

# Aptitude Practice

## Simple Interest

### formula

$$\underline{S.I.} = \frac{PTR}{100} \quad \text{or} \quad \frac{PNR}{100}$$

$P$  = Principal,  $T$  = Time Duration  
 $R$  = Rate of Interest,  $A$  = Total Amount

Note: Interest calculated only  
on Principal

$$A = P \left[ 1 + \frac{RT}{100} \right]$$

Q)  $P = 1,00,000$     $R = 10\%$  p.a.    $T = 3$  years

$$\begin{aligned} \rightarrow 1^{\text{st}} \text{ yr} &\rightarrow 10,000 \text{ (I)} \\ 2^{\text{nd}} \text{ yr} &\rightarrow 10,000 \text{ (I)} \\ 3^{\text{rd}} \text{ yr} &\rightarrow 10,000 \text{ (I)} \\ &\hline & 30,000 \end{aligned}$$

$$\begin{array}{rcl} 1,00,000 & \leftarrow & \text{Principal (P)} \\ + 30,000 & \leftarrow & \text{Interest (I)} \\ \hline 1,30,000 & \leftarrow & \text{Total Amount } \} \quad \text{(A)} \\ & \hline & \end{array}$$

Note 'R' always per annum, 'T' must in years

$$T = 24 \text{ months} \rightarrow \therefore T = 2 \text{ years}$$

$$T = 36 \text{ months} \rightarrow \therefore T = 3 \text{ years}$$

$$R = 5\% \text{ p.q.} \rightarrow R = 5 \times 4 = [20\% \text{ p.a.}]$$

(per quarter)

$$R = 5\% \text{ p.a.} \rightarrow [5\% \text{ p.a.}] \quad (\because P.C = 1.)$$

$$R = 6\% \text{ per six months} \rightarrow [12\% \text{ p.a.}]$$

$$R = 8\% \text{ per eight months} \rightarrow [12\% \text{ p.a.}]$$

$$T = 7 \text{ months} \rightarrow \left[ \frac{7}{12} \text{ years} \right]$$

$$R = 12\% \text{ per 6 months} \rightarrow [24\% \text{ p.a.}]$$

$$R = 10\% \text{ P.C.P.Q} \Rightarrow 10\% \times 4 = [40\% \text{ p.a.}]$$

$(P.C \rightarrow \%$   
 $P.Q \rightarrow \text{per quarter})$

① What would be the simple Interest accrued in 4 years on principle Rs 18440 at the rate of 15% p.a.?

→ formula

$$SI = \frac{P \cdot T \cdot R}{100}$$

$$SI = \frac{18440 \times 4 \times 15}{100 \times 25}$$

$$SI = 11,064$$

Percentage method

$$100\% = 18440$$

$$60\% = x$$

$$x = \frac{18440 \times 60}{100}$$

$$x = 11,064$$

$$\begin{aligned} & 15\% \text{ p.a.} \\ & \times 4 \text{ years} \\ & \underline{\underline{60\%}} \leftarrow \text{Total Interest} \end{aligned}$$

② Dinesh deposit an amount of Rs 65800 to obtain Simple interest at 14% p.a. for 4 years. What total amount will Dinesh get at the end of 4 years?

$$A = P \left[ 1 + \frac{TR}{100} \right]$$

$$A = 65800 \left[ 1 + \frac{56}{100} \right]$$

$$= 65800 \times 156$$

$$= 658 \times 156$$

$$\text{Total Amount} = 102648$$

Percentage method

$$T = P + \frac{I}{(100)}$$

$$100\% = 65800$$

$$156\% = x$$

$$x = \frac{65800 \times 156}{100}$$

$$= 102648$$

$$\begin{aligned} & 14\% \text{ p.a.} \\ & \times 4 \text{ years} \\ & \underline{\underline{56\%}} \text{ p.a.} \end{aligned}$$

③ Mr. A takes loan from Mr. B for 2 years at the rate of interest 5% p.a. and after two years he gave back Rs 6600 to Mr. B and complete the payment of loan. Find the interest paid by Mr. A?

$$P = x, T = 2 \text{ yrs}, R = 5\% \text{ p.a.}, A = 6600$$

$$A = P \left[ 1 + \frac{TR}{100} \right]$$

$$6600 = P \left[ 1 + \frac{10}{100} \right]$$

$$\frac{6600}{600} = P \left[ \frac{+10}{10} \right]$$

$$P = 6000$$

600 Rs

Percentage method

$$\frac{P + I}{(100) + (10)}$$

$$+10\% = \frac{60}{6600}$$

$$10\% = x$$

$$x = 600$$

$$\begin{aligned} & 5\% \text{ p.a.} \text{ for } 2 \text{ years} \\ & 5\% \text{ p.a. for } 1 \text{ year} \\ & \frac{10\% \text{ p.a.}}{2 \text{ years}} \end{aligned}$$

④ A sum of Rs 2668 amounts to Rs 4469 in 5 years at the rate of simple interest. Find the rate percentage?

$$\rightarrow \text{Principle} = 2668 \xrightarrow[\text{(5 yr)}]{\text{Rate}=?} 4469$$

$$A = P \left[ 1 + \frac{TR}{100} \right]$$

$$4469 = 2668 \left[ 1 + \frac{5x}{100} \right]$$

$$4469 = 2668 \left[ \frac{100 + 5x}{100} \right]$$

$$446900 = 266800 + 13340x$$

$$20010x = 13340x$$

$$x = \frac{20010}{13340} \cdot 15$$

$$x = 15 \cdot 1 \cdot$$

⑤ P = Rs 2000, R = 10% p.a., T = 2 years, SI = ?

