23 Compound Interest

Compound Interest: Sometimes it so happens that the borrower and the lender agree to fix up a certain unit of time, say *yearly* or *half-yearly* or *quarterly* to settle the previous account.

In such cases, the amount after first unit of time becomes the principal for the second unit, the amount after second unit becomes the principal for the third unit and so on.

After a specified period, *the difference between the amount and the money borrowed is called the **Compound Interest** (abbreviated as C.I.) for that period*.

IMPORTANT FACTS AND FORMULAE

Let Principal = P, Rate = R% per annum, Time = n years.

I. When interest is compounded Annually:

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

II. When interest is compounded Half-yearly:

$$\text{Amount} = P\left[1 + \frac{(R/2)}{100}\right]^{2n}$$

III. When interest is compounded Quarterly:

$$\text{Amount} = P\left[1 + \frac{(R/4)}{100}\right]^{4n}$$

IV. When interest is compounded Annually but time is in fraction, say $3\frac{2}{5}$ years.

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^3 \times \left(1 + \frac{\frac{2}{5}R}{100}\right)$$

V. When rates are different for different years, say R_1%, R_2%, R_3% for 1st, 2nd and 3rd year respectively.

Then, Amount = $P\left(1 + \dfrac{R_1}{100}\right)\left(1 + \dfrac{R_2}{100}\right)\left(1 + \dfrac{R_3}{100}\right)$.

VI. Present worth of ₹ x due n years hence is given by:

$$\text{Present Worth} = \frac{x}{\left(1 + \dfrac{R}{100}\right)^n}.$$

SOLVED EXAMPLES

Ex. 1. *After 3 years, how much compound interest will be obtained on ₹ 7800 at the interest rate of 5% per annum?* **(R.R.B., 2009)**

Sol. Amount = ₹ $\left[7800 \times \left(1 + \dfrac{5}{100}\right)^3\right]$ = ₹ $\left(7800 \times \dfrac{21}{20} \times \dfrac{21}{20} \times \dfrac{21}{20}\right)$

$\qquad$ = ₹ $\left(\dfrac{361179}{40}\right)$ = ₹ 9029.475.

$\therefore$ C.I. = ₹ (9029.475 − 7800) = ₹ 1229. 475.

Ex. 2. *Find the compound interest on ₹ 8000 at 15% per annum for 2 years 4 months, compounded annually.*

Sol. Time = 2 years 4 months = $2\frac{4}{12}$ years = $2\frac{1}{3}$ years.

$$\therefore \text{ Amount} = ₹ \left[8000 \times \left(1+\frac{15}{100}\right)^2 \times \left(1+\frac{\frac{1}{3}\times 15}{100}\right) \right] = ₹ \left(8000 \times \frac{23}{20} \times \frac{23}{20} \times \frac{21}{20}\right) = ₹ \ 11109.$$

$$\therefore \quad \text{C.I.} = ₹ \ (11109 - 8000) = ₹ \ 3109.$$

Ex. 3. *Find the compound interest on ₹ 10,000 in 2 years at 4% per annum, the interest being compounded half-yearly.*

Sol. Principal = ₹ 10000; Rate = 2% per half-year; Time = 2 years = 4 half-years.

$$\therefore \text{ Amount} = ₹ \left[10000 \times \left(1+\frac{2}{100}\right)^4 \right] = ₹ \left(10000 \times \frac{51}{50} \times \frac{51}{50} \times \frac{51}{50} \times \frac{51}{50}\right) = ₹ \ 10824.32.$$

$$\therefore \quad \text{C.I.} = ₹ \ (10824.32 - 10000) = ₹ \ 824.32.$$

Ex. 4. *Find the compound interest on ₹ 16000 at 20% per annum for 9 months, compounded quarterly.*

Sol. Principal = ₹ 16000; Time = 9 months = 3 quarters;

Rate = 20% per annum = 5% per quarter.

$$\therefore \quad \text{Amount} = ₹ \left[16000 \times \left(1+\frac{5}{100}\right)^3 \right] = ₹ \left(16000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}\right) = ₹ \ 18522.$$

$$\therefore \quad \text{C.I.} = ₹ \ (18522 - 16000) = ₹ \ 2522.$$

Ex. 5. *The simple interest accrued on an amount of ₹ 40000 at the end of four years is ₹ 24000. What would be the compound interest accrued on the same amount at the same rate in the same period?*

Sol. Clearly, Principal = ₹ 40000, Time = 4 years, S.I. = ₹ 24000.

