

Multiplying and Dividing Rational Expressions

(Pages 644–649)

To multiply rational expressions, you can divide by the common factors either *before* or *after* you multiply the expressions. To divide algebraic rational expressions, multiply by the reciprocal of the divisor (the second fraction).

EXAMPLES

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

$$\begin{aligned} \frac{2x^2(3x-2)}{3x^2+x-2} \cdot \frac{1}{4x} &= \frac{2x^2(3x-2)}{(3x-2)(x+1)} \cdot \frac{1}{4x} && \text{Factor.} \\ &= \frac{\overset{1}{\cancel{2x^2}}(\overset{1}{\cancel{3x-2}})}{\overset{1}{\cancel{(3x-2)}}(x+1)} \cdot \frac{1}{\overset{1}{\cancel{4x}}} && \text{Divide by the GCF, } 2x(3x-2). \\ &= \frac{x}{2(x+1)} \text{ or } \frac{x}{2x+2} && \text{Multiply. Then, simplify.} \end{aligned}$$

B Find $\frac{x^2-4}{5x} \div \frac{x+2}{x-2}$.

$$\begin{aligned} \text{The reciprocal of } \frac{x+2}{x-2} \text{ is } \frac{x-2}{x+2}. \\ \frac{x^2-4}{5x} \div \frac{x+2}{x-2} &= \frac{x^2-4}{5x} \cdot \frac{x-2}{x+2} \\ &= \frac{\overset{1}{\cancel{(x+2)}}(x-2)}{5x} \cdot \frac{\overset{1}{\cancel{x-2}}}{\overset{1}{\cancel{x+2}}} && \text{Factor. Then divide by } x+2. \\ &= \frac{(x-2)(x-2)}{5x} \text{ or } \frac{x^2-4x+4}{5x} && \text{Multiply.} \end{aligned}$$

Try These Together

1. Find $\frac{ab^2}{12} \cdot \frac{6}{b}$.

HINT: Divide both numerator and denominator by the same quantity—their greatest common factor.

2. Find $\frac{3a-15}{a+4} \div (a-5)$.

HINT: The reciprocal of $a-5$ is $\frac{1}{a-5}$.

PRACTICE

Find each product.

3. $\frac{15a}{b^3} \cdot \frac{2b^4}{3}$

4. $\frac{25mn^2}{4n} \cdot \frac{10n^3}{5m}$

5. $\frac{x^2+2x-15}{x^2+4x} \cdot \frac{x^2}{x+5}$

6. $\frac{y^2-36}{y+3} \cdot \frac{y-4}{y^2+2y-24}$

7. $\frac{3x+12}{x^2-x-2} \cdot \frac{2x-2}{6x+24}$

8. $\frac{12(a-1)}{3a} \cdot \frac{a^2}{a-1}$

Find each quotient.

9. $\frac{8x}{3yz^2} \div \frac{4xy}{3yz}$

10. $10bc^2 \div \frac{2abc}{8b}$

11. $\frac{x-8}{x+3} \div \frac{x+2}{x+2}$

12. $\frac{b^2-25}{4} \div (b+5)$

13. $\frac{2k+10}{k-3} \div \frac{2}{k-3}$

14. $\frac{x+1}{x^2+2x+1} \div \frac{x-3}{x+1}$



15. **Standardized Test Practice** Find the quotient $\frac{x+1}{2} \div \frac{x^2+6x+5}{4}$.

A $\frac{2}{x+5}$

B $2(x+5)$

C $\frac{1}{2}(x+5)$

D $\frac{x+5}{2}$

Answers: 1. $\frac{ab}{3}$ 2. $\frac{2}{3} \cdot \frac{a+4}{a-5}$ 3. $10ab$ 4. $\frac{25n^4}{2}$ 5. $\frac{x(x-4)}{3}$ 6. $\frac{y+3}{y-6}$ 7. $\frac{(x+1)(x-2)}{x-1}$ 8. $4a$ 9. $\frac{y}{2}$ 10. $\frac{a}{40bc}$ 11. $\frac{x+3}{x-8}$ 12. $\frac{b-5}{4}$ 13. $k+5$ 14. $\frac{x-3}{x+1}$ 15. A