Chapter 10 Review

1. Use a vertical format to add or subtract.
   a. $(2m - 8m^2 - 3) + (m^2 + 5m)$
   b. $(a + 3a^2 + 2a^3) - (a^4 - a^3)$
   c. $(7x^4 - x^2 + 3x) - (x^3 + 6x^2 - 2x + 9)$

2. Use a horizontal format to add or subtract.
   a. $(x^3 + x^2 + 1) - x^2$
   b. $(3a^3 - 4a^2 + 3) - (a^3 + 3a^2 - a - 4)$
   c. $(6b^4 - 3b^3 - 7b^2 + 9b + 3) + (4b^4 - 6b^2 + 11b - 7)$
   d. $(x^3 - 6x) - (2x^3 + 9) - (4x^2 + x^3)$

3. Use a vertical format or a horizontal format to add or subtract.
   a. $\left(x^4 - \frac{1}{2}x^2\right) + \left(x^3 + \frac{1}{3}x^2\right) + \left(\frac{1}{4}x^2 - 9\right)$
   b. $(10w^3 + 20w^2 - 55w + 60) + (-25w^2 + 15s - 10) + (-5w^2 + 10w - 20)$
   c. $\left(\frac{2}{5}a^4 - 2a + 7\right) - \left(-\frac{3}{10}a^4 + 6a^3\right) - \left(2a^2 - 7\right)$
   d. $\left(u^3 - u\right) - \left(u^2 + 5\right)$

4. Projected from 1950 through 2010, the total population P and the male population M of the United States (in thousands) can be modeled by the following equations, where t is the number of years since 1950.

   Total population model: $P = 2387.74t + 155211.46$
   Male population model: $M = 1164.16t + 75622.43$

   a. Find a model that represents the female population of the United States from 1950 through 2010.
   b. For the year 2010, the value of P is 298,475.86 and the value of M is 145,472.03. Use the figures to predict the female population in 2010.

5. You plan to build a house that is $1\frac{1}{2}$ times as long as it is wide. You want the land around the house to be 20 feet wider than the width of the house, and twice as long as the length of the house.

   a. Write an expression for the area of the land surrounding the house.

   b. If x = 30 feet, what is the area of the house? What is the area of the entire property?

6. Find the product.

   a. $-y(6y^2 + 5y)$

   b. $(3w^3 - 2w^2 - w)(4w^2)$

   c. $(3s^2 - s - 1)(s + 2)$

   d. $(2d + 2)(3d + 1)$

   e. $(x + 6)(x^2 - 6x - 2)$

   f. $(4x + 1)(x - 8)$

   g. $(3x + 4)\left(\frac{2}{3}x + 1\right)$

   h. $(9.4y - 5.1)(7.3y - 12.2)$

   i. $(-4s^2 + s - 1)(s + 4)$

7. The annual number of admissions D into movie theaters between 1980 and 1996 can be modeled by $D = 13.75t + 1057.36$, where D is measured in millions and t is the number of years since 1980. For the same years the admission price P can be modeled by $P = 0.11t + 2.90$, where P is the price per person and t is the number of years since 1980.

   a. Find a model for the annual box office revenue. Give the model as a quadratic trinomial.

   b. What conclusions can you make from your model?

8. Write the product of the sum and difference

   a. $(3b - 1)(3b + 1)$

   b. $(6 + 5n)(6 - 5n)$

9. Write the square of the binomial as a trinomial.

   a. $(2s - 4)^2$

   b. $(3t + 1)^2$

10. Find the product.

   a. $(a + 2b)(a - 2b)$

   b. $(-a - 2b)^2$

   c. $\left(2x + \frac{1}{2}\right)\left(2x - \frac{1}{2}\right)$

   d. $(3y + 8)^2$

11. In chickens, neither the normal-feathered gene F nor the frizzle-feathered gene f is dominant. So chickens whose feather genes are FF will have normal feathers. Chickens with Ff will have mildly frizzled feathers. Chickens with ff will have extremely frizzled feathers.

   a. Draw a Punnett square to show the possible results of crossing two chickens with mildly frizzled feathers. Find a model that can be used to represent the Punnett square and write the model as a polynomial.

   b. What percent of the offspring will have normal feathers? What percent will have mildly frizzled feathers? What percent will have extremely frizzled feathers?

12. Solve the equation.

   a. $(x + 4)(x + 1) = 0$

   b. $\left(t + \frac{1}{2}\right)(t - 4) = 0$

   c. $(4x - 8)(7x + 21) = 0$

   d. $8(9n + 27)(6n - 9) = 0$

   e. $(x + 44)(3x - 2)^2 = 0$

   f. $7(b - 5)^3 = 0$

   g. $\left(\frac{1}{2}x + 2\right)\left(\frac{2}{3}x + 6\right)\left(\frac{1}{6}x - 1\right) = 0$

   h. $\left(2n - \frac{1}{4}\right)\left(5n + \frac{3}{10}\right)\left(3n - \frac{2}{3}\right) = 0$

13. The Barringer Meteor Crater near Winslow, Arizona was formed about 49,000 years ago when a nickel and iron meteorite struck the desert at about 25,000 miles per hour. The model below represents a cross section of the crater where *x* and *y* are measured in meters.

Berringer Meteor Crater model: $y = \frac{1}{1800}(x - 600)(x + 600)$

a. Assuming the lip of the crater is at y = 0, how wide is the crater?

b. What is the depth of the crater?