formula

$$\begin{aligned} S.I. &= \frac{PTR}{100} \\ &= \frac{2000 \times 2 \times 10}{100} \end{aligned}$$

$$S.I. = 400$$

% method

$$\begin{aligned} 100 \% &= 2000 \\ 20 \% &= x \\ 100 \times x &= 2000 \times 20 \\ x &= 400 \end{aligned}$$

$$\begin{aligned} 10 \% & \\ \times 2 \text{ year} & \\ \hline 20 \% \text{ p.a.} & \end{aligned}$$

⑥ P = x, R = 10% p.a., T = 2 years, S.I. = 400

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

$$400 = \frac{P \times x \times 10}{100}$$

$$P = 2000$$

% method

$$\begin{aligned} 100 \% &= x \\ 20 \% &= 400 \\ 100 \times \frac{400}{20} &= 2000 \times x \\ x &= 2000 \end{aligned}$$

$$\begin{aligned} 10 \% & \\ \times 2 \text{ year} & \\ \hline 20 \% \text{ p.a.} & \end{aligned}$$

$$\textcircled{7} \quad A = 2400, R = 10\%, P.A, T = 2 years, P = x$$

$$A = P \left[ 1 + \frac{TR}{100} \right]$$

$$2400 = P \left[ 1 + \frac{2x}{100} \right]$$

$$2400 = P \left( 1 + \frac{2x}{5} \right)$$

$$P = 2000$$

∴ method

$$100\% = x$$

$$120\% = 2400$$

$$x = \frac{2400}{120} \times 100$$

$$x = 2000$$

Total Amount =  $P + I$   
(A)

$$A = P + I$$

$$= 100\% + 20\%$$

$$A = 120\%$$

Note

- ① Simple Interest on a certain value is Rs 20
- ② Rs 1200 is invested  
↳ Principle Amount
- ③ The amount becomes 1800  $\Rightarrow$  Total Amount (A)
- ④ Maturity amount is Rs 1000  
↳ Total Amount (A)  $\leftarrow$   $P + I$

## Comparison

① Simple Interest for sum of Rs 1230 for 2 years is Rs 10 more than the simple interest for Rs 1130 for same duration. Find the rate of Interest?

$$\rightarrow SI_1 \sim SI_2 = 10$$

$$\frac{PTR}{100} - \frac{PTR}{100} = 10$$

$$\frac{1230 \times 2 \times x}{100} - \frac{1130 \times 2 \times x}{100} = 10$$

$$2460x - 2260x = 10 \times 100$$

$$200x = \frac{10 \times 100}{5}$$

$$x = 5\%$$

acc. to options 2 years

$$(a) 5\% \rightarrow 5\% \times 2 = \underline{\underline{10\%}}$$

$P_1$

1230

$$\downarrow 10\%$$

$\underline{\underline{123}}$

$SI_1$

Rs 10 more

$P_2$

1130

$$\downarrow 10\%$$

$\underline{\underline{113}}$

$SI_2$

∴ Ans  $\Rightarrow 5\%$

② For certain sum the simple interest in 2 years at 8% P.A. is Rs 110 more than the simple interest in 1 year at 5% P.A. for same sum. find the sum?

$$\rightarrow SI_1 \sim SI_2 = 110$$

$$\frac{PTR}{100} - \frac{PTR}{100} = 110$$

$$P \left[ \frac{2 \times 8}{100} - \frac{1 \times 5}{100} \right] = 110$$

$$P \left[ \frac{11}{100} \right] = 110$$

$$P = 1000$$

acc. to option

(b) 1000

$\frac{8\% + 8\%}{2 \text{ years}}$

$\underline{\underline{16\%}}$

160

$\frac{5\%}{1 \text{ year}}$

$\underline{\underline{5\%}}$

50

diff 110

$\therefore P = 1000$

③ Simple Interest for sum of Rs 1500 is Rs 30 in 4 yrs and

Rs 60 in 8 yrs. Find the rate?

→

1500

30 ~ 60

$$SI_1 \sim SI_2 = 30$$

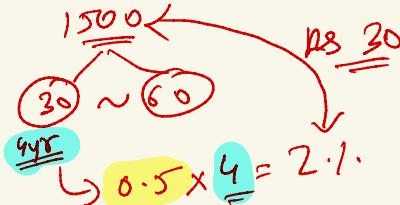
$$\frac{PTR}{100} - \frac{PTR}{100} = 30$$

$$\frac{50}{100} \times x \times 2 = 30$$
$$\frac{100x}{100} = 30$$
$$2x = 1$$
$$x = 0.5\%$$

$$150 \left[ \frac{4x}{100} - \frac{8x}{100} \right] = 30$$

Options

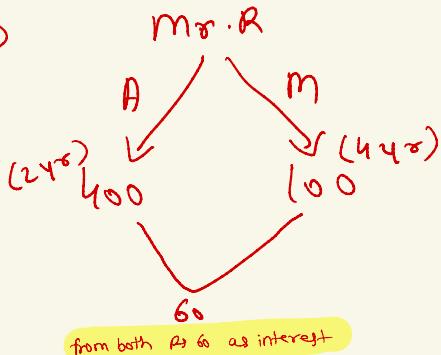
(a) 0.5



(ans 0.5)

④ Mr. R lent Rs 400 to Mr. A for 2 years and Rs. 100 to Mr. M for 4 yrs and received from both Rs 60 as interest. find the rate of Interest?

→



$$SI_1 + SI_2 = 60$$

$$\frac{PTR}{100} + \frac{PTR}{100} = 60$$

$$\frac{400 \times 2 \times x}{100} + \frac{100 \times 4 \times x}{100} = 60$$

$$8x + 4x = 60$$

$$12x = 60$$

$$x = 5\%$$

by option

(a) 5%

140 - 5%.

240 - 10%.

440 - 20%.

10% ↴ 40 ↴ 20%

Rs 60  
∴ (ans  $\Rightarrow 5\%$ )

⑤ Arjun borrowed Rs 800 at 6% and Rajesh borrowed Rs 600 at 10%. After how much time will they both have equal debts?