So, Rate = $\left(\frac{100 \times 24000}{40000 \times 4}\right)\% = 15\%.$

Amount = $₹ \left[40000 \times \left(1+\frac{15}{100}\right)^4 \right] = ₹ \left(40000 \times \frac{23}{20} \times \frac{23}{20} \times \frac{23}{20} \times \frac{23}{20}\right) = ₹ \left(\frac{279841}{4}\right) = ₹ \ 69960.25.$

$$\therefore \quad \text{C.I.} = ₹ \ (69960.25 - 40000) = ₹ \ 29960.25.$$

Ex. 6. *Rohit invested a certain amount at the rate of 6 p.c.p. a and obtained a simple interest of ₹ 8730 at the end of 3 years. What amount of compound interest would he obtain on the same amount at the same rate of interest at the end of 2 years?*

Sol. Clearly, Rate = 6% p.a; Time = 3 years, S.I. = ₹ 8730.

So, Principal = $₹ \left(\frac{100 \times 8730}{3 \times 6}\right) = ₹ \ 48500.$

Amount = $₹ \left[48500 \times \left(1+\frac{6}{100}\right)^2 \right] = ₹ \left(48500 \times \frac{53}{50} \times \frac{53}{50}\right) = ₹ \ 54494.60.$

$$\therefore \quad \text{C.I.} = ₹ \ (54494.60 - 48500) = ₹ \ 5994.60.$$

Ex. 7. *In how many years ₹ 100000 will become ₹ 1,33,100 at compound interest rate of 10% per annum?*

Sol. Principal = ₹ 100000, Amount

= ₹ 133100, Rate = 10% p.a.

Let the time be n years. Then,

$$100000 \left(1+\frac{10}{100}\right)^n = 133100 \Rightarrow \left(\frac{11}{10}\right)^n = \left(\frac{1331}{1000}\right) = \left(\frac{11}{10}\right)^3 \Rightarrow n = 3.$$

Hence, required time = 3 years.

Ex. 8. *At what rate percent per annum of compound interest will ₹ 1600 amount to ₹ 1852.20 in 3 years?*

Sol. Let the rate be $R\%$ per annum. Then,

$$1600 \left(1+\frac{R}{100}\right)^3 = 1852.20$$

$$\Rightarrow \left(1+\frac{R}{100}\right)^3 = \frac{1852.20}{1600} = \frac{18522}{16000}$$

$$\Rightarrow \left(1+\frac{R}{100}\right)^3 = \frac{9261}{8000} = \left(\frac{21}{20}\right)^3$$

$$\Rightarrow 1+\frac{R}{100} = \frac{21}{20} \Rightarrow \frac{R}{100} = \frac{1}{20} \Rightarrow R = 5.$$

Hence, rate = 5% p.a.

Ex. 9. *Find the sum of money which will amount to ₹ 26010 in 6 months at the rate of 8% per annum when the interest is compounded quarterly.*

Sol. Amount = ₹ 26010; Time = 6 months = 2 quarters;

Rate = 8% p.a. = 2% per quarter.

Let the sum be ₹ x. Then,

$$x \times \left(1+\frac{2}{100}\right)^2 = 26010 \Rightarrow \left(x \times \frac{51}{50} \times \frac{51}{50}\right) = 26010$$

$$\Rightarrow x = \left(\frac{26010 \times 10 \times 50 \times 50}{51 \times 51}\right) = 25000.$$

Hence, required sum = ₹ 25000.

