

SIMPLE & COMPOUND INTEREST

• Simple Interest Formula

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

where

P → Principal amount

R → rate of interest

T → Time period.

• Compound Interest Formula

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

where

P → Principal amount

R → Rate of Interest

n → no. of periods.

• Nominal Interest Formula

$$I = P \left(1 + \frac{R}{m \times 100} \right)^{mn}$$

where m → no. of compounding periods.

★ $m = 2$ { Semiannually }

★ $m = 4$ { Quarterly }

★ $m = 12$ { Monthly }

- Formula of present value or profitability Index -

$$\text{Present Value/profitability index} = \frac{\text{Present value of cash inflows}}{\text{Investment required}}$$

Important Formula's:-

- i) When the interest is compounded Annually -

$$\text{Amount} = P(1 + R/100)^n$$
- ii) When the interest is compounded Half - yearly -

$$\text{Amount} = P(1 + (R/2)/100)^{2n}$$
- iii) When the interest is compounded Quarterly -

$$\text{Amount} = P(1 + (R/4)/100)^{4n}$$
- iv) When rates are different for different years -

$$\text{Amount} = P(1 + R_1/100)(1 + R_2/100)(1 + R_3/100)$$
- v) Present worth of Rs x due n years is given by -

$$\text{Present worth} = x/(1 + R/100)^n$$
- vi) Time

$$\text{Time} = \frac{SI \times 100}{P \times R}$$

Questions:-

- 1) The compound interest on Rs 30,000 at 7% per annum is Rs 4347. The period (in years) is:-
(A) 2 ✓ (B) $2\frac{1}{2}$ (C) 3 (D) 4

→ Amount = Rs $(30000 + 4347)$ = Rs 34347.

Let ~~n~~ be the time;

$$30000 \left(1 + \frac{7}{100}\right)^n = 34347$$

$$\Rightarrow \left(\frac{107}{100}\right)^n = \frac{34347}{30000}$$

$$\Rightarrow n = 2 \text{ yrs}$$

- 2) The least number of complete years in which a sum of money put out at 20% compound interest will be more than doubled is:

- (A) 3 (B) 4 ✓ (C) 5 (D) 6

→ $P \left(1 + \frac{20}{100}\right)^n > 2P$

$$\Rightarrow P \left(1 + \frac{1}{5}\right)^n > 2P$$

$$\Rightarrow \left(\frac{6}{5}\right)^n > 2$$

⇒ Here, we will take different values of 'n' for which the condⁿ should be true.

So, for $n=4$, it satisfies the condition.

$$\therefore n = 4 \text{ years.}$$

- 3) Difference between simple interest and compound interest on Rs 1200 for one year at 10% per annum reckoned half-yearly is -
 (A) Rs 2.50 (B) ☒ Rs 3 (C) Rs 4 (D) None of these

$$\rightarrow SI = Rs \left(\frac{1200 \times 10 \times 1}{100} \right) = Rs 120$$

$$CI = \left[1200 \times \left(1 + \frac{5}{100} \right)^2 - 1200 \right] = Rs 123$$

$$\therefore \text{Difference} = Rs (123 - 120) = Rs 3.$$

- 4) Find the simple interest of Rs 500/- for 5 years at 5% per annum.
 (A) Rs 75 (B) Rs 100 (C) ☒ Rs 125 (D) Rs 150.

$$SI = \frac{500 \times 5 \times 5}{100} = 125$$

- 5) In what time Rs 5000 amounts to Rs 6000 at 5% per annum at simple interest?
 (A) 2 years (B) ☒ 4 years (C) 5 years (D) 7 years

$$1000 = \frac{5000 \times 5 \times T}{100}$$

$$\Rightarrow T = 4 \text{ years}$$

So, In 4 years, Rs 5000/- will \uparrow to Rs 6000/-

- 6) A sum becomes triple in 6 years at S.I. The same sum will become 19 times in how many years?
 (A) 50 years (B) 48 years (C) ~~54~~ years (D) None.

$$SI = A - P \text{ --- (1)}$$

$$\Rightarrow A = 3P \text{ (as sum triples) } \{A/Q\}$$

$$SI = 3P - P = 2P \text{ (in 6 years)}$$

So, In 19 times;

$$SI = 18P - 54 \text{ years.}$$

[$\because 18P = 54$ Here, the ratio is 2:6].

- 7) Simple Interest on a sum at 4% per annum for 2 years is Rs 80. The CI on the same sum for the same period is?

- (A) Rs 81.60 ✓ (C) Rs 1081.60
 (B) Rs 160 (D) Rs 90

$$SI = 40 + 40$$

$$CI = 40 + 40 + 1.6$$

$$\Rightarrow CI = 81.6$$

- 8) A sum of money at simple interest amounts to Rs 815 in 3 years and to Rs 854 in 4 years. The sum is :-

- (A) Rs 650 (B) Rs 690 (C) ~~Rs 698~~ (D) Rs 700

$$SI \text{ for 1 year} = Rs (854 - 815) = Rs 39.$$

$$SI \text{ for 3 years} = Rs (39 \times 3) = Rs 117.$$

$$\therefore \text{Principal} = Rs (815 - 117) = Rs 698.$$

9.) A sum fetched a total simple interest of Rs 4016.25 at the rate of 9 p.c.p.a in 5 years. What is the sum?

