

Compound interest is an interest calculated on the principal and previous accumulated interest.

For 1st year, $CI = SI$

$$SI \text{ for 1st year} = \frac{P \times R \times T}{100}$$

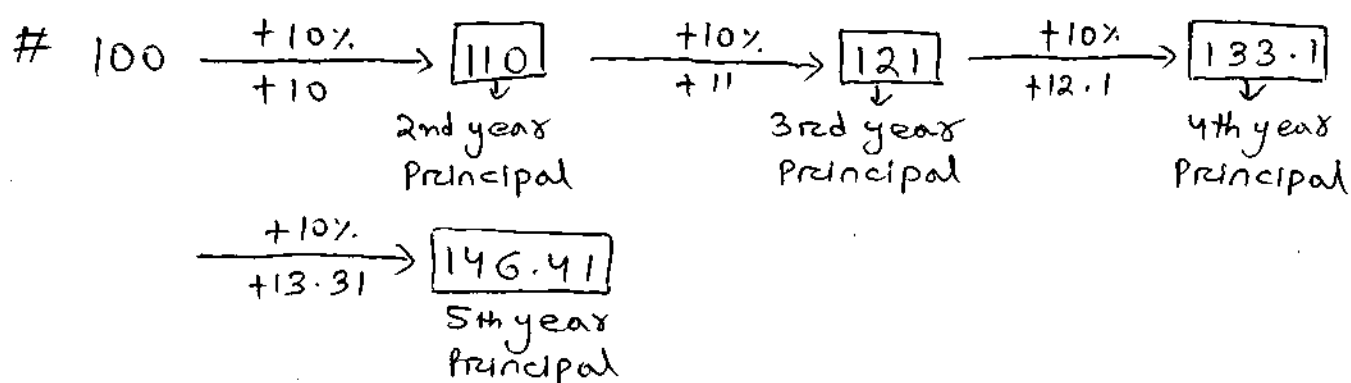
$$A_1 = P + \frac{PR}{100} = P \left(1 + \frac{R}{100} \right)$$

Multiplying Factor

$$A_2 = P \left(1 + \frac{R}{100} \right) \left(1 + \frac{R}{100} \right) = P \left(1 + \frac{R}{100} \right)^2$$

$$A_3 = P \left(1 + \frac{R}{100} \right) \left(1 + \frac{R}{100} \right) \left(1 + \frac{R}{100} \right) = P \left(1 + \frac{R}{100} \right)^3$$

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



$n = 1$ year

$n = 2$ years

$n = 3$ years

$n = 4$ years

$\Rightarrow$ For 1 year, $CI = A$

$\Rightarrow$ For 2 years, $CI = 2A + B$

$\Rightarrow$ For 3 years, $CI = 3A + 3B + C$

$\Rightarrow$ For 4 years, $CI = 4A + 6B + 4C + D$

$CI \text{ for 2nd year} = A + B$

$CI \text{ for 3rd year} =$
 $A + 2B + C$

$CI \text{ for 4th year} =$

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- ① A principle of Rs. 10,000 after 2 years compounded annually the rate of interest being 10% per annum during the first year and 12% per annum during the 2nd year will amount to:

Method:-1

$$\begin{array}{rcl}
 10,000 & \xrightarrow{12\%} & 1,200 \\
 & \longrightarrow & 1,000 + 120 \\
 & & 2,200 + 120 = 2320
 \end{array}$$

$$\text{Amount} = 10,000 + 2320 = 12,320$$

Method:-2

$$\text{Effective ROI} = 10 + 12 + \frac{12 \times 10}{100} = 22 + 1.2 = 23.2\%$$

$$\begin{array}{rcl}
 100\% & \longrightarrow & 10,000 \\
 23.2\% & \longrightarrow & 2320 \\
 & & \hline
 & & 12,320
 \end{array}$$

Method:-3

$$10,000 \xrightarrow[+1200]{+12\%} 11,200 \xrightarrow[+1120]{+10\%} 12,320$$

Method:-4

$$10\% = \frac{1}{10}, \quad 12\% = \frac{3}{25}$$

$ \begin{array}{r} 10 \\ 25 \\ \hline 250 \end{array} $	$ \begin{array}{r} 11 \\ 28 \\ \hline 308 \end{array} $	$ \begin{array}{rcl} 250 \text{ units} & \xrightarrow{\times 40} & 10,000 \\ 308 \text{ units} & \xrightarrow{\times 40} & 12,320 \end{array} $
$\downarrow$ Principal	$\downarrow$ Amount	

- ② If the rate of interest be 4% per annum for 1st year, 5% per annum in 2nd year and 6% per annum for 3rd year, then the compound interest of Rs. 10,000 for 3 years will be:

