

# Compound Interest

$$\text{Amount} = P + CI$$

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

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

1. Find the compound interest on ₹ 48000 for 2 years at 20% per annum if the interest is compounded annually.

Soln:-

$$CI = 48000 \left(1 + \frac{20}{100}\right)^2 - 48000$$

a) and b)

$$\begin{aligned} & 20+20+\frac{20 \times 20}{100} \\ & 48000 \times 1.20 - 48000 \\ & = 441200 \end{aligned}$$

$$100\% = 48000$$

$$\begin{aligned} 44\% &= 44 \times 480 \\ &= 21120 \end{aligned}$$

$$\begin{array}{r} 48 \times 144 \\ \hline 17152 \\ 576 \\ \hline 6512 \end{array}$$

$$\begin{array}{r} 56151200 \\ 480000 \\ \hline 111200 \end{array}$$

$$\begin{array}{r} 480 \times 44 \\ \hline 1720 \\ + \end{array}$$

2. In 2 years at SI, the principal increases by 16%. What will be the compound interest earned on ₹ 25000 in 2 years at same rate?

$$\text{Soln: } 16\% \xrightarrow{2y}$$

$$1y \rightarrow 8\%$$

$$100\% = 25000$$

$$16.64\% = ?$$

$$100\% = 25000 \times 16.64$$

$$x = \frac{25000 \times 16.64}{100} = \boxed{4160}$$

$$CI = 8 + 8 + \frac{64}{100}$$

$$= 16.64\%$$

R%	2 years	3 years	4 years
10%	21%	33.11%	$46.41\%$ $1.01^4 = 1.4641$
20%	44%	72.8%	$(1.01)^4 = 1.728$
5%	10.25%	15.7625%	$9 - \left(\frac{9}{100} + 1\right)^9 = 1.09$

Q3) If in 3 years at SI, SI increased by 15%. What is approximate CI on ₹15,00,000 in 3 years at same rate.

Soln'

15%  $\rightarrow$  3 years

R = 5% for 1 year

CI  $\Rightarrow$  5% for 3 years Rs 15.7625%.

100% = 1500000

15.7625% = ?

$$100x = 1500000 \times 15.7625$$

$$x = 1500 (15.7625)$$

$$\boxed{= 2.36}$$

नेत व्यवसायीय लोगोंके लिए, यह सब एक अभिभावक विषय है। इसका उपयोग करने के लिए, वह एक बड़ा विद्युत विकास कार्यक्रम है। यह विद्युत की आपूर्ति को बढ़ावा देता है और इसका उपयोग विद्युत की आपूर्ति को बढ़ावा देता है।

4. What is the compound interest on the sum of ₹10000 at 14% pa CI for 5 years. If the interest is compounded annually.

1 year	2 years	5/7 years	5/7 × 14 <sup>2</sup>
14%	14%	10%	

Soln:-

$$14 + 14 + 10 + \frac{14 \times 14 \times 10}{10000} + \frac{196 + 280}{100}$$

$$38 + 4.76 + 0.196 = 42.956\% \quad 42.956 \times 100 \\ = 4295.60/-$$

$$\boxed{= 4295.60/-}$$

5. What is the CI earned on ₹80,000 at 40% pa in 1 year compounded quarterly?

Soln:-

3m	3m	3m	3m
10%	10%	10%	10%

12 mon - 40%

3m = 10%

$$CI = 46.41\% \rightarrow 800 \times 46.41\%$$

$$= 4641 \times 8 \quad \frac{3}{5}$$

$$\boxed{= 37128}$$

6. A certain sum amounts to ₹29892 in 4 years at 10% pa compounded annually. What is the SI on the same sum for same time at same rate?

Soln:-

$$A = P + CI$$

$$SI = 4 \times 10\%.$$

$$100\% + 46.41\%$$

$$146.41\% \rightarrow 29882$$

$$SI = 40\% \rightarrow \frac{29282}{146.4} \times 40$$

$$= 8000$$

7. Arun invested a certain amount at 8% pa for 1<sup>st</sup> year and 9% pa for 2<sup>nd</sup> year at CI in a bank. If ₹11568 is received after 2 years in this scheme, what is the amount he invested?

