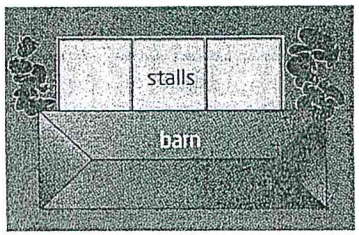
Review Unit 2-3U

11. **a)** Find the vertex of the parabola defined by $f(x) = -\frac{1}{2}x^2 + 4x + 3$.

b) Is the vertex a minimum or a maximum? Explain.

c) How many x-intercepts does the function have? Explain.

12. Pat has 30 m of fencing to enclose three identical stalls behind the barn, as shown.



a) What dimensions will produce a maximum area for each stall?

b) What is that maximum area of each stall?

13. Simon knows that at \$30 per ticket, 500 tickets to a show will be sold. He also knows that for every \$1 increase in price, 10 fewer tickets will be sold.

a) Model the revenue as a quadratic function.

b) What ticket price will maximize revenue?

c) What is the maximum revenue?

14. Perform each radical multiplication and simplify where possible.

a) $3\sqrt{2}(2\sqrt{3} - 3\sqrt{2})$

b) $(\sqrt{2} + x)(\sqrt{2} - x)$

15. For what value of x is $\sqrt{x} + \sqrt{x} = \sqrt{x} \times \sqrt{x}$, where $x > 0$? Justify your answer.

16. Consider the quadratic function $f(x) = -\frac{1}{2}x^2 + 4x + 10$.

a) Find the x-intercepts.

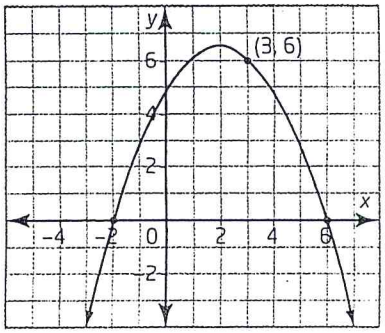
b) Use two methods to find the vertex.

c) Sketch a graph of the function.

17. A rectangle has a length that is 3 m more than twice the width. If the total area is 65 m², find the dimensions of the rectangle.

18. Find the equation, in standard form, of the quadratic function that has x-intercepts $-5 \pm \sqrt{3}$ and passes through the point $(-3, 8)$.

19. The graph of a quadratic function is given.



a) Find the equation of the function.

b) Find the maximum value of the function.

20. Find the point(s) of intersection of $y = -x^2 + 5x + 8$ and $y = 2x - 10$.

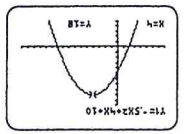
21. **a)** Compare the graphs of $f(x) = 3x^2 - 4$ and $g(x) = 3(x - 2)(x + 2)$.

b) What needs to be changed in the equation for $f(x)$ to make the two functions part of the same family of curves with the same x-intercepts? Explain.

c) Describe the family of curves, in factored form, that has the same x-intercepts as $h(x) = 5x^2 - 7$.

22. A baseball is travelling on a path given by the equation $y = -0.011x^2 + 1.15x + 1.22$. The profile of the bleachers in the outfield can be modelled with the equation $y = 0.6x - 72$. All distances are in metres. Does the ball reach the bleachers for a home run? Justify your answer.

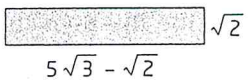
11. **a)** $(4, 11)$
b) maximum; the parabola opens downward
c) two x-intercepts
12. **a)** 3.75 m by 5 m **b)** 18.75 m²
13. **a)** $R(x) = -10(x - 10)^2 + 16\,000$
b) \$40 **c)** \$16 000
14. **a)** $-18 + 6\sqrt{6}$ **b)** $2 - x^2$
15. $\sqrt{x} + \sqrt{x} = \sqrt{x} \times \sqrt{x}$ is true for $x = 4$.
$\sqrt{4} + \sqrt{4} = 2 + 2 = 4$ and
$\sqrt{4} \times \sqrt{4} = 2 \times 2 = 4$.
16. **a)** -2, 10
b) Answers may vary. Sample answer: $(4, 18)$
c)

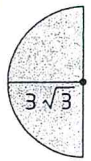


17. 5 m by 13 m
18. $f(x) = 8x^2 + 80x + 176$
19. **a)** $f(x) = -\frac{2}{5}x^2 + \frac{8}{5}x + \frac{24}{5}$ **b)** 6.4
20. $(-3, -16)$, $(6, 2)$
21. **a)** Answers may vary.
b) Answers may vary. Sample answer: The equation needs to be changed from $f(x) = 3x^2 - 4$ to $f(x) = 3x^2 - 12$.
c) $f(x) = a\left(x^2 - \frac{7}{5}\right)$
22. Answers may vary. Sample answer: Yes. The quadratic function that models the path of the baseball intersects with the linear function that models the profile of the bleachers in the outfield.