→

$$A = R$$

$$P + I = P + I$$

$$800 + \frac{PTR}{100} = 600 + \frac{PTR}{100}$$

$$\frac{800 + 800 \times T \times 6}{100} = \frac{600 + 600 \times T \times 10}{100}$$

$$800 + 48T = 600 + 60T$$

$$200 = 12T$$

$$T = \frac{200}{12} = \frac{50}{3}$$

$$3 \frac{16}{50} = \frac{48}{3}$$

$16 \frac{2}{3}$  yrs

## Profit & Loss Beginner

① A person buys a book for Rs 200 and sells it for Rs 225. What will be his gain percent?

→ formula

$$\% \text{ gain} = \frac{S.P - C.P}{C.P} \times 100$$
$$= \frac{225 - 200}{200} \times 100$$
$$= 12.5 \%$$

Percentage

(C.P)

$$100\% = 200$$

$$x\% = 25 \quad (\text{S.P})$$
$$x = \frac{25 \times 100}{200}$$

$$x = 12.5 \%$$

② A person buys a watch for Rs 500 and sells it for Rs 300. Find his loss percent?

→ formula

$$\% \text{ loss} = \frac{C.P - S.P}{C.P} \times 100$$
$$= \frac{500 - 300}{500} \times 100$$
$$= 40 \%$$

Percentage

$$100\% = 500$$

$$x\% = 300$$
$$x = \frac{300 \times 100}{500}$$

$$x = 60 \%$$

③ A gold bracelet is sold for Rs 14500 at a loss of 20%. What is the cost price of the gold bracelet?

→ formula

$$C.P = \frac{100}{100 - 20} \times 14500$$
$$= \frac{100}{80} \times 14500$$
$$= 18125$$

$$C.P = 18125$$

Percentage

$$(C.P) 100\% = x$$

$$(\text{S.P}) 80\% = 14500$$

$$80x = 14500$$

$$x = \frac{14500}{8}$$

$$x = 18125$$

④ By selling a cycle for Rs 4860, a student loses 19%. His cost price is?

→ **formula**

$$C.P. = \frac{100}{81} \times 4860$$

$$\boxed{C.P. = 6000}$$

**Percentage**

$$100\% = x$$

$$81\% = 4860$$

$$81 \times x = 4860 \times 100$$

$$\boxed{x = 6000}$$

⑤ A calculator is bought for Rs 350 and sold at a gain of 15%. What will be the selling price of calculator (in Rs)?

→ **formula**

$$S.P. = \frac{100 + \text{Profit \%}}{100} \times C.P.$$

$$= \frac{115}{100} \times 350$$

$$= 115 \times 3.5$$

$$\boxed{= 402.5}$$

**Percentage method**

$$100\% = 350$$

$$115\% = x$$

$$100x = 350 \times 115$$

$$x = 3.5 \times 115$$

$$\boxed{x = 402.5}$$

⑥ By selling a cell phone for Rs 2400, a shopkeeper makes a profit of 25%. Then his profit percentage, if he had sold it for Rs 2040, is

→ **formula**

$$C.P. = \frac{100}{125} \times 2400$$

$$C.P. = 1920, S.P. = 2040$$

$$\% \text{ gain} = \frac{2040 - 1920}{1920} \times 100$$

$$= \frac{120}{192} \times 100 \Rightarrow \boxed{6.25\%}$$

**% method**

$$125\% = 2400$$

$$x\% = 2040$$

$$x = \frac{2040 \times 125}{2400}$$

$$= 106.25$$

$$(C.P) \quad \boxed{\underline{\underline{\text{Profit \%}}}}$$

⑦ The owner of cell phone shop charges his customer 28% more than the cost price. If the customer paid Rs 8960 for the cell phone, what was the cost price of the cell phone?

→ Formula

$$C.P = \frac{100}{128} \times 8960$$

$$C.P = 7000$$

Percentage method

$$100\% = x$$

$$128\% = 8960$$

$$x = \frac{8960 \times 100}{128}$$

$$x = 7000$$

⑧ By selling an article for Rs 720, a man loses 10%. At what price should he sell it gain 5%?

→ Formula

$$C.P = \frac{100}{90} \times 720 = 800$$

$$C.P = 800$$

$$S.P = \frac{105}{100} \times 800$$

$$S.P = 840$$

% method

$$90\% = 720$$

$$105\% = x$$

$$x = \frac{720 \times 105}{90}$$

$$x = 840$$

⑨ A loses 20% by selling a radio for Rs 768. What % will be gain by selling it for Rs 1020?

→ Formula

$$C.P = \frac{100}{80} \times 768$$

$$C.P = 960, S.P = 1020$$

$$\% \text{ gain} = \frac{1020 - 960}{960} \times 100$$

$$= \frac{60}{960} \times 100 \Rightarrow \frac{100}{16} = 6.25\%$$

% method

$$80\% = 768$$

$$x\% = 1020$$

$$x = \frac{1020 \times 80}{768}$$

$$x = 106.25$$

$$100\% \\ C.P$$

$$6.25\% \\ \text{Profit \%}$$

① Mita got profit of 10% on selling an article in Rs 220 to get the profit of 30%, she should sell the article in how many rupees?

→ formula

$$CP = \frac{100}{110} \times 220$$

$$CP = 200, P \Rightarrow 30\%$$

$$SP = \frac{100+30}{100} \times 200$$

$$= \frac{130}{100} \times 200 = 260$$

1. method

$$110\% = 220$$

$$130\% = x$$

$$x = \frac{220 \times 130}{110}$$

$$x = 260$$

② A women brought oranges at Rs 30 per dozen. The selling price per hundred so as to gain 12% will be (in Rs)

→ formula

$$12 \text{ oranges} = Rs 30 \rightarrow 1 \text{ orange} = 2.5$$

$$100 \times 2.5 = 250 \text{ (C.P.)}, g = 12\%$$

$$SP = \frac{12}{100} \times 250 = 280$$

1. method

$$100\% = 250$$

$$112\% = x$$

$$x = \frac{250 \times 112}{100}$$

$$x = 280$$

③ Meena purchased two fans each at Rs 1200. She sold one fan at the loss of 5% and other at the gain of 10%. Find the total gain or loss percent.

