5. What value(s) for the variables must be excluded when working with each rational expression?

a) $\frac{4\pi r^2}{8\pi r^3}$

b) $\frac{2t + t^2}{t^2 - 1}$

c) $\frac{x - 2}{10 - 5x}$

d) $\frac{3g}{g^3 - 9g}$

6. Simplify each rational expression. State any non-permissible values for the variables.

a) $\frac{2c(c - 5)}{3c(c - 5)}$

b) $\frac{3w(2w + 3)}{2w(3w + 2)}$

c) $\frac{(x - 7)(x + 7)}{(2x - 1)(x - 7)}$

d) $\frac{5(a - 3)(a + 2)}{10(3 - a)(a + 2)}$

7. Consider the rational expression $\frac{x^2 - 1}{x^2 + 2x - 3}$.

a) Explain why you cannot divide out the x^2 in the numerator with the x^2 in the denominator.

b) Explain how to determine the non-permissible values. State the non-permissible values.

c) Explain how to simplify a rational expression. Simplify the rational expression.

8. Write each rational expression in simplest form. State any non-permissible values for the variables.

a) $\frac{6r^2p^3}{4rp^4}$

b) $\frac{3x - 6}{10 - 5x}$

c) $\frac{b^2 + 2b - 24}{2b^2 - 72}$

d) $\frac{10k^2 + 55k + 75}{20k^2 - 10k - 150}$

e) $\frac{x - 4}{4 - x}$

f) $\frac{5(x^2 - y^2)}{x^2 - 2xy + y^2}$

Apply

9. Since $\frac{x^2 + 2x - 15}{x - 3}$ can be written as $\frac{(x - 3)(x + 5)}{x - 3}$, you can say that $\frac{x^2 + 2x - 15}{x - 3}$ and $x + 5$ are equivalent expressions. Is this statement always, sometimes, or never true? Explain.

10. Explain why 6 may not be the only non-permissible value for a rational expression that is written in simplest form as $\frac{y}{y - 6}$. Give examples to support your answer.

11. Mike always looks for shortcuts. He claims, "It is easy to simplify expressions such as $\frac{5 - x}{x - 5}$ because the top and bottom are opposites of each other and any time you divide opposites the result is −1." Is Mike correct? Explain why or why not.

12. Suppose you are tutoring a friend in simplifying rational expressions. Create three sample expressions written in the form $\frac{ax^2 + bx + c}{dx^2 + ex + f}$ where the numerators and denominators factor and the expressions can be simplified. Describe the process you used to create one of your expressions.

13. Shali incorrectly simplifies a rational expression as shown below.

$$\begin{aligned}\frac{g^2 - 4}{2g - 4} &= \frac{(g - 2)(g + 2)}{2(g - 2)}\\ &= \frac{g + 2}{2}\\ &= g + 1\end{aligned}$$

What is Shali's error? Explain why the step is incorrect. Show the correct solution.

14. Create a rational expression with variable p that has non-permissible values of 1 and −2.

Chapter 6 Rational Expressions and Equations

6.1 Rational Expressions, pages 317 to 321

1. a) 18 **b)** $14x$ **c)** 7
d) $4x - 12$ **e)** 8 **f)** $y + 2$

2. a) Divide both by pq.
b) Multiply both by $(x - 4)$.
c) Divide both by $(m - 3)$.
d) Multiply both by $(y^2 + y)$.

3. a) 0 **b)** 1 **c)** -5
d) none **e)** ± 1 **f)** none

4. The following values are non-permissible because they would make the denominator zero, and division by zero is not defined.
a) 4 **b)** 0 **c)** $-2, 4$
d) $-3, 1$ **e)** 0 **f)** $\frac{4}{3}, -\frac{5}{2}$

5. a) $r \neq 0$ **b)** $t \neq \pm 1$
c) $x \neq 2$ **d)** $g \neq 0, \pm 3$

6. a) $\frac{2}{3}$; $c \neq 0, 5$ **b)** $\frac{3(2w + 3)}{2(3w + 2)}$; $w \neq -\frac{2}{3}, 0$
c) $\frac{x + 7}{2x - 1}$; $x \neq \frac{1}{2}, 7$ **d)** $-\frac{1}{2}$; $a \neq -2, 3$

