

# NOTES 13-1

## UNIT 13 MULTIPLY AND DIVIDE RATIONALS

### Simplifying or Writing a Rational Expression in Lowest Terms:

2 \*Subtract exponents

$$1. \frac{14a^3bc^4}{35ab^5c} = \frac{2a^2c^3}{5b^4}$$

$$2. \frac{x^2 - 4}{x^2 + 6x + 8} = \frac{(x-2)(x+2)}{(x+2)(x+4)} = \frac{x^2 - 5x - 24}{x^2 - 7x - 30} = \frac{(x-8)(x+3)}{(x-10)(x+3)}$$

Use this space to write the steps needed to simplify rational expressions.

$$\frac{(x-8)(x+3)}{(x-10)(x+3)}$$

$$\frac{x-8}{x-10}$$

### Multiplying Rational Expressions:

\*You can cancel out common factors before multiplying

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

OYO

$$4. \frac{5x^3}{x^2y^2} \cdot \frac{y^3}{15x^2} = \frac{x^3y^3}{3x^4y^2} = \frac{y}{3x}$$

$$\frac{25x^2}{9y^8} \cdot \frac{24y^4}{55x^7}$$

$$5. \frac{2x^2 - 6x}{x^2 + 18x + 81} \cdot \frac{9x + 81}{x^2 - 9} =$$

$$\frac{x^2 + 3x}{x^2 + 6x + 8} \cdot \frac{x^2 + x - 2}{4x^3 + 12x}$$

$$\frac{2x(x-3)}{(x+9)(x+9)} \cdot \frac{9(x+9)}{(x+3)(x-3)} = \frac{18x}{(x+9)(x+3)}$$

Use this space to write the steps needed to multiply rational expressions.

$$6. \frac{\overset{1}{3}x^5y^4}{\underset{3}{1}y^5} \cdot \frac{\overset{1}{4}y^3}{\underset{7}{2}x^9} = \frac{x^5y^7}{21x^9y^5} = \frac{y^2}{21x^4}$$

$$\text{OYO} \\ \frac{4x^2y}{2z^2} \cdot \frac{6xz^3}{20y^4}$$

$$7. \frac{x^2-9}{x^2+x-20} \cdot \frac{x^2-8x+16}{9-3x} =$$

$$\frac{6x^2+24x}{6-x} \cdot \frac{x^2-36}{6x^2-36x}$$

$$\frac{(x+3)(x-3)}{(x+5)(x-4)} \cdot \frac{(x-4)(x-4)}{3(3-x)}$$

$$\frac{(x+3)(x-3)}{(x+5)(x-4)} \cdot \frac{(x-4)(x-4)}{-3(x+3)}$$

$$\frac{\cancel{(x+3)}(x-3)}{(x+5)\cancel{(x-4)}} \cdot \frac{\cancel{(x-4)}(x-4)}{-3\cancel{(x+3)}}$$

$$\frac{(x-3)(x-4)}{-3(x+5)}$$

# NOTES 13-2

## UNIT 13 MULTIPLY AND DIVIDE RATIONALS

### Dividing Rational Expressions

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

**KEEP IT, CHANGE IT, FLIP IT!!!**

1.  $\frac{3x^3}{5y^2} \div \frac{6x^5}{5y^3} = \frac{\cancel{3}x^3}{5y^2} \cdot \frac{\cancel{5}y^3}{\cancel{6}x^5}$

$$\frac{x^3 y^3}{2x^5 y^2} = \frac{y}{2x^2}$$

2.  $\frac{x+3}{x^2+x-12} \div \frac{x^2-9}{x^2+7x+12} = \frac{x+3}{x^2+x-12} \cdot \frac{x^2+7x+12}{x^2-9}$

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

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

OYO:  $\frac{x^2+8x+16}{x+2} \div \frac{x^2+6x+8}{x^2-4}$

### Simplifying Complex Fractions:

3.  $\frac{\frac{2x}{27y^2}}{\frac{6x^2}{9}}$

Re-write as 2 Fractions:

$$\frac{2x}{27y^2} \div \frac{6x^2}{9} = \frac{\cancel{2}x}{\cancel{27}y^2} \cdot \frac{\cancel{9}}{\cancel{6}x^2} = \frac{x}{3y^2}$$

Simplified Answer:

$$\frac{x}{9x^2y^2}$$

OYO:  $\frac{\frac{5x}{x+2}}{\frac{10}{x-2}}$

Re-write as 2 Fractions:

$$\frac{5x}{x+2} \div \frac{10}{x-2} = \frac{\cancel{5}x}{x+2} \cdot \frac{x-2}{\cancel{10}} = \frac{x(x-2)}{2(x+2)}$$

Simplified Answer:

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

$$\begin{array}{r} 3 \\ \times 3 \\ \hline 9 \\ 4 \end{array}$$

	$x+1$	
$3x$	$3x^2$	$3x$
$+1$	$x$	$1$

$$\begin{array}{r} 6 \\ \times 1 \\ \hline 6 \\ -5 \end{array}$$

	$x-2$	
$3x$	$3x^2$	$-6x$
$+1$	$1x$	$-2$

Re-write as 2 Fractions:

Factor:

Simplified Answer:

5.  $\frac{\frac{3x^2+4x+1}{3x^2-5x-2}}{\frac{x^2-2x-3}{5x^2+25x+30}}$

$$\frac{3x^2+4x+1}{3x^2-5x-2} \div \frac{x^2-2x-3}{5x^2+25x+30}$$

$$\begin{aligned} \frac{3x^2+4x+1}{3x^2-5x-2} \cdot \frac{5x^2+25x+30}{x^2-2x-3} &= \frac{(3x+1)(x+1)}{(3x+1)(x-2)} \cdot \frac{5(x^2+5x+6)}{(x-3)(x+1)} \\ &= \frac{\cancel{(3x+1)}(\cancel{x+1})}{\cancel{(3x+1)}(x-2)} \cdot \frac{5(x+5)(\cancel{x+1})}{(x-3)(\cancel{x+1})} \\ &= \frac{5(x+5)(x+1)}{(x-2)(x-3)} \end{aligned}$$

OYO:  $\frac{\frac{2x^2+5x+3}{2x^2+7x+6}}{\frac{x^2+6x+5}{5x^2+35x+50}}$