→ formula

$$CP_1 = 1200 + CP_2 = 1200 = 2400$$

$$\text{Loss} = 5\%$$

$$\text{Profit} = 10\%$$

$$SP = \frac{95}{100} \times 1200$$

$$= 1140$$

$$SP = \frac{110}{100} \times 1200$$

$$= 1320$$

$$\text{Profit \%} = \frac{\frac{1320 - 1140}{1140}}{100} \times 100 = 2.5\%$$

1. method

$$100\% = 1200, 100\% = 1200$$

$$95\% = x, 110\% = x$$

$$x = \frac{1200 \times 95}{100}$$

$$= 1140$$

$$x = \frac{110 \times 1200}{100}$$

$$= 1320$$

$$SP = 2460, \text{Profit \%} = \frac{60}{2460} \times 100$$

$$Ans = 2.5\%$$

③ The cost price of an item is two-third of its selling price. What is the gain or loss % on that time?

→ formula

$$SP = x \quad CP = \frac{2}{3}x$$

$$\% \text{ Profit} = \frac{x - \frac{2}{3}x}{\frac{2}{3}x} \times 100$$
$$= \frac{\frac{1}{3}x}{\frac{2x}{3}} \times 100$$
$$= \frac{1}{3} \times \frac{3}{2} \times 100 \quad (\Rightarrow 50\%)$$

1. method

$$100\% = \frac{2}{3}$$

$$x\% = 1$$

$$100 = \frac{2}{3}x$$

$$x = \frac{3 \times 100}{2}$$

$$= 150$$

$$100\% \quad (50\%)$$

④ Sumit purchased an item for Rs 4000 and sold it at the gain of 35%. From that amount he purchased another item and sold it at the loss of 20%. What is his over all gain/loss?

→ formula

$$CP = 4000$$

$$SP = \frac{135}{100} \times 4000 \quad (= 5400)$$

$$SP = \frac{80}{100} \times 5400 \quad (= 4320)$$

$$\text{Profit} = 4320 - 4000$$

$$( = 320 )$$

1. method

$$\frac{80}{100} \times \frac{135}{100} \times 4000 \% = ?$$

$$32 \times 135 = ?$$

$$4320 = x$$

$$\text{Profit} = 4320 - 4000$$

$$( = 320 )$$

⑤ A fruit seller buys lemons at 2 for a rupee and sells them at 5 for three rupees what is his gain per cent?

→ formula

$$2L = 1R$$

$$\% \text{ Gain} = \frac{0.1}{0.5} \times 100$$

$$( \textcircled{C} ) \quad ( 1L = 0.5 R )$$

$$= 20\%$$

1. method

$$100\% = 0.5$$

$$x\% = 0.6$$

$$x = \frac{100 \times 0.6}{0.5}$$

$$= 120$$

$$100\% \quad ( CP ) \quad 20\% \quad \text{Profit \%}$$

$$1L = \frac{3}{5} R \Rightarrow 0.6 R \quad ( SP )$$
$$SP - CP = 0.6 - 0.5 = 0.1$$

⑥ A person sold his watch for Rs 75 and got a percentage profit equal to the cost price. The cost price of the watch is,

→ **formula**

$$\therefore \text{Profit} = \text{C.P.} = x \\ \text{S.P.} = 75$$

$$\therefore \text{Profit} = \frac{\text{S.P.} - \text{C.P.}}{\text{C.P.}} \times 100$$

$$x = \frac{75 - x}{x} \times 100$$

$$x^2 = 7500 - 100x$$

$$x^2 + 100x - 7500 = 0$$

$$(x+150)(x-50) = 0$$

$$x = -150 \quad \boxed{x = 50}$$

∴

⑦ The diff betn the CP and SP of an article is Rs 240. If the profit is 20%. the selling price is,

→ **formula**

$$\text{C.P.} - \text{SP} = 240 \\ \text{Profit \%} = 20\%$$

$$\therefore \text{Profit} = \frac{\text{SP} - \text{CP}}{\text{CP}} \times 100$$

$$20 = \frac{240}{\text{CP}} \times 100$$

$$\text{CP} = \frac{240 \times 100}{20}$$

$$\underline{\underline{\text{CP} = 1200}}$$

$$\text{S.P.} - \text{CP} = 240$$

$$\text{SP} = 1200 + 240$$

$$\boxed{\text{SP} = 1440}$$

8) The furniture seller sells two tables at Rs 1500 each. He earned a profit of 20% on one table and suffered a loss of 20% on the another table. Net profit or loss in this deal is;

→ formula

$$\text{Loss} \left( \frac{x^2}{100} \right)$$

$$\text{Loss} \left( \frac{20^2}{100} \right)$$

Loss 4%.

9) The profit earned after selling an article for Rs 625 is same as the loss incurred after selling the article for Rs 435 the cost price of the article is,

→ formula

$$\text{Profit} = \text{Loss}$$

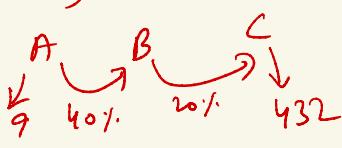
$$SP_1 - CP = CP - SP_2$$

$$625 + 435 = 2CP$$

$$CP = \frac{1060}{2} \Rightarrow CP = 530$$

10) A sold a watch to B at 40% gain and B sold it to C at a loss of 20%. If C bought the watch for Rs 432 at what price did A purchase it?