7. a) x^2 is not a factor.
b) Factor the denominator. Set each factor equal to zero and solve. $x \neq -3, 1$
c) Factor the numerator and denominator. Determine the non-permissible values. Divide like factors. $\frac{x + 1}{x + 3}$

8. a) $\frac{3r}{2p}$, $r \neq 0, p \neq 0$ **b)** $-\frac{3}{5}$, $x \neq 2$
c) $\frac{b - 4}{2(b - 6)}$, $b \neq \pm 6$ **d)** $\frac{k + 3}{2(k - 3)}$, $k \neq -\frac{5}{2}, 3$
e) -1, $x \neq 4$ **f)** $\frac{5(x + y)}{x - y}$, $x \neq y$

9. Sometimes true. The statement is not true when $x = 3$.

10. There may have been another factor that divided out. For example: $\frac{y(y + 3)}{(y - 6)(y + 3)}$

11. yes, provided the non-permissible value, $x \neq 5$, is discussed

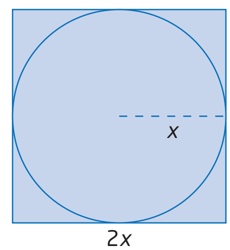
12. Examples: $\frac{x^2 + 2x + 1}{x^2 + 3x + 2}$, $\frac{x^2 + 4x + 4}{x^2 + 5x + 6}$, $\frac{2x^2 + 5x + 2}{3x^2 + 7x + 2}$
Write a rational expression in simplest form, and multiply both the numerator and the denominator by the same factor. For example, the first expression was obtained as follows: $\frac{x + 1}{x + 2} = \frac{(x + 1)(x + 1)}{(x + 2)(x + 1)}$.

13. Shali divided the term 2 in the numerator and the denominator. You may only divide by factors. The correct solution is the second step, $\frac{g + 2}{2}$.

14. Example: $\frac{2p}{p^2 + p - 2}$

15. a) $\frac{2n^2 + 11n + 12}{2n^2 - 32}$ **b)** $\frac{2n + 3}{2(n - 4)}$, $n \neq \pm 4$

16. a)



b) $\frac{\pi x^2}{4x^2}$
c) $x \neq 0$
d) $\frac{\pi}{4}$
e) 79%

17. a) The non-permissible value, -2, does not make sense in the context as the mass cannot be -2 kg.
b) $p = 0$ **c)** 900 kg

18. a) $\frac{50}{q}$, $q \neq 0$ **b)** $\frac{100}{p - 4}$, $p \neq 4$

19. a) \$620 **b)** $\frac{350 + 9n}{n}$
c) \$20.67

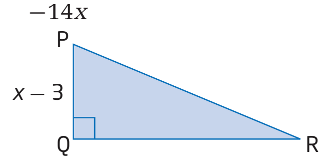
20. a) No; she divided by the term, 5, not a factor.
b) Example: If $m = 5$ then $\frac{5}{10} \neq \frac{1}{6}$.

21. a) Multiply by $\frac{5}{5}$. **b)** Multiply by $\frac{x - 2}{x - 2}$.

22. a) $\frac{4x - 8}{12}$ **b)** $\frac{3x - 6}{9}$
c) $\frac{2x^2 + x - 10}{6x + 15}$

23. a) $\frac{25b}{5b}$ **b)** $\frac{4a^2bx + 4a^2b}{12a^2b}$
c) $\frac{2b - 2a}{-14x}$

24. a)



b) $2(x + 2)$ **c)** $x \neq 3$

25. a) $\frac{(2x - 1)(3x + 1)}{(3x + 1)(3x - 1)} = \frac{(2x - 1)}{(3x - 1)}$, $x \neq \pm\frac{1}{3}$
b) In the last step: $\frac{n + 3}{-n} = \frac{-n - 3}{n}$, $n \neq 0, \frac{5}{2}$

26. a) $\frac{x + 6}{x + 3}$, $x \neq \pm 3$
b) $(2x - 7)(2x - 5)$, $x \neq -3$
c) $\frac{(x - 3)(x + 2)}{(x + 3)(x - 2)}$, $x \neq -3, -1, 2$
d) $\frac{(x + 5)(x + 3)}{3}$, $x \neq \pm 1$

27. $6x^2 + \frac{19}{2}x + 2$, $x \neq \frac{1}{4}, \frac{3}{2}$