FV of single Present cash flow

Find the amount if Rs. 1800 is invested at 5% compounded semiannually for 8 years. Also determine the compound interest.

Principal (P)		₹1,800.00		1000
Rate of Interest (r)		5%		15%
Time in years (t)		8		5
No. of times compounding in a year (m)		2		12
Amount (A)	**P*(1+r/m)^(m*t)**	**₹2,672.11**	**1800*(1+0.05/2)^(8*2)**	
Compound Interest (CI)	**A-P**	**₹872.11**		
Using Excel Formula				
Amount (A) or FV	**FV(r/m,m*t,0,-P,0)**	**₹2,672.11**	**FV(RATE,NPER,PMT,[PV],[TYPE])**	$2,107.18
Compound Interest (CI)	**A-P**	**₹872.11**		

FV of series of Equal Annual cash flows

Find the total accumulation of deposits of Rs. 500 made at the end of every 3 months for 4 years at the rate of 6% compounded quarterly.

Periodic Payment/Annuity (PMT)		₹500.00			
Rate of Interest (r)		6%			
Time in years (n)		4			
No. of times compounding in a year (m)		4			
Amount (A)	**Periodic payments*CVAF**	**₹8,966.18**	**500*17.93236984**	**CVAF for 0.015 and 16 years**	17.9323698

	Using Excel Formula		
Amount (A) or FV	**FV(r/m,m*t,-PMT,0,0)**	**₹8,966.18**	**FV(RATE,NPER,PMT,[PV],[TYPE])**

FV of an Annuity Due

At the beginning of each quarter, Rs. 600 is deposited into a savings account that pays 6% compounded quaterly. Find the balance in the account at the end of 5 years

Periodic Payment/Annuity (PMT)		₹600.00			
Rate of Interest (r)		6%			
Time in years (n)		5			
No. of times compounding in a year (m)		4			
Amount (A)	**Periodic payments*CVAF*(1+r/m)**	**₹14,082.31**	**600*23.1236671*(1+6%/4)**	**CVAF for 0.015 and 20 years**	23.1236671
Using Excel Formula					
Amount (A) or FV	**FV(r/m,m*t,-PMT,0,1)**	**₹14,082.31**	**FV(RATE,NPER,PMT,[PV],[TYPE])**		

FUTURE VALUE

$$FV = PV\left[1 + \frac{r}{m}\right]^{m \times t}$$

where FV = future value
PV = Present value
r = rate of interest
m = No. of times compounding in a year
t = Time period in years

or $FV = PV \times CVF_{(r/m\%,\ m \times t)}$

where, CVF = compound value factor.

ANNUITY :- is a sequence of payments, usually equal in size, and made at equal intervals of time.

- Ordinary Annuity :- is the annuity whose first payment is made at the end of first payment interval.
  TYPE = 0.
- Annuity Due :- is an annuity the first payment is made at the beginning of the first payment interval.
  TYPE = 1

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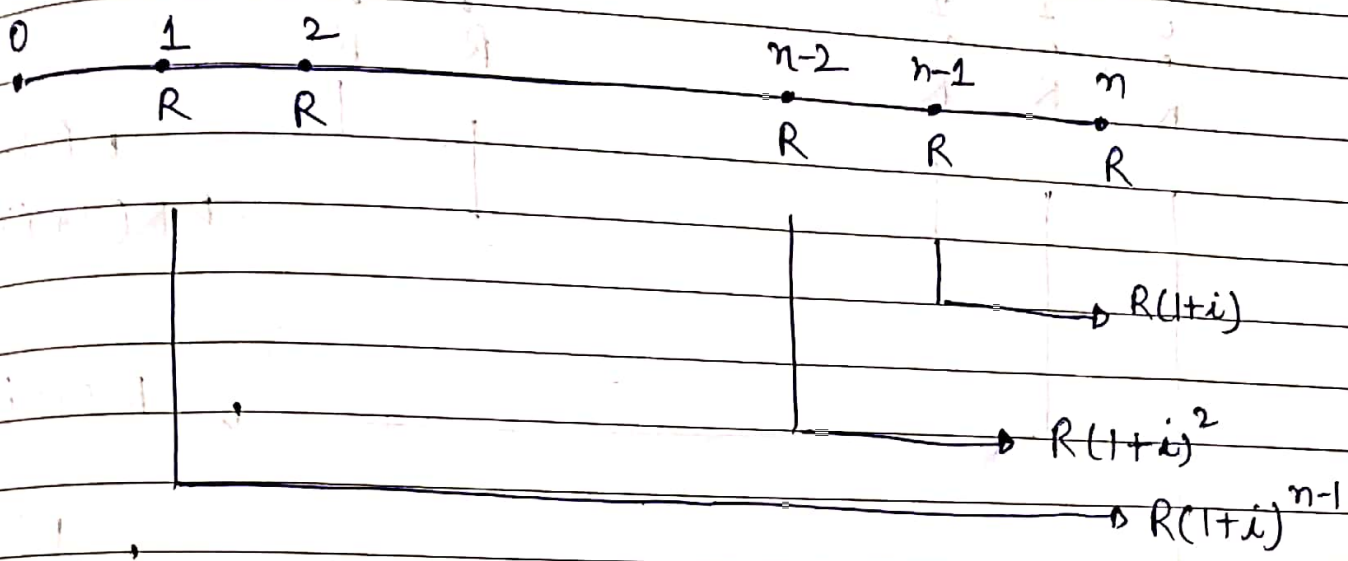
Amount/FV of an Ordinary Annuity



Amount of 1st payment $= R(1+i)^{n-1}$

Amount of 2nd payment $= R(1+i)^{n-2}$

⋮

Amount of nth payment $= R$

Thus, Amount of annuity is given by

$$A = R + R(1+i) + \text{_____} + R(1+i)^{n-2} + R(1+i)^{n-1}$$

This is geometric series consisting of n terms with first term R and common ratio $1+i$.

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

Or, $A = R \times CVAF_{(i\%, n)}$

where

A = Amount (Future value)

R = periodic payment

CVAF = Compounded Value Annuity Factor

$i = \frac{r}{m}$ and $n = m \times t$

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AMOUNT OF AN ANNUITY DUE

Amount of 1st payment $= R(1+i)^n$

Amount of 2nd payment $= R(1+i)^{n-1}$

⋮

Amount of last payment $= R(1+i)$

$$A = R(1+i) + R(1+i)^2 + \text{———} + R(1+i)^n$$

Geometric series consisting of n terms with first term $R(1+i)$ and common ratio $1+i$.

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

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

Or $A = R \times CVAF_{(i\%, n)} \times (1+i)$

where

A = Amount / FV ; CVAF = Compounded value Annuity factor

$i = \frac{r}{m}$; $n = m \times t$.

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