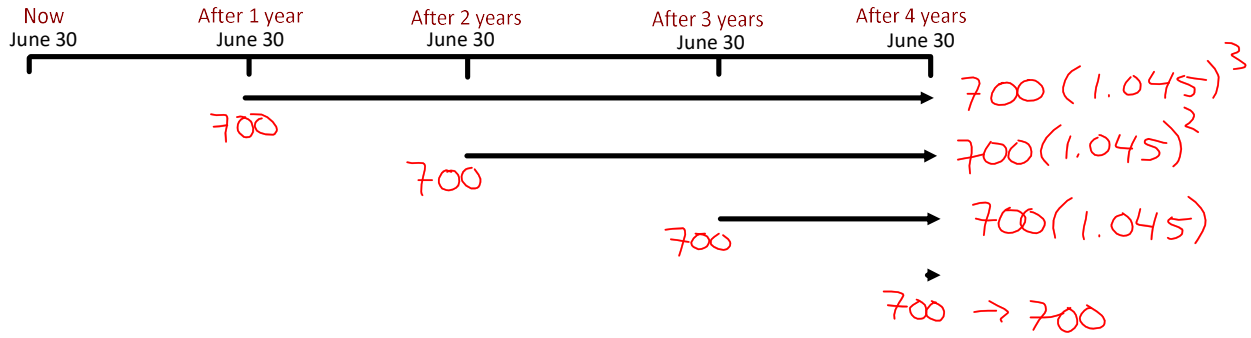
7.3 Amount of an Annuity

Annuity: A series of equal payments made at regular intervals (savings plan, paying off a debt, etc.)

Last June 30, Nigel decided to save for a trip when he graduates. Starting next June 30, and for each of the following 3 years, he plans to deposit $700 into an account that pays 4.5%/a, compounded annually. How much money will Nigel have accumulated when he makes the last deposit into this annuity?



- How much is each deposit worth at the end of the 4 years?

How much money in total did Nigel accumulate?

Total $= 700(1.045)^3 + 700(1.045)^2 + 700(1.045) + 700$

$= \$2994.74$

- Annuity Formulas:

$$A = \frac{R[(1+i)^n - 1]}{i}$$

- Use this to find the amount.

$$R = \frac{Ai}{\left[(1+i)^n - 1\right]}$$

- Use this to find the regular payment.

- *where*
- A = Amount at the time of the last payment
- R = Regular payment
- i = Interest rate per compound pd.
- n = # of compound periods/# of payments

Ex. 1 Mary deposits $250 into an account at the end of each month paying 7.2%/a compounded monthly for 5 years. How much money will she have at the end of 5 years?

By Hand:

Given

$R = 250$

$i = \frac{0.072}{12}$

$n = 12 \times 5$

$= 60$

$$A = \frac{R[(1+i)^n - 1]}{i}$$

$$= \frac{250\left[\left(1+\frac{0.072}{12}\right)^{60} - 1\right]}{\frac{0.072}{12}}$$

$\doteq 17991.18$

By TVM:

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

N = # of compounding periods
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 as "1" if there are no payments)
C/Y = number of compound periods per year
PMT: = choose END

TAKE NOTE:
In annuities N = number of compounding periods not years.

N=5x12 = 60
I%=7.2
PV=0
PMT=-250
FV= → 17991.18
P/Y=12
C/Y=12
PMT: END BEGIN

Ex. 2 Cameron wants to be an astronaut and needs to save for university. He plans on making regular bi-weekly deposits into an account paying 5.3%/a compounded bi-weekly. If he wants to have $9000 in 3 years, how much does he need to deposit each time?

By Hand

$$R = \frac{Ai}{(1+i)^n - 1}$$

Given

$A = 9000$

$i = \frac{0.053}{26}$

$n = 26 \times 3 = 78$

$= \frac{9000\left(\frac{0.053}{26}\right)}{\left(1+\frac{0.053}{26}\right)^{78} - 1}$

$= 106.57$

By TVM

N=26x3=78
I%=5.3
PV=0
PMT= □ → -106.57
FV=9000
P/Y=26
C/Y=26
PMT: END BEGIN

∴ Cam's pmts are $106.57

Ex. 3 Who wants to be a Millionaire?
You want to know how much to put away every month, from now until you retire, to become a millionaire. Assume interest at 5% compounded monthly, and that you retire at 65.

65 − 16
= 49

N= 49 × 12 → 588
I%= 5
PV= 0
PMT= → −395.71
FV= 1000000
P/Y= 12
C/Y= 12
PMT: END BEGIN

∴ You will need $395.71 as monthly payment

Homework

Pg. 453 #C2,2bc,4-6,8,11,12a

(Graphing Calculator 4-6)