

**B Apply Your Skills**

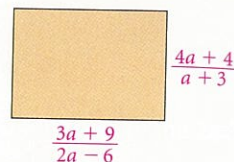
**Simplify each rational expression. State any restrictions on the variables.**

19.  $\frac{x^2 - 5x - 24}{x^2 - 7x - 30}$

20.  $\frac{2y^2 + 8y - 24}{2y^2 - 8y + 8}$

21.  $\frac{xy^3 - 9xy}{12xy^2 + 12xy - 144x}$

22. Write an expression for the area of the rectangle at the right.



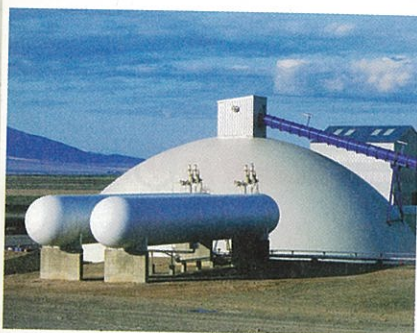
23. **Error Analysis** A student claims that  $x = 2$  is the only solution of the equation  $\frac{x}{x-2} = \frac{1}{2} + \frac{2}{x-2}$ . Is the student correct? Explain.

24. **Open-Ended** Write three rational expressions that simplify to  $\frac{x}{2x+1}$ .

25. **Writing** How can you tell whether a rational expression is in simplest form? Include an example with your explanation.

26. **Industrial Design** A storage tank will have a circular base of radius  $r$  and a height of  $r$ . The tank can be either cylindrical or hemispherical (half a sphere).

- Write and simplify an expression for the ratio of the volume of the hemispherical tank to its surface area (including the base). For a sphere,  $V = \frac{4}{3}\pi r^3$  and  $S.A. = 4\pi r^2$ .
- Write and simplify an expression for the ratio of the volume of the cylindrical tank to its surface area (including the bases).
- Compare the ratios of volume to surface area for the two tanks.
- Compare the volumes of the two tanks.



Exercise 26

**Multiply or divide. State any restrictions on the variable.**

27.  $\frac{a+3}{a^2+a-12} \div \frac{a^2-9}{a^2+7a+12}$

28.  $\frac{b^2-25}{(b+5)^2} \div \frac{2b+10}{4b+20}$

29.  $\frac{6x^3-6x^2}{x^4+5x^3} \div \frac{3x^2-15x+12}{2x^2+2x-40}$

30.  $\frac{2x^2-6x}{x^2+18x+81} \cdot \frac{9x+81}{x^2-9}$

31.  $\frac{x^2-x-2}{2x^2-5x+2} \div \frac{x^2-x-12}{2x^2+5x-3}$

32.  $\frac{2x^2+5x+2}{4x^2-1} \cdot \frac{2x^2+x-1}{x^2+x-2}$

**Simplify. State any restrictions on the variables.**

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

34.  $\frac{2x+6}{(x-1)^{-1}(x^2+2x-3)}$

35.  $\frac{54x^3y^{-1}}{3x^{-2}y}$

36. The width of the rectangle at the right is  $\frac{a+10}{3a+24}$ . Write an expression for the length of the rectangle.

$A = \frac{2a+20}{6a+15}$

37. **Physics** The acceleration of an object is a measure of how much its velocity changes in a given period of time.

acceleration =  $\frac{\text{final velocity} - \text{initial velocity}}{\text{time}}$

Suppose you are riding a bicycle at 6 m/s. You step hard on the pedals and increase your speed to 12 m/s in about 5 s.

- Find your acceleration in meters per second per second.
  - A sedan can go from 0 to 60 mi/h in about 10 s. What is the acceleration in meters per second per second? (*Hints:* 1 mi  $\approx$  1609 m; 1 h = 3600 s.)
38. a. **Critical Thinking** Simplify  $\frac{(2x^n)^2 - 1}{2x^n - 1}$ , where  $x$  is an integer and  $n$  is a positive integer. (*Hint:* Factor the numerator.)  
 b. Use the result from part (a) to show that the value of the given expression is always an odd integer.

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**C Challenge**