→ formula



$$x \times \frac{140}{100} \times \frac{80}{100} = 432$$

$$x = 385.71$$

formula

$$\text{profit} = SP - CP \quad , \quad \text{loss} = CP - SP$$

$$\text{profit \%} = \frac{SP - CP}{CP} \times 100 \quad , \quad \text{loss \%} = \frac{CP - SP}{CP} \times 100$$

$$SP = \left( \frac{100 + \text{Profit \%}}{100} \right) \times C.P \quad , \quad SP = \left( \frac{100 - \text{Loss \%}}{100} \right) \times C.P$$

$$C.P = \left( \frac{100}{100 + \text{Profit \%}} \right) \times S.P \quad , \quad C.P = \left( \frac{100}{100 - \text{Loss \%}} \right) \times S.P$$

Two method

① formula ② per centage

L) in this method always take  $C.P = 100\%$

(Note)

when two articles are sold at same selling price getting a gain of  $x\%$  on the first and loss of  $x\%$  on the second the overall  $\%$  loss in the transaction is,

$$\text{loss} \left[ \frac{x^2}{100} \right]$$

# Compound Interest

Formula Method

Traditional Method

Percentage method

Shortcut method

$$C.I = P \left\{ \left[ 1 + \frac{R}{100} \right]^n - 1 \right\}$$

(without using formula)

$$atb + \frac{9b}{100}$$

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

$$\begin{aligned} & \text{maturity amount} \\ & \text{Total amount} \\ & \text{Amount borrowed} \end{aligned} \Bigg\} = A$$

① What will be the compound Interest for the sum of Rs 8000 after 3 years at the rate of 5% p.a.

$$\rightarrow P = \text{Rs } 8000, T = 3 \text{ yrs}, R = 5\% \text{ p.a.}, CI = ?$$

Traditional

$$1^{\text{st}} \Rightarrow \frac{5}{100} \times 8000 = 400$$

$$\begin{array}{r} 8000 \\ + 400 \\ \hline 8400 \end{array}$$

$$2^{\text{nd}} \Rightarrow \frac{5}{100} \times 8400 = 420$$

$$\begin{array}{r} 8400 \\ + 420 \\ \hline 8820 \end{array}$$

$$3^{\text{rd}} \Rightarrow \frac{5}{100} \times 8820 = 441$$

$$\boxed{CI = 1261}$$

$$T.A = P + CI$$

$$= 8000 + 1261$$

$$= 9261$$

=

formula method

$$\begin{aligned} A &= P \left[ 1 + \frac{R}{100} \right]^n \\ &= 8000 \left[ 1 + \frac{5}{100} \right]^3 \\ &= 8000 \left[ \frac{105}{100} \right]^3 \end{aligned}$$

$$\begin{aligned} &= 8000 \times \frac{105}{100} \times \frac{105}{100} \times \frac{105}{100} \\ &= 21 \times 21 \times 21 \\ &= 21^3 \\ &= 9261 \end{aligned}$$

$$P = 8000$$

$$\boxed{CI = 1261}$$

② The compound Interest on Rs 30000 at 7% p.a. for a certain time is Rs 4347, then the Time is?

$$\rightarrow P = \text{Rs } 30000, CI = 4347, R = 7\% \text{ p.a.}, T = ?$$

$$CI = P \left\{ \left[ 1 + \frac{R}{100} \right]^n - 1 \right\}$$

$$4347 = 30000 \left\{ \left[ 1 + \frac{7}{100} \right]^n - 1 \right\}$$

$$\frac{4347}{30000} = \left( 1 + \frac{7}{100} \right)^n - 1$$

$$\frac{4347}{30000} + 1 = \left( 1 + \frac{7}{100} \right)^n$$

$$\frac{11447}{30000} = \left( \frac{107}{100} \right)^n$$

$$\left( \frac{107}{100} \right)^2 = \left( \frac{107}{100} \right)^n$$

$$n = 2$$

③ At what percent annual compound Interest rate, if a sum of Rs 1000 amounts to Rs 27000 in 3 years.

$$\rightarrow P = 1000, A = 27000, T = 3 \text{ yrs}, R = ?$$

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

$$27000 = 1000 \left( 1 + \frac{R}{100} \right)^3$$

$$27 = \left( 1 + \frac{R}{100} \right)^3$$

$$(3)^3 = \left( 1 + \frac{R}{100} \right)^3$$

$$3 = 1 + \frac{R}{100}$$

$$2 = \frac{R}{100}$$

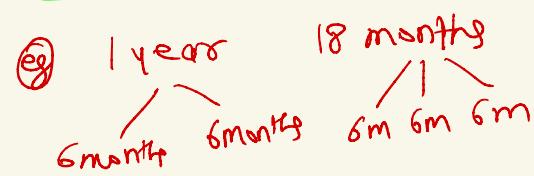
$$R = 200\%$$

# Half Yearly

Traditional method

①  $\frac{\text{Rate of Interest}}{2}$

② Split the Given year  
in term of 6 months



formula method

$$A = P \left[ 1 + \frac{R/2}{100} \right]^{2n}$$

e.g.  $R = 20\% \text{ p.a.}$

half yearly

$$R = \frac{20}{2} \% \text{ p.a.} \Rightarrow 10\%$$

③ A invested Rs 16000 at the rate of 10% p.a. for 1 year. If the interest is compounded half yearly, then find the total amount received by A at the end of the year?