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Soln:-

$$10,000 \xrightarrow[+600]{+6\%} 10,600 \xrightarrow[+424]{+4\%} 11,024 \xrightarrow[+551.2]{+5\%} 11,575.20$$

$$CI = 11,575.20 - 10,000 = 1575.20$$

let $r\% = \frac{a}{b}$

CI for 2 cycle

$$b^2 \xrightarrow[\times 2]{\times \frac{a}{b}} ab \xrightarrow[\times 1]{\times \frac{a}{b}} a^2$$

$$CI = 2ab + a^2$$

$$\text{Principal} = b^2$$

CI for 3 cycle

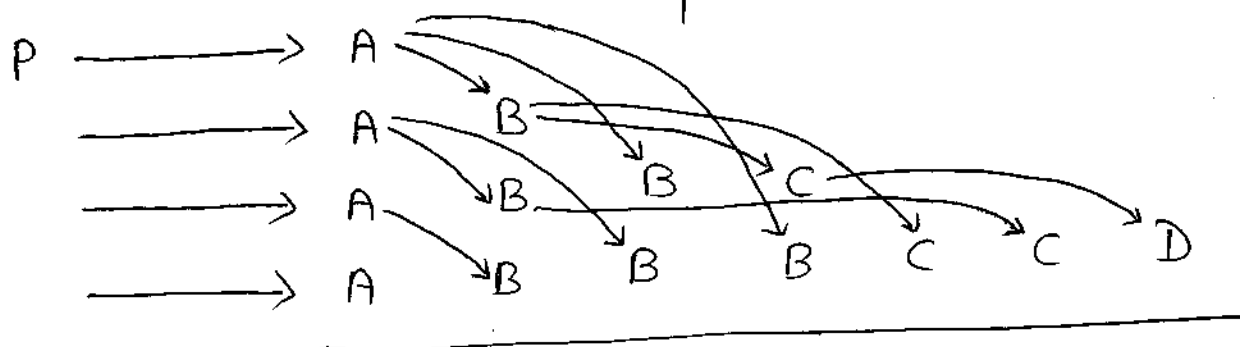
$$b^3 \xrightarrow[\times 3]{\times \frac{a}{b}} b^2a \xrightarrow[\times 3]{\times \frac{a}{b}} a^2b \xrightarrow[\times 1]{\times \frac{a}{b}} a^3$$

$$\text{Principal} = b^3$$

$$CI = 3b^2a + 3a^2b + a^3$$

CI for 4 cycle

$$b^4 \xrightarrow[\times 4]{\times \frac{a}{b}} b^3a \xrightarrow[\times 6]{\times \frac{a}{b}} b^2a^2 \xrightarrow[\times 1]{\times \frac{a}{b}} ba^3 \xrightarrow[\times 1]{\times \frac{a}{b}} a^4$$



$$CI = 4A + 6B + 3C + D$$

③ what is the compound interest on Rs. 12,500 at the rate of 12% per annum compounded yearly for 2 years.

Soln:- $12\% = \frac{3}{25}$, $(25)^2 = 625 = \text{Principal}$

$$625 \xrightarrow[\times 2]{\times \frac{3}{25}} 75 \xrightarrow[\times 2]{\times \frac{3}{25}} 9$$

$$150 + 9 = 159$$

ATQ, 625 units $\xrightarrow{\times 20}$ 12,500

159 units $\xrightarrow{\times 20}$ 3,180

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④ what will be the compound interest of 3 years at the rate of 12.5% on an amount?

Soln:- $12.5\% = \frac{1}{8}$, $8^3 = 512 = \text{Principal}$

$$512 \xrightarrow{\frac{1}{8}} 64 \xrightarrow{\times \frac{1}{8}} 8 \xrightarrow{\times \frac{1}{8}} 1$$

$$\begin{array}{ccc} \times 3 & & \times 3 \\ \hline 192 & + & 24 \\ & & + \frac{1}{1} = 217 \end{array}$$

$$\begin{array}{rcl} \text{ATQ, } 512 \text{ units} & \times 10 & 5120 \\ 217 \text{ units} & \times 10 & 2170 \end{array}$$

————— X —————

⑤ what is the compound interest on a sum of Rs. 10,000 at 14% p.a. for $2\frac{5}{7}$ years where the interest is compounded annually.

Soln:- $\frac{14\%}{1\text{st cycle}}$ $\frac{14\%}{2\text{nd cycle}}$ $\frac{\frac{5}{7} \times 14\% = 10\%}{3\text{rd cycle}}$

$$\begin{array}{rcl} 10,000 & \xrightarrow{14\%} & 1400 \\ & \xrightarrow{14\%} & 1400 \\ & \xrightarrow{10\%} & 1000 \\ & \hline & 3800 & \\ & \xrightarrow{10\%} & 140 \\ & \xrightarrow{10\%} & 140 \\ & \xrightarrow{10\%} & 196 \\ & \xrightarrow{10\%} & 196 \\ & \xrightarrow{10\%} & 19.6 \\ & \hline & 476 & \\ & \hline & 4295 & \end{array}$$

————— X —————

⑥ what is the compound interest on a sum of Rs. 7200 for $2\frac{2}{5}$ years at 20% p.a., interest compounded yearly.