Ex. 10. *If the compound interest on a certain sum at $16\frac{2}{3}$% for 3 years is ₹ 1270, find the simple interest on the same sum at the same rate and for the same period.*

Sol. Let the sum be ₹ x. Then,

$$\text{C.I.} = \left[x \times \left(1+\frac{50}{3 \times 100}\right)^3 - x\right] = \left(\frac{343x}{216} - x\right) = \frac{127x}{216}.$$

$$\therefore \quad \frac{127x}{216} = 1270 \text{ or } x = \frac{1270 \times 216}{127} = 2160.$$

Thus, the sum is ₹ 2160.

$$\therefore \quad \text{S.I.} = ₹\left(2160 \times \frac{50}{3} \times 3 \times \frac{1}{100}\right) = ₹\ 1080.$$

Ex. 11. *The compound interest accrued on an amount of ₹ 22000 at the end of two years is ₹ 5596.80. What would be the simple interest accrued on the same amount at the same rate in the same period?*

Sol. Let the rate be $R\%$ p.a. Then,

$$22000 \left(1+\frac{R}{100}\right)^2 = (22000 + 5596.80) = 27596.80$$

$$\Rightarrow \left(1+\frac{R}{100}\right)^2 = \frac{275968}{220000} = \left(\frac{28}{25}\right)^2$$

$$\Rightarrow \left(1+\frac{R}{100}\right) = \frac{28}{25} \Rightarrow \frac{R}{100} = \frac{3}{25} \Rightarrow R = 12.$$

$$\therefore \quad \text{S.I.} = ₹\left(\frac{22000 \times 12 \times 2}{100}\right) = ₹\ 5280.$$

Ex. 12. *If the difference between the compound and simple interests on a certain sum of money for 3 years at 5% per annum is ₹ 15.25, find the sum.* (C.P.O., 2006)

Sol. Let the sum be ₹ x. Then,

C.I. = $x \left(1 + \dfrac{5}{100}\right)^3 - x = \dfrac{9261}{8000}x - x = \dfrac{1261}{8000}x$.

S.I. = $\left(\dfrac{x \times 5 \times 3}{100}\right) = \dfrac{3x}{20}$.

∴   (C.I.) − (S.I.) = $\left(\dfrac{1261}{8000}x - \dfrac{3x}{20}\right) = \dfrac{61x}{8000}$.

So, $\dfrac{61x}{8000}$ = 15.25

$\Leftrightarrow x = \dfrac{15.25 \times 8000}{61}$ = 2000.

Hence, required sum = ₹ 2000.

Ex. 13. *The difference between the compound interest and the simple interest accrued on an amount of ₹ 18,000 in 2 years was ₹ 405. What was the rate of interest p.c.p.a.?*

Sol. Let the rate be R% p.a. Then,

$\left[18000 \left(1 + \dfrac{R}{100}\right)^2 - 18000\right] - \left(\dfrac{18000 \times R \times 2}{100}\right)$ = 405

$\Leftrightarrow 18000 \left[\dfrac{(100 + R)^2}{10000} - 1 - \dfrac{2R}{100}\right]$ = 405

$\Leftrightarrow 18000 \left[\dfrac{(100 + R)^2 - 10000 - 200R}{10000}\right]$ = 405

$\Leftrightarrow \dfrac{9}{5}R^2 = 405 \Leftrightarrow R^2 = \left(\dfrac{405 \times 5}{9}\right) = 225 \Leftrightarrow R = 15$.

∴   Rate = 15%.