Traditional method  $P = \text{Rs } 16000, R = 10\% \text{ p.a.}, T = 1 \text{ year}$

Half yearly  $\rightarrow \frac{10}{2}\% = 5\%$

$$\begin{array}{r} \text{1st 6 months} \\ \hline \underline{\underline{P}} \quad \underline{\underline{5}} \\ \hline \underline{\underline{16000}} \end{array} \times \frac{5}{100} \times \underline{\underline{16000}} = 800$$

$$\begin{array}{r} \\ + \\ \hline \underline{\underline{800}} \end{array}$$

$$\begin{array}{r} \text{2nd 6 months} \\ \hline \underline{\underline{P}} \quad \underline{\underline{5}} \\ \hline \underline{\underline{16800}} \end{array} \times \frac{5}{100} \times \underline{\underline{16800}} = 840$$

$$\begin{array}{r} \\ + \\ \hline \underline{\underline{840}} \end{array}$$

$$\begin{aligned} T.A &= P + I \\ &= 16000 + 1640 \\ &= 17640 \end{aligned}$$

formula

$$A = P \left[ 1 + \frac{R/2}{100} \right]^{2n}$$

$$A = 16000 \left[ 1 + \frac{5}{100} \right]^2$$

$$= 16000 \left[ \frac{105}{100} \right]^2$$

$$= \frac{16000 \times 105}{100} \times \frac{105}{100}$$

$$= 105 \times 168$$

$$= 168 \times (100 + 5) \Rightarrow + \frac{16800}{840}$$

$$17640$$

② A sum of Rs 40,000 is invested for 18 months at 20% p.a. on compound interest. If the interest is compounded half yearly, what will be the interest to be paid?

→ Trad. method  $P = \text{Rs } 40,000, R = 20\% \text{ p.a.}, T = 18 \text{ months}$

half yearly  $\rightarrow R = \frac{20}{2} = 10\% \text{ p.a.}$  / 6m 6m 6m

1<sup>st</sup> 6m  $\frac{10}{100} \times 40,000 = 4000$

2<sup>nd</sup> 6m  $\frac{10}{100} \times 44000 = 4400$

3<sup>rd</sup> 6m  $\frac{10}{100} \times 48400 = 4840$

CI 13240

**formula**  $A = P \left[ 1 + \frac{R/2}{100} \right]^{2n}$   $n = \text{Time}$

$A = 40,000 \left[ 1 + \frac{10}{100} \right]^{\frac{1}{2} \times \frac{3}{6}}$

$A = 40,000 \left[ \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} \right]$

$= 40 \times 1331 = 53,240$

$P = 40,000$  13240 CI

Note Always put  $n = \text{no of years}$  so we put  $n = \frac{18}{12}$  bcz 18 months.

③ find the amount of Rs 8000 in  $1\frac{1}{2}$  years at 5% p.a. compound interest payable half yearly?

→ Trad. method  $T = 1\frac{1}{2} = \frac{3}{2}$

P = Rs 8000, R = 5% p.a., T =  $1\frac{1}{2}$  yrs

$R = \frac{5}{2}\% \text{ p.a.}$  18 months

half yrs  $\Rightarrow R = 2.5\%$  / 6m 6m 6m

$1^{\text{st}} 6m \rightarrow \frac{25}{100} \times 8000 = 200 \text{ (6m)}$

$2^{\text{nd}} 6m \rightarrow \frac{25}{100} \times 8200 = 205 \text{ (6m)}$

$3^{\text{rd}} 6m \rightarrow \frac{25}{100} \times 8405 = 210.125 \text{ (6m)}$

CI = 615.125

**formula**  $A = P \left[ 1 + \frac{R/2}{100} \right]^{2n}$

$A = 8000 \left[ 1 + \frac{2.5}{100} \right]^{\frac{1}{2} \times \frac{3}{2}}$

$A = 8000 \times \frac{41}{40} \times \frac{41}{40} \times \frac{41}{40}$

= 8615.125

Made with Goodnotes  $A = P + CI = 8000 + 615.125 = \underline{\underline{8615.125}}$

## Quarterly

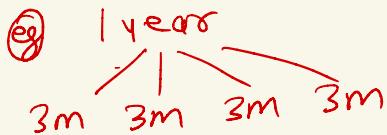
Traditional method

①  $\Rightarrow$  Rate of Interest by 4

formula method

$$A = P \left[ 1 + \frac{R/4}{100} \right]^{4n}$$

② Split the given year in term of 3 months



① The compound interest on Rs 8000 for 9 months at 20% p.a. interest being compounded quarterly is,  
→ Trad. method

$$P = \text{Rs } 8000, R = \frac{20}{4} \% \text{ p.a.}, T = 9 \text{ months}$$

$$9 \text{ months} = \frac{9}{12}$$

$$\underline{\underline{1^{\text{st}} 3m}} \quad \frac{5}{100} \times 8000 = 400$$

$$\underline{\underline{2^{\text{nd}} 3m}} \quad \frac{5}{100} \times 8400 = 420$$

$$\underline{\underline{3^{\text{rd}} 3m}} \quad \frac{5}{100} \times 8820 = 441$$

CI 1261

$$T = P + I \\ = 8000 + 1261 = \underline{\underline{9261}}$$

formula

$$A = P \left[ 1 + \frac{R/4}{100} \right]^{4n}$$

$$A = 8000 \left[ 1 + \frac{5}{100} \right]^4 \left[ \frac{9}{12} \right]^3$$

$$= 8000 \left[ \frac{105}{100} \times \frac{105}{100} \times \frac{105}{100} \right]$$

$$= 21^3$$

$$= 9281 \quad P = 8000 \quad I = \underline{\underline{1261}}$$

② Find the compound interest on Rs 32000 for 6 months at 10% p.a. interest being compounded quarterly i.e.,

$$\rightarrow P = \text{Rs } 32000 \quad R = 10\% \text{ p.a.} \quad T = 6 \text{ months}$$

$$R = \frac{2.5}{4} \cdot 1. \cdot \text{p.a.} \quad \overbrace{3m}^{\frac{1}{4}} \quad \overbrace{3m}^{\frac{1}{4}}$$

$$\left[ \frac{2.5}{100} = \frac{25}{1000} \right]$$

$$1^{\text{st}} 3m \rightarrow \frac{25}{1000} \times 32000 = 800$$

$$2^{\text{nd}} 3m \rightarrow \frac{25}{1000} \times 320800 = 820$$

$$CI = 1620$$

formula

$$A = P \left[ 1 + \frac{R/4}{100} \right]^{4n}$$
$$= 32000 \left[ 1 + \frac{25}{1000} \right]^4 \left( \frac{2}{3} \right)$$
$$= 32000 \times \frac{41}{40} \times \frac{41}{40} \Rightarrow 33620$$

