



Factoring skills can be helpful when working with **rational expressions**. In this lesson, you will learn to simplify *rational expressions*.

**Rational Expressions**

Rational expressions are ratios, or fractions, involving variables or polynomials.

Simplifying Rational Expressions

To simplify *rational expressions*, factor both the numerator and denominator as much as possible. Since common factors in both the numerator and denominator make forms of one, the expression can be simplified by eliminating these common factors.

Example 1:

$$\begin{aligned}\frac{9x^2yz}{24xyz^2} &= \\ &= \frac{3 \cdot 3 \cdot x \cdot x \cdot y \cdot z}{2 \cdot 2 \cdot 2 \cdot 3 \cdot x \cdot y \cdot z \cdot z} \\ &= \frac{3 \cdot 3 \cdot \cancel{x} \cdot \cancel{x} \cdot y \cdot \cancel{z}}{2 \cdot 2 \cdot 2 \cdot 3 \cdot \cancel{x} \cdot y \cdot \cancel{z} \cdot z} \\ &= \frac{3x}{8z}\end{aligned}$$

Example 2:

$$\begin{aligned}\frac{a+3}{a^2+4a+3} &= \\ &= \frac{1 \cdot (a+3)}{(a+3)(a+1)} \\ &= \frac{1 \cdot \cancel{(a+3)}}{\cancel{(a+3)}(a+1)} \\ &= \frac{1}{a+1}\end{aligned}$$

Simplify each rational expression by eliminating all common factors. Show your work clearly.

1. $\frac{15a}{39a^2} =$

2. $\frac{35y^2z}{14yz^2} =$

3. $\frac{28a^2}{49ab} =$

4. $\frac{56x^2y}{70x^3y} =$

5. $\frac{4a}{3a+a^2} =$

6. $\frac{y+3y^2}{3y+1} =$

7. $\frac{x^2 - 9}{2x + 6} =$

8. $\frac{y^2 - 49}{14 - 2y} =$

9. $\frac{a - 3}{a^2 - 7a + 12} =$

10. $\frac{x + 4}{x^2 + 8x + 16} =$

11. $\frac{12 - 4a - a^2}{a^2 + 2a - 8} =$

12. $\frac{4 + 3b - b^2}{b^2 - 13b + 36} =$

13. $\frac{4x^2 + 8x + 4}{5x^2 + 10x + 5} =$

14. $\frac{14x^2 + 35x + 21}{12x^2 + 30x + 18} =$

More Lesson 11-1 Sounds Even More Rational

Factor each then simplify, if possible.

1. $\frac{y^2 + 2y - 24}{y^2 - 16}$

2. $\frac{3x^2 - 5x + 2}{x^2 - 3x + 2}$

3. $\frac{x^2 - 6x - 16}{8 - x}$

4. $\frac{y^2 - 12y + 35}{y^2 - 25}$

5. $\frac{x + 3}{x^2 + 6x + 9}$

6. $\frac{4y - 8}{8 - 4y}$

7. $\frac{2x^2 - 3x - 2}{x^2 - 5x + 6}$

8. $\frac{7x - 56}{40 - 5x}$

9. $\frac{3x^2 - 2x}{6x - 4}$

10. $\frac{x^2 + 6x + 5}{x^2 - 1}$

11. $\frac{5y^2 + 15y}{6 - y - y^2}$

12. $\frac{y}{y^2 - 3y}$

13. $\frac{7x - 28}{3x - 12}$

14. $\frac{y^2 - 49}{y^2 - 14y + 49}$

15. $\frac{6y^2 - 7y + 2}{6y^2 + 5y - 6}$

16. $\frac{2x^2 - 8x - 42}{-x^2 - 6x - 9}$

17. $\frac{y - 7}{y^2 - 5y - 14}$

18. $\frac{x^2 + 4x + 4}{x^2 - 4}$

Scrambled Answers: $\frac{x+2}{x-2}, \frac{x}{2}, \frac{7}{3}, \frac{3x+1}{x-1}, -1, \frac{1}{x+3}, \frac{1}{y+2}, \frac{1}{y-3}, \frac{y+6}{y+4}, \frac{2y-1}{2y+3},$
 $\frac{-2(x-7)}{x+3}, \frac{y+7}{y-7}, \frac{2x+1}{x-3}, \frac{y-7}{y+5}, \frac{-5y}{y-2}, -(x+2), \frac{x+5}{x-1}, \frac{-7}{5}, \frac{3x-2}{x-2}$