Notes – Unit 4, Day 6

FINANCE

I. SIMPLE INTEREST

Simple interest is when you leave your money alone and NOTHING is added or taken out, not even interest. Interest is calculated at the end of the account's life and then handed to you. This grows slower than other types of interest.

$A = P + Prt$ (A = Final Amount, P = Principal (Initial amount), r = rate, t = time)

Convert to decimal ($\div 100$)

This can be rewritten as $\boxed{A = P(1 + rt)}$

Ex: Fred deposits $1200 into a 12 month CD (Certificate of Deposit) for 5 years at Wells Fargo with a simple interest rate of 4.25%. How much will have at the end of the CD term?

P; t=5

r=0.0425 A=?

$A = 1200(1 + 5(0.0425)) = \boxed{\$1455}$

II. COMPOUND INTEREST

Compound Interest is when interest is periodically added to your account, thereby increasing the amount you have in the account for the next period in which interest will be calculated. This grows quicker than simple interest.

Annual n=1 | Semi-Annually n=2 | Quarterly n=4 | Weekly n=52

$\boxed{A = P\left(1 + \frac{r}{n}\right)^{nt}}$ (n = the number of times interest is calculated per year)

Daily n=365 | Monthly n=12 etc.

Ex2: Linda deposited $3200 into her money market account that pays 4.08% compounded monthly. Find the amount after 10 years.

P; r=.0408 n=12

A=? t=10

$A = 3200\left(1 + \frac{0.0408}{12}\right)^{12(10)} = \boxed{\$4808.85}$

challenge *

Ex3: George deposited $23,470 into an account paying 5.2% quarterly. How many years will it take to grow to $30,000?

P r=.052 n=4 t=?

A

$\frac{30000}{23470} = \frac{23470}{23470}\left(1 + \frac{.052}{4}\right)^{4t} \rightarrow t \approx \boxed{4.75 \text{ years}}$

III. ANNUITIES

An annuity is a more realistic finance model. This takes into consideration the idea of making PAYMENTS! In real life, if you borrow money, you pay it back in small amounts over time – usually monthly. If you are trying to save for something big, your money will grow quicker if you periodically add some money to your account.

To do annuity problems, we can use a scary formula… or we can use the FINANCE *application in the calculator, which has the formula saved in it for us!*

To do:

1. Select APPS
2. 1: FINANCE
3. 1: TVM-Solver
4. N = nt
5. I% is the interest rate as a percent, not as a decimal!
6. PV = Present Value – the amount you have right now!
7. PMT = your monthly payment
8. FV = Future Value – the amount you want to have (or owe) in the future.
9. P/Y = payments per year
10. C/Y = compounding per year
11. PMT: END should be highlighted
12. To Solve, put your cursor on the line with the piece of information you are looking for, and then hit the ALPHA button and then the ENTER button (this selects the option "Solve")

To indicate the "flow" of money, one of these needs to be negative.

For this class, these will always match.

n=?

IV: **FUTURE VALUE: SAVING FOR A FUTURE PURCHASE**

Samples: Retirement, saving for college, saving on your own to buy a car, computer, etc.

PMT nt = 12(30) I

Ex4: Kari can put away $250 a month to save for retirement in 30 years. If the interest rate is 6.1% compounded monthly, find the amount she has at retirement.

n=12

In the TVM-Solver, you should type:

N = 12*30
I% = 6.1
PV = 0
PMT = 250
FV =
P/Y = 12
C/Y = 12
PMT: END

$\boxed{\$255,986.36}$

Put your cursor on the line that says FV =, then hit ALPHA SOLVE (the enter button)

t=7

Ex 5: The University Ambulance Service needs to purchase a new ambulance for $150,000 in seven years. To avoid paying interest, they are saving on their own now. How much should they be putting into an account weekly if it earns 4.2% compounded weekly?

PMT?

n=52 I

PV=0

$\boxed{\$354.64}$

V: **PRESENT VALUE: BORROWING MONEY TO BUY SOMETHING NOW**

Samples: Getting a loan for college, a loan to buy a house, a loan to buy a car, credit card debt.

PMT t

Ex6: Luke wants to buy a boat and can spend $175 a month over the next 15 years. If his bank will give him a loan at 7.2% compounded monthly, what is the size of the loan he can afford (and hence, the price of the boat he can afford)?

I n=12 PV

(In this case, PV = what you are solving for, FV = 0 because you need to pay off the loan completely!)

$\boxed{19,229.78}$

a) How much does she need to borrow?

$265000 - .1(265000) = \boxed{\$238500} = PV$

b) The bank will give her a mortgage (loan) at 6.1% compounded monthly for 25 years. What will her monthly payments be?

I n=12 t

PMT

$\boxed{\$1551.27}$

Ex 8: Nicole racked up $10,000 (PV) in credit card debt while in college. If the interest rate is 18.75% (I) compounded monthly (n=12) and she makes the minimum monthly payment of $30 (PMT), how long will it take her to pay off the debt? (This is actually based on a true story and happens ALL the time to college kids!) t=?

$N = \frac{117.7}{12} \approx$ $\boxed{\text{Almost 10 yrs!}}$

When you borrow money and pay the bank back, some of your monthly payment goes toward repaying the loan itself, and the rest of the payment goes toward paying off the interest. The reason for this is in case you decide to pay off your loan early. The bank will still need to make money off you, so they take a little each month. If you decide to repay a loan early, finding out how much you still owe is tricky... you CANNOT just subtract what you have paid so far from the amount of the loan because the bank will not have made any money...

Ex 9: Chaz bought his house for $150,000 (PV) at 4.6% (I) compounded monthly (n=12) for 30 years (t). Find the principal remaining after 10 years.

To do:

1. Find the monthly payment using your TVM-Solver PMT = $768.97
2. Now, start over in the TVM-Solver using the TIME LEFT on the loan...

N= 12*20
I% = 4.6
PV =
PMT = what you found in step 1
FV = 0
P/Y = 12
C/Y = 12
PMT = END

$120516.33

IV. COMPOUNDED CONTINUOUSLY

This is not realistic, but it describes interest being calculated ALL THE TIME (continuously!). This is how things grow in nature (bacteria, viruses, etc). This would be the fastest growing interest.

$\boxed{A = Pe^{rt}}$ *NO more n!!*

Ex 10: You decide to save up for college. You deposit $2000 (P) into an account that has a 2.3% (r=.023) compounded continuously interest rate. How long will it take for your investment to double? t=? A=4000

$4000 = 2000e^{.023t}$

$\ln 2 = .023t \rightarrow t \approx \boxed{30 \text{ years}}$