Soln:- $\frac{20\%}{1\text{st cycle}}$ $\frac{20\%}{2\text{nd cycle}}$ $\frac{20\% \times \frac{2}{5} = 8\%}{3\text{rd cycle}}$

$$\text{Effective ROI} = 20 + 20 + \frac{20 \times 20}{100} = 44\%$$

$$44 + 8 + \frac{44 \times 8}{100} = 52 + 3.52 = 55.52\%$$

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$$100\% \quad \underline{\quad \times 72 \quad} \quad 7200$$

$$55.52\% \quad \underline{\quad \times 72 \quad} \quad 3997.44$$

X

- ⑦ The compound interest on a certain sum at 10% p.a. for 2 year 4 months is Rs. 1201.60, interest compounded yearly. The sum is:

Soln:-

10% 1st cycle	10% 2nd cycle	1/3 x 10% 3rd cycle
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$$\begin{array}{cc} 10\% & 10\% \\ \hline \end{array} \quad \frac{10}{3}\%$$

Effective ROI

$$= 10 + 10 + \frac{10 \times 10}{100}$$

$$= 21\%$$

$$300 \quad \begin{array}{r} 21\% \\ \hline \frac{10}{3}\% \end{array} \quad 63 \quad \begin{array}{r} 10\frac{1}{3}\% \\ \hline 10 + 2.1 \end{array}$$

$$73 + 2.1 = 75.1$$

$$\begin{array}{rcl} \text{ATQ, } 75.1 \text{ units} & \underline{\times 16} & 1201.60 \\ 300 \text{ units} & \underline{\times 16} & 4800 \end{array}$$

X

- ⑧ A sum amounts to Rs. 7727.104 at the rate of 12% per annum compounded annually after three years. What is the value of principal (in Rupees)

A) 5000 B) 5200 C) 5350 D) 5500

$$\boxed{DS = 1} \quad \frac{(1.12)^3}{DS = 1} \rightarrow \frac{7727.104}{DS = 1}$$

option (D) :- DS of 5500 = 1

X

- ⑨ The compound interest on Rs. 4000 for 4 years at 10% per annum will be:

Soln:-

$$10,000 \xrightarrow{\quad \times \frac{4}{100} \quad} 1000 \xrightarrow{\quad \times \frac{6}{100} \quad} 100 \xrightarrow{\quad \times \frac{4}{100} \quad} 10 \xrightarrow{\quad \times \frac{1}{10} \quad} 1$$

$$10,000 \text{ units} \quad \underline{\times \frac{4}{10}} \quad 4000$$

$$4,641 \text{ units} \quad \underline{\times \frac{4}{10}} \quad 1856.40$$

⇒ When interest is calculated annually, half yearly, Quarterly or monthly basis

$$\text{Effective ROI} = \frac{\text{Yearly rate of interest}}{\text{No. of cycle in a year}}$$

<u>Calculation Basis</u>	<u>Effective ROI</u>	<u>No. of cycle in a year</u>
Semi annually	$\frac{R}{2} \%$	2
4 months	$\frac{R}{2} \%$	3
Quarterly	$\frac{R}{4} \%$	4
1 month	$\frac{R}{12} \%$	12

⑩ The compound interest on Rs. 24,000 at 10% per annum for $1\frac{1}{2}$ years, interest being compounded Semi annually is:

Soln:- $R = \frac{10\%}{2} = 5\%$, No. of cycle = $\frac{18}{6} = 3$

$$24,000 \xrightarrow{5\%} \begin{array}{r} 1200 \\ \times 3 \\ \hline 3,600 \end{array} \xrightarrow{5\%} \begin{array}{r} 60 \\ \times 3 \\ \hline 180 \end{array} \xrightarrow{5\%} \begin{array}{r} 3 \\ \times 1 \\ \hline 3 \end{array}$$

$$\underline{\hspace{10em}} \times \hspace{10em} = 3783$$

⑪ What will be the compound interest on a sum of Rs. 31,250 for 2 years at 12% p.a., if the interest is compounded 8 monthly.

Soln:- $\text{ROI} = 12 \times \frac{2}{3} = 8\%$, No. of cycle = $\frac{24}{8} = 3$

$$31,250 \xrightarrow{\times \frac{2}{25}} \begin{array}{r} 2500 \\ \times 3 \\ \hline 7500 \end{array} \xrightarrow{\times \frac{2}{25}} \begin{array}{r} 200 \\ \times 3 \\ \hline 600 \end{array} \xrightarrow{\times \frac{2}{25}} \begin{array}{r} 16 \\ \times 1 \\ \hline 16 \end{array}$$

$$= 8,116$$

- ⑫ An amount was lent for one year at the rate of 18% per annum compounding annually. Had the compounding been done half yearly, the interest would have increased by 324. what was the amount lent?

Soln:- yearly — 18

half yearly — $9 + 9 + \frac{9 \times 9}{100}$

$= 18.81$

$18.81 - 18 = 0.81$

ATQ

$0.81\% \frac{\times 400}{100} = 324$

$100\% \frac{\times 400}{100} = 40,000$

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

$$1 + \frac{R}{100} = \frac{\sqrt[n]{A}}{\sqrt[n]{P}} \Rightarrow \frac{R}{100} = \frac{\sqrt[n]{A} - \sqrt[n]{P}}{\sqrt[n]{A}}$$

$$\Rightarrow R = \frac{\sqrt[n]{A} - \sqrt[n]{P}}{\sqrt[n]{A}} \times 100$$

_____ X _____

- ⑬ If the amount is $3 \frac{3}{8}$ times the sum after 3 years at compounded interest compounded annually, then the rate of interest per annum is:

Soln:- $3 \frac{3}{8} = \frac{27}{8}$

$$\frac{P}{\sqrt[3]{8}} : \frac{A}{\sqrt[3]{27}}$$

$$2 : 3$$

$$\frac{1}{2} \times 100 = 50$$

_____ X _____

- ⑭ At what rate percent per annum will 7200 amount to 7938 in one year, if interest is compounded half yearly?

