7.2 Problems with Compound Interest

Present Value:

- principal that needs to be invested/borrowed now to achieve a future goal
- PV can be calculated when the interest rate, compounding period and length of term are known

Formula: use compound interest formula, but rearrange for "P" or "PV"

$$A = P(1 + i)^n$$

$$\frac{A}{(1 + i)^n} = P$$

$$A(1 + i)^{-n} = P$$

where
A= amount at end of investment
P = present value/principal
i = interest rate per compound pd.
n = # of compound periods

Ex. 1 Julia wants to have $5000 in 2 years to use as a down-payment for a car. How much does she need to invest now at 6.3%/a compounded monthly?

$P = ?$
$A = 5000$
$i = \frac{0.063}{12}$
$n = 2 \times 12 = 24$

$P = A(1+i)^{-n}$
$= 5000\left(1 + \frac{0.063}{12}\right)^{-24}$
$= 4409.53$

∴ She should invest $4409.53

Ex.2 David plans to put money into an RESP so that he has $9000 in 5 years. Which option is the best deal for David?

a) 7.2% compounded semi-annually

$P = ?$

$A = 9000$

$i = \frac{0.072}{2}$

$n = 5 \times 2$

$= 10$

$P = 9000\left(1 + \frac{0.072}{2}\right)^{-10}$

$\doteq 6318.95$

b) 6.5% compounded bi-weekly

$P = ?$

$A = 9000$

$i = \frac{0.065}{26}$

$n = 5 \times 26$

$= 130$

$P = 9000\left(1 + \frac{0.065}{12}\right)^{-130}$

$\doteq 6505.38$

Option A is best.

Ex. 3 Sam borrowed $8000 at 7.5%/a compounded monthly for ~~5~~ years. He lands a good paying job after 2 years and wants to make a lump sum payment to pay off his debt. How much should he have to pay?

We don't care

$P = 8000$

$A = ?$

$i = \frac{0.075}{12}$

$n = 2 \times 12$

$= 24$

$A = 8000\left(1 + \frac{0.075}{12}\right)^{24}$

$= 9290.34$

∴ He would pay back $9290.34 after 2 years

Jan 3-2:24 PM

The TVM Solver

- a program on the graphing calculator used for financial calculations

To find the TVM Solver program:

APPS , 1: Finance..., ENTER , 1: TVM Solver... ENTER

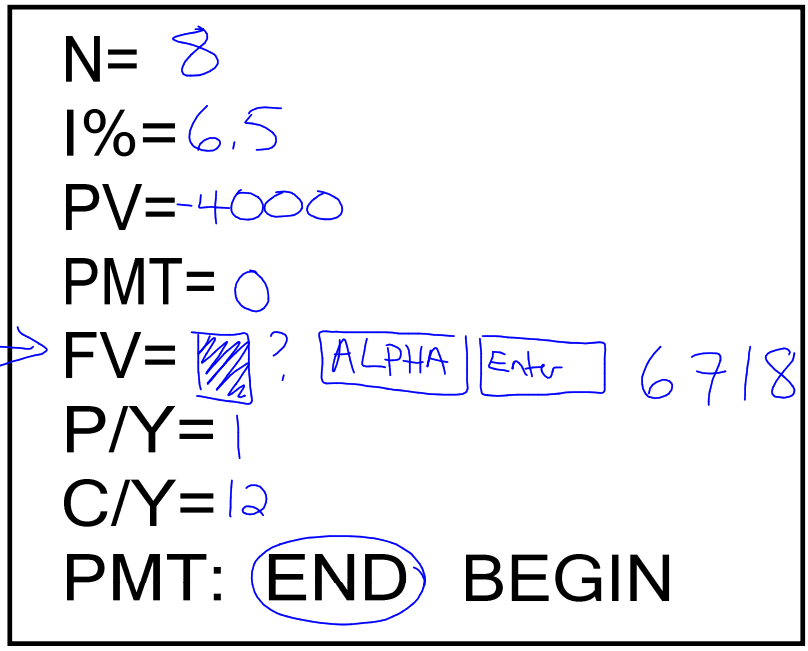
N	= # of years
I%	= interest rate/a as a percent
PV	= present value (P)
PMT	= the payment amount (put as "0" if there are no payments)
FV	= future value (A)
P/Y	= number of payments per year (put "1" if no payments)
C/Y	= number of compound periods per year
PMT:	= choose END

