

NAME _____

Module 15 Simplifying Rational Expressions
Lesson 3 Multiplying and Dividing Rational Expressions



Find each product or quotient. Write answer in simplest form.

1. $\left(\frac{3x}{4}\right)\left(\frac{2}{6x}\right) \cdot \frac{1}{4}$ _____
2. $\frac{12}{ab} \cdot \frac{3a^2b^3}{6b^2}$ **6a** _____
3. $10c \cdot \frac{1}{5d} \cdot \frac{2c^2}{d^2}$ **$\frac{4c^3}{d^2}$** _____
4. $\frac{5m^2n}{2} \cdot \frac{4n}{p^2} \cdot \frac{6p^3}{15mn}$ **4mnp** _____
5. $\frac{5x-30}{x^2-4x-21} \cdot \frac{x^2+x-6}{15x-30}$ **$\frac{x-6}{3x-21}$** _____
6. $\frac{p^2-7p+12}{p^2-8p+15} \cdot \frac{p-5}{p+4}$ **$\frac{p-4}{p+4}$** _____
7. $\frac{2y-4}{6y+30} \cdot \frac{y^2+3y-10}{y^2-4}$ **$\frac{y-2}{3y+6}$** _____
8. $\frac{d^2+d-42}{d^2+8d+7} \cdot \frac{d^2+6d+5}{d^2-3d-18}$ **$\frac{d+5}{d+3}$** _____
9. $\frac{2r^2-9r-18}{2r^2+5r+3} \cdot \frac{r^2+r}{5r^2-26r-24}$ **$\frac{r}{5r+4}$** _____
10. $\frac{24g^4}{7g^2h} \div \frac{15h^3}{14g^2}$ **$\frac{16g^4}{5h^4}$** _____
11. $\frac{4j}{5} \div \frac{12j^2}{25}$ **$\frac{5}{3j}$** _____
12. $\frac{2x^3yz}{9z^3} \div \frac{14x^2y^3}{3xz^2}$ **$\frac{x^2}{21y^2}$** _____
13. $\frac{a^2b}{2b^2} \div \frac{6a^3}{9ab^2}$ **$\frac{3b}{4}$** _____
14. $\frac{y^2-36}{y^2+4y} \div \frac{y^2-5y-6}{y^2+5y+4}$ **$\frac{y+6}{y}$** _____
15. $\frac{4x-12}{2x+8} \div \frac{6x-18}{x^2-16}$ **$\frac{x-4}{3}$** _____
16. $\frac{t^2+7t+6}{t^2+4t+3} \div \frac{t^2+2t-24}{5t-20}$ **$\frac{5}{t+3}$** _____

Journal

1. Sam and Stephanie both simplified $\frac{4x+8}{4x+4} \cdot \frac{x^2-1}{x^2+3x+2}$. Their work is shown below. Who is correct and why?

Sam

$$\begin{aligned} &\frac{4x+8}{4x+4} \cdot \frac{x^2-1}{x^2+3x+2} \\ &\frac{4(x+2)}{4(x+1)} \cdot \frac{(x-1)(x+1)}{(x+2)(x+1)} \\ &\frac{x+2}{x+1} \cdot \frac{x-1}{x+2} \\ &\frac{x-1}{x+1} \end{aligned}$$

Stephanie

$$\begin{aligned} &\frac{4x+8}{4x+4} \cdot \frac{x^2-1}{x^2+3x+2} \\ &\frac{2}{1} \cdot \frac{-1}{3x+2} \\ &\frac{-2}{3x+2} \\ &\frac{-1}{3x} \end{aligned}$$

2. Write two rational expressions whose quotient is $\frac{2}{3y}$.
3. Explain how to multiply $\frac{3x+2}{4x+1} \cdot \frac{4x^2+13x+3}{3x^2-13x-10}$.
4. In order to divide $\frac{2x-2}{x^2-1} \div \frac{4x+4}{x^2+2x+1}$, the first step is to invert the second rational expression. Would the next most logical second step be to multiply or to simplify? Explain.
5. Using three different methods, write the quotient of $\frac{4x-3}{2x}$ and $\frac{2x+1}{3x^2}$ as an unsimplified algebraic expression.

Cumulative Review

State the restricted values of each rational expression.

1. $\frac{1-x}{x}$ **0** _____

2. $\frac{3r}{r-7}$ **7** _____

3. $\frac{2y+1}{3y-6}$ **2** _____

4. $\frac{4t-1}{2t+7}$ **-3.5** _____

Simplify.

5. $\frac{x^2y^3z^{-6}}{x^{-2}y}$ **$\frac{x^4y^2}{z^6}$** _____

6. $\frac{3x+6}{7x+14}$ **$\frac{3}{7}$** _____

7. $\frac{d^2+3d-4}{d^2-5d+4}$ **$\frac{d+4}{d-4}$** _____

8. $\frac{2m^2-7m-15}{2m^2-13m+15}$ **$\frac{2m+3}{2m-3}$** _____

9. $\frac{b-3}{3-b}$ **-1** _____

10. $\frac{4n^2-9}{2n^2-n-3}$ **$\frac{2n+3}{n+1}$** _____

Possible Journal Answers

1. Sam is correct. Rational expressions must be simplified by canceling factors as Sam did. It is incorrect to cancel individual terms as Stephanie did.

2. A possible answer is $\frac{3y}{2} \div \frac{9y^2}{4}$.

3. In order to multiply $\frac{3x+2}{4x+1} \cdot \frac{4x^2+13x+3}{3x^2-13x-10}$, begin by factoring. The problem becomes $\frac{3x+2}{4x+1} \cdot \frac{(4x+1)(x+3)}{(3x+2)(x-5)}$. Canceling yields $\frac{x+3}{x-5}$.

4. The next most logical second step is to simplify. The final answer must be in simplest form; it is less complicated to simplify the expressions before finding the product.

5. Some possible answers are $\frac{4x-3}{2x} \div \frac{2x+1}{3x^2}$, $\frac{4x-3}{2x} \cdot \frac{3x^2}{2x+1}$, and $\frac{4x-3}{2x} \cdot \frac{1}{\frac{2x+1}{3x^2}}$.