

8-4

Practice

Form G

Rational Expressions

Simplify each rational expression. State any restrictions on the variables.

1. $\frac{4x + 6}{2x + 3}$ $2; x \neq -\frac{3}{2}$

2. $\frac{2y}{y^2 + 6y}$ $\frac{2}{y + 6}; y \neq -6, 0$

3. $\frac{20 + 40x}{20x}$ $\frac{2x + 1}{x}; x \neq 0$

4. $\frac{7x - 28}{x^2 - 16}$ $\frac{7}{x + 4}; x \neq \pm 4$

5. $\frac{3y^2 - 3}{y^2 - 1}$ $3; y \neq \pm 1$

6. $\frac{3x^2 - 12}{x^2 - x - 6}$ $\frac{3x - 6}{x - 3}; x \neq -2, 3$

7. $\frac{x^2 + 3x - 18}{x^2 - 36}$ $\frac{x - 3}{x - 6}; x \neq \pm 6$

8. $\frac{x^2 + 13x + 40}{x^2 - 2x - 35}$ $\frac{x + 8}{x - 7}; x \neq -5, 7$

Multiply. State any restrictions on the variables.

9. $\frac{5a}{5a + 5} \cdot \frac{10a + 10}{a}$ $10; a \neq -1, 0$

10. $\frac{2x + 4}{10x} \cdot \frac{15x^2}{x + 2}$ $3x; x \neq 0, -2$

11. $\frac{x^2 - 5x}{x^2 + 3x} \cdot \frac{x + 3}{x - 5}$ $1; x \neq -3, 0, 5$

12. $\frac{x^2 - 6x}{x^2 - 36} \cdot \frac{x + 6}{x^2}$ $\frac{1}{x}; x \neq 0, \pm 6$

13. $\frac{5y - 20}{3y + 15} \cdot \frac{7y + 35}{10y + 40}$ $\frac{7(y - 4)}{6(y + 4)}; y \neq -5, -4$

14. $\frac{x - 2}{(x + 2)^2} \cdot \frac{x + 2}{2x - 4}$ $\frac{1}{2x + 4}; x \neq \pm 2$

15. $\frac{3x^3}{x^2 - 25} \cdot \frac{x^2 + 6x + 5}{x^2}$ $\frac{3x^2 + 3x}{x - 5}; x \neq 0, \pm 5$

16. $\frac{y^2 - 2y}{y^2 + 7y - 18} \cdot \frac{y^2 - 81}{y^2 - 11y + 18}$ $\frac{y}{y - 2}; y \neq 2, \pm 9$

Divide. State any restrictions on the variables.

17. $\frac{7x^4}{24y^5} \div \frac{21x}{12y^4}$ $\frac{x^3}{6y}; x, y \neq 0$

18. $\frac{6x + 6}{7} \div \frac{4x + 4}{x - 2}$ $\frac{3(x - 2)}{14}; x \neq -1, 2$

19. $\frac{5y}{2x^2} \div \frac{5y^2}{8x^2}$ $\frac{4}{y}; x, y \neq 0$

20. $\frac{3y + 3}{6y + 12} \div \frac{18}{5y + 5}$ $\frac{5(y + 1)^2}{36(y + 2)}; y \neq -2, -1$

21. $\frac{y^2 - 49}{(y - 7)^2} \div \frac{5y + 35}{y^2 - 7y}$ $\frac{y}{5}; y \neq 0, \pm 7$

22. $\frac{x^2 + 10x + 16}{x^2 - 6x - 16} \div \frac{x + 8}{x^2 - 64}$ $x + 8; x \neq -2, \pm 8$

23. $\frac{y^2 - 5y + 4}{y^2 - 1} \div \frac{y^2 - 9}{y^2 + 5y + 4}$

$\frac{y^2 - 16}{y^2 - 9}; y \neq \pm 1, \pm 3, -4$

24. $\frac{x^2 - 4}{x^2 + 6x + 9} \div \frac{x^2 + 4x + 4}{x^2 - 9}$

$\frac{x^2 - 5x + 6}{x^2 + 5x + 6}; x \neq -2, \pm 3$

8-4 Practice (continued)

Rational Expressions

Form G

25. A farmer must decide whether to build a cylindrical grain silo or a rectangular grain silo. The cylindrical silo has radius r . The rectangular silo has width r and length $2r$. Both silos have the same height h .
- Write and simplify an expression for the ratio of the volume of the cylindrical silo to its surface area, including the circular floor and ceiling. $\frac{rh}{2r + 2h}$
 - Write and simplify an expression for the ratio of the volume of the rectangular silo to its surface area, including the rectangular floor and ceiling. $\frac{rh}{2r + 3h}$
 - Compare the ratios of volume to surface area for the two silos. $\frac{rh}{2r + 2h} > \frac{rh}{2r + 3h}$
 - Compare the volumes of the two silos. $V_{cyl} > V_{rect}$
 - Reasoning** Assume the average cost of construction materials per square foot of surface area is the same for either silo. How can you measure the cost-effectiveness of each silo? **Answers may vary. Sample: The surface area of a silo determines the cost to build the silo. Compare the ratios of the volume to the surface area of the silos.**

Simplify each rational expression. State any restrictions on the variables.

26. $\frac{2x^2 + 11x + 5}{3x^2 + 17x + 10} \cdot \frac{2x + 1}{3x + 2}; x \neq -5, -\frac{2}{3}$
27. $\frac{6x^2 + 5xy - 6y^2}{3x^2 - 5xy + 2y^2} \cdot \frac{2x + 3y}{x - y}; x \neq y, \frac{2}{3}y$

Multiply or divide. State any restrictions on the variables.

28. $\frac{x^2 + 2x + 1}{x^2 - 1} \cdot \frac{x^2 + 3x + 2}{x^2 + 4x + 4}$
 $\frac{x^2 + 2x + 1}{x^2 + x - 2}; x \neq -2, \pm 1$
29. $\frac{x^2 - 3x - 10}{2x^2 - 11x + 5} \div \frac{x^2 - 5x + 6}{2x^2 - 7x + 3}$
 $\frac{x + 2}{x - 2}; x \neq \frac{1}{2}, 2, 3, 5$
30. **Reasoning** A rectangle has area $\frac{10b}{6b - 6}$ and length $\frac{b + 2}{2b - 2}$. Write an expression for the width of the rectangle. $\frac{10b}{3b + 6}$

31. **Open-Ended** Write three rational expressions that simplify to $\frac{x + 1}{x - 1}$.
Answers may vary. Sample: $\frac{x^2 + 2x + 1}{x^2 - 1}, \frac{x^2 + 3x + 2}{x^2 + x - 2}, \frac{x^2 - x - 2}{x^2 - 3x + 2}$