1. Simplify each of the following expressions.

   a) $m^2 \cdot m^3$ b) $\left(m^2\right)^3$ c) $\dfrac{\left(a^3b^2\right)^3}{ab^4}$ d) $\dfrac{3^{2x-1}}{9^{x-1}}$ e) $\dfrac{\left(-p^2\right)^3 q^5}{(-p)^2 q^4}$ f) $\left(-\dfrac{2x^3y}{y^4}\right)^2 \left(\dfrac{2x^3y^2}{-8x^5y^2}\right)^3$

2. Solve each of the following systems of linear equations.

   a) $\begin{cases} 3x-2y=12 \\ 2x-y=4 \end{cases}$ b) $\begin{cases} x+5y=3 \\ y=-\dfrac{1}{5}x+\dfrac{3}{5} \end{cases}$ c) $\begin{cases} 2x-y=6 \\ x=\dfrac{1}{2}y+1 \end{cases}$

3. Solve each of the following linear inequalities.

   a) $-2x+7 \le -21$ b) $\dfrac{3x-1}{5} > x+1$ c) $(x-4)^2 < x^2-4$

4. Solve each of the following word problems.

   a) A farmer has some chickens and cows. One day he was asked: "*How many chickens and how many cows do you have?*" His answer was: *"All together, there are* 73 *heads and* 188 *legs"*. How many chickens and how many cows does the farmer have?

   b) A total of \$20 000 is to be invested in bonds and stocks. If the amount invested in bonds is to be \$4500 more than the amount invested in stocks, how much money is invested in each category?

   c) Sally worked 50 hours last week and made \$660 for the week. For every hour worked over 40 her job pays time and a half. What is Sally's regular hourly pay rate?

5. Re-write the decimal $0.1\overline{74}$ as a fraction of two integers.

6. What is the smallest possible value of the expression $x^2-12x+25$?

7. Simplify each of the following expressions.

   a) $(5a-1)^2$
   b) $\left(3x^5+4y\right)\left(3x^5-4y\right)$
   c) $\sqrt{125}-3\sqrt{80}+\sqrt{45}$
   d) $\left(2-\sqrt{3}\right)\left(5\sqrt{3}+1\right)$
   e) $\left(\sqrt{7}-2\right)^2$
   f) $\left(\sqrt{7}-2\right)^3$
   g) $\left(\sqrt{5}-\sqrt{2}\right)^2$

8. Rationalize the denominator in each of the following expressions.

   a) $\dfrac{3}{\sqrt{5}}$ b) $\dfrac{1}{\sqrt{10}-3}$ c) $\dfrac{2}{\sqrt{7}+1}$ d) $\dfrac{6}{2-\sqrt{12}}$ e) $\dfrac{2}{\sqrt{5}-\sqrt{3}}$

9. Find the exact value of $-x^2+4x+6$ if $x=2-\sqrt{3}$.

10. Factor each of the following by completing the square.

    a) $22x+3x^2-16$ b) $9x^2-12x-1$

11. Completely factor each of the following.

    a) $9x^2-16y^{10}$ b) $5x^2+10x$ c) $900x+15x^2-3x^3$ d) $32x^4-2$

12. Solve each of the following equations. Make sure to check your solution(s).

    a) $2x^3=20x^2+1750x$
    b) $\dfrac{3x+17}{2}=x-1+\dfrac{x+19}{2}$
    c) $\dfrac{2}{3}(x-7)=\dfrac{4}{5}(x+1)$
    d) $2x^2=2x$
    e) $8a+2a^2=42$
    f) $8x^3=50x^2$
    g) $8p^3=50p$

h) $2-(3-x)(2x+5)=(x-1)(2x-1)$ i) $7x^2+(x+3)(2x-1)=(3x+1)^2$

13. a) Graph the line $2x-3y=-12$.
b) Graph the parabola $y=-8x+x^2+15$. Clearly label the coordinates of five points on the parabola, including vertex and intercepts.

14. a) One side of a rectangle is 4 ft shorter than three times the other side. Find the sides if the perimeter is 64 ft.
b) One side of a rectangle is 4 ft shorter than three times the other side. Find the sides if the area is 84 ft^2.

15. Today a cab ride costs a flat fee of \$3.25 and then \$1.8 per mile. We take a ride that costs \$23.05. How far was our destination?

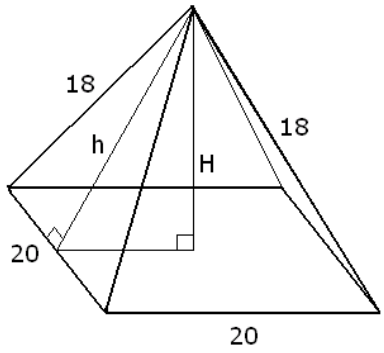
16. a) The shortest side of a right triangle is 12 cm. The difference between the other two sides is 2 cm. Find the sides of the triangle. Use exact values.
b) The hypotenuse of a right triangle is 82 cm. The difference between the other two sides is 62 cm. Find the sides of the triangle. Use exact values.

