7.4 Present Value of an Annuity

Present value: The amount of money invested/borrowed NOW!!!

Formula:

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

where
PV= Present Value
R= Regular payment (made at the end of the compounding period)
i = interest rate per compound pd.
n = total # of payments

Don't worry we are going to give you all these formulas :)

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 James wants to invest now so that he will receive $700 every month for 5 years. How much should he invest now at 4.3%/a compounded monthly to achieve this?

By Hand

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

$P = ?$

$R = 700$

$i = \frac{0.043}{12}$

$n = 12 \times 5 = 60$

$$P = \frac{700\left[1-\left(1+\frac{0.043}{12}\right)^{-60}\right]}{\left(\frac{0.043}{12}\right)}$$

$\doteq 37731.35$

By TVM

N= 60
I%= 4.3
PV= −37731.35
PMT= 700
FV= 0
P/Y= 12
C/Y= 12
PMT: END BEGIN

How much does he receive in total?

700×60

$= 42000$

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Ex.2 Charlie has won the lottery prize of a lump sum payment of $78,000. He has placed the money into an account at 6.3%/a compounded semi-annually and plans to withdraw an equal payment every 6 months for 10 years. How big will the payment be?

By Hand

$P = 78\,000$

$R = ?$

$i = \frac{0.063}{2}$

$n = 2 \times 10$

$= 20$

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

$$= \frac{78000\left(\frac{0.063}{2}\right)}{\left[1-\left(1+\left(\frac{0.063}{2}\right)\right)^{-20}\right]}$$

$\doteq 5315.80$

By TVM

N= 20
I%= 6.3
PV= −78000
PMT= 5315.80
FV= 0
P/Y= 2
C/Y= 2
PMT: END BEGIN

Pg. 540
#3,6,8-14