Soln:-

$$\begin{array}{l} 7200 : 7938 \\ 800 : 882 \\ 400 : 441 \end{array}$$

$$\sqrt{400} : \sqrt{441}$$

$$20 : 21$$

$$\frac{1}{20} \times 100 = 5\%$$

Half yearly $\rightarrow 5\%$

yearly $\rightarrow 10\%$

- (15) The compound interest on Rs. 30,000 at 7% Per annum for a certain time is Rs. 4347. The time is:

Soln:-

$$\frac{A}{P} = \frac{34347}{30000} = \frac{11449}{10000} = \left(\frac{100+7}{100}\right)^n$$

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

- (16) An amount of money at compound interest grows upto Rs. 3840 in 4 years and upto Rs. 3936 in 5 years find the rate of interest.

Soln:-

<u>4 years</u>	<u>5 years</u>
3840	3936
↓	
Principal for	
5th year	

$$\frac{96}{3840} \times 100 = 2.5\%$$

- (17) If the compound interest received on a certain amount in the 2nd year is Rs. 1200, what will be the compounded interest for 4th year on the same amount at 10% rate of interest?

Soln:-

2nd : 1200 $\xrightarrow{10\%}$ 120

3rd : 1200 $\xrightarrow{10\%}$ 120

4th : 1200 $\xrightarrow{10\%}$ 120 $\xrightarrow{10\%}$ 120

Soln:-

$$\begin{aligned}\text{Amount in } 2\frac{2}{5} \text{ years} &= 18150 + \frac{2}{5} (19965) \\ &= 18150 + 726 = 18,876\end{aligned}$$

Soln:-

$$\text{ROI} = \frac{10}{2} = 5\% \text{ (Half-yearly)}$$
$$5\% = \frac{1}{20}$$
$$\text{No. of cycle} = 3$$
$$\text{No. of year} = \frac{3}{2} = 1.5 \text{ years}$$

$$8000 \xrightarrow{20\%} 1600$$
$$\left(\frac{1600}{2400} + \frac{320}{160} \right) \times \frac{1}{2}$$
$$2400 + 160 = 2560$$

Distribution of Interest

Suppose a certain sum is distributed between two person, so that the amount that one person receive in t_1 years is equal to another person receives in t_2 years at same rate of interest.

Then $P_1 \left(1 + \frac{R}{100}\right)^{t_1} = P_2 \left(1 + \frac{R}{100}\right)^{t_2}$

$$\Rightarrow \frac{P_1}{P_2} = \left(1 + \frac{R}{100}\right)^{t_2 - t_1}$$

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20) If the compound interest in the 3rd year at 8% P.a. on a certain sum is Rs. 3,600, then what is the difference between the compound interest in the 4th and 5th year?

Soln:- $3600 \xrightarrow{\times 8\%} 288 \xrightarrow{8\%} 23.04$

(A) (B) (C)

3rd - 2nd = B + C = 288 + 23.04 = 311.04

21) If the rate of interest is 20% per annum, compounded yearly and the interest on a certain sum in the second year is Rs. 250, then what will be the interest on the same sum in the fifth year?

Soln:- $\begin{matrix} \text{(A)} & & \text{(B)} & & \text{(C)} & & \text{(D)} \\ 250 & \xrightarrow{\times \frac{1}{5}} & 50 & \xrightarrow{\times \frac{1}{5}} & 10 & \xrightarrow{\times \frac{1}{5}} & 2 \\ \frac{\times 1}{250} & + & \frac{\times 3}{150} & + & \frac{\times 3}{30} & + & \frac{\times 1}{2} = 432 \end{matrix}$

or $20\% = \frac{1}{5}$

2nd year (5) ³ = 125	5th year (6) ³ = 216	125 units $\xrightarrow{\times 2}$ 250 216 units $\xrightarrow{\times 2}$ 432
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22) The compound interest for 2 years at 12% per annum is Rs. 477. What is the principal amount invested?

Soln:- $12\% = \frac{3}{25}$

$b^2 \xrightarrow{\times \frac{3}{25}} ab \xrightarrow{\times \frac{3}{25}} a^2$

$(25)^2 \xrightarrow{\times \frac{3}{25}} 75 \xrightarrow{\times \frac{3}{25}} 9$

$\frac{\times 2}{150} + \frac{\times 1}{9} = 159$

159 units $\xrightarrow{\times 3}$ 477

625 units $\xrightarrow{\quad}$ 1875

(23) The compound interest on a certain sum at a certain rate percentage P.a. for the second year and third year are Rs. 3,300 and Rs. 3,630. What is the amount of the same sum at the same rate in 2.5 years, interest compounded yearly?

Soln:- 1st year: $\left(\begin{matrix} 3000 \\ -\frac{1}{11} \end{matrix} \right) \xrightarrow{+\frac{1}{10}}$
2nd year: 3300 $\swarrow$ ROI = $\frac{330}{3300} \times 100 = 10\%$
3rd year: 3300 + 330

10% ————— 3,000

Principal 100%. ——— 30,000

$$\begin{aligned} \text{Amount} &= 30,000 + \frac{3000}{1^{\text{st}}} + \frac{3300}{2^{\text{nd}}} + \underbrace{\frac{1}{2} (3300 + 330)}_{0.5 \text{ year}} \\ &= 36,300 + 1815 = 38115 \end{aligned}$$

(24) What is the difference between the compound interest compounded yearly and compounded half-yearly for 18 months at 20% per annum on a sum of Rs. 12,000?

