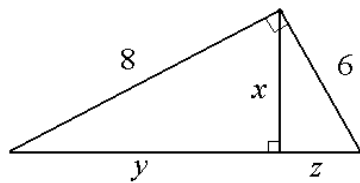
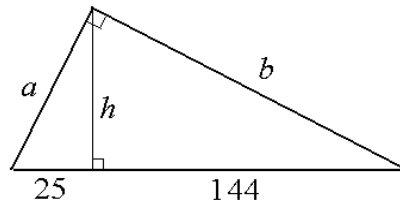


- Re-write  $0.30\overline{72}$  as a fraction of integers.
- Simplify each of the following.
  - $(4\sqrt{3} - 2)^2$
  - $\sqrt{20} - 3\sqrt{180} + \sqrt{500}$
  - Rationalize the denominator in  $\frac{6}{5 - \sqrt{7}}$
  - Find the exact value of  $x^2 - 5x + 8$  if  $x = 1 - 2\sqrt{3}$
- Simplify each of the following.
  - $\frac{2a^{-5}(2a^{-2})^{-3}(-4a^0)}{(2a^{-2})^{-3}(-4a)^2}$
  - $\frac{2^{-2} - 3^{-2}}{1 - 2^{-1}(3^{-1})}$
  - $\frac{3^{2x-3}2^{3x+1}}{6^{2x-1}}$
- Let  $x$  denote the number  $2^{143}$ . Simplify the expression  $2^{143} + 3 \cdot 2^{144} + 2^{145}$  and write it in terms of  $x$ .
- Solve each of the following equations. Make sure to check your solution.
  - $x^3 = 24x^2 + 217x$
  - $\frac{3-x}{4} - \frac{10-3x}{5} = x+2$
  - $(3x-2)(9-x) = 5x-2(x-3)^2$
  - $3(x-5) - 5(x-1) = -2x+1$
  - $18x^3 = 2x$
- Solve  $3x^2 + 5x = 1$  by completing the square. Check your solution(s), using exact values.
- Solve each of the following inequalities.
  - $12x - 2x^2 > 20$
  - $12x + x^2 \geq 45$
  - $\frac{1}{3}x^2 - 4x \leq -12$
  - $-x^2 + 6x > 1$
- Solve each of the following system of equations.
  - $\begin{cases} 3x - 5y = -12 \\ y - x = 4 \end{cases}$
  - $\begin{cases} 2x + 5y = -11 \\ 3x - y = -25 \end{cases}$
  - $\begin{cases} 2x + 3y = -1 \\ y = -\frac{2}{3}x + 2 \end{cases}$
- Completely factor each of the following.
  - $8a^2m - n - 2m + 4a^2n$
  - $125p^{21} + 1$
  - $a^3 - x^2 + a^3x^2 - 1$
  - $16y^4 - 1$
- Factor each of the following by completing the square.
  - $3x^2 - 4x - 319$
  - $3x^2 - 3x + 4$
  - $20x - 2x^2 - 46$
  - $-4x^2 + 3x + 7$
- Graph each of the following equations.
  - $y = -\frac{2}{3}x + 1$
  - $y = 8x - 2x^2 - 6$
  - $10x + x^2 + y^2 = 6(y - 5)$
  - $2x - 3y + xy = 6$
- Find the point(s) of intersection of  $y = x^2 - 4x - 21$  and  $y = 4x - 28$ .
- Write an equation for the circle centered at  $(2, -2)$  with radius  $\sqrt{3}$ .
- Find the coordinates of all points of intersection of the circles
  - $(x+1)^2 + (y-6)^2 = 25$  and  $(x-13)^2 + (y-4)^2 = 125$
  - $(x+3)^2 + (y+1)^2 = 50$  and  $(x-1)^2 + (y-2)^2 = 25$
  - $(x+3)^2 + (y+1)^2 = 25$  and  $(x-3)^2 + (y-2)^2 = 10$
  - $(x+4)^2 + (y-1)^2 = 5$  and  $x^2 + (y-3)^2 = 45$
  - $(x-1)^2 + (y+2)^2 = 20$  and  $x^2 + (y+3)^2 = 36$
- Find an equation of the tangent line drawn to  $(x-10)^2 + (y+6)^2 = 29$  at the point  $P(8, -1)$ .
- Suppose that  $x$  and  $y$  are real numbers with  $x + 3y = 20$ .
  - Find the smallest possible value of  $x^2 + y^2$ .
  - Find the greatest value of  $xy$ .
  - Find the smallest value of  $(x-y)^2$ .
  - Find the greatest value of  $y^2 - x^2$ .

