Simplifying Rational Expressions

Algebra Worksheet · Grade 8–10

Name: _____ Date: _____

Learning Objectives

- Factor numerators and denominators using GCF, quadratic factoring, and other techniques
- Cancel common factors to simplify rational expressions to lowest terms
- Apply the laws of exponents when simplifying expressions with variable exponents

Problems

1. Simplify the rational expression below:

$$\frac{18x^2}{24x}$$

2. Simplify the rational expression below:

$$\frac{-36x^3}{42x^2}$$

3. Simplify the rational expression below:

$$\frac{4x-8}{x-2}$$

4. Simplify the rational expression below:

$$\frac{3x+9}{x+3}$$

5. Simplify the rational expression below:

$$\frac{x-5}{x^2-10x+25}$$

6. Simplify the rational expression below:

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$$\frac{x^2 - 9}{x + 3}$$

7. Simplify the rational expression below:

$$\frac{x^2 + 5x + 6}{x + 2}$$

8. Simplify the rational expression below:

$$\frac{9x^2 + 81x}{x^3 + 8x^2 - 9x}$$

9. Simplify the rational expression below:

$$\frac{x^2 - 4x - 12}{x^2 - 2x - 24}$$

10. Simplify the rational expression below:

$$\frac{2x^3 - 8x^2}{x^3 - 2x^2 - 8x}$$

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Simplifying Rational Expressions — Answer Key

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Answer Key

1. Answer: 3x/4
- Factor the numerator: 18x^2 = 6 * 3 * x^2
- Factor the denominator: 24x = 6 * 4 * x
- Cancel the common factor 6x from numerator and denominator
- Result: 3x/4

2. Answer: -6x/7
- Factor the numerator: -36x^3 = -6 * 6 * x^3
- Factor the denominator: 42x^2 = 6 * 7 * x^2
- Cancel the common factor 6x^2
- Result: -6x/7

3. Answer: 4
- Factor the numerator using GCF of 4: 4x - 8 = 4(x - 2)
- The denominator is already (x - 2)
- Cancel the common factor (x - 2)
- Result: 4

4. Answer: 3
- Factor the numerator using GCF of 3: 3x + 9 = 3(x + 3)
- The denominator is already (x + 3)
- Cancel the common factor (x + 3)
- Result: 3

5. Answer: 1/(x - 5)
- The numerator is (x - 5)
- Factor the denominator: x^2 - 10x + 25 = (x - 5)(x - 5)
- Cancel one common factor of (x - 5)
- Result: 1/(x - 5)

6. Answer: x - 3
- Factor the numerator as a difference of squares: x^2 - 9 = (x + 3)(x - 3)
- The denominator is already (x + 3)
- Cancel the common factor (x + 3)
- Result: x - 3

7. Answer: x + 3
- Factor the numerator: x^2 + 5x + 6 = (x + 2)(x + 3)
- The denominator is already (x + 2)

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- Cancel the common factor (x + 2)
- Result: x + 3

8. Answer: 9/(x - 1)

- Factor the numerator using GCF of 9x: 9x^2 + 81x = 9x(x + 9)
- Factor the denominator using GCF of x: x^3 + 8x^2 - 9x = x(x^2 + 8x - 9)
- Factor the quadratic: x^2 + 8x - 9 = (x + 9)(x - 1)
- So denominator = x(x + 9)(x - 1)
- Cancel common factors x and (x + 9)
- Result: 9/(x - 1)

9. Answer: (x + 2)/(x + 4)

- Factor the numerator: x^2 - 4x - 12 = (x - 6)(x + 2)
- Factor the denominator: x^2 - 2x - 24 = (x - 6)(x + 4)
- Cancel the common factor (x - 6)
- Result: (x + 2)/(x + 4)

10. Answer: 2x/(x + 2)

- Factor the numerator using GCF of 2x^2: 2x^3 - 8x^2 = 2x^2(x - 4)
- Factor the denominator using GCF of x: x^3 - 2x^2 - 8x = x(x^2 - 2x - 8)
- Factor the quadratic: x^2 - 2x - 8 = (x - 4)(x + 2)
- So denominator = x(x - 4)(x + 2)
- Cancel common factors x and (x - 4)
- Result: 2x/(x + 2)

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