

## Sec 9-4 Simplifying the Product or Quotient of Rational Expressions

- Factor all numerators and denominators.
- If multiplying rational expressions you can simplify within the same fraction and/or cross cancel and finally multiply and write as a single fraction.
- Instead of dividing, multiply by **the reciprocal** then simplify. Write answer as a single fraction.
- State restrictions on the variable.

Simplify. State the restrictions on the variables.

$$\frac{8x^4 + 2x^3}{6x^2 - 24x} \cdot \frac{x^2 + x - 6}{4x^2 + 13x + 3}$$

Handwritten work shows the following steps:

$$\frac{2x^3(x+1)}{6x(x-4)} \cdot \frac{(x+3)(x-2)}{(x+3)(4x+1)}$$

After canceling common factors, the simplified expression is:

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

Restrictions on the variable are:

$$x \neq 4, 0, -\frac{1}{4}, -3$$

A box diagram is also shown for factoring the quadratic  $4x^2 + 13x + 3$ :

12	1
12	1
13	
x	+3
4x	4x <sup>2</sup> 12x
+1	x +3

Simplify. State the restrictions on the variables.

$$\frac{x^2 - 16}{9x^2 + 18x} \div \frac{x^2 - 3x - 4}{3x^2 + 6x}$$

Handwritten work shows the following steps:

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

After canceling common factors, the simplified expression is:

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

Restrictions on the variable are:

$$x \neq 0, -2, -1, 4$$

Simplify. State restrictions on the variable.

$$\frac{x^2 + 3x - 10}{2x^2 + x - 3} \div \frac{x^3 + 5x^2 - 4x - 20}{x^2 + x - 2}$$

Handwritten work shows the following steps:

$$\frac{(x+5)(x-2)}{(2x+3)(x-1)} \cdot \frac{(x+2)(x-1)}{(x+5)(x+2)(x-2)}$$

After canceling common factors, the simplified expression is:

$$\frac{1}{2x+3}$$

Restrictions on the variable are:

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

A box diagram is also shown for factoring the cubic  $x^3 + 5x^2 - 4x - 20$ :

x	+5
x <sup>2</sup>	x <sup>3</sup> +5x <sup>2</sup>
-4	-4x -20

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Problems 5, 6, 10, 11, 16, 17, 39

Find this sum:

$$\frac{11}{56} + \frac{7}{64}$$

If you factor the denominators first you notice that they already have an 8 in common. Therefore, all you need to do is multiply the first fraction by  $\frac{8}{8}$  and the second by  $\frac{7}{7}$  to make the denominators the same.

$$\begin{aligned} \frac{8}{8} \cdot \frac{11}{7 \cdot 8} + \frac{7}{8 \cdot 8} \cdot \frac{7}{7} &= \frac{88 + 49}{8 \cdot 8 \cdot 7} \\ &= \frac{137}{448} \end{aligned}$$