Soln:- <u>Yearly</u> <u>20% , 10%</u> $20 + 10 + \frac{20 \times 10}{100}$ $= 32\%$	<u>Half-yearly</u> <u>10% , 10% , 10%</u> $10 + 10 + \frac{100}{100} = 21\%$ $21 + 10 + \frac{21 \times 10}{100}$
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$$\begin{aligned}\text{Difference} &= 15.7615 - 15.5 \\ &= .2615\%\end{aligned}$$

$$21 + 10 + \frac{21 \times 10}{100}$$
$$= 31 + 2.1$$
$$= 33.1$$

Difference = $33.1 - 32 = 1.1\%$

$$\text{Difference} = 1.1\% \text{ of } 12,000 = 132$$

Suppose A sum of money becomes 't' times in n years.

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

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

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

n years ————— t^1 times

2n years ————— t^2 times

3n years ————— t^3 times

 xn years ————— t^n times

————— X —————

- (25) A sum of Rs. 18,000 is lent at 10% p.a. compounded annually. what is the difference between the compound interest for 3rd year and 4th year?

	A	B	C	D
4th year →	1	3	3	1
3rd year →	1	2	1	
		1	2	1

$$\begin{array}{ccccccc}
 P & & A & & B & & C \\
 18,000 & \xrightarrow{10\%} & 1800 & \xrightarrow{10\%} & 180 & \xrightarrow{10\%} & 18 \\
 & & & & \times 1 & & \times 2 \\
 & & & & 180 & + & 36 \\
 & & & & & & \times 1 \\
 & & & & & & 1.8 \\
 \hline
 & & & & & & = 217.80
 \end{array}$$

- (26) A sum of money becomes double in 3 years at Compound Interest compounded annually at the same rate. In how many years will it becomes four times of itself?

Soln:- 2 times ————— 3 years

2^2 times ————— $2 \times 3 = 6$ years.

(27) A sum of money becomes 3 times in 10 years at the rate of compound interest. In how many years will it become 81 times?

Soln:-

3 times	_____	10 years
3^4 times	_____	40 years

_____ X _____

(28) A sum of Rs. 7,000 deposited at compound interest becomes triple of itself after 4 years. How much will the amount be after 12 years.

Soln:-

4 years	_____	3 times		$= 27 \times 7000$
3×4 years	_____	3^3 times		$= 189,000$

_____ X _____

(29) A sum amounts to Rs. 18,600 after 3 years and to Rs. 27,900 after 6 years at a certain rate percentage P.a., When the interest is compounded annually. The sum is:

Soln:- $P \xrightarrow{3 \text{ years}} 18,600 \xrightarrow{3 \text{ years}} 27,900$

P , 18,600 and 27,900 are in G.P.

$$\frac{P}{18,600} = \frac{18,600}{27,900} \Rightarrow P = \frac{18,600 \times 18,600}{27,900}$$

$$\Rightarrow P = 12,400$$

_____ X _____

(30) A sum of Rs. 12,000 amounts to Rs. 20,736 in 3 years at a certain rate percent per annum, interest compounded annually. What will amount of the same sum to in 2 years at the same rate on compound interest?

Soln:-

12,000	20,736
1,000	1,728
$\sqrt[3]{1000}$	$\sqrt[3]{1728}$
10	12

$$R = \frac{2}{10} \times 100$$

$$= 20\%$$

$$20\% = \frac{1}{5}$$

$$\begin{array}{c}
 \text{+ } \frac{1}{5} \\
 \text{17,280} \leftarrow \text{20,736} \\
 \text{- 3456} \\
 \text{- } \frac{1}{6}
 \end{array}$$

- (31) A sum of Rs. 2,400 becomes Rs. 3,600 in 6 years at a certain rate of compound interest. What will be the amount after 12 years at the same rate of interest?

Soln:- $2,400 \xrightarrow{6 \text{ years}} 3,600 \xrightarrow{6 \text{ years}} n$

2,400, 3,600 and n are in AP

$$n = \frac{3600 \times 3600}{2400} = 5,400$$

- (32) A sum of Rs. 5000 amounts to Rs. 7000 in 8 years at a certain rate percent p.a. compounded yearly. What will be the compound interest on a sum of Rs. 6,550 in 4 years at the same rate of interest?

Soln:- $5,000 \xrightarrow[+1000]{4 \text{ years}} n \xrightarrow[6000]{4 \text{ years}} 7,200$

$$n = \sqrt{7,200 \times 5,000} = \sqrt{36,000,000} = \text{Rs. } 6,000$$

<u>Principal</u>		<u>Interest</u>
5000	$\xrightarrow{\times \frac{1}{5}}$	1000
6550	$\xrightarrow{\times \frac{1}{5}}$	1310

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(33) A and B together borrowed a sum of Rs. 51,750 at an interest rate of 7%. Compound interest in such a way that to settle the loan. A paid as much amount after 3 years as paid by B after 4 years from the day of borrowing. The sum borrowed by A was:

Soln:- $\frac{A}{B} = \left(1 + \frac{7}{100}\right)^{4-3}$ | 207 units ————— 51,750
 $\Rightarrow \frac{A}{13} = \frac{107}{100}$ | 1 unit ————— 250
 107 units ————— 26,750

