Study Guide for Exam 1

1C- Know how to draw Venn diagram and use them to answer questions about relationships between sets. Sample problems:

1. Draw a Venn diagram to represent the relationship between the following sets. Specify whether the sets are disjoint, overlapping, or if one set is a subset of the other set.
  a. Apples and oranges.
  b. People who can speak English and people who can speak German.
  c. Dogs and mammals.

2. Of the 43 students in a certain club, 16 are taking mathematics, 23 are taking biology, and 6 are taking astronomy. One student is taking all 3 courses, two are taking only astronomy, one is taking only biology and astronomy, and 5 are taking only mathematics and biology.
  a. Draw a Venn diagram to represent the information given. Include numbers in every
  section of the Venn diagram to represent the quantities present.
  b. How many students are taking only mathematics and astronomy?
  c. How many students are taking only mathematics?
  d. How many students are not taking any of these three subjects?

1D- Know how to determine if arguments are inductive or deductive. Be able to analyze both kinds of arguments (remember that the terms "weak" and "strong" are used to describe inductive arguments and "valid" and "sound" are used to describe deductive arguments). Sample problems:

1. Determine whether the following arguments are inductive or deductive arguments.
  a. Every day this week, I have seen Mitch on my way to the bus stop. He must be there
  every week.
  b. Norway, Denmark, and Sweden are in Scandinavia. Bergen is a city in Norway, so
  Bergen must be in Scandinavia.

2. Determine if the following deductive argument is valid by using a Venn diagram. If the argument is valid, also determine if the argument is sound.
  Premise: Everyone who eats steak is a quarterback
  Premise: John eats steak.
  Conclusion: John is a quarterback.

2A- Be able to work with units. Sample problems:

1. A box has a volume of 108 cubic feet. What is its volume in cubic yards?

2. You traveled a total of 201.5 miles in 3 hours and 15 minutes. What was your average speed in miles per hour? If your car averages 30 miles per gallon of gas, how much gas did you use during the trip?

2B- Be able to convert units using a chain of conversions, especially when dealing with the metric system. Sample problems:

1. Carry out the following unit conversions. Be sure to include units in your work.

a. 60 mph to kilometers per second (0.6214 mi = 1 km)
b. 15 square miles to square kilometers
c. 60 liters to gallons (1 qt = 0.9464 L, 1 gal = 4 qts)
d. -40° C to degrees Fahrenheit
e. 98.6° F to degrees Celsius
f. 36° C to Kelvin
g. 285.25 K to degrees Celsius

3A- Be able to work with percentages and calculate absolute and relative differences. Sample problems:

1. Fill in the blanks in the following sentences:
   a. _____ is 42% less than 250.
   b. _____ is 76% of 300.
   c. _____ is 125% more than 400.
   d. 72 is _____% of 92.
   e. 99 is 10% more than _____.
   f. 250 is 7% less than _____.
   g. 96 is _____% more than 42.

2. This year, 630 people in Mayberry bought a new car. Last year, 600 people bought a new car. Find the absolute and relative change for the number of new cars bought.

3B- Be able to use scientific notation to represent numbers. Sample problems:

1. Carry out the following calculations without a calculator. Give your answers in scientific notation:
   a. $(3.2\times10^{8})\times(2\times10^{10})$
   b. $(1.6\times10^{-2})\div(8\times10^{3})$
   c. $(5.8\times10^{3})+(4.4\times10^{2})$
   d. $(3.5\times10^{-1})-(2.3\times10^{-2})$

2. Rewrite each of the following numbers in scientific notation.
   a. 3,240,000,000,000,000
   b. 0.000004256
   c. 98 million

3C- Know the difference between precision and accuracy. Also know how to calculate absolute and relative error. Sample problems:

1. Your true weight is 127 pounds. Your bathroom scale, which measures to the nearest 0.5 pound says that you weigh 126.5 pounds. The scale at the doctor's office, which measures to the nearest 0.1 pound gives a reading of 127.7 pounds.
   a. Which measurement is more precise?
   b. Which measurement is more accurate?
   c. What is the absolute error for the measurement taken at home?
   d. What is the relative error for the measurement taken at home?