Algebra: Multiplying and Dividing Rational Expressions

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DIRECTIONS

Multiply or divide each pair of rational expressions and simplify completely. Factor first whenever possible, then cancel common factors. When dividing, multiply by the reciprocal of the second fraction. Assume no denominator equals zero.

1. Multiply:

$$\frac{3x}{4} \cdot \frac{8}{9x^2}$$

Answer: _____

2. Multiply:

$$\frac{x^2}{5y} \cdot \frac{10y^2}{x}$$

Answer: _____

3. Multiply:

$$\frac{x+2}{3} \cdot \frac{6}{x+2}$$

Answer: _____

4. Multiply:

$$\frac{x^2-9}{x+3} \cdot \frac{1}{x-3}$$

Answer: _____

5. Multiply:

$$\frac{x^2+5x+6}{x+1} \cdot \frac{x+1}{x+2}$$

Answer: _____

6. Divide:

$$\frac{5x}{3} \div \frac{10x^2}{9}$$

Answer: _____

7. Divide:

$$\frac{x+1}{4} \div \frac{x+1}{8}$$

Answer: _____

8. Divide:

$$\frac{x^2-4}{x} \div \frac{x-2}{x^2}$$

Answer: _____

9. Divide:

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

Answer: _____

10. Multiply:

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

Answer: _____

Answer Key & Solutions

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TEACHER NOTES

Items 1–5 are multiplication (cancel before multiplying). Items 6–10 are division (flip and multiply). Items 4, 5, 8, 9, 10 require factoring (difference of squares, trinomials).

1. Multiply: $(3x/4)\cdot(8/(9x^2))$

Answer: $2 / (3x)$

$24x / (36x^2) = 2/(3x)$.

2. Multiply: $(x^2/(5y))\cdot(10y^2/x)$

Answer: $2xy$

Cancel one x and one y: $10x^2y^2 / (5xy) = 2xy$.

3. Multiply: $((x+2)/3)\cdot(6/(x+2))$

Answer: 2, $x \neq -2$

(x+2) cancels; 6/3 = 2.

4. Multiply: $((x^2-9)/(x+3))\cdot(1/(x-3))$

Answer: 1, $x \neq \pm 3$

$x^2-9 = (x-3)(x+3)$. Both factors cancel.

5. Multiply: $((x^2+5x+6)/(x+1))\cdot((x+1)/(x+2))$

Answer: $x + 3$

$x^2+5x+6=(x+2)(x+3)$; (x+1) and (x+2) cancel.

6. Divide: $(5x/3) \div (10x^2/9)$

Answer: $3 / (2x)$

Multiply by reciprocal: $(5x/3)(9/(10x^2)) = 45x/(30x^2) = 3/(2x)$.

7. Divide: $((x+1)/4) \div ((x+1)/8)$

Answer: 2, $x \neq -1$

$((x+1)/4)\cdot(8/(x+1)) = 8/4 = 2$.

8. Divide: $((x^2-4)/x) \div ((x-2)/x^2)$

Answer: $x(x + 2)$

Flip: $((x-2)(x+2)/x)\cdot(x^2/(x-2)) = x(x+2)$.

9. Divide: $((x^2-25)/(x+1)) \div ((x+5)/(x^2-1))$

Answer: $(x - 5)(x - 1)$

Factor: $((x-5)(x+5)/(x+1))\cdot((x-1)(x+1)/(x+5)) = (x-5)(x-1)$.

10. Multiply: $((x^2-x-6)/(x^2-4))\cdot((x+2)/(x-3))$

Answer: $(x + 2) / (x - 2)$

Factor: $((x-3)(x+2))/((x-2)(x+2)) \cdot (x+2)/(x-3)$. Cancel (x–3) and one (x+2): $(x+2)/(x-2)$.