Ex. 14. *The difference between compound and simple interests on a certain sum of money at the interest rate of 10% per annum for $1\dfrac{1}{2}$ years is ₹ 183, when the interest is compounded semi-annually. Find the sum of money.* (S.S.C., 2007)

Sol. Let the sum be ₹ x. Then,

C.I. = ₹ $\left[x\left(1 + \dfrac{5}{100}\right)^3 - x\right]$ = ₹ $\left[\left(x \times \dfrac{21}{20} \times \dfrac{21}{20} \times \dfrac{21}{20}\right) - x\right]$

= ₹ $\left(\dfrac{9261x}{8000} - x\right)$ = ₹ $\left(\dfrac{1261x}{8000}\right)$.

S.I. = ₹ $\left(\dfrac{x \times 10 \times 3}{100 \times 2}\right)$ = ₹ $\dfrac{3x}{20}$.

∴ $\dfrac{1261x}{8000} - \dfrac{3x}{20}$ = 183 $\Rightarrow \dfrac{61x}{8000} = 183$

$\Rightarrow x = \left(\dfrac{183 \times 8000}{61}\right) = 24000$.

Hence, required sum = ₹ 24000.

Ex. 15. *Divide ₹ 1301 between A and B, so that the amount of A after 7 years is equal to the amount of B after 9 years, the interest being compounded at 4% per annum.*

Sol. Let the two parts be ₹ x and ₹ $(1301 - x)$.

$$x\left(1 + \frac{4}{100}\right)^7 = (1301 - x)\left(1 + \frac{4}{100}\right)^9$$

$$\Leftrightarrow \frac{x}{(1301 - x)} = \left(1 + \frac{4}{100}\right)^2 = \left(\frac{26}{25} \times \frac{26}{25}\right).$$

$$\Leftrightarrow 625x = 676 \,(1301 - x)$$

$$\Leftrightarrow 1301x = 676 \times 1301 \Leftrightarrow x = 676.$$

So, the two parts are ₹ 676 and ₹ $(1301 - 676)$ i.e. ₹ 676 and ₹ 625.

Ex. 16. *A certain sum amounts to ₹ 7350 in 2 years and to ₹ 8575 in 3 years. Find the sum and rate percent.*

Sol. S.I. on ₹ 7350 for 1 year = ₹ $(8575 - 7350)$ = ₹ 1225.

$$\therefore \quad \text{Rate} = \left(\frac{100 \times 1225}{7350 \times 1}\right)\% = 16\frac{2}{3}\%.$$

Let the sum be ₹ x. Then,

$$x\left(1 + \frac{50}{3 \times 100}\right)^2 = 7350 \Leftrightarrow x \times \frac{7}{6} \times \frac{7}{6} = 7350 \Leftrightarrow x = \left(7350 \times \frac{36}{49}\right) = 5400.$$

$$\therefore \quad \text{Sum} = ₹ \ 5400.$$

Ex. 17. *A sum of money becomes ₹ 13380 after 3 years and ₹ 20070 after 6 years on compound interest. Find the sum.*

Sol. Let the sum be ₹ P. Then,

$$P\left(1 + \frac{R}{100}\right)^3 = 13380 \quad\quad\quad ...(i)$$

and $P\left(1 + \frac{R}{100}\right)^6 = 20070 \quad\quad\quad ...(ii)$

On dividing, we get: $\left(1 + \frac{R}{100}\right)^3 = \frac{20070}{13380} = \frac{3}{2}.$

Substituting this value in (*i*), we get;

$$P \times \frac{3}{2} = 13380 \quad \text{or} \quad P = \left(13380 \times \frac{2}{3}\right) = 8920.$$

Hence, required sum = ₹ 8920.

Ex. 18. *A sum of money doubles itself at compound interest in 15 years. In how many years will it become eight times?*

Sol. $P\left(1 + \frac{R}{100}\right)^{15} = 2P \Rightarrow \left(1 + \frac{R}{100}\right)^{15} = \frac{2P}{P} = 2 \quad\quad\quad ...(i)$

Let $P\left(1 + \frac{R}{100}\right)^n = 8P \Rightarrow \left(1 + \frac{R}{100}\right)^n = 8 = 2^3 = \left\{\left(1 + \frac{R}{100}\right)^{15}\right\}^3$ [using (*i*)]

$$\Rightarrow \left(1 + \frac{R}{100}\right)^n = \left(1 + \frac{R}{100}\right)^{45} \Rightarrow n = 45.$$

Thus, the required time = 45 years.

