7.3 Amount of an Annuity

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

Formula:

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

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 = total # of payments

Note: # compound periods per year and how the payments are made must match to use formula ie. payments are made at the end of each month and interest is compound monthly

Recall:

interest rate per period

$$i = \frac{\text{rate}}{\text{\# of compounding periods per year}}$$

n = # of years x # of periods per year

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Ex 1. Sarah 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....

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

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

$n = 60$

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

$\doteq 17991.18$

Now by TVM... RECALL...

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

N = total # of payments
I% = interest rate/a as a percent
PV = present value (P)
PMT = the payment amount (will be negative because it is $ paid out)
FV = future value (A)
P/Y = number of payments per year
C/Y = number of compound periods per year
PMT: = choose END

TAKE NOTE:
In annuities the N is total # of pmts = number of compounding periods x # of years

Will always match while doing simple annuities
*(mortgages are different)

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

∴ She will have $17991.18

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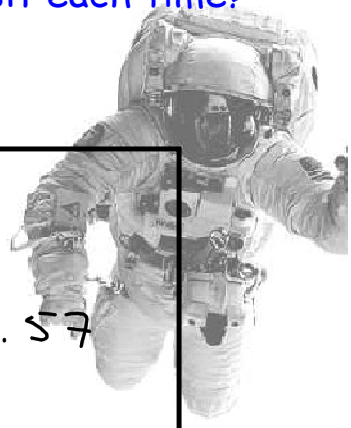
Ex.2 Cameron wants to be an astronaut and needs to save for univeristy. He plans on making regular bi-weekly deposits into an account paying 5.3%/a compounded bi-weekly. If he wants to have $9000 in 3 years, how much does he need to deposit each time?



By Hand

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

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

$$= 106.57$$

By TVM

N= 78
I%= 5.3
PV= 0
PMT= [redacted] −106.57
FV= 9000
P/Y= 26
C/Y= 26
PMT: END BEGIN

∴ He would need to make payments of $106.57

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Ex.3 Who wants to be a Millionaire???????

You want to know how much to put away every week, from now until you retire, to become a millionaire. Assume interest at 5% compounded weekly, and that you retire at 65.

N= 52 x (65 - 16)
I%= 5
PV= 0
→ PMT= [redacted] $90.93
FV= 1 000 000
P/Y=52
C/Y=52
PMT: (END) BEGIN

∴ You need to make payments of $90.93

Hmk. Pg. 532, #4-10,12

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