

# Math 121

## Quiz #1

### Problem 1

I am a famous art critic who recently sold a painting for \$100. That \$100 was deposited into a bank account earning 10% APR compounded monthly. Using that information, solve the following problems.

#### Problem 1.a

How much money will my bank account be worth in 2 years?

Answer

$$S = P \left( 1 + \frac{r}{k} \right)^n$$
$$S = 100 \left( 1 + \frac{.1}{12} \right)^{2(12)}$$

#### Problem 1.b

How long would the money need to sit in the bank to accumulate \$1000?

Answer

$$S = P \left( 1 + \frac{r}{k} \right)^n$$
$$1000 = 100 \left( 1 + \frac{.1}{12} \right)^n$$
$$10 = \left( 1 + \frac{.1}{12} \right)^n$$
$$\log 10 = n \log \left( 1 + \frac{.1}{12} \right)$$
$$n = \frac{\log 10}{1 + \frac{.1}{12}}$$

## Problem 2

I am presented with an investment opportunity where I will receive a \$10000 payment 6 months from now and \$5000 1 year from now. Suppose the relevant interest rate is 5% compounded monthly. How much should this investment cost, that is, what is the present value of this investment?

### Answer

We need to add up the two individual present values:

$$P_1 = 10000 \left(1 + \frac{.05}{12}\right)^{-6}$$

$$P_2 = 5000 \left(1 + \frac{.05}{12}\right)^{-12}$$

So the total present value is

$$P = 10000 \left(1 + \frac{.05}{12}\right)^{-6} + 5000 \left(1 + \frac{.05}{12}\right)^{-12}$$

## Useful Information

$P$  - principal value of the investment

$r$  - APR (annual interest rate)

$k$  - number of times per year interest is compounded

$n$  - number of periods for which interest is accumulated

$S$  - final value of the investment

Compound Interest Formula

$$S = P \left(1 + \frac{r}{k}\right)^n$$

Present Value Formula

$$P = S \left(1 + \frac{r}{k}\right)^{-n}$$

Continuously Compounded Interest Formula

$$S = Pe^{rt}$$