Ex. 19. *What annual payment will discharge a debt of ₹ 7620 due in 3 years at $16\frac{2}{3}$ % per annum compound interest?*

Sol. Let each instalment be ₹ x. Then,

(P.W. of ₹ x due 1 year hence) + (P.W. of ₹ x due 2 years hence) + (P.W. of ₹ x due 3 years hence) = 7620.

∴ $\dfrac{x}{\left(1+\dfrac{50}{3\times100}\right)} + \dfrac{x}{\left(1+\dfrac{50}{3\times100}\right)^2} + \dfrac{x}{\left(1+\dfrac{50}{3\times100}\right)^3} = 7620$

⇔ $\dfrac{6x}{7} + \dfrac{36x}{49} + \dfrac{216x}{343} = 7620$ ⇔ $294x + 252x + 216x = 7620 \times 343$

⇔ $x = \left(\dfrac{7620 \times 343}{762}\right) = 3430.$

∴ Amount of each instalment = ₹ 3430.

Ex. 20. *A T.V. set is available for ₹ 19650 cash payment or for ₹ 3100 cash down payment and three equal annual instalments. If the shopkeeper charges interest at the rate of 10% per annum compounded annually, calculate the amount of each instalment.* **(S.S.C., 2008)**

Sol. Total cost of the T.V. set = ₹ 19650. Down payment = ₹ 3100.

Balance = ₹ (19650 – 3100) = ₹ 16550.

Let the value of each instalment be ₹ x. Then,

(P. W. of ₹ x due 1 year hence) + (P. W. of ₹ x due 2 years hence) + (P. W. of ₹ x due 3 years hence) = ₹ 16550.

∴ $\dfrac{x}{\left(1+\dfrac{10}{100}\right)} + \dfrac{x}{\left(1+\dfrac{10}{100}\right)^2} + \dfrac{x}{\left(1+\dfrac{10}{100}\right)^3} = 16550$ ⇒ $\dfrac{10x}{11} + \dfrac{100x}{121} + \dfrac{1000x}{1331} = 16550$

⇒ $1210x + 1100x + 1000x = 16550 \times 1331$ ⇒ $3310x = 16550 \times 1331$

⇒ $x = \left(\dfrac{16550 \times 1331}{3310}\right) = 6655.$

Hence, value of each instalment = ₹ 6655.

EXERCISE

(OBJECTIVE TYPE QUESTIONS)

Directions: *Mark (✓) against the correct answer:*

1. What would be the compound interest accrued on an amount of ₹ 8000 at the rate of 15 p.c.p.a. in 3 years? **(Bank P.O., 2009)**
(*a*) ₹ 4051
(*b*) ₹ 4167
(*c*) ₹ 4283
(*d*) ₹ 4325
(*e*) None of these

2. What would be the compound interest accrued on an amount of ₹ 8400 @ 12.5 p.c.p.a. at the end of 3 years? **(Bank P.O., 2010)**
(*a*) ₹ 2584.16
(*b*) ₹ 3560.16
(*c*) ₹ 3820.14
(*d*) ₹ 4205.62
(*e*) None of these

3. The compound interest on ₹ 2800 for 18 months at 10% p.a. is **(L.I.C.A.D.O., 2008)**
(*a*) ₹ 420
(*b*) ₹ 434
(*c*) ₹ 436.75
(*d*) ₹ 441.35

4. The compound interest on ₹ 20,480 at $6\frac{1}{4}$ % per annum for 2 years 73 days, is
(*a*) ₹ 2929
(*b*) ₹ 3000
(*c*) ₹ 3131
(*d*) ₹ 3636

