Formulas

You may detach this page from the exam and use it for reference.

Simple Interest

$$I = Prt \qquad F = P + Prt \qquad P = \frac{F}{1+rt} \qquad r = \frac{F-P}{Pt} \qquad t = \frac{F-P}{Pr}$$

Annual Compound Interest

$$F = P(1+r)^t \qquad P = \frac{F}{(1+r)^t} \qquad r = \left(\frac{F}{P}\right)^{1/t} - 1 \qquad t = \frac{\log \frac{F}{P}}{\log(1+r)}$$

Multiple Compounding Periods

$$F = P\left(1+\frac{r}{n}\right)^{nt} \qquad P = \frac{F}{\left(1+\frac{r}{n}\right)^{nt}} \qquad r = n\left[\left(\frac{F}{P}\right)^{1/nt} - 1\right]$$

$$t = \frac{\log \frac{F}{P}}{n \log\left(1+\frac{r}{n}\right)} \qquad APY = \left(1+\frac{r}{n}\right)^{n} - 1$$

This exam is *open-notes* and *open-book*. A calculator is permitted. Please show all work. If you need to continue an answer on another page or on the back of a page, please make that clear so that it can be followed by the grader. Answers which are monetary values should be rounded to the nearest cent; other answers should be accurate to at least one place past the decimal point.

1. **(18 points)** I want to borrow money to be repaid in five years; I predict that at that time I will be able to repay $4500. My bank offers me a personal loan at 7.5% annual interest, compounded monthly.

   (a) **(12 points)** How much money could I safely borrow on these terms?

   (b) **(6 points)** What is the annual percentage rate of the above loan?

2. **(18 points)** If an investment of $1000 grows in value to $1500 in ten years, answer the following questions about its interest rate.

   (a) What annual rate of simple interest would produce this result?

   (b) What annual rate of annually compounding interest would produce this result?

For TA Use Only	
1	/ 18
2	/ 18
3	/ 16
4	/ 10
5	/ 8
6	/ 14
7	/ 16
8	/ (5)
Σ	/100

3. **(16 points)** Sara invests \$8000 in a high-yielding investment which returns 11% interest per year for six years. Determine the quantity of *interest* she earns in each of the following scenarios.

   (a) The loan earns *simple interest*.

   (b) The loan earns *annually compounding interest*.

   (c) The loan earns *monthly compounding interest*.

4. **(10 points)** Dante has invested \$7000 into long-term treasury bonds which earn an annual interest rate of 3.2% compounded quarterly. How long will it take his investment to grow to \$10000?

5. **(8 points)** You have put \$2000 into a two-and-a-half year certificate of deposit which returns an annual interest rate of 3% compounding semiannually. How much will your investment be worth at the end of the CD's lifetime?

6. **(14 points)** Answer the following questions about percentages and change.

   (a) **(7 points)** A news report claims that the population of the town of Springcenter is 7.4% Native American, and further mentions that 45 Native Americans live in Springcenter. What is the total population of Springcenter?

   (b) **(7 points)** A five-pound bag of flour costs \$1.60 at present, and the consumer price index is currently 147.98. In 1958 the consumer price index was 28.70. Based on this information, what would be the expected price for that same bag of flour in 1958?

7. **(16 points)** Javier borrows \$1000 for three years on a variable-rate loan which initially has an annual interest rate of 5% compounded quarterly. After a year the annual interest rate is increased to 7% (while compounding continues quarterly), where it remains for two years. How much will Javier need to pay back at the end of the loan's lifetime?

8. **(5 point bonus)** In the last question, what is the effective APR on the loan taken as a whole?