Soln:

$$8\% \text{ } 9\% \quad \text{₹}11568 \rightarrow \text{Amount}$$

$$8+9+\frac{72}{100} = 17.72\%$$

$$100\% + 17.72\% = 117.72\%$$

$$\begin{array}{r} 8784 \\ \underline{117.72} \times 100 \\ 17568 \\ \underline{117.72} \\ 58.86 \\ \underline{29.43} \\ = 14925.541 \end{array}$$

$P = 100\%$

$17568 \rightarrow 117.72\%$

$\leftarrow 100\%$

8. The difference between CI & SI on ₹x at 18.5% pa for 2 years is ₹ 28.90. Find the value of x.

Soln:-

$$CI = x \cdot 18.5 + x \cdot 18.5 + \frac{18.5 \times 18.5}{100} \quad SI = x \times 2 \times 18.5$$

$$= 17.725x$$

$$= 17.725x$$

$$0.7725x = 28.90$$

$$100\% = \frac{28.90}{0.7725} \times 100^{20}$$

$$= 4000/-$$

9. If the difference b/w CI & SI on a sum of money for 3 years is ₹ 186. Find the sum of money if the rate of Interest in both is 10% pa.

Soln:-

$$CI = 33\cdot1\%$$

$$SI = 3 \times 10\% = 30\%$$

$$3\cdot1\% = 186$$

$$100\% = \frac{186}{3\cdot1\%} \times 100 \\ = 6000$$

10. The rate of interest on two different schemes is 20% pa. In one of the scheme the interest is compounded half yearly and in other it is compounded annually. Equal amounts are invested in both the schemes. If the difference of the returns after 2 years is ₹ 482. Then what is the principal invested in each scheme?

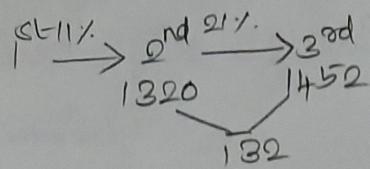
Soln:-

2 schemes

$$\begin{array}{ll} \text{10\% half year compounded} & \text{Compounded annually} \\ \text{half yearly} & 20 + 20 + \frac{20 \times 20}{100} \\ \text{10\% for 4 times} & = 44\% \\ 46\cdot41\% & = 46\cdot41\% - 44\% \\ & = 2\cdot41\% \\ \Rightarrow 2\cdot41\% & = 482 \end{array}$$

$$100\% = \frac{482}{2\cdot41} \times 100 \\ = 20000$$

11) The annual CI on an amount is 1320 for the 2<sup>nd</sup> year  
 = 1452 for 3<sup>rd</sup> year. Find the principal invested initially.



$$= \frac{132}{1320} \times 100 = 10\%$$

$$11x = 1320$$

$$100\% \rightarrow \frac{1320 \times 100}{11}$$

$$(= 12000)$$

12) In how many years will ₹3000 gives ₹993 as compound interest at 10% per annum compounded annually.

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

$$993 = 3000 \left(1 + \frac{10}{100}\right)^T - 3000$$

$$993 = 3000 \left(\frac{11}{10}\right)^T$$

$$\frac{993}{3000} = \left(\frac{11}{10}\right)^T$$

$$\frac{133}{1000} = \left(\frac{11}{10}\right)^T$$

$$\frac{11^3}{10^3} = \left(\frac{11}{10}\right)^T$$

$$T = 3 \text{ yrs}$$

$$Y.R = \frac{993}{3000} \times 100$$

$$= 33.11\%$$

$$= 3 \text{ yrs}$$

13) In how many months ₹8000 gives ₹648 CI at 20% pa compounded semi-annually (half-yearly).

$$Y.R = \frac{CI}{P} \times 100$$

$$12m \rightarrow 20\%$$

$$= \frac{648}{8000} \times 100 = 33.11\%$$

$$6m \rightarrow 10\%$$

= 2 times

$$\text{Total times} = 6m \times 3 = 18 \text{ months}$$

14) A sum of money amounts to ₹ 800 in 3 years, ₹ 882 in 5 years. Find the rate of interest.

