Math 29

Homework problems for Exam 1

(1) **Scaling and Units:** Monarch butterflies fly 4500 kilometers when they migrate from Southern Canada to Mexico. On average, the body of a monarch is 9 centimeters long. On average, an American male is 5'9". If Monarchs were scaled up to the size of men, how many miles would their scaled up migration be?

(2) **Concentrations:** You need a 15% acid solution for a certain test, but your supplier only ships a 10% solution and a 30% solution. Rather than pay the hefty surcharge to have the supplier make a 15% solution, you decide to mix 10% solution with 30% solution, to make your own 15% solution. You need 10 liters of the 15% acid solution. How many liters of 10% solution and 30% solution should you use?

(3) **Sampling:** I want to estimate how many m & m's I have in a jar. I add 30 skittles to the jar without removing any m & m's. Then I take a sample of 35 candies and find that it contains 6 skittles. How many m & m's were originally in the jar?

(4) **Significant figure arithmetic** Compute the following, rounding to the nearest significant digit: $(0.0766 - 0.0123) + (1.245 \times 10^{-3}) - (4.998 \times 10^{-4})$

(5) **Percent:** A hot air balloon in the shape of a sphere has a radius of 12 yards. If the radius of the balloon is increased by 1 meter, by what percent is the enclosed volume increased?

(6) **Big and small numbers:** Estimate $18^{-10,000}$.

(7) **Estimation:** A single strand of DNA can be represented by a string of bases. Each base is chosen from among the letters A, C, G, and T. Estimate how many distinct single strands of DNA there are which each contain 2 million bases where the first one million bases are chosen just from the letters A and C. Give your answer in scientific notation.

(8) **Experimental error** A student analyzing a sample obtains the results: 84.1, 87.2, 83.8, and 80.3. The theoretical value is 82.2. Calculate the mean, error, percent error, deviation, and percent deviation of the student's results.

(9) **Equations with logs** Solve the following equation for x,

$$\log_2(17.6) + 3\log(x) - 2\log(.067) = 6\log_2(104)$$