Annuity (Annually) (Every Year) (Installment) (Uniform Amount) (Uniform Time)

- Future Value
  - Investment / Sinking Fund
    - O/N/R — End of Silence — $FV = A\left[\frac{(1+i)^n-1}{i}\right]$
    - Due / Immediate — Starting / Beginning — $FV = A\left[\frac{(1+i)^n-1}{i}\right](1+i)$
- Loan / Borrowing
  - Present Value
    - O/N/R — End of Silence — $PV = A\left[\frac{(1+i)^{-n}-1}{i}\right]$ or $P\left[\frac{(1+i)^n-1}{(1+i)^n}\right]$
    - Due / Immediate — Starting / Beginning — $PV = A\left[\frac{(1+i)^{-n}-1}{i}\right](1+i)$

CALCULATOR TRICKS

FUTURE VALUE

Annuity Regular / Ordinary / Normal → $(1+i)\ x = = \boxed{n+1} - 1 \div i \times A$

Annuity Due / Immediate → $(1+i)\ x = = \boxed{n+1} - 1 \div i \times A \times (1+i)$

PRESENT VALUE

Annuity Regular / Ordinary / Silence → $(1+i) \div = = \boxed{n+1}\ GT \times A$

Annuity Due / Immediate → $(1+i) \div = = \boxed{n+2}\ GT \times A \times (1+i)$

Note :-

1) GT is used only in PV.
2) In FV — we go upto → $n+1$
   In PV — we go upto → $n+2$

If A is given, P to be found

$(1+i)\ x = = \boxed{n+1} - 1 \div i \times$ Amount = (A)

$(1+i) \div = = \boxed{n+1}\ GT \div$ Amount = (P)

$(1+i)\ x = = \boxed{n+1} \times$ (CF)	$(1+i) \div = = \boxed{n+1} \times A$
To find Future Value	To find Present Value

(CF = Cash Flow)

Simple Interest

- It is always calculated on Principal.
- Interest in S.I are always equal. (Int in 1st year = Int in 2nd year = ...)

$$S.I = \frac{PTR}{100}$$

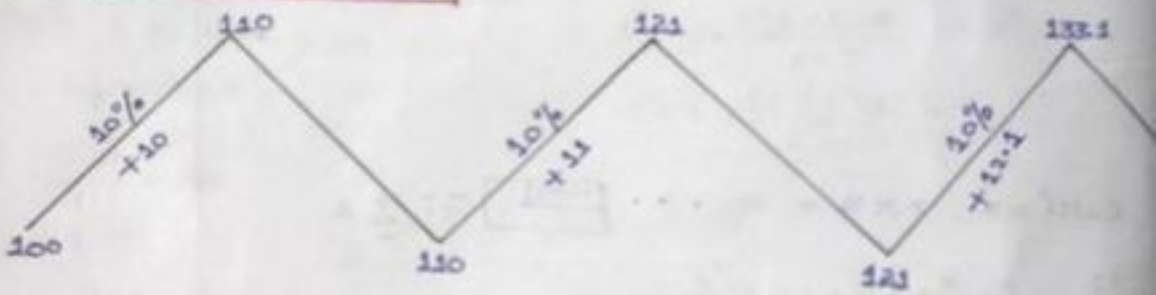
$$A = P + I$$
$$= P + Pit$$
$$= P(1+it)$$

$$P = A - I$$
$$I = A - P$$

1 yr 3 months
$1 + \frac{3}{12} = 1.25$

1 yr 7 months
$1 + \frac{7}{12} = 1.6$

Compound Interest



- It is always calculated on Amount.
- In C.I we receive interest on interest i.e.,

Interest will always increase year by year.

$$A_n = P(1+i)^n$$
$$C.I = P[(1+i)^n - 1]$$

- If same P, T, R for both S.I & C.I then Interest for 1st year is equal i.e, S.I = C.I

Calc Trick

$$C.I = P + (r\% + r\% + \ldots T \text{ times (years)} - P)$$

$$\text{Amount} = P + (r\% + r\% + r\% \ldots T \text{ times (years)})$$

Case-2

Eg: If sum of money gets doubles in 6 years. In how many years it will get triple?

$$\frac{T_2}{T_1} = \frac{n_2 - 1}{n_1 - 1}$$

$n_1 = 2$ $\quad n_2 = 3$

$T_1 = 6$ $\quad T_2 = ?$

$$T_2 = T_1 \left(\frac{n_2-1}{n_1-1}\right)$$

$$= 6\left(\frac{3-1}{2-1}\right) \qquad \frac{3-1}{2-1} \times 6$$

$$= 6 \times 2$$

$$= 12$$

∴ It triples in 12 years.