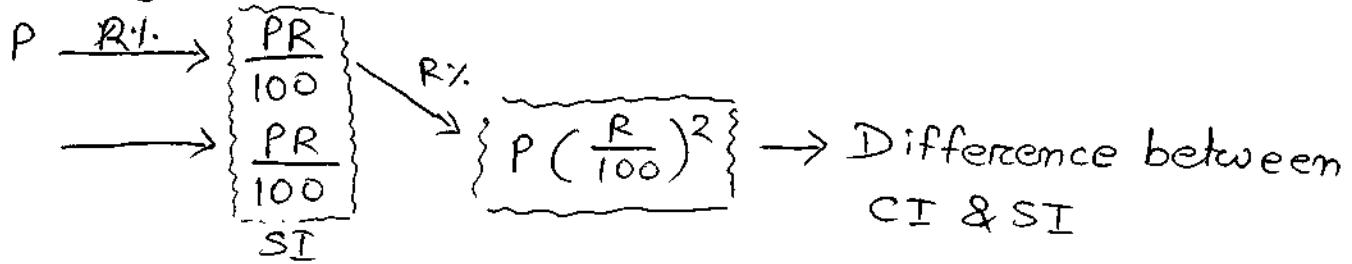
(34) Rs. 260,200 is divided between Ram and Shyam so that the amount that Ram receives in 4 years is the same as that Shyam receives in 6 years. If the interest is compounded annually at the rate of 4% per annum, then Ram's share is:

Soln:- $\frac{\text{Ram}}{\text{Shyam}} = \left(1 + \frac{4}{100}\right)^{6-4} = \left(\frac{26}{25}\right)^2 = \frac{676}{625}$

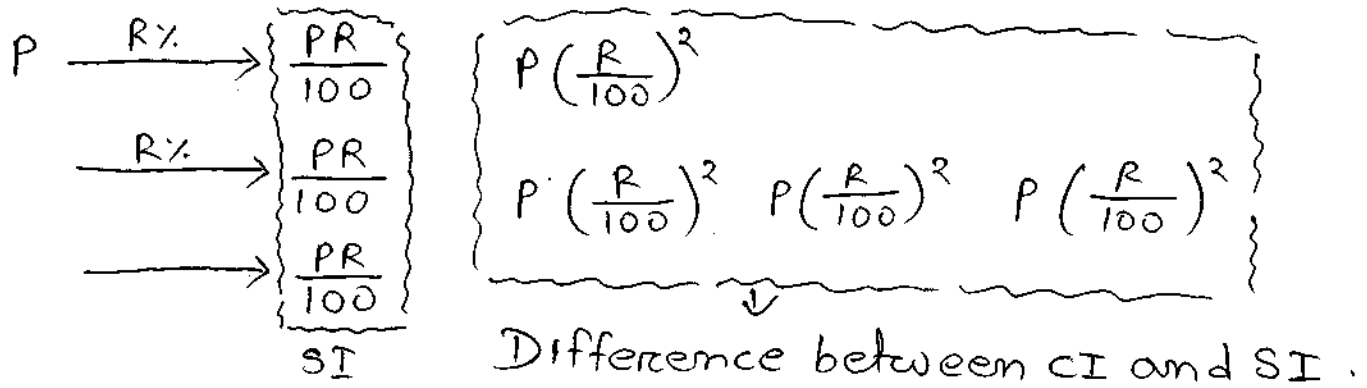
ATQ, $1301 \xrightarrow{\times 200} 260,200$
 $676 \xrightarrow{\times 200} 135,200$

CI and SI

For 2 cycle



For 3 years

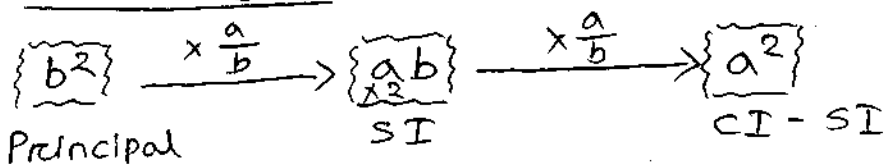


$$3P \left(\frac{R}{100} \right)^2 + P \left(\frac{R}{100} \right)^3$$

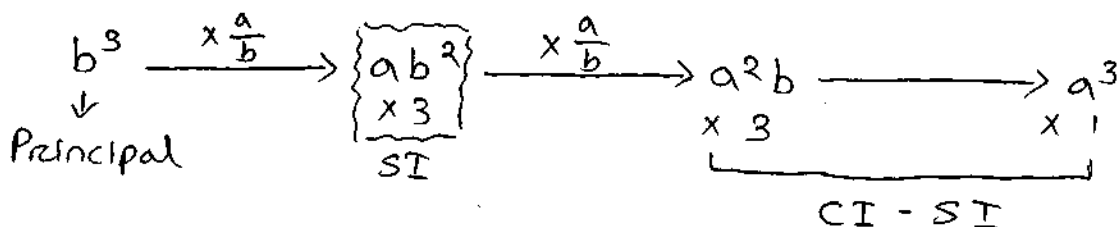
$$\boxed{P \left(\frac{R}{100} \right)^2 \left(3 + \frac{R}{100} \right)} \rightarrow \text{CI - SI for 3 cycle}$$

