Find the excluded values, if any, of the expression.

1. $\dfrac{14}{3x}$

2. $\dfrac{-8}{x-5}$

3. $\dfrac{5x}{x+10}$

4. $\dfrac{-x}{4x-8}$

5. $\dfrac{3x}{7x+21}$

6. $\dfrac{x+1}{3x+7}$

7. $\dfrac{x+6}{x^2-2x+1}$

8. $\dfrac{8}{x^2+4x-12}$

9. $\dfrac{7x}{x^2-25}$

Simplify the rational expression, if possible. Find the excluded values.

10. $\dfrac{-36x^2}{18x}$

11. $\dfrac{6x-24}{x-4}$

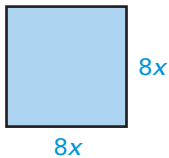**12.** $\dfrac{4x-12}{3-x}$

13. $\dfrac{x+11}{x^2-121}$
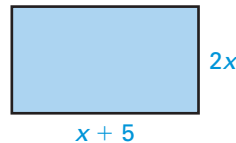
14. $\dfrac{x+3}{x^2+10x+21}$

15. $\dfrac{x-4}{x^2+11x+24}$

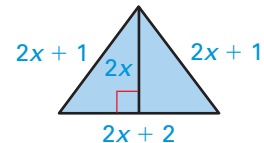**Write and simplify a rational expression for the ratio of the perimeter to the area of the given figure.**

16. Square

8x
8x

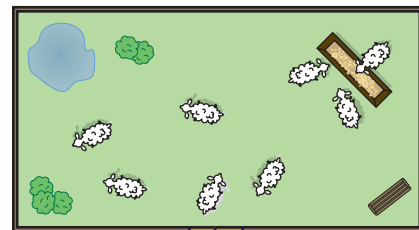**17.** Rectangle

2x
x + 5

18. Triangle

2x + 1   2x + 1
2x
2x + 2

19. Zoo Exhibit The directors of a zoo have drawn up preliminary plans for a rectangular exhibit. They have decided on dimensions that are related as shown.

a. Write a rational expression for the ratio of the perimeter to the area of the exhibit.

b. Simplify your expression from part (a).

4x − 2
4x + 3

20. Materials Used The material consumed M (in thousands of pounds) by a plastic injection molding machine per year between 1995 and 2004 can be modeled by

$$M = \frac{8t^2 + 66t + 70}{(3 - 0.2t + 0.1t^2)(t + 7)}$$

where t is the number of years since 1995. Simplify the model and approximate the number of pounds consumed in 2000.

Find the excluded values, if any, of the expression.

1. $\dfrac{-x}{3x^2 + 11x - 4}$

2. $\dfrac{12}{8x^2 - 3x - 5}$

3. $\dfrac{5x^2}{x^2 - 14x + 49}$

Simplify the rational expression, if possible. Find the excluded values.

4. $\dfrac{x - 7}{x^2 - 6x - 7}$

5. $\dfrac{-8x^3}{12x^2 - 20x}$

6. $\dfrac{9x^2 - 36x}{12x - 24x^2}$

7. $\dfrac{15x^4}{15x^2 + 20x}$

8. $\dfrac{2x - 4}{x^2 + 8x - 20}$

9. $\dfrac{4x^2 - 12x}{2x^2 - 5x - 3}$

10. $\dfrac{x^2 + 4x - 60}{2x^2 + 23x + 30}$

11. $\dfrac{x - 4}{x^3 - 8x^2 + 16x}$

12. $\dfrac{x^2 + 7x + 10}{2x^3 - 8x}$

13. Are the rational expressions $\dfrac{x^2 + 2x}{x^2 - 4}$ and $\dfrac{x^2}{x^2 - 2x}$ equivalent? *Explain* how you know. What are the excluded values, if any, of the rational expressions.

14. The expression $\dfrac{a}{15x^2 + 13x + 2}$ simplifies to $\dfrac{5x + 1}{3x + 2}$. What is the value of a? *Explain* how you got your answer.

15. Find two polynomials whose ratio simplifies to $\dfrac{3x - 1}{5x + 1}$ and whose sum is $8x^2 + 24x$. *Describe* your steps.

16. **Gazebo** You have drawn up a preliminary plan for a gazebo that you want to build in your backyard. Your plan for the base is to use two identical trapezoids as shown at the right.

   a. Write a rational expression for the ratio of the perimeter to the area of the floor of the gazebo.

   b. Simplify your expression from part (a).

(Figure labels: $x + 3$, x, $x - 1$, x, $2x + 4$)
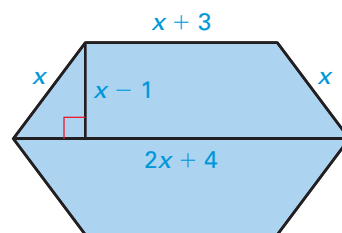
17. **Advertisement Flyers** The number A (in hundreds of thousands) of advertising flyers sent out by a department store between 1995 and 2004 can be modeled by

$$A = \dfrac{6t^2 + 102t + 312}{(18 - 0.5t + 0.01t^2)(t + 13)}$$

where t is the number of years since 1995.

   a. Simplify the model.

   b. Use the model to approximate how many flyers were sent out in 2001.

   c. Graph the model. *Describe* how the number of flyers sent out changed over time.

UNIT 3