}{6}$        $n \neq 0$   
 $\xrightarrow{2 \rightarrow 5}$   
 $\xrightarrow{1n^2 \rightarrow 1}$   
 $= \boxed{\frac{10}{n^2}}$

d)  $\frac{3a^2}{9c^3} \times \frac{6c}{12c} \times \frac{4}{15c}$        $c \neq 0$   
 $\xrightarrow{1a^2 \rightarrow 2a}$   
 $\xrightarrow{3c^3 \rightarrow 4c}$   
 $\xrightarrow{2a^3 \rightarrow 1}$   
 $= \boxed{\frac{2a^3}{45c^5}}$

$$e) \frac{4x(x+3) \cdot 5(x-1)}{3(x-1) \cdot 2x} \quad X \neq 1, 0$$

$2(x+3) \rightarrow 5$   
 $3 \rightarrow 1$

$$= \frac{10(x+3)}{3} \quad \text{or} \quad \frac{10x+30}{3}$$

$$f) \frac{2(x-1) \cdot x(x-2)}{3x \cdot 4(x-1)} \quad X \neq 0, -1$$

$1 \rightarrow (x-2)$   
 $3 \rightarrow 2$

$$= \frac{x-2}{6}$$

$$\begin{array}{r} 4 \\ \times 1 \\ \hline 4 \\ 5 \end{array}$$
  

$$\begin{array}{r} 4 \\ \times -2 \\ \hline -2 \\ -4 \end{array}$$

$$g) \frac{x^2+5x+4}{2x^2-8x+8} \times \frac{4x-8}{x^2-1} \quad X \neq 2, -1, 1$$

$(x+4) \rightarrow 2$

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

$1(x-2) \rightarrow (x-1)$

$$= \frac{2(x+4)}{(x-2)(x-1)} \quad \text{or} \quad \frac{2x+8}{x^2-3x+2}$$

$$h) \left( \frac{2x^2+7x+6}{6-3x} \right) \left( \frac{x-2}{x^2-4} \right) \left( \frac{2x^2+7x+6}{-3x+6} \right) \left( \frac{x-2}{x^2-4} \right)$$

$X \neq 2, -2$

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

$1 \rightarrow (x-2)$

$$= \frac{2x+3}{-3(x-2)} = \frac{-(2x+3)}{3(x-2)} \quad \text{or} \quad \frac{-2x-3}{3x-6}$$

Assignment: Multiplication of Rational Expressions Assignment #1 - 4



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



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.

Complete Assignment Questions #1 - #8

## Assignment

1. Simplify. State the restrictions on the variables.

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

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

2. Simplify. State the restrictions on the variable.

a)  $\frac{15a^2(a-1)}{8(2a+3)} \times \frac{10(2a+3)}{3a}$

b)  $\frac{7x(x+2)(x-3)}{21(x-7)(x+7)} \times \frac{(x+7)^2(x-7)}{2x(x-3)}$

c)  $\frac{6y-30}{(y-1)} \times \frac{5y-5}{3y^2-15y}$

d)  $\frac{10x+2}{5x-1} \times \frac{x-1}{35x+7}$

3. Simplify. State the nonpermissible values.

a)  $\frac{x^2-9}{6x+24} \times \frac{10x+40}{x(x+3)}$

b)  $\frac{4a^2-1}{4a^2-16} \times \frac{2-a}{2a-1}$

c)  $\frac{x^2+5x+6}{3x} \times \frac{6x}{x^2+9x+14}$

d)  $\frac{2y^3-4y^2}{3y^2-9y} \times \frac{y^2-y-6}{y^2-4}$

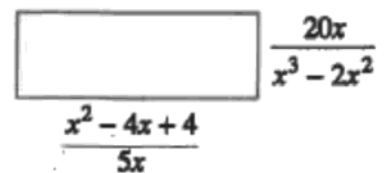
4. Simplify. State the nonpermissible values.

$$\text{a) } \left( \frac{x^2 - 3x + 2}{x^2 + 3x - 4} \right) \left( \frac{x^2 + 9x + 20}{x^2 + x - 6} \right) \quad \text{b) } \left( \frac{3t^2 + 3t - 6}{2t^2 - 2t - 4} \right) \left( \frac{4t^2 + 4t - 24}{3t^2 + 6t - 9} \right)$$

$$\text{c) } \frac{x^2 - 6x}{x^2 + 5x} \times \frac{x^2 + 7x + 10}{18 - 3x}$$

$$\text{d) } \frac{a^2 - 6a + 8}{2a^2 - 8a} \times \frac{a^2 - a}{8a^2 + 28} \times \frac{12a^2 + 42}{2a}$$

5. Consider the rectangle shown



a) Write and simplify an expression for the area of the rectangle.

b) Calculate the *exact* area if  $x = 4\sqrt{5}$  cm.

### Answer Key

1. a)  $\frac{4a^3}{3c}, a \neq 0, b \neq 0, c \neq 0$

b)  $\frac{4x^2y}{7}, x \neq 0, y \neq 0$

2. a)  $\frac{25a(a-1)}{4}, a \neq -\frac{3}{2}, 0$

b)  $\frac{(x+2)(x+7)}{6}, x \neq 0, 3, \pm 7$

c)  $\frac{10}{y}, y \neq 0, 1, 5$

d)  $\frac{2(x-1)}{7(5x-1)}, x \neq \pm \frac{1}{5}$

3. a)  $\frac{5(x-3)}{3x}, x \neq -4, -3, 0$

b)  $\frac{-2a-1}{4(a+2)}, a \neq \pm 2, \frac{1}{2}$

c)  $\frac{2(x+3)}{x+7}, x \neq -7, -2, 0$

d)  $\frac{2y}{3}, y \neq \pm 2, 0, 3$

4. a)  $\frac{x+5}{x+3}, x \neq -4, -3, 1, 2$

b)  $\frac{2(t+2)}{t+1}, t \neq -3, \pm 1, 2$

c)  $\frac{-x-2}{3}, x \neq -5, 0, 6$

d)  $\frac{3(a-1)(a-2)}{8a}, a \neq 0, 4$

5. a)  $\frac{4(x-2)}{x^2}$  b)  $\frac{2\sqrt{5}-1}{10} \text{ cm}^2$

6. D 7. 

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8. a)  $\frac{x(x-2y)}{2}, x \neq -\frac{1}{2}y, -2y$

b)  $\frac{a}{a+b}, a \neq -b, -6b, 3b, 4b$

c)  $\frac{3q-p}{6(p-7q)}, p \neq -5q, -3q, 4q, 7q$

d)  $\frac{(4y+3x)(4y+7x)}{(4y+x)^2}, y \neq -\frac{1}{4}x, \frac{2}{3}x, \frac{3}{2}x$