5. A man saves ₹ 200 at the end of each year and lends the money at 5% compound interest. How much will it become at the end of 3 years?
(*a*) ₹ 565.25
(*b*) ₹ 635
(*c*) ₹ 662.02
(*d*) ₹ 666.50

6. If the rate of interest be 4% per annum for first year, 5% per annum for second year and 6% per annum for third year, then the compound interest of ₹ 10000 for 3 years will be **(C.P.O., 2006)**
(*a*) ₹ 1575.20
(*b*) ₹ 1600
(*c*) ₹ 1625.80
(*d*) ₹ 2000

7. What will be the compound interest accrued on an amount of ₹ 10000 @ 20 p.c.p.a. in 2 years if the interest is compounded half-yearly? **(Bank P.O., 2009)**
(*a*) ₹ 4400
(*b*) ₹ 4600
(*c*) ₹ 4641
(*d*) ₹ 4680
(*e*) None of these

8. A bank offers 5% compound interest calculated on half-yearly basis. A customer deposits ₹ 1600 each on 1st January and 1st July of a year. At the end of the year, the amount he would have gained by way of interest is:
(*a*) ₹ 120
(*b*) ₹ 121
(*c*) ₹ 122
(*d*) ₹ 123

9. What is the difference between the compound interests on ₹ 5000 for $1\frac{1}{2}$ years at 4% per annum compounded yearly and half-yearly?
(a) ₹ 2.04
(b) ₹ 3.06
(c) ₹ 4.80
(d) ₹ 8.30

10. Mr Duggal invested ₹ 20000 with rate of interest @ 20 p.c.p.a. The interest was compounded half-yearly for first one year and in the next year it was compounded yearly. What will be the total interest earned at the end of 2 years? **(Bank P.O., 2009)**
(a ₹ 8040
(b) ₹ 8800
(c) ₹ 9040
(d) ₹ 9800
(e) None of these

11. Find the compound interest on ₹ 15625 for 9 months at 16% per annum compounded quarterly.
(a) ₹ 1851
(b) ₹ 1941
(c) ₹ 1951
(d) ₹ 1961

12. A man gets a simple interest of ₹ 1000 on a certain principal at the rate of 5 p.c.p.a. in 4 years. What compound interest will the man get on twice the principal in 2 years at the same rate? **(Bank P.O., 2010)**
(a) ₹ 1000
(b) ₹ 1005
(c) ₹ 10125
(d) ₹ 11025
(e) None of these

13. The simple interest accrued on an amount of ₹ 20000 at the end of 3 years is ₹ 7200. What would be the compound interest accrued on the same amount at the same rate in the same period? **(Bank P.O., 2008)**
(a) ₹ 8098.56
(b) ₹ 8112.86
(c) ₹ 8246.16
(d) ₹ 8342.36
(e) None of these

14. The difference between simple interest and compound interest on ₹ P at R% p.a. in 2 years is **(Compus Recruitment, 2010)**
(a) ₹ $\dfrac{PR}{100}$
(b) ₹ $\dfrac{2PR}{100}$
(c) ₹ $\dfrac{PR^2}{100}$
(d) ₹ $\dfrac{PR^2}{(100)^2}$

15. What will be the difference between the simple interest and compound interest accrued on an amount of ₹ 19200 at the end of 3 years @ 12 p.c.p.a.? **(S.B.I.P.O., 2008)**
(a) ₹ 722.6826
(b) ₹ 798.1824
(c) ₹ 802.5144
(d) ₹ 862.6176
(e) None of these

16. What will be the difference between S.I. and C.I. on a sum of ₹ 15000 for 2 years at the same rate of interest of $12\frac{1}{2}$ % per annum? **(R.R.B., 2006)**

(a) ₹ 230.550
(b) ₹ 234.375
(c) ₹ 250.129
(d) ₹ 324.357

17. The difference between simple interest and compound interest on ₹ 1200 for one year at 10% per annum reckoned half-yearly is
(a) ₹ 2.50
(b) ₹ 3
(c) ₹ 3.75
(d) ₹ 4
(e) None of these

