

FORMULAS

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

Simple Interest

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

Annual Compound Interest

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

Multiple Compounding Periods

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

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

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.

1. **(20 points)** I borrow \$1000 from the Kneecappers' Trust and Loan at an annual interest rate of 21.2%, with terms to repay the loan in full 4 years later. For each of the descriptions of the interest procedures below, calculate the quantity (in dollars) of *interest* to be paid at the end of the loan term.

(a) The loan earns *simple interest*.

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

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

2. **(20 points)** How many years will it take to grow an investment of \$1200 to a value of \$1600 at an annual interest rate of 2.6% if the investment pays out:

(a) Simple interest?

(b) Annually compounding interest?

FOR TA USE ONLY	
1	/ 20
2	/ 20
3	/ 12
4	/ 20
5	/ 12
6	/ 16
Σ	/100

3. **(12 points)** Series Q US Treasury Bonds earn 0.76% annual interest, compounding semiannually. Each bond certificate has a face value of \$500, to which it matures over the course of 30 years. What is the fair market price for a newly issued bond certificate?
4. **(20 points)** The C19 index fund is an investment which reliably earns an annual interest rate of 7.2%, compounding monthly. You have \$600 invested in this fund.
- (a) How many months need to pass before your investment has doubled in value?
- (b) What annually-compounding interest rate would have the same yield as this fund's monthly compounding interest rate?

5. **(12 points)** Lagomorph Loans offers a ten-year loan of \$1500 with \$2500 to be repaid at the end of the loan period. What annually compounding interest rate are they charging?

6. **(16 points+3 point bonus)** Anna deposits \$3000 in a “rewards checking” account which pays an annual rate of 4.5% compounded monthly during months when she uses their bank-branded credit card, but which only pays an annual rate of 0.5% compounded monthly in months when she does not. For the first ten months she uses their credit card but neglects to do so in for the next fourteen months.

(a) **(16 points)** What is the balance in her account at the end of this two-year period?

(b) **(3 point bonus)** What is the effective APY she has earned over these two years?