To determine a value:

- move the cursor to the appropriate line and press ALPHA ENTER

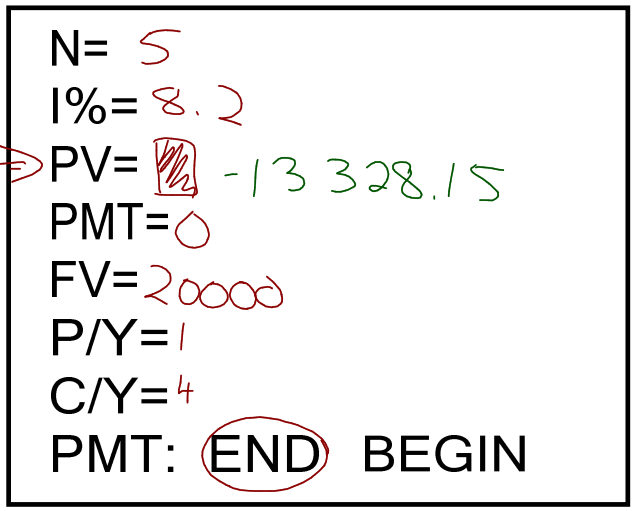
Jan 3-2:28 PM

Ex. 1 Harriet invested $4 000 in an investment fund that pays 6.5%/a compounded monthly. How much money is in the account after 8 years?



∴ Harriet has $6718.68

Ex. 2 How much do you need to invest now at 8.2%/a compounded quarterly to have $20 000 in 5 years?



Jan 3-2:31 PM

Ex. 3 Graham deposits $4500 into an account paying 3.5%/a compounded monthly. How long will it take him to have $8000 to buy a motorcycle?

N= [redacted] ≈ 16.5
I%= 3.5
PV= -4500
PMT= 0
FV= 8000
P/Y= 1
C/Y= 12
PMT: END BEGIN

∴ It will take him approx. 16½ yrs.

Ex. 4 Jason invested $1200 in a fund that compounded interest semi-annually. At what rate did he invest at if he earned $500 interest in 6 years?

N= 6
I%= [redacted] ≈ 5.9
PV= -1200
PMT= 0
FV= 1700
P/Y= 1
C/Y= 2
PMT: END BEGIN

∴ Interest was 5.9%

Ex. 5 Which investment will reach $10 000 faster?

A: $7500 invested at 4.5%/a compounded monthly

OR

B: $8200 invested at 4.2% compounded semi-annually

N=	6.4
I%=	4.5
PV=	−7500
PMT=	0
FV=	10000
P/Y=	1
C/Y=	12
PMT:	END BEGIN

N=	÷ 4.8
I%=	4.2
PV=	−8200
PMT=	0
FV=	10000
P/Y=	1
C/Y=	2
PMT:	END BEGIN

∴ Definitely B

Ex.6 Brian is investing $6800 at an interest rate of 7% per annum, compounded quarterly, for 2 years. Then, he will invest the amount plus additional money at 6.5%/a, compounded semi-annually, for 3 years. At the end of the second investment, he wants to have $15000. How much extra must he invest for the second investment?

N= 2
I%= 7
PV= -6800
PMT= 0
→ FV= =7812.40
P/Y= 1
C/Y= 4
PMT: END BEGIN

N= 3
I%= 6.5
→ PV= −12380.86
PMT= 0
FV= 15000
P/Y= 1
C/Y= 2
PMT: END BEGIN

Need 12380.86 to reach $15000

So we need 12380.86 − 7812.40 additionally.

∴ We need an additional 4568.46

Jan 3-4:09 PM

Page 523

#4 - 7 (use calculator)

#8-11,15,16

Jan 3-2:33 PM