6. The power, P, in watts, produced by a solar panel is given by the function $P(I) = -5I^2 + 100I$, where I represents the current, in amperes.
   a) What value of the current will maximize the power?
   b) What is the maximum power?

1.4 Skills You Need: Working With Radicals, pages 34 to 42

7. Perform each radical operation and simplify where needed.
   a) $\sqrt{27} - 4\sqrt{3} + \sqrt{243} - 8\sqrt{81} + 2$
   b) $-3\sqrt{3}(\sqrt{3} + 5\sqrt{2})$
   c) $(\sqrt{3} + 5)(5 - \sqrt{3})$
   d) $5\sqrt{2}(11 + 2\sqrt{2}) - 4(8 + 3\sqrt{2})$
8. Find a simplified expression for the area of each shape.
   a)


   b)


1.5 Solving Quadratic Equations, pages 43 to 51

9. Solve each quadratic equation. Give exact answers.
   a) $3x^2 - 2x - 2 = 0$
   b) $6x^2 - 23x + 20 = 0$
10. Use the discriminant to determine the number of roots for each equation.
   a) $3x^2 + 4x - 5 = 0$
   b) $-2x^2 + 5x - 1 = 0$
   c) $9x^2 - 12x + 4 = 0$
11. Jessica reasoned that since $2 \times 2 = 4$ and $2 + 2 = 4$, $\sqrt{2} + \sqrt{2}$ must have the same value as $\sqrt{2} \times \sqrt{2}$. Is she correct? Justify your answer.

1.6 Determine a Quadratic Equation Given Its Roots, pages 52 to 59

12. Determine the equation in standard form for each quadratic function.
   a) x-intercepts -2 and 5, containing the point (3, 5)
   b) x-intercepts $-2 \pm \sqrt{5}$, containing the point $(-4, 5)$
13. A golf ball is hit, and it lands at a point on the same horizontal plane 53 m away. The path of the ball took it just over a 9-m-tall tree that was 8 m in front of the golfer.
   a) Assume the ball is hit from the origin of a coordinate plane. Find a quadratic function that describes the path of the ball.
   b) What is the maximum height of the ball?
   c) Is it possible to move the origin in this situation and develop another quadratic function to describe the path? If so, find a second quadratic function.
14. **Use Technology** Use a graphing calculator to verify your solution to question 13.

1.7 Solve Linear-Quadratic Systems, pages 60 to 69

15. Determine the points of intersection of each pair of functions.
   a) $y = 4x^2 - 15x + 20$ and $y = 5x - 4$
   b) $y = -2x^2 + 9x + 9$ and $y = -3x - 5$
16. For what value of b will the line $y = -2x + b$ be tangent to the parabola $y = 3x^2 + 4x - 1$?
17. Do all linear-quadratic systems result in a solution? Justify your answer using a real-life example.

6. a) 10 A b) 500 W
7. a) $-70 + 8\sqrt{3}$ b) $-9 - 15\sqrt{6}$
   c) 22 d) $-12 + 43\sqrt{2}$
8. a) $5\sqrt{6} - 2$ square units b) $\frac{27\pi}{2}$ square units
9. a) $\frac{1 - \sqrt{7}}{3}, \frac{1 + \sqrt{7}}{3}$ b) $\frac{4}{3}, \frac{5}{2}$
10. a) two distinct real roots
    b) two distinct real roots
    c) one real root
11. Answers may vary. Sample answer: Jessica is not correct. Since $\sqrt{2} + \sqrt{2} = 2\sqrt{2} \doteq 2.8$ and $\sqrt{2} \times \sqrt{2} = 2$, then $\sqrt{2} + \sqrt{2} \neq \sqrt{2} \times \sqrt{2}$.
12. a) $f(x) = -\frac{1}{2}x^2 + \frac{3}{2}x + 5$
    b) $f(x) = -5x^2 - 20x + 5$
13. a) $f(x) = -\frac{1}{40}x^2 + \frac{53}{40}x$ b) 17.6 m
    c) Answers may vary. Sample answer: Yes. The second quadratic function is $f(x) = -\frac{1}{40}x^2 + \frac{2809}{40}$.
14. Answers may vary.
15. a) (2, 6), (3, 11) b) (−1, −2), (7, −26)
16. $b = -4$
17. Answers may vary. Sample answer: No. The line $y = 2x + 1$ and the parabola $y = x^2 - 3$ do not intersect.