MATH 1030: Final Exam Study Guide

The following is an overview of the material that will be covered on the first exam.

1. Sets and Venn Diagrams

   - The definitions of disjoint sets, subsets, and intersecting sets.
   - Making Venn Diagrams (with 3 sets).
   - Drawing venn diagrams for categorical propositions.

2. Analyzing Arguments

   - Identifying inductive and deductive arguments.
   - Evaluating the strength of an inductive argument.
   - Evaluating the validity and soundness of deductive arguments.

3. Unit Conversions

   - Memorize the following conversion factors
     - $1\,\text{inch} = 2.54\,\text{cm}$
     - $1\,\text{mile} = 1.60\,\text{km}$
     - $1\,\text{kg} = 2.2\,\text{lb}$
     - $1\,\text{gal} = 3.785\,\text{Liters}$
     - Conversion between Celcius and Fahrenheit: $F = 1.8C + 32$
   - Memorize the table of common metric prefixes. This is table 2.5 on page 99.
   - Be able to do unit conversion problems
   - Know how to deal with units raised to powers (i.e. converting ft^2 to m^2)
   - Currency conversion problems.
   - Know what energy and power are, and know how to do unit conversion problems of this type.
   - Know how to calculate concentrations and density (e.g. blood alcohol content or population density)

4. Percentages and Ratios

   - Using percentages as fractions.
   - Using percentages to describe change. This includes knowing the formulas for absolute and relative change.
   - Using percentages for comparisons. Know the formulas for absolute and relative differences.
   - Be able to do problems with percentages of percentages. Remember that absolute differences are expressed in percentage points while relative differences are expressed as a percent.

- In all problems involving percentages of percentages, take *extreme* care to read the problem carefully. Read it at least two or three times and be sure you understand what relationships are being claimed. For example "Newspaper readership is now 90%, up 50% from the previous year." In this statement, 50% is not an absolute change, it is a relative change. Moreover, the reference value (the value to which this change is being compared) is not 90% but is the percent of the population that read the paper in the previous year!!

5. Large and small numbers

   - Convert between scientific and standard notation.
   - Add, subtract, multiply, and divide numbers in scientific notation.
   - Make approximations to get an order of magnitude estimate.

6. Simple and Compound Interest

   - Know how to do computations with simple interest
   - Know the compound interest formula for an account that compounds n times per year.

   $$A = P\left(1 + \frac{APR}{n}\right)^{nY}$$

   - Know the compound interest formula for an account that compounds continuously

   $$A = Pe^{APR \cdot Y}$$

   - Know how to compute the APY given the APR for an account. If the account is compounded n times per year, then $APY = \left(1 + \frac{APR}{n}\right)^{n} - 1$. If the account is compounded continuously, then $APY = e^{APR} - 1$.

7. Savings and Loan

   - You do *not* need to memorize the savings plan formula, but you do need to know how to use it:
   $$A = PMT \times \frac{\left(1 + \frac{APR}{n}\right)^{n \cdot Y} - 1}{\frac{APR}{n}}$$

   - You do *not* need to memorize the loan payment formula, but you do need to know how to use it:
   $$PMT = P \times \frac{\frac{APR}{n}}{1 - \left(1 + \frac{APR}{n}\right)^{-n \cdot Y}}$$

8. Linear vs. Exponential Growth/Decay

   - Determine whether a given situation is described by linear or exponential growth.
   - Find the domain and range of a given function.

9. Linear Models

   - Differentiate between the independent and dependent variables in a situation.

- Find the slope/rate of change.
- Graph linear functions.
- Find the y-intercept.
- Find the equation of a line. Know the slope-intercept formula for the equation of a line. It is $y = mx + b$.
- Also know the point-slope formula for the equation of a line.

10. Exponential Models

- Equation for exponential growth, given a growth/decay rate.

$$Q = Q_0(1 + r)^t$$

- Equation for exponential growth, given the doubling time or half-life.

$$Q = Q_0 \cdot 2^{t/T_2} \qquad \text{and} \qquad Q = Q_0 \left(\tfrac{1}{2}\right)^{t/T_{1/2}}$$

- Find the doubling time or half-life, given a growth/decay rate, r.

11. Modeling Geometry

- Find the area and perimeter of standard shapes (e.g. circle, square, rectangle, triangle, parallelogram)
- Find the surface area and volume of standard three dimensional objects (e.g. cylinder, sphere, rectangular prism).
- You should know that surface area scales with the square of the scale factor.
- You should know that volume scales with the cube of the scale factor.
- You should be able to solve scaling problems involving surface area and volume.
- Understand surface-area-to-volume ratio and how it changes as the size of an object changes.