- (A) Rs 4462.50 (B) Rs 8032.50 (C) Rs 8900 (D) ~~Rs 8952~~
Rs 8925

$$\text{Principal} = \text{Rs} \left(\frac{100 \times 4016.25}{9 \times 5} \right)$$

$$= \text{Rs } 8925$$

10.) What will be the ratio of Simple interest earned by certain amount at the same rate of interest for 6 years and that for 9 years?

- (A) 1:3 (B) 1:4 (C) ~~2:3~~ (D) None of these.

Let, P → Principal

R → Rate of interest

$$\therefore \text{Ratio} = \left(\frac{P \times R \times 6}{100} \right) / \left(\frac{P \times R \times 9}{100} \right)$$

$$= \frac{6 \cdot PR}{9 \cdot PR} = 2:3.$$

11.) A sum of money placed at compound interest doubles itself in 4 years. In how many years will it amount to 16 times itself?

$$(x)^{1/a} = (y)^{1/b}$$

$$\Rightarrow (2)^{1/4} = (16)^{1/x}$$

$$\Rightarrow \frac{1}{4} = \frac{4}{x} \Rightarrow x = 16 \text{ years (Ans)}$$

← [Short cut method to solve]

- 12) An amount of money grows upto Rs 30000 in 3 years and upto Rs 40000 in 4 years on compound interest. What will be the rate percent?

$$\text{Let, } x = 30000$$

$$y = 40000$$

Then,

$$R\% = \frac{y-x}{x} \times 100$$

$$\Rightarrow R\% = \frac{40000-30000}{30000} \times 100$$

$$\Rightarrow R\% = \frac{100}{3}\%$$

- 13) If a certain sum becomes 16 times in 2 years, what will be the rate of compound interest?

Shortcut formula which can be used here -

$$R = 100[(x)^{1/t} - 1]$$

$$\text{So, } R = 100[(16)^{1/2} - 1]$$

$$\Rightarrow R = 300\%$$

- 14) Find CI on a sum of Rs 10,000 at 10% for 9 months, where the interest is compounded quarterly.

For 9 months on quarterly basis, $n=3$, $R=10\%/4$
 $\Rightarrow R=2.5\%$

Net effective rate for 6 months

$$\begin{aligned} &= a + b + \frac{ab}{100} \\ &= 2.5 + 2.5 + \frac{2.5 \times 2.5}{100} \\ &= 5 + 6.25/100 \\ &= 5.0625\% \end{aligned}$$

Net effective rate for 9 months

$$\begin{aligned} &= a + b + \frac{ab}{100} \\ &= 5.0625 + 2.5 + \frac{5.0625 \times 2.5}{100} \\ &= 7.69\% \text{ (Approx) } \end{aligned}$$

Hence, CI for 9 months = 7.69% of 10,000
= Rs 769.

- 15) ~~CI~~ = The difference between simple interest & compound interest compounded yearly on a certain sum of money for 2 years at 4% per annum is Re 1. The Sum (in Rs) is -

$$\rightarrow CI - SI = \frac{P(R)^2}{100^2} \text{ [for 2 years]}$$

$$\text{So, } 1 = \frac{P(4)^2}{100^2} \Rightarrow P = \frac{10000}{16} = \text{Rs } 625.$$

16) Find SI if -

$$P = \text{Rs } 1000, R = 20\% \text{ annum}, T = 4 \text{ years.}$$

$$\rightarrow \frac{SI}{1000} \times 100 = 20 \times 4$$

$$\Rightarrow SI = 20 \times 4 \times 10$$

$$\Rightarrow SI = 800. \checkmark$$

17) Find $A = ?$ if $P = \text{Rs } 500, R = 3\% \text{ annum}, T = 2 \text{ Years}$

Method - I

$$R \times t = \frac{SI}{\text{Principal}}$$

$$\Rightarrow 3 \times 2 = \frac{SI}{100} \times 100$$

$$\Rightarrow SI = 6$$

$$\therefore \text{Amount} = SI + \text{Principal}$$

$$= 6 + 100$$

$$A = 106$$

Method - II

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

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

$$\Rightarrow A = 100 \times \frac{106}{100}$$

$$\Rightarrow A = 106$$

18) Question of Blood Relations -

If $P+Q$ means P is husband of Q ,

P/Q means P is the sister of Q ,

$P * Q$ means P is the son of Q .

How is D related to A in $D * B + C/A$.

$\rightarrow C/A \rightarrow C$ is the sister of A

$B+C/A \rightarrow B$ is brother-in-law of A

$\therefore D + B + C/A \rightarrow D$ is nephew to A.

19.) Series Questions -

i) 2, 1, $1/2$, $1/4$... what number should come next?

(A) $1/3$ (B) $1/8$ (C) $2/8$ (D) $1/16$

Hint [If we divide all no's by 2 then we can find the next number].

So, $4/2 = 2$

$2/2 = 1$

$1/2 = 1/2$

$(1/2)/2 = 1/4$

$(1/4)/2 = 1/8$ ---

ii) 7, 10, 8, 11, 9, 12 ... next?

Hint: [This is an alternating addⁿ & subⁿ series].

Here, In first pattern 3 is added i.e., $7 + 3 = 10$

& In second pattern 2 is subtracted i.e., $10 - 2 = 8$

\therefore Next no should be (10). ✓

20.) Puzzle Questions -

→ Which letter replaces the (?) mark?

6	4	4	1
4	N	L	7
5	U	?	1
6	10	14	2

Q will replace "?".

{ Adding 3 no's each square gives the numeric value of the letter at centre }