Soln

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

$$\frac{\frac{800}{400}}{\frac{882}{441}} = \frac{P \left(1 + \frac{R}{100}\right)^3}{P \left(1 + \frac{R}{100}\right)^5} \Rightarrow \frac{(20)^2}{(21)^2} = \frac{1}{\left(1 + \frac{R}{100}\right)^2}$$

$$\frac{(21)^2}{(20)^2} = \left(1 + \frac{R}{100}\right)^2$$

$$1 + \frac{R}{100} = \frac{21}{20}$$

$$\frac{R}{100} = \frac{21 - 20}{20}$$

$$R = \frac{100}{20}$$

$$R = 5\%$$

M-2: 3 years → 800  
5 years → 882  
82 ↑ for 800 in 2 years  
CI = 10.25% in 2 years

$$R.Y. = 5\%$$

15. If ₹ 2500 becomes 2970.25 in 2 years compounded annually. Find the rate of interest.

Soln:-

$$CI = \text{difference} = 470.25$$

$$Y.R = \frac{470.25}{2500} \times 100 = \frac{47025}{2500}$$

$$Y.R = 18.81\% \Rightarrow 2 \text{ years}$$

For 1 year → 9%

16. What is the rate of interest if the SI earned at certain sum for 3rd year is ₹ 1750 and compound interest earned for 2 years is ₹ 3622.50.

$$SI = 1750 + 1750 \text{ (same for all years)}$$

$$CI = 3622.50$$

$$CI - SI = 3622.50 - 3500 \\ = 122.50$$

$$Y.R = \frac{122.50}{1750} \times 100$$

$$R = 7\%$$

17. What is the rate of interest if the simple interest earned on a certain sum for 5 years is ₹45000 and compound interest earned for 2 years is ₹18360.

Soln:

$$SI = 45000 \text{ for } 5 \text{ years}$$

$$= \frac{45000}{5} \times 2$$

$$SI = 18000 \text{ for } 2 \text{ years}$$

SI	CI
9000	9000
18000	18360

$$Y.R = \frac{360}{18000} \times 100$$

$$= 4\%$$

18) At what rate pa will ₹45000 gives a compound interest of ₹7566 compounded quarterly.

$$\text{ROI}_{(9 \text{ months})} = \frac{7566}{45000} \times 100 = 15.7625\%$$

↳ compounded  
quarterly (3 times)

5%  $\rightarrow$  3 months

20%  $\rightarrow$  12 months

$$= 20\%$$

19. A sum of money doubles itself at CI in 15 years. In how many years, it will become 8 times of itself.

Soln: Note:-

In compound Interest amount always increases exponentially.

$$P \xrightarrow{15 \text{ yrs}} 2P \xrightarrow{15 \text{ yrs}} 4P \xrightarrow{15 \text{ yrs}} 8P$$

$\times 2$        $\times 2$        $\times 2$

$$\boxed{= 45 \text{ years}}$$

20. A sum of money becomes 8 times of itself in 3 years. Compounded annually. In how much time will the same amount at same compounding rate become 16 times of itself?

Soln:-

$$8 \text{ times} \rightarrow 3 \text{ years}$$

$$16 \text{ times} \rightarrow ?$$

$$P \xrightarrow{3 \text{ years}} 2P \xrightarrow{1 \text{ year}} 2^4 P$$

$$P \xrightarrow{1 \text{ yr}} 2P \xrightarrow{1 \text{ yr}} 4P \xrightarrow{1 \text{ yr}} 8P \xrightarrow{1 \text{ yr}} 16P$$

$$\boxed{= 4 \text{ years}}$$

21. A sum of money placed at CI becomes thrice of itself in 8 years. In how many years, it will become 243 times of itself?

Soln:-

$$P \xrightarrow{8 \text{ yrs}} 3P \xrightarrow{8 \text{ yrs}} 9P \xrightarrow{8 \text{ yrs}} 27P \xrightarrow{8 \text{ yrs}} 81P$$

$\xrightarrow{8 \text{ yrs}}$   $\xrightarrow{243 P}$

$$\boxed{= 40 \text{ years}}$$

22. A sum of money becomes 24.389 times of itself in 45 years. In how many years it will become 2.9 times of itself?

$$(2.9)^3 = 24.389$$

Soln:-

$$P \xrightarrow{45 \text{ years}} (2.9)^3 P$$

$$P \xrightarrow{15 \text{ yrs}} (2.9)P$$

$$= 15 \text{ years}$$

23. A certain sum of money becomes 2.25 times of itself in 2 years. Find the rate of interest if it is compounded annually.

