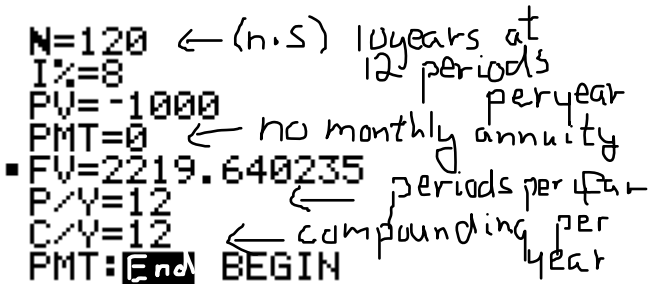
GRADE 12 APPLIED
UNIT B PERSONAL FINANCE
SOLVING COMPOUND INVESTMENT FORMULA

Name:_____
Date: _____

1. We have calculated some simple calculations to determine the Future Value (**FV**) for a compound interest investment.

$A = P * \left(1 + \frac{r}{s}\right)^{n*s}$ when we did it manually using the meaning of the symbols we learned. We call **A** the '**FV**' in an App.

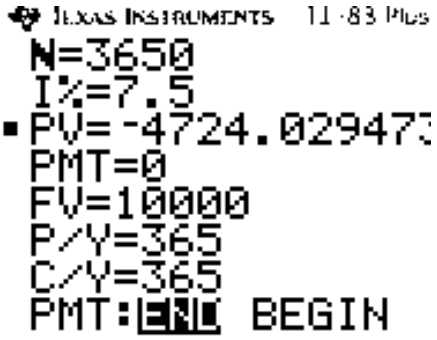
2. In the TI-83 TVM App we used it looked like this:



So, investing $1000 [out of your pocket so (-)], for 120 monthly periods (ie: 10 years) gives you $2,219.64 cents at the end of those 120 periods (10 years)

3. But what if we want to work the calculation backwards? *i.e*. Solve for other variables besides just the Future Value? The Apps make it so simple

4. How much principal would you have to invest today (PV; present value) if you want a future amount of $10,000 in 10 years at an APR of 7.5% compounded daily?



Answer: $4,724.03 today would turn into an FV of $10,000 after 10 years.

YOU TRY:

5. How much principal would you have to invest today (PV; present value) if you want a future amount of $10,000 in 10 years at an APR of 7.5% compounded monthly?

Show your inputs and the result.

Curious (compare with previous question which was compounded daily)

6. Try this last question manually without an App using the compound interest formula.

7. How much principal would you have to invest today (PV; present value) if you want a future amount of $25,000 in 15 years at an APR of 6.25% compounded monthly?

Show your inputs and the result.

8. Are you doing a sanity check on these? Rule of 72 perhaps. Or plugging you answer back into a simple Annual Compounding formula (since the compounding period does not make a huge difference for a normal number of years). Sometimes even the simple interest formula will at least give you a lower bound to the answer.

Plug in your solution into your last question, the Principal you need to invest into the simple Annual formula $A = P*(1+I\%/100)^{years}$. Does it work out close, a bit less perhaps since not compounded as often?

Checking your answer is ALWAYS a good idea!

9. How much principal would you have to invest today (PV; present value) if you want a future amount of $1 Million in 36 years at an APR of 8% compounded quarterly?

Show your inputs and the result.

10. Sanity check? Rule of 72? Plug in to the annual formulae to see if close; a bit less. Rule of 72 backwards? (How many doublings?)

11. Do the last question manually, solve for the P manually just using the Compound interest formula!

12. Now let's solve for some of the other variables (aka *parameters, arguments*)

Find the Percentage Rate you Need

13. What percentage rate (APR) would you need if you want to turn $2,000 into $4,000 in 10 years? The account is a daily interest savings account.

Show your inputs and the result.

Sanity checks?

14. What percentage rate (APR) would you need if you want to turn $4,000 into $20,000 in 10 years? The interest is compounded monthly

Show your inputs and the result.

15. Are you likely to find an investment that pays that rate of interest today?

DETERMINE HOW MANY YEARS FOR AN INVESTMENT TO GROW

16. Lets manipulate the formulae in the TI-83 App (but have you tried the one in Google or Apple Store yet?). Let's find how many years it would take to achieve a goal.

17. How many years will it take to turn an investment of $2,000 into a FV of $4,000 if the interest is an APR of 7.2 % compounded daily.

Show your inputs and the result.

Reality check? Rule of 72 says 10 years.

19. How many years will it take to turn an investment of $5,000 into a FV of $20,000 if the interest is an APR of 6% compounded semi-annually.

Show your inputs and the result.

20. Is it possible to do the last question manually just using the compound interest formula? (This would be what students do in Pre-Calculus! In Applied you get to use technology tools)

We will learn how to solve by graphing soon too! You do not need fancy Algebra if you know how to graph.

Word Problems

(Manually draw a 'screen shot' to show all your inputs and answer)

Kira purchases a sofa for $1015.87 (taxes included). The department store offers her a promotion of 0% interest with no payments for **up to** one year. If Kira does not pay the amount in full ***within*** one year, interest will be charged from the date of purchase at an annual rate of 28.80%, compounded monthly.

a) If Kira does not make any payments, what will the department store bill her one year after the date of purchase? (she had not paid within the one year).
b) State a different compounding period such that the overall cost of the sofa is lower than if the annual interest rate were compounded monthly. (does it make much of a difference really for one year?)

13. According to the Rule of 72, a reasonable estimate for the time it would take to double an investment of $24,000.00 at an interest rate of 6.00%, compounded monthly is:

Select the one best answer:

A. 3 years B. 4 years C. 12 years D. 18 years

14. Imani is going to buy a car. She can afford monthly payments of $600.00. The dealer offers two financing options:

Option 1: financing over 60 months at a rate of 0.90% compounded monthly

Option 2: financing over 60 months at a rate of 2.90% compounded monthly with an instant rebate of $3000.00 at the time of purchase

Which option allows Imani to purchase a more expensive car?

15. Salwa bought a new computer system for $6,000.00. She anticipates the value of the system to *depreciate* at a rate of 15% per year.
What will the computer system be worth at the end of 3 years?

Depreciate: go down in value by some percentage every year. It is like exponential growth of an investment but ***decaying*** in value instead of decreasing. In our exponential growth for money we have had it going up in value by $(1 + \text{a bit})^n$, in depreciation we have $(1 - \text{a bit})^n$ so an asset slowly ***decays*** in value.