let $r\% = \frac{a}{b}$

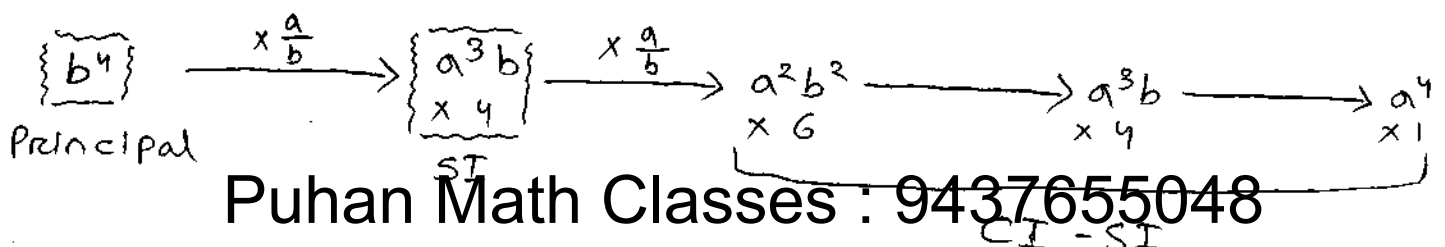
For 2 cycle



For 3 cycle



For 4 cycle



625 units _____ $625 \times 4.8 = 3,000$

Soln:- $5\% = \frac{1}{20} = \frac{a}{b}$

$$\text{Sum} = b^3 = (20)^3 = 8000$$

Difference = $3a^2b + a^3 = 3 \times 20 \times 1 + 1 = 61$

ATQ, GI units $\xrightarrow{\times 0.6}$ 36.60

$$8000 \text{ units} \xrightarrow{\times 0.6} 4800$$

Soln:-

$\frac{10\%}{1\text{st cycle}}$	$\frac{10\%}{2\text{nd year}}$	$\frac{\frac{2}{5} \times 10\%}{3\text{rd cycle}} = 4\%$
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$8000 \xrightarrow{10\%} 800$
 $\xrightarrow{10\%} 800$
 $\xrightarrow{10\%} 800$

From the first 800:

- $10\% \rightarrow 80$
- $4\% \rightarrow 32$

From the second 800:

- $4\% \rightarrow 32$

From the third 800:

- $4\% \rightarrow 3.20$

$$80 + 32 + 32 + 3 \cdot 20 = 147.20$$

(38) Find the difference between the compound interest and simple interest on Rs. 32,000 at 10% p.a. for 4 years.

Soln:- $10\% = \frac{1}{10} = \frac{a}{b}$

Sum = $b^4 = 10,000$

Difference = $6a^2b^2 + 4a^3b + a^4 = 600 + 40 + 1$

10,000 units $\xrightarrow{\times 3.2}$ 32,000

641 units $\xrightarrow{\times 3.2}$ 2051.20

$\xrightarrow{\times}$

(39) The difference between the compound and simple interest on a sum for 2 years at 10% per annum, when the interest is compounded annually is Rs. 28. If the yearly interest were compounded half-yearly the difference in the two interests will be:

Soln:- $100 \xrightarrow{10\%} 10 \xrightarrow{10\%} 1$

1 unit $\xrightarrow{\quad\quad\quad}$ 28

100 units $\xrightarrow{\quad\quad\quad}$ 2,800

ROI = $\frac{R\%}{2} = 5\% = \frac{1}{20} = \frac{a}{b}$

2800 $\xrightarrow{\quad\quad\quad}$ 140 $\xrightarrow{\begin{smallmatrix} 7 \\ \times 6 \end{smallmatrix}}$.35 $\xrightarrow{\begin{smallmatrix} .35 \\ \times 4 \end{smallmatrix}}$.0175

$\begin{smallmatrix} 42 \\ + \\ 1.4 \end{smallmatrix}$ $\xrightarrow{\begin{smallmatrix} .0175 \\ \times 1 \end{smallmatrix}}$ 0.0175

$\xrightarrow{\quad\quad\quad}$ $\xrightarrow{\quad\quad\quad}$ = 43.4175

$\xrightarrow{\quad\quad\quad}$ $\xrightarrow{\quad\quad\quad}$

(40) What is the difference (in Rs.) between the compound interest when the interest is compounded 5-monthly and the simple interest on a sum of Rs. P for 1.25 years at 12% per annum?

Soln:- $ROI = 12\% \times \frac{5}{12} = 5\%$, No. of cycle = $\frac{15 \text{ months}}{5 \text{ months}} = 3 \text{ times}$

$$5\% = \frac{1}{20}, P = (20)^3 = (b)^3$$

$$CI - SI = 3a^2b + a^3 = 3 \times 1 \times 20 + 1 = 61$$

ATQ, 8000 units	_____	Rs. P
1 unit	_____	Rs. P
		<u>8,000</u>
61 units	_____	Rs. 61P
		<u>8,000</u>

_____ X _____

- (41) Amit borrowed a sum of Rs. 25,000 on simple interest. Bhola borrowed the same amount on compound interest. At the end of 2 years, Bhola had to pay Rs. 160 more interest than Amit. The rate of interest charged per annum is:

Soln:- $12\% = \frac{a}{b}$ Principal = b^2 and $CI - SI = a^2$

$$\Rightarrow \frac{a^2}{b^2} = \frac{160}{25,000} = \frac{16}{2500}$$

$$\Rightarrow \frac{a}{b} = \frac{4}{50}$$

$$12\% = \frac{4}{50} \times 100 = 8\%$$

_____ X _____

- (42) The difference of compound interest and simple interest for 3 years and 2 years are in the ratio 23:7 respectively. What is rate of interest per annum (in %)?