18. A man borrows ₹ 4000 at 15% compound rate of interest. At the end of each year he pays back ₹ 1500. How much amount should be pay at the end of the third year to clear all his dues? **(N.M.A.T., 2005)**
(a) ₹ 874.75
(b) ₹ 824.50
(c) ₹ 924.25
(d) ₹ 974.25

19. A man invests ₹ 5000 for 3 years at 5% p.a. compound interest reckoned yearly. Income tax at the rate of 20% on the interest earned is deducted at the end of each year. Find the amount at the end of the third year. **(M.A.T., 2004)**
(a) ₹ 5624.32
(b) ₹ 5627.20
(c) ₹ 5630.50
(d) ₹ 5788.125

20. The compound interest on ₹ 30,000 at 7% per annum is ₹ 4347. The period (in years) is **(L.I.C.A.A.O., 2003)**
(a) 2 years
(b) $2\frac{1}{2}$ years
(c) 3 years
(d) 4 years

21. Compound interest accrued on an amount of ₹ 26500 in two years is ₹ 9775.85. What is the rate of interest p.c.p.a? **(Bank P.O., 2010)**
(a) 12%
(b) 15%
(c) 17%
(d) 22%
(e) None of these

22. ₹ 2000 amounts to ₹ 2226.05 in 2 years at compound interest. What will be the rate of interest? **(E.S.I.C., 2006)**
(a) 5%
(b) 5.25%
(c) 5.5%
(d) 6%

23. A man invests ₹ 4000 for 3 years at compound interest. After one year the money amounts to ₹ 4320. What will be the amount (to the nearest rupee) due at the end of 3 years? **(R.R.B., 2006)**
(a) ₹ 4939
(b) ₹ 5039
(c) ₹ 5789
(d) ₹ 6129

24. An amount of ₹ 10000 becomes ₹ 14641 in 2 years if the interest is compounded half-yearly. What is the rate of compound interest p.c.p.a.? **(Bank P.O. 2009)**
(a) 10%
(b) 12%
(c) 16%
(d) 20%
(e) None of these

25. The principal that amounts to ₹ 4913 in 3 years at $6\frac{1}{4}$ % per annum compound interest compounded annually, is   **(S.S.C., 2005)**
(a) ₹ 3096   (b) ₹ 4076
(c) ₹ 4085   (d) ₹ 4096

26. The present worth of ₹ 169 due in 2 years at 4% per annum compound interest is
(a) ₹ 150.50   (b) ₹ 154.75
(c) ₹ 156.25   (d) ₹ 158

27. The compound interest accrued on an amount at the end of 3 years @ 15 p.c.p.a. is ₹ 6500.52. What is the amount?   **(S.B.I.P.O., 2008)**
(a) ₹ 10500   (b) ₹ 12480
(c) ₹ 13620   (d) ₹ 14800
(e) None of these

28. In how many years will a sum of ₹ 800 at 10% per annum compounded semi-annually become ₹ 926.10?
                    (S.S.C., 2010)
(a) $1\frac{1}{3}$ years   (b) $1\frac{1}{2}$ years

(c) $2\frac{1}{3}$ years   (d) $2\frac{1}{2}$ years

29. If the compound interest on a sum for 2 years at $12\frac{1}{2}$ % per annum is ₹ 510, the simple interest on the same sum at the same rate for the same period of time is :   **(S.S.C., 2004)**
(a) ₹ 400   (b) ₹ 450
(c) ₹ 460   (d) ₹ 480

30. The compound interest on a certain sum for 2 years at 10% per annum is ₹ 525. The simple interest on the same sum for double the time at half the rate percent per annum is
(a) ₹ 400   (b) ₹ 500
(c) ₹ 600   (d) ₹ 800

31. The simple interest on a certain sum of money for 3 years at 8% per annum is half the compound interest on ₹ 4000 for 2 years at 10% per annum. The sum placed on simple interest is
(a) ₹ 1550   (b) ₹ 1650
(c) ₹ 1750   (d) ₹ 2000

