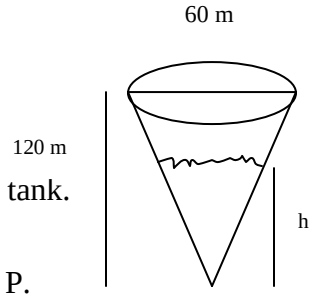
Unit 1 Functions-Word Problems

1. Express the area A of a $30° - 60° - 90°$ triangle as a function of the length h of the hypotenuse.
2. A tourist walks n km at 4 km/h and then travels 2n km at 36 km/h by bus. Express the total traveling time t (in hours) as a function of n.
3. A store owner bought n dozen toy boats at a cost of $3.00 per dozen, and sold them at $.75 apiece. Express the profit P (in dollars) as a function of n.
4. The height of a cylinder is twice the diameter. Express the total surface area A as a function of the height h.
5. A light 3 m above the ground causes a boy 1.8 m tall to cast a shadow s meters long measured along the ground. Express s as a function of d, the boy's distance in meters from the light.
6. A box with a square base has a surface are (including the top) of 3 m^2. Express the volume V of the box as a function of the width w of the base.
7. A stone is thrown into a lake, and t seconds after the splash the diameter of the circle ripples is t meters.
   a. Express the circumference C of this circle as a function of t.
   b. Express the area A of this circle as a function of t.
8. A box with a square base and no top has a volume of 8 m^3. The material for the base costs $8 per square meter, and the material for the sides cost $6 per square meter.
   a. Express the cost C of the materials used to make the box as a function of the width w of the base.
   b. Use a graphing calculator to find the minimum cost.
9. At 2:00 P.M. bike A is 4 km north of point C and traveling south at 16 km/h. At the same time, bike B is 2 km east of C and traveling east at 12 km/h.
   a. Show that t hours after 2:00 P.M. the distance between the bikes is:
      $\sqrt{400t^2 - 80t + 20}$
   b. At what time is the distance between the two bikes the least?
   c. What is the distance between the bikes when they are closest?
10. Water is flowing at a rate of 5 m^3/s into a conical tank.
    a. Find the volume V of the water as a function of the water level h.
    b. Find h as a function of the time t during which water has been flowing into the tank.



11. P(x,y) is an arbitrary point on the line $2x + y = 10$.
    a. Express the distance d from the origin to P as a function of the x-coordinate of P.
    b. What are the domain and range of this function.
12. Rectangle ABCD has vertices C and D on the x-axis and vertices A and B on the part of the parabola $y = 9 - x^2$ that is above the x-axis.
    a. Express the perimeter P of the rectangle as a function of the x-coordinate of A.
    b. What is the domain of the perimeter function?
    c. For what value of x is the perimeter a maximum?
13. From raft 50 m offshore, a lifeguard wants to swim to shore and run to a snack bar 100 m down the beach.
    a. If the lifeguard swims at 1 m/s and runs 3 m/s, express the total swimming and running time t as a function of the distance x.
    b. Use a graphing calculator to find the minimum time.