Soln:- $b^4 \xrightarrow{\times \frac{a}{b}} ab^3$

$$\longrightarrow ab^3$$

$$a^2b^2$$

$$\longrightarrow ab^3$$

$$a^2b^2 \quad a^2b^2$$

$$b^3 \xrightarrow{\times \frac{a}{b}} ab^2$$

$$\xrightarrow{\times \frac{a}{b}} ab^2 \xrightarrow{\times \frac{a}{b}} ab$$

$$\begin{aligned} b^3 &\longrightarrow ab^2 \\ &\longrightarrow ab^2 \\ &\longrightarrow ab^2 \end{aligned}$$

$$\left\{ \begin{array}{l} \boxed{a^2b} \\ a^2b \quad a^2b \quad a^3 \end{array} \right\} \begin{array}{l} \longleftarrow \text{Difference CI - SI for 2 years} \\ \searrow \text{CI - SI for 3 years} \end{array}$$

$$\frac{3a^2b + a^3}{a^2b} = \frac{23}{7}$$

$$\Rightarrow \frac{3a^2b + a^3}{3a^2b} - 1 = \frac{23}{21} \Rightarrow \frac{a^3}{3a^2b} = \frac{2}{21} \Rightarrow \frac{a}{b} = \frac{2}{7}$$

$$R\% = \frac{2}{7} \times 100 = \frac{200}{7}\%$$

- _____X_____
- (43) If the compound interest on a sum for 2 years at $12\frac{1}{2}\%$. The simple interest on the same sum at the same rate for the same period of time is :

Soln:- $12\frac{1}{2}\% = \frac{1}{8} \quad P = 8^2 = 64$

$$64 \xrightarrow{\times \frac{1}{8}} 8 \xrightarrow{\times \frac{1}{8}} 1$$

$$\frac{\times 2}{16} + \frac{\times 1}{1} = 17$$

$$17 \text{ units } \xrightarrow{\times 30} 510$$

$$16 \text{ units } \xrightarrow{\times 30} 480$$

_____X_____

- (44) The compound interest on a certain sum of money at a certain rate per annum for two years is Rs. 2050 and the simple interest on the same amount of money at the same rate for 3 years is Rs. 3000. Then the sum of money is :

Soln:- SI for 3 years _____ 3000

1 year _____ 1000

CI for 2 years

1000

1000

50

$$ROI = \frac{50}{1000} \times 100 = 5\%$$

5% ——— 1000

100% ——— 20,000

X

- (45) The Simple interest on a certain sum for 4.4 years at 9% per annum is Rs. 1072.50 more than the Compound interest on the same sum for 2 years at 15% per annum interest compounded 8-monthly. The sum (in Rs.) is:

Soln:- $SI = 9 \times 4.4 = 39.6$

Difference =

$$36.6 - 33.1 = 6.5$$

ATQ 6.5 ——— 1072.50

1% ——— 165

100% ——— 16,500

CI

$$ROI = 15 \times \frac{2}{3} = 10\%$$

$$\text{No. of cycle} = \frac{2 \text{ years}}{8 \text{ months}} = 3$$

effective ROI

10% 10% 10%

$$\underbrace{10 + 10 + \frac{10 \times 10}{100}}$$

$$= 21\% \quad 10\%$$

$$\underbrace{21 + 10 + \frac{21 \times 10}{100}}$$

$$= 33.1\%$$

X

- (46) If the simple interest on a amount at the rate of 7% for 3 years is Rs. 9450. Then what is the Compound interest compounded annually at the rate of 7% for 2 years.

Soln:- 3 years ————— Rs. 9,450
 1 year ————— Rs. 3,150

$$\begin{array}{l} \text{SI} \\ \left\{ \begin{array}{l} 3150 \\ 3150 \end{array} \right\} \begin{array}{l} \nearrow 7\% \\ \searrow 220.5 \end{array} \\ \hline 6300 + 220.5 = 6520.50 \end{array}$$

(47) on a certain Principal if the Simple interest for two years is 4800 and compound interest for the two years is 5088, what is the rate of interest?

Soln:- $\begin{array}{l} 2400 \\ 2400 \end{array} \begin{array}{l} \nearrow x\% \\ \searrow 288 \end{array} \quad \left| \quad x\% = \frac{288}{2400} \times 100 = 12\% \right.$

(48) A certain amount of money earns Rs. 540 as Simple interest in 3 years. If it earns a compound interest of Rs. 376.20 at the same rate of interest in 2 years find the principal.

Soln:- $\begin{array}{l} 3 \text{ years} \text{ ————— Rs. 540} \\ 1 \text{ year} \text{ ————— Rs. 180} \end{array} \quad \left| \quad \begin{array}{l} R\% = \frac{16.20}{180} \times 100 \\ 9\% \text{ ————— } \times 20 \text{ ————— } 180 \\ P: 100\% \text{ ————— } \times 20 \text{ ————— } 2000 \end{array} \right.$

$\begin{array}{l} P \xrightarrow{R\%} 180 \\ \xrightarrow{R\%} 180 \end{array} \begin{array}{l} \nearrow R\% \\ \searrow 16.20 \end{array}$