Word, Formula, and Geometry Problems

Math 130 *Kovitz* 2012

1. During a trip in Europe a group first went one-third of the way by boat, then 10 miles by foot, then one-fifth of the distance remaining by train, and finally one-half of the entire trip by plane. How long was the trip?

2. A box is in the shape of a cube. If another box were to be constructed with a square base the sides of which were each one inch less than a side of the the cube and with height three inches greater than a side of the cube, the resulting volume would be one cubic inch less than the volume of the cubic box.

   Find the volume of the cubic box.

3. Health-care workers in Port Vila, Vanuatu, are vaccinating children against smallpox. All children contacted, as well as one third of those children not contacted, have been vaccinated. Overall, three fifths of the children in that city have been vaccinated.

   (a) What percent of children in Port Vila, Vanuatu, have been contacted?

   (b) If 4286 children have not been vaccinated, how many children have not been contacted?

4. Subtracting a number from its reciprocal gives 8/3 as the answer.

   What could that number possibly be?

5. A driver travels 40 miles to the gym at a constant speed and travels the same distance home at a constant speed. His speed on the return trip was six miles per hour faster, and the total time for both trips was three hours.

   Find his speed on the way to the gym.

6. A driver drove at constant speed during the first half of his trip and then drove at a constant speed 12 miles-per-hour faster during the second half of his trip. But if he would have driven the whole way at a constant speed 5 miles-per-hour faster than he actually drove during the first half, the whole trip would have taken just as long.

   How fast did he actually drive during the first half of the trip?

7. Solve:
   (a) $A = \frac{1}{2}h(c - d)$, for d.
   (b) $T = 9uv - 4v + 8$, for v.
   (c) $3x + 4x(2y - 5) = y + 7(3x + 1) - 2y - \sqrt{3}y$, for y.
8. (a) Find a formula for the radius of a circle expressed in terms of its area.
   (b) Find a formula for the area of a circle expressed in terms of its circumference.
   (c) From the previous result, derive a formula for the circumference of a circle expressed in terms of its area.
   (d) In any circle, how far is the center from any point on the circle?
9. Find the approximate area of a circle with circumference 17.00079 feet.
10. A semicircle is drawn in the Cartesian coordinate plane above the x-axis with endpoints of $(-5, 0)$ and $(5, 0)$.

    Then a triangle is to be inscribed in that semicircle by selecting any point on the semicircle and connecting the three points with line segments.
    (a) What are the coordinates of that point on the semicircle that will lead to a triangle of maximum area?
    (b) What is the exact value of that maximum area?
    (c) Decide whether that triangle of maximum area is a right triangle and justify your decision.
    (d) Find the area of that part of the semicircle that lies outside of the triangle of maximum area.
11. Draw a rectangle with base of length b and height of length h.

    Find the area of the rectangle.

    Now connect two opposite vertices with a diagonal line segment.
    (a) Find the length of that line segment.
    (b) Prove that the two triangles formed are congruent (have equal sides and angles).
    (c) Based on the above facts, find the area of one of the triangles.
    (d) Find the perimeter of one of the two triangles.