$P = \text{Rs } 32000$

$CI = 1620$

### Half/Quarter Yearly

$T = 27 \text{ months}, T = 30 \text{ months}$

$R = 20\% \text{ p.a.}, R = 20\% \text{ p.a.}$

$T = 27$

$\overbrace{1 \text{ yr}}^1 \overbrace{1 \text{ yr}}^1 \overbrace{3 \text{ m (Quart)}}^1$   
 $20\% \quad 20\% \quad 5\%$

$27 \text{ m} = 2 \frac{1}{4} \text{ yr}$

formula

$$A = P \left[ 1 + \frac{R}{100} \right]^n \left[ 1 + \frac{R/4}{100} \right]^{4n}$$

$T = 30 \text{ m}$   
 $\overbrace{1 \text{ yr}}^1 \overbrace{1 \text{ yr}}^1 \overbrace{6 \text{ m}}^1$   
 $20\% \quad 20\% \quad 10\%$

formula  $30 \text{ months} \Rightarrow 2 \frac{1}{2} \text{ yr}$

$$A = P \left[ 1 + \frac{R}{100} \right]^n \left[ 1 + \frac{R/2}{100} \right]^{2n}$$

① A sum of Rs 10,000 was deposited in a bank for a period of 27 months at the rate of 20% p.a. on compound interest. What will be the total amount received.

$$\rightarrow P = \text{Rs } 10000, R = 20\% \text{ p.a.}, T = 27 \text{ months}$$

Trick.

$$1^{\text{st}} \text{ yr} \rightarrow \frac{20}{100} \times 10000 = 2000$$

$$2^{\text{nd}} \text{ yr} \rightarrow \frac{20}{100} \times 12000 = 2400$$

$$\begin{array}{l} 3^{\text{rd}} \cdot 4^{\text{th}} \\ \text{but only} \\ 6 \text{ months} \end{array} \rightarrow \frac{5}{100} \times 14400 = 720$$

$$\text{CI } \underline{\underline{5120}}$$

$$\begin{aligned} \text{T.A.} &= 10000 + 5120 \\ &= \underline{\underline{15120}} \end{aligned}$$



formula  $27 \text{ m} = 2 \frac{1}{4} \text{ yrs}$

$$A = P \left[ 1 + \frac{R}{100} \right]^n \left[ 1 + \frac{R/4}{100} \right]^{4n}$$

$$A = 10000 \left[ \frac{120}{100} \right]^2 \left[ \frac{105}{100} \right]$$

$= 15120$

② What will be the total amount received for the sum of Rs 20,000 for the period of 30 months at the rate of 8% p.a. on compound interest.

$$\rightarrow P = 20,000, R = 8\% \text{ p.a.}, T = 30 \text{ months}$$

Trick

$$1^{\text{st}} \text{ yr} \rightarrow \frac{8}{100} \times 20000 = 1600$$

$$2^{\text{nd}} \text{ yr} \rightarrow \frac{8}{100} \times 21600 = 1728$$

$$\begin{array}{l} 3^{\text{rd}} \text{ yr} \\ \text{but only} \\ 6 \text{ months} \end{array} \rightarrow \frac{4}{100} \times 23328 = 933.12$$

$$\text{CI } \underline{\underline{4261.12}}$$

$$\begin{aligned} \text{T.A.} &= P + I \\ &= 20000 + 4261.12 \\ &= \underline{\underline{24261.12}} \end{aligned}$$



formula  $30 \text{ m} = 2 \frac{1}{2} \text{ yrs}$

$$A = P \left[ 1 + \frac{R}{100} \right]^n \left[ 1 + \frac{R/2}{100} \right]^{2n}$$

$$= 20000 \left[ \frac{108}{100} \right]^2 \left[ \frac{104}{100} \right]$$

$$= 20000 \times \frac{108}{100} \times \frac{108}{100} \times \frac{104}{100}$$

$= 24261.12$

# Population Increase / Decrease

Traditional method

Formula  
① After 'n' years

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

② 'n' years ago

$$A = \frac{P}{\left[1 + \frac{R}{100}\right]^n}$$



① The population of Chennai city increased at a rate of 15% p.a. If the population was 4000 at the end of the year 2015 then what will be its population at the end of 2017?

→ Sol.

$$2015 = 4000$$

$$2016 = \frac{15}{100} \times 4000 = 600$$

$$= 4600$$

$$2017 = 4600 \times \frac{15}{100} = 690$$

$$= 4600 + 690$$

$$= \underline{\underline{5290}}$$

Formula

$$2015 = 4000$$

$$2017 = ?$$

after  $n$  years

$$A = P \left[1 + \frac{R}{100}\right]^n$$

$$= 4000 \left[1 + \frac{15}{100}\right]^2$$

$$= 4000 \times \frac{115}{100} \times \frac{115}{100}$$

$$= \underline{\underline{5290}}$$

2015  
2016  
2017 → 2 years

∴  $n = 2$  years

② The population of chennai city decreased at a rate of 10% p.a. If the population was 400000 at the end of the years 2017 then what will be its population after 3 years?