17. A citrus grower estimates that if 60 orange trees are planted, the average yield per tree will be 400 oranges. The average yield will decrease by 4 oranges per tree for each additional tree planted on the same acreage. Find the total number of trees the grower should plant to maximize yield.
18. There is an animal farm where chickens and cows live. All together, there are 53 heads and 174 legs. How many chickens, how many cows?
19. An arc is in the shape of a semicircle. At a point along the base 3 feet from an end of the arch, the height of the arch is 11 feet. Find the maximum height of the arch.
20. We invested \$10000 into two bank accounts. One account earns 14% per year, the other account earns 8% per year. How much did we invest into each account if the combined interest from the two accounts is \$1238 after the first year?
21. Sally worked 50 hours last week and made \$495 for the week. For every hour worked over 40 her job pays time and a half. What is Sally's regular hourly pay rate?
22. The cost of manufacturing  $q$  units of a product is given by  $C(q) = 6q^2 + 10q$ . Suppose we can sell all  $q$  units for a total of  $142q + 1674$  dollars. Find the maximum profit we can achieve.
23. Find the distance between the points  $A(-3, -5)$  and  $B(3, 3)$ .
24. A person is standing 3 ft away from a street light that is 15.6 ft tall. How long is his shadow if he is 5.2 ft tall?
25. Find the exact value of  $x$ ,  $y$ , and  $z$ , and  $a$ ,  $b$ , and  $h$  based on the figures shown below.

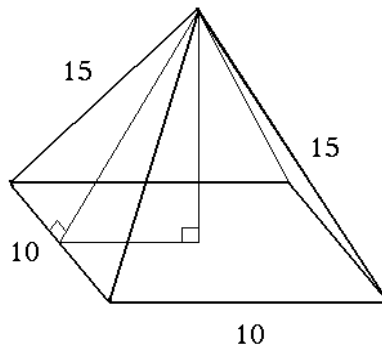


(a)



(b)

26. Compute the exact value of the area of the triangle with sides 6, 6, and 8 units long.
27. The picture below shows a straight pyramid with a square base. The sides of the base are 10 in long. The other edges are 15 in long.

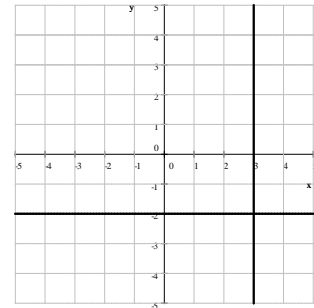
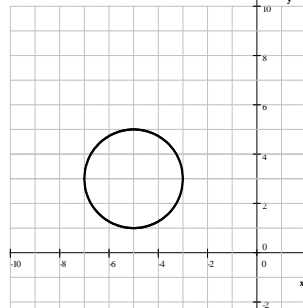
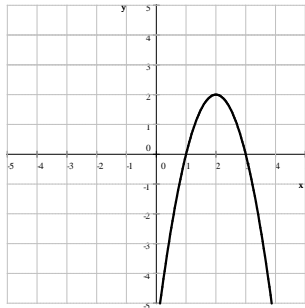
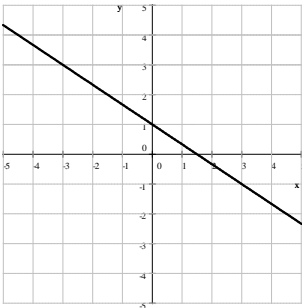


- a) Find the height of a triangular face.
- b) Use part a) to find the height of the pyramid.