14. Factor the trinomial

a. $w^2 + 13w + 36$

b. $m^2 - 7m - 30$

c. $x^2 - 45x + 450$

15. Solve the equation by factoring.

a. $x^2 + 7x + 10 = 0$

b. $x^2 - 5x = 84$

c. $x^2 + 42 = 13x$

d. $x^2 + 3x - 31 = -3$

e. $x^2 - 9x + 18 = 2x$

16. Tell whether the quadratic expression can be factored with integer coefficients. If it can, find the factors.

a. $y^2 + 19y + 60$

b. $w^2 - 6w + 16$

c. $x^2 - 26z - 87$

17. Consider a rectangle having one side of length $x - 6$ and having an area given by $A = x^2 - 17x + 66$.

a. Use factoring to find an expression for the other side of the rectangle.

b. If the area of the rectangle is 84 square feet, what are possible values of *x*?

c. For the value of *x* found in part b, what are the dimensions of the rectangle?

18. Factor the trinomial if possible. If it cannot be factored, write *not factorable*.

a. $3t^2 + 16t + 5$

b. $4n^2 - 26n - 42$

c. $4x^2 + 27x + 35$

d. $12m^2 + 48m + 96$

19. Solve the equation by factoring.

a. $2x^2 - 9x - 35 = 0$

b. $4x^2 - 8x = -3$

c. $18x^2 - 30x - 100 = 67x + 30$

d. $8x^2 - 34x + 24 = -11$

20. Solve the equation by factoring, by finding square roots, or by using the quadratic formula.

a. $4n^2 + 2n = 0$

b. $x^2 - 10x = -25$

c. $9x^2 - 19 = -3$

d. $24z^2 + 46z - 55 = 10$

21. Multiply each side of the equation by an appropriate power of 10 to obtain integer coefficients. Then solve by factoring.

a. $0.8x^2 + 3.2x + 2.40 = 0$

b. $0.119y^2 - 0.162y + 0.055 = 0$

c. $0.23t^2 - 0.54t + 0.16 = 0$

22. Use the vertical motion model and solve by factoring.

a. A gymnast dismounts the uneven parallel bars at a height of 8 feet with an initial upward velocity of 8 feet per second. Find the time t (in seconds) it takes for the gymnast to reach the ground. Is your answer reasonable?

Vertical Motion Models

Object is dropped: $h = -16t^2 + s$

Object is thrown: $h = -16t^2 + vt + s$

h = height (feet) t = time in motion (seconds)

s = initial height (feet) v = initial velocity (feet per second)

b. At a basketball game, T-shirts are rolled-up into a ball and shot from a "T-shirt cannon" into the crowd. The T-shirts are released from a height of 6 feet with an initial upward velocity of 44 feet per second. If you catch a T-shirt at your seat 30 feet above the court, how long was it in the air before your caught it? Is your answer reasonable?

23. Factor each expression.

a. $60y^2 - 540$

b. $9t^2 - 4q^2$

c. $x^2 + 8x + 16$

d. $25n^2 - 20n + 4$

e. $18x^2 + 12x + 2$

f. $-3k^2 + 42k - 147$

24. Factor the expression. Tell which special product pattern you used.

a. $-2x^2 + 52x - 338$

b. $x^2 + \frac{2}{3}x + \frac{1}{9}$

c. $4b^2 - 40b + 100$

d. $y^2 + 12y + 36$

25. Use factoring to solve the equation.

a. $3x^2 - 24x + 48 = 0$

b. $27 - 12x^2 = 0$

c. $x^2 - \frac{5}{3}x + \frac{25}{36} = 0$

d. $90x^2 - 120x + 40 = 0$

e. $-\frac{4}{5}x^2 - \frac{4}{5}x - \frac{1}{5} = 0$

26. In the sport of pole-vaulting, the height h (in feet) reached by the pole-vaulter is a function of v, the velocity of the pole-vaulter, as shown in the model below. The constant g is approximately 32 feet per second per second.

Pole-vaulter height model: $h = \dfrac{v^2}{2g}$

a. To reach a height of 9 feet, what is the pole-vaulter's velocity?

b. To reach a height of 16 feet, what is the pole-vaulter's velocity?

27. Find the greatest common factor and factor it out of the expression.

a. $4a^5 + 8a^3 - 2a^2$

b. $18d^6 - 6d^2 + 3d$

28. Factor the expression completely.

a. $2y^3 - 10y^2 - 12y$

b. $c^4 + c^3 - 12c - 12$

c. $7n^5 + 7n^4 - 3n^2 - 6n - 3$

d. $-12z^4 + 3z^2$

29. Solve the equation. Tell which solution method you used.

a. $y^7 + 7y + 12 = 0$

b. $10x^3 - 290x^2 + 620x = 0$

c. $-14x^4 + 118x^3 + 72x^2 = 0$

d. $27 + 6w - w^2 = 0$

30. Use the vertical motion models where h is the initial height (in feet), v is the initial velocity (in feet per second) and t is the time (in seconds). The object spends in the air. (Note that the acceleration due to gravity on the Moon is $\frac{1}{6}$ that of Earth.)

Vertical Motion Models

On Earth: $h = 16t^2 + vt$

On the Moon: $h = \frac{16}{6}t^2 - vt$

h = height (feet) t = time in motion (seconds)

v = initial velocity (feet per second)

a. On Earth, you toss a tennis ball from a height of 96 feet with an initial upward velocity of 16 feet per second. How long will it take the tennis ball to reach the ground?

b. On the Moon, you toss a tennis ball from a height of 96 feet with an initial velocity of 16 feet per second. How long will it take the tennis ball to reach the surface of the moon?