

Worksheet Finance 4: Summary of Topics

1. Below are the formulas you will be given on Exam 3. For each scenario below, **plug in numbers into the appropriate formula** needed to calculate the value. Do **not** actually calculate the the value.

Formulas

$$A = P + I$$

$$A = P(1 + rt)$$

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

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

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

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

- (a) You want to take out a loan to buy a \$150,000 home. The bank offers a 30-year mortgage with an interest rate of 5.2% compounded monthly. What will the monthly payments be?

Asking for
d

Answer:

$$d = \frac{(150,000) \left(\frac{0.052}{12}\right)}{\left(1 - \left(1 + \frac{0.052}{12}\right)^{-(12)(30)}\right)}$$

- (b) You loan your friend \$900. They agree to pay an annual interest rate of 4% **simple interest**. Eighteen months later, they repay the loan. How much did they pay you in total?

Asking for
A

Answer

$$A = 900 \left(1 + (0.04)(1.5)\right)$$

↑ 18 months = 1.5 yr

- (c) You deposit \$2000 in a savings account with an APR of 3.2% compounded quarterly. How much will the account be worth in 10 years?

Asking for
A

Answer

$$A = (2000) \left(1 + \frac{0.032}{4}\right)^{(4)(10)}$$

- (d) Suppose an investment typically earns 10% interest compounded yearly. How much would your initial investment (or **principal**) need to be in order for the future value of the account to be worth \$100,000 at the end of 40 years?

Asking for
P

Answer

$$P = \frac{100,000}{(1 + 0.10)^{40}}$$

(Here
n = 1)

2. For the questions below, **write out the appropriate calculation** and use a calculator to find the numerical answer.

- (a) Someone tells you that 2 years after depositing \$1200 in an account, the value of the account increased by 28%. How much money was added to the account over this 2-year period?

$$(1200)(0.28) = \$336$$

- (b) A savings account earns 3% interest each year. If someone initially invests \$1400, what is the value of the account in 30 years?

$$A = (1400)(1.03)^{30} = \$3398.17$$

- (c) If you have a mortgage and you pay exactly \$1200 a month for 30 years, how much did you pay over the life of the mortgage?

$$(1200)(12)(30) = \$432,000$$

3. These problems should be completed using a spreadsheet.

- (a) Suppose someone has a balance of \$2000 on their credit card which has an APR of 27% compounded monthly. Suppose the person pays the **minimum payment** which can be as low as the interest plus 1% of the remaining balance.

- i. How long will it take to pay off the \$2000 purchase assuming no additional purchases are added to the credit card?

over 5½ years

FYI It would take 12 years total w/ payout of \$5234

- ii. How much in total will have been paid to the credit card company?

\$3162.06

- (b) (Bonus) Suppose you open a retirement account with an initial deposit of \$1000 and each month you add \$100. If this account earns 4% interest compounded monthly, how much money will be in the account in 30 years assuming there are no withdrawals?

\$72,718.44