28. Find the exact value of the area of a regular triangle with sides 5 meters long.
29. The vertical location of an object is given by  $h(t) = -16t^2 + 256t + 1280$ . What is the highest point that the object reaches?

## Answers

- 1.)  $\frac{3042}{9900}$     2.) a)  $52 - 16\sqrt{3}$     b)  $-6\sqrt{5}$     c)  $\frac{\sqrt{7} + 5}{3}$     d)  $6\sqrt{3} + 16$
- 3.) a)  $-\frac{1}{2a^7}$     b)  $\frac{1}{6}$     c)  $\frac{4}{9} \cdot 2^x$     4.)  $11x$
- 5.) a)  $-7, 0, 31$     b)  $-5$     c)  $0, 12$     d) no solution    e)  $-\frac{1}{3}, 0, \frac{1}{3}$
- 6.)  $-\frac{5}{6} \pm \frac{\sqrt{37}}{6}$     7.) a) no solution    b)  $x \leq -15$  or  $x \geq 3$     c)  $x = 6$     d)  $3 - 2\sqrt{2} < x < 3 + 2\sqrt{2}$
- 8.) a)  $x = -4, y = 0$     b)  $x = -8, y = 1$     c) no solution    9.) a)  $(2a - 1)(2a + 1)(2m + n)$   
 b)  $(5p^7 + 1)(25p^{14} - 5p^7 + 1)$     c)  $(x^2 + 1)(a - 1)(a^2 + a + 1)$     d)  $(4y^2 + 1)(2y - 1)(2y + 1)$
- 10.) a)  $3\left(x + \frac{29}{3}\right)(x - 11)$     b) does not factor    c)  $-2(x - 5 + \sqrt{2})(x - 5 - \sqrt{2})$     d)  $-4(x + 1)\left(x - \frac{7}{4}\right)$
- 11.) a)  $y = -\frac{2}{3}x + 1$     b)  $y = 8x - 2x^2 - 6$     c)  $10x + x^2 + y^2 = 6(y - 5)$     d)  $2x - 3y + xy = 6$



- 12.)  $(1, -24)$  and  $(7, 0)$     13.)  $(x - 2)^2 + (y + 2)^2 = 3$     14.) a)  $(2, 2)$  and  $(3, 9)$     b)  $(-2, 6)$  and  $(4, -2)$   
 c)  $(0, 3)$  and  $(2, -1)$     d)  $(-6, 0)$     e) there is no intersection point    15.)  $y + 1 = \frac{2}{5}(x - 8)$
- 16.) a) 40 when  $x = 2, y = 6$     b)  $\frac{100}{3}$  when  $x = \frac{10}{3}, y = \frac{10}{3}$     c) 0 when  $x = 5, y = 5$   
 d) 50 when  $x = -\frac{5}{2}, y = \frac{15}{2}$     17.) if we plant 80 trees, then we will obtain a maximal yield of 25 600 oranges.
- 18.) 19 chickens and 34 cows    19.)  $\frac{65}{3}$  feet    20.) \$7300 at 14% and \$2700 at 8%    21.) \$9    22.) \$2400
- 23.) 10 units    24.) 1.5 ft    25.) a)  $x = \frac{24}{5} = 4.8, y = \frac{32}{5} = 6.4, z = \frac{18}{5} = 3.6$     b)  $a = 65, b = 156, h = 60$
- 26.)  $8\sqrt{5}$     27.) a)  $10\sqrt{2}$  in  $\approx 14.142136$  in    b)  $5\sqrt{7}$  in  $\approx 13.228757$  in    28.)  $\frac{25}{4}\sqrt{3}$  m<sup>2</sup>    29.) 2304 feet