To find Note: we subtract bcz every year 10% dec. population

$$2017 = 400000$$

$$2018 = 400000 \times \frac{10}{100} = 40,000$$

$$= 400000 - 40000$$

$$= 360000$$

$$2019 = 360000 \times \frac{10}{100} = 36000$$

$$= 360000 - 36000$$

$$= 324000$$

$$2020 = 324000 \times \frac{10}{100} = 32400$$

$$= 291600$$

(formula)

$$A = P \left[ 1 - \frac{R}{100} \right]^n$$

$$= 400000 \left[ 1 - \frac{1}{10} \right]^3$$

$$= 400000 \times \frac{9}{10} + \frac{9}{10} \times \frac{9}{10}$$

$$= 291600$$

③ The population of chennai city inc. at a rate of 5% p.a. If the present population of the city is 370,400 then what was the population 3 years ago?

To find: Method Use formula

$$A = \frac{P}{\left[ 1 + \frac{R}{100} \right]^n}$$

$$A = 370,400$$

$$\frac{1}{\left[ 1 + \frac{5}{100} \right]^3}$$

$$A = \frac{370,400}{\left( \frac{105}{100} \right)^3}$$

$$A = 370,400 \times \frac{100}{105} \times \frac{100}{105} \times \frac{100}{105}$$

$$\cancel{21} \quad \cancel{21} \quad \cancel{21}$$

$$A = 8 \times 20 \times 20 \times 100$$

$$A = 320000$$

Q) The population of Chennai city is 5000. It Inc. by 10% in the first year. It decreases by 20% in the second year and in the third year the population is increased by 30%. What will be the population of Chennai city at the end of the 3rd years?

→ Trad. Method

$$1^{\text{st}} \text{ year} \rightarrow 5000 \times \frac{10}{100} = 500 (\uparrow) = 5500$$

$$\begin{array}{r} 5000 \\ + 500 \\ \hline 5500 \end{array}$$

$$2^{\text{nd}} \text{ year} \rightarrow 5500 \times \frac{20}{100} = 1100 (\downarrow) = 4400$$

$$\begin{array}{r} 5500 \\ - 1100 \\ \hline 4400 \end{array}$$

$$3^{\text{rd}} \text{ year} \rightarrow 4400 \times \frac{30}{100} = 1320 (\uparrow) = 5720$$

$$\begin{array}{r} 4400 \\ + 1320 \\ \hline 5720 \end{array}$$

formulae

$$A = P \left[ 1 + \frac{R}{100} \right]^n$$

$$A = 5000 \left[ 1 + \frac{10}{100} \right] \left[ 1 - \frac{20}{100} \right] \left[ 1 + \frac{30}{100} \right]$$

$$= 5000 \times \frac{110}{100} \times \frac{80}{100} \times \frac{130}{100}$$

$$A = 5720$$

A IN  $x$ -years B IN 4-years

\* A sum of money amounts to Rs  $x_1$  in  $T_1$  years and to  $x_2$  in  $T_2$  years at compound Interest

① A sum of money amounts to Rs 4840 in 2 years and to Rs 5324 in 3 years at compound Interest compounded annually. The rate of interest per annum is,

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

$$4840 = P \left( 1 + \frac{R}{100} \right)^2 \quad \text{---} \textcircled{1}$$

$$5324 = P \left( 1 + \frac{R}{100} \right)^3 \quad \text{---} \textcircled{2}$$

$$\frac{5324}{4840} = \frac{P \left( 1 + \frac{R}{100} \right)^3}{P \left( 1 + \frac{R}{100} \right)^2}$$

$$\frac{5324}{4840} = 1 + \frac{R}{100}$$

$$\frac{R}{100} = \frac{5324}{4840} - 1$$

$$\therefore \frac{a^m}{a^n} = a^{m-n}$$

$$= a^{3-2}$$

$$= a^1$$

$$\frac{R}{100} = \frac{5324 - 4840}{4840}$$

$$\frac{R}{100} = \frac{484}{4840}$$

$$R = 10\%$$

② A sum of money invested at compound interest amounts to Rs 800 in 3 years and Rs 882 in 5 years. What is the rate of interest.

$$\rightarrow 800 = P \left(1 + \frac{R}{100}\right)^3 \quad \text{--- (1)}$$

$$882 = P \left(1 + \frac{R}{100}\right)^5 \quad \text{--- (2)}$$

$$\frac{882}{800} = \frac{\left(1 + \frac{R}{100}\right)^5}{\left(1 + \frac{R}{100}\right)^3}$$

$$\begin{aligned} \dots \frac{a^m}{a^n} &= a^{m-n} \\ &= a^{5-3} \\ &= a^2 \end{aligned}$$

$$\Rightarrow \frac{882}{800} = \left(1 + \frac{R}{100}\right)^2$$

$$\sqrt{\frac{882}{800}} = \left(1 + \frac{R}{100}\right)$$

$\frac{21}{20} = 1 + \frac{R}{100}$
$\frac{21}{20} - 1 = \frac{R}{100}$
$\frac{1}{20} = \frac{R}{100}$
$R = 5\% \text{ p.a.}$

③ A sum of money amounts to Rs 7000 after 4 years and to Rs 10000 after 8 years at a certain compound Interest Compounded Annually. The initial amount of money was,

$$\rightarrow 7000 = P \left(1 + \frac{R}{100}\right)^4 \quad \text{--- (1)}$$

$$10000 = P \left(1 + \frac{R}{100}\right)^8 \quad \text{--- (2)}$$

$$\frac{10000}{7000} = \frac{P \left(1 + \frac{R}{100}\right)^8}{P \left(1 + \frac{R}{100}\right)^4} \Rightarrow \frac{q^8}{q^4} = q^{8-4}$$

$$\frac{q^8}{q^4} = q^4$$

$$\frac{10}{7} = \left(1 + \frac{R}{100}\right)^4 \quad \text{--- (3)}$$

Sub (3) in eqn (1)

$$7000 = P \times \frac{10}{7}$$

$$P = \frac{7000 \times 7}{10}$$

$$P = 4900$$