Mathematics 105 Study Guide for Test 1

Section 1.8 of your text gives a Review and Overview of Sections 1.1 - 1.7. On the exam you will be given the Basic Simple Interest Formulas, the Basic Compound Interest Formulas, and the formula for APY as they are listed in Section 1.8. **Be sure you understand the meaning of the variables in these formulas, and how to solve each formula for each variable.**

Since you will be given the necessary formulas, your major task is to understand how to use them. On most problems you must:

(1) decide whether the problem involves simple or compound interest,
(2) decide whether dollar amounts give a present value or future value,
(3) decide which variables are known and which variable is the unknown, and
(4) solve for the unknown variable.

Drawing a time line is always a good idea, as it helps visualize the situation. It also helps determine whether a dollar amount is a Future Value (value at end of growth) or Present Value (value at start of growth), and the values of n = number of compoundings **per year**, $i = r/n$ the interest rate applied at each compounding, and $m = nt$ the **total** number of compoundings.

When finding time: (a) if compounding is involved, the time must be calculated in terms of compounding periods; (b) If simple interest is used, or if the APY is known, you may solve for t directly.

When finding APY: (a) If r and n are known, use the formula that calculates Y directly from them; (b) If a P, an F, and t are known, find Y by solving $F = P(1 + Y)^t$ for Y.

The problems in Section 1.7 are somewhat different:

Type 1a: How much money do you need to make in a future year to have the same purchasing power as a given salary in the present year, assuming a certain rate of inflation i?

This is simply a F problem, where the given current salary is P and the inflation rate i is given in the problem, as is the time until the future year.

Type 1b: What will be the purchasing power, in today's dollars, of a certain amount of money in a specified future year assuming a certain rate of inflation i?

This is a P problem, with F = the amount of money in the future year, and $P = F/(1+i)^m$

Type 2: When working with years in the past, for problems having to do with calculating the purchasing power of a price or salary in one year's dollars from a price or salary in another year, use the CPI and:

$$\text{Purchasing Power in Year A dollars} = \left(\frac{\text{Year A CPI}}{\text{Year B CPI}}\right)\times\left(\text{Purchasing Power in Year B dollars}\right)$$

$$\text{Adjusted Price in Year A dollars} = \left(\frac{\text{Year A CPI}}{\text{Year B CPI}}\right)\times\left(\text{Price in Year B dollars}\right)$$

Example: What is the purchasing power, in 1973 dollars, of a 1992 salary of \$65,100? We look up the CPI's in the table (CPI for 1973 is 44.4, CPI for 1992 is 140.3) and calculate:

$$\text{Purchasing Power in 1973 dollars} = \left(\frac{44.4}{140.3}\right)\times\left(\$65{,}100\right) = \$20602 \approx \$20{,}600$$

We round to three significant digits since all the data has at least 3 significant digits, and the 1973 CPI had 3 significant digits..

(over)

Tips on Solving the Basic Equations:

1. When solving the Simple Interest equation for r or t, either (i) use $I = F - P$ so you can start from the $I = Prt$ form, or (ii) start from the $F = P + Prt$ form and first subtract P, then divide.
2. When solving the Compound Interest equation for r or Y, use fractional exponents (or roots) to "undo" the known exponent. Be sure to put parentheses around the fractional exponent when you use your calculator.
3. When solving the Compound Interest equation for the total number of compoundings m, use logarithms to convert the unknown exponent to an unknown factor. Be sure to round the result of your logarithm calculations **up** to the next whole number; only whole compoundings are allowed.
4. When solving the Basic Equations for P, make sure this unknown is a factor of one side before you divide.

Rounding and calculator considerations:

1. Do not round any numbers until you get to your final answer. If your answer is a money amount calculated from compound interest, make certain that you round to two decimal places. If your answer is a money amount calculated using CPI or assumed rates of inflation, round using the Rule for Accuracy of Combined Numbers on page 23.
2. It is usually better to solve for the unknown before making any calculations with your calculator. (You may do mental simplifications if you are confident they are correct.) If you do intermediate calculations, do not round them.
3. If your answer is supposed to be an interest rate, that is you have solved for r or Y, then you must convert your answer to a percent and then round to two decimal places.
   Example: Suppose that the answer you get when calculating r or Y shows up in your calculator as 0.0785682482. Then the answer, written as a percent (7.85682482... %) and rounded to two decimal places, giving 7.86%.
4. When periodic compounding is used, the value of m is always an integer. If your calculations using logarithms result in a number with a decimal part, round up to the next larger whole number get m. When using an APY as the rate in a calculation, m does not need to be an integer.
5. When you are given an interest rate in percentage form, like 8.75%, remember you MUST change this to a decimal 0.0875 before you make calculations.
6. To maximize credit on a problem, and as a good problem solving technique, you should list the values of all known variables, and write down the formula you use with these values inserted. Then proceed to solve the problem.

Conclusion: The Review Exercises for Chapter 1 (page 78) are **excellent** practice for the test. Detailed solutions are given in the back of the text, but work them yourself before consulting the solutions.