17. Find the distance between $(3,8)$ and $(8,-4)$. Use exact values.

18. Find the length of the main diagonal in a rectangular prism with sides 7 m, 8 m, and 10 m long. Use exact values.

19. Consider the isosceles triangle with sides 7 m (meter), 7 m, and 10 m long.
a) Compute the exact value of the height belonging to the 10 m long sides.
b) Compute the exact value of the area of the triangle.

20. Find the length of the line segments denoted by h and H, based on the picture given. Use exact values.



Answers

1. See handout Exponents.) a) m^5 b) m^6 c) a^8b^2 d) 3 e) $-p^4q$ f) $-\dfrac{1}{16y^6}$

2. See handout on system of equations.
a) $(-4,-12)$ b) this system is dependent, there are infinitely many solutions
c) this system is inconsistend, there is no solution

3. See handout on linear inequalities. a) $[14,\infty)$ b) $(-\infty,-3)$ c) $\left(\dfrac{5}{2},\infty\right)$

4. See handout on system of equations.
a) 52 chickens and 21 cows b) 7750 in stocks and 12 250 in bonds c) \$12

5. See handout Decimals and Fractions. $\dfrac{173}{990}$

6. -11 after completing the square: $x^2 - 12x + 25 = (x-6)^2 - 11$

7. See handout Radical Expressions.
   a) $25a^2 - 10a + 1$ b) $9x^{10} - 16y^2$ c) $-4\sqrt{5}$ d) $9\sqrt{3} - 13$ e) $11 - 4\sqrt{7}$ f) $-50 + 19\sqrt{7}$
   g) $7 - 2\sqrt{10}$

8. See handout Radical Expressions.
   a) $\dfrac{3\sqrt{5}}{5}$ b) $\sqrt{10} + 3$ c) $\dfrac{\sqrt{7} - 1}{3}$ d) $-\dfrac{3\sqrt{3} + 3}{2}$ e) $\sqrt{5} + \sqrt{3}$

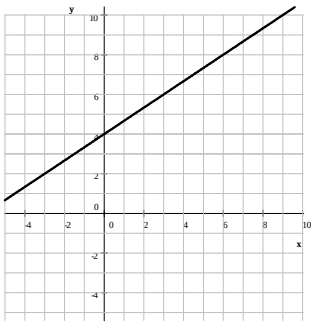
9. See handout Radical Expressions. 7

10. a) See handout Completing the Square - Part 3. $3(x+8)\left(x - \dfrac{2}{3}\right) = (x+8)(3x-2)$
    b) See handout Completing the Square - Part 4. $9\left(x - \dfrac{2-\sqrt{5}}{3}\right)\left(x - \dfrac{2+\sqrt{5}}{3}\right)$

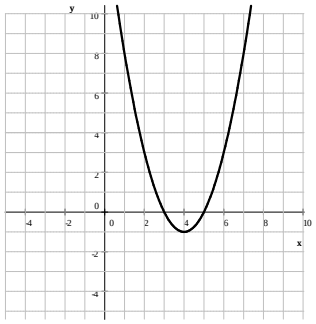
11. See handout Factoring 1.
    a) $\left(3x - 4y^5\right)\left(3x + 4y^5\right)$ b) $5x(x+2)$ c) $-3x(x+15)(x-20)$ d) $2\left(4x^2+1\right)(2x+1)(2x-1)$

12. See handouts Linear Equations and Factoring 1.
    a) $35, 0$, and -25 b) identity, all real numbers are solution c) -41 d) $0, 1$ e) $-7, 3$
    f) $\dfrac{25}{4}, 0$ g) $-\dfrac{5}{2}$, 0, $\dfrac{5}{2}$ h) 7 i) -4

13. See handouts Graphing Lines and Graphing a Parabola 1.



a) $y = \dfrac{2}{3}x + 4$



b) $y = x^2 - 8x + 15$

   b) vertex: $(4, -1)$ $y-$intercept:$(0, 15)$ $x-$intercepts: $(3, 0)$ and $(5, 0)$ additional points: $(1, 8)$, $(2, 3)$

14. a) See handout Wordproblems 1. 9 ft and 23 ft
    b) See handouts Factoring 1 and Wordproblems 2. 6 ft and 14 ft

15. see handout word problems 1 11 miles

    For problems 16-20, see handout Pythagorean Theorem.

16. a) 35 cm and 37 cm b) 18 cm and 80 cm

17. 13 units 18. $\sqrt{213}$ m 19. a) $\sqrt{24}$ m $= 2\sqrt{6}$ m b) $10\sqrt{6}$ m^2

20. $h = \sqrt{224}$ unit$= 4\sqrt{14}$ unit $H = \sqrt{124}$ unit$= 2\sqrt{31}$ unit