Case-2

Eg: A sum of money doubles itself at C.I in 10 years in how many years will it become 8 times?

$$T = \frac{69}{r} + 0.35$$

$$10 = 0.35 + \frac{69}{r}$$

$$r = 7.15\%$$

$$10 - 0.35 = \frac{69}{r}$$

$$r = \frac{69}{9.65} = 7.15\%$$

A=nP

$$A = P\left(1 + \frac{R}{100}\right)^T$$

$$8P = P\left(1 + \frac{7.15}{100}\right)^T$$

$$8 = \left(\frac{100 + 7.15}{100}\right)^T$$

$$8 = \left(\frac{107.15}{100}\right)^T$$

$$8 = (1.0715)^T$$

Type in Calculator

1.0715 x ..... (Till u get 8 or nearby val

T = 30 yrs

Case-3:-

Eg: If a population of a village becomes 10250 after 2 years and 11070 after 3 years, what is the rate of increase per annum.

a) 5% b) 6% c) 7% d) 8%

By 0.Y

10250 + 8% = 11070

So By: 8%

when 10250 ⟶ 2 years

11070 ⟶ 3 years (10250 + ___ % = 11070)

↓

While calculating this the Principal Amt is Amount of previous years.

7) To find n^{th} power if n is a fraction $(x^{1/n})$

- Type the number.
- √ √ √ ..... 12 times
- −1
- ÷n
- +1
- x=, x=, x= ..... 12 times

8) To find n^{th} power if n is a fraction $(x^{a/b})$

- Type the number.
- √ √ √ ..... 12 times
- −1
- x a, ÷b
- +1
- x=, x=, x= ..... 12 times

9) Use of (M+ Memory+), (M− Memory−), (MRC Memory Recall)

Eg: $(8 \times 5) + (7 \times 3) + (6 \times 5) + (9 \times 3)$

8 x 5 = 40 M+
7 x 3 = 21 M+
6 x 5 = 30 M+
9 x 3 = 27 M+
MRC = 118

Eg: $(7 \times 2) + (6 \times 2) + (7 \times 2) - (3 \times 2)$

7 x 2 = 14 M+
6 x 2 = 12 M+
7 x 2 = 14 M+
3 x 2 = 6 M−

- Type (1.03)
- √ √ √ ... 12 times
- −1
- ÷3
- +1
- x=, x=, x= ... 12 times

$(1.05)^{7/4} = 1.0871$

- Type 1.05
- √ √ √ √ ... 12 times
- −1
- x7, ÷4
- +1
- x=, x=, x= ..... 12 times

To clear Memory press MRC 2 times

10) Trick for ratio

Eg: ~~Divide 17455 in 2:7:3.~~

Eg: 15000 should be divided among 3 persons in 2:3:5

- Total Ratio = 2+3+5 = 10.
- $\frac{15000}{10} = 1500$
- $1500 \times 2 = 3000$

(No need to press any button) $3 = 4500$

$5 = \frac{7500}{15000}$

11) Trick for finding %

Eg: 17240 ~~Should~~ be divided in 10%, 25%, 30%, 12%.

- $17240 \times 10\% \quad 1724$

(No need to press any button)

$25\% \quad 4310$

$30\% \quad 5172$

$12\% \quad 2068.8$

CALCULATOR TRICKS

SEQUENCES AND SERIES

To find $T_n = a+(n-1)d$ (A.P)

Calci ⟶ $(a+d) = = \ldots$ [n+1]

Eg: 2, 5, 8, ... T_{21}

$2+3 = = \ldots$ [21]

$T_{21} = 62$

Sum of A.P series

Eg: $S_3 = T_1 + T_2 + T_3$

$S_n = \frac{n}{2}[2a+(n-1)d]$ $\quad S_n = \frac{n}{2}(a+l)$

Calci ⟶ $a+d = \ldots$ [n+1] GT [=] a

Eg: 2, 4, 6, 8 ..... S_{10}

If a is -ve, +ve

GT-a GT+a

$S_{10} = 2+2 = =$ [10] GT+2

$= 110$

Eg: $-2, -4, -6, -8 \ldots S_{10}$

$S_{10} = -2-2 = =$ [10] GT-2

A.M

AM $\frac{a+b}{2}$

Q: 58 & 43

$\frac{58+43}{2}$

$= 49$

Insert $\frac{b-a}{n+1}$

Q: 3 terms b/w 2 & 8

$\frac{8-2}{2+1} = \frac{6}{3} = 2$

1st term = 2

$T_2 = 2+2 = 4$

To find $T_n = ar^{n-1}$ (G.P)

Calci → r × a = = · · · [n+1]

Eg: 2, 4, 8, 16, · · · · T_{10}

2 × 2 = = · · · [11]

$T_{11} = 1024$

Eg: 3, 6, 12 · · · · T_{14}

r = 2 a = 3

2 × 3 = = = = [15]

$T_{14} = 24576$

Sum of G.P series

$$S_n = \frac{a(1-r^n)}{1-r}, \quad r<1$$

$$= \frac{a(r^n-1)}{r-1}, \quad r>1$$

Calci ⇒ r × a = = · · · [n+1] GT $\overset{+}{-}$ a

Eg: 2, 4, 8, 16 · · · · S_8

S_8 - 2 × 2 = = [9] GT +2

$S_8 = 510$

$$S_\infty = \frac{a}{1-r}$$

Calci ⇒ r × a = = · · · [0] GT $\overset{+}{-}$ a