Soln:-

$$A = 2.25P$$

$$CI = 1.25P$$

$$\% R = \frac{CI}{P} \times 100\% = 125\% \quad \begin{aligned} & 50+50+\frac{\frac{25}{50} \times 50}{100} \\ & = 125\% \end{aligned}$$

$$\% R = 50\% \text{ pa}$$

24. A certain sum of money  $\frac{512}{162}$  times of itself in 4 years. Find the rate of interest if it is compounded annually.

Soln:-

$$A = \frac{512}{162} P = \frac{(4)^4}{(3)^4} P = \left(\frac{4}{3}\right)^4 P$$

$$P \xrightarrow{4 \text{ yrs}} \left(\frac{4}{3}\right)^4 P$$

$$P \xrightarrow{1 \text{ yr}} \frac{4}{3}P \quad \frac{P}{3}$$

$$P + \frac{P}{3} = \frac{4}{3}P$$

$$\begin{aligned} CI &= \frac{P}{3} \\ \frac{CI}{P} &= \frac{1}{3} \end{aligned}$$

$$= 33.33\%$$

$$\% R = \frac{CI}{P} \times 100 = \frac{100}{3}\%$$

25) The amount received 8% p.a.CI. After 2 years is ₹12900. Find the principal.

Soln:

M-1:

$$12900 = P \left(1 + \frac{8}{100}\right)^2$$

$$12900 = P \left(\frac{108}{100}\right)^2$$

$$12900 = P \left(\frac{108 \times 108}{10000}\right)$$

$$P = \frac{12900 \times 10000}{108 \times 108} = \frac{12900}{12} = 1075$$

$$\boxed{P = 62500}$$

M-2:

$$8 + 8 + \frac{8 \times 8}{100}$$

$$= 16.64\%$$

$$116.64 = 12900$$

$$100\% = \frac{12900}{116.64} \times 100$$

$$\boxed{= 62500}$$

M-3:

$$R = \frac{8}{100} = \frac{2}{25} = \frac{CI}{P}$$

	$P(CI+P)$	$P$	$A$
1 <sup>st</sup> yr	$25 + 2 = 27$	25	27
2 <sup>nd</sup> yr		625	729

729

$$729P = 72900$$

$$625P = 62500$$

$$\boxed{P = 62500}$$

26. If the compound interest on a sum for 3 years at 12.5% p.a. is ₹151.90. Find the principal.

Soln:

$$R = \frac{1}{8} = \frac{CI}{P}$$

$$A(CI+P) = 1 + 8 = 9$$

	P	CI	A
1 <sup>st</sup> yr	8	1	9
2 <sup>nd</sup> yr	64	1	81
3 <sup>rd</sup> yr	512	1	729

$$CI = A - P$$

$$= 729 - 512 = 217$$

$$P = 512P = \frac{151.90}{217} \times 512 = \boxed{358.40}$$

Q7. A sum of money become ₹ 64800 at CI. If the rate of interest for the 3 years is 12.5%, 6 2/3%, 9.09% respectively. Find the compound interest.

Soln:-

$$R = \frac{1}{8} + \frac{1}{15} + \frac{1}{11} \quad A = 64800 \quad = \frac{1}{15}$$

P : A

8 : 9

15 : 16

11 : 12

$$= \frac{8 \times 15 \times 11}{9 \times 16 \times 12}$$

$$= \frac{55}{72} \Rightarrow \frac{P}{A}$$

$$72P = 64800$$

$$CI = 72 - 55$$

$$= 17P$$

$$CI = 15300$$

$$6 \frac{2}{3} = \frac{20}{3} \times \frac{1}{100}$$

$$\begin{array}{r} 88 \times 15 \\ 1440 \\ 88 \\ \hline 1320 \end{array}$$

$$\begin{array}{r} 900 \\ + 0800 \\ \hline 66800 \end{array} \times 17$$

$$\begin{array}{r} 72 \\ 12 \\ 1 \\ \hline 17 \\ 153 \end{array}$$