32. There is 60% increase in an amount in 6 years at simple interest. What will be the compound interest of ₹ 12,000 after 3 years at the same rate?
(a) ₹ 2160   (b) ₹ 3120
(c) ₹ 3972   (d) ₹ 6240
(e) None of these

33. The compound interest earned by Sachin on a certain amount at the end of two years at the rate of 8 p.c.p.a. was ₹ 1414.40. What was the total amount that Sachin got back at the end of 2 years in the form of principal plus interest earned
                    (S.B.I.P.O., 2010)
(a) ₹ 8914.40   (b) ₹ 9014.40
(c) ₹ 9414.40   (d) ₹ 9914.40
(e) None of these

34. The compound interest accrued on an amount of ₹ 25500 at the end of 3 years is ₹ 8440.50. What would be the simple interest accrued on the same amount at the same rate in the same period?
                    (Bank P.O., 2009)
(a) ₹ 4650   (b) ₹ 5650
(c) ₹ 6650   (d) ₹ 7650
(e) None of these

35. Sriram invested equal sums of money in two schemes. Under scheme X, the compound interest rate was 10 p.c.p.a. and under scheme Y, the compound interest rate was 12 p.c.p.a. The interest after 2 years on the sum invested in scheme X was ₹ 63. How much is the interest earned under scheme Y after 2 years?
                    (Bank P.O., 2006)
(a) ₹ 70.56   (b) ₹ 76.32
(c) ₹ 79.0272
(d) ₹ Cannot be determined
(e) None of these

36. The difference between the amount the amount of compound interest and simple interest accrued on an amount of ₹ 26000 at the end of 3 years is ₹ 2994.134. What is the rate of interest p.c.p.a.?
                    (Bank P.O., 2005)
(a) 17%   (b) 19%
(c) 22%
(d) Cannot be determined
(e) None of these

37. The difference between compound interest and simple interest on a sum for 2 years at 8 per cent is ₹ 768. The sum is
(a) ₹ 100000   (b) ₹ 110000
(c) ₹ 120000   (d) ₹ 170000

38. The compound interest on a sum of money for 2 years is ₹ 832 and the simple interest on the same sum for the same period is ₹ 800. The difference between the compound interest and the simple interest for 3 years will be
(a) ₹ 48   (b) ₹ 66.56
(c) ₹ 98.56   (d) None of these

39. The difference between the simple interest on a certain sum at the rate of 10% per annum for 2 years and compound interest which is compounded every 6 months is ₹ 124.05. What is the principal sum?

(*a*) ₹ 6000   (*b*) ₹ 8000

(*c*) ₹ 10,000   (*d*) ₹ 12,000

(*e*) None of these

40. The difference between compound interest and simple interest on a sum for 2 years at 10% per annum, when the interest is compounded annually is ₹ 16. If the interest were compounded half-yearly, the difference in two interests would be

(*a*) ₹ 24.81   (*b*) ₹ 26.90

(*c*) ₹ 31.61   (*d*) ₹ 32.40

41. A money-lender borrows money at 4% per annum and pays the interest at the end of the year. He lends it at 6% per annum compound interest compounded half-yearly and receives the interest at the end of the year. In this way, he gains ₹ 104.50 a year. The amount of money be borrows, is   **(S.S.C., 2007)**

(*a*) ₹ 4500   (*b*) ₹ 5000

(*c*) ₹ 5500   (*d*) ₹ 6000

42. A sum of money lent at compound interest for 2 years at 20% per annum would fetch ₹ 482 more, if the interest was payable half-yearly than if it was payable annually. The sum is :

(*a*) ₹ 10,000   (*b*) ₹ 20,000

(*c*) ₹ 40,000   (*d*) ₹ 50,000

43. On a sum of money, the simple interest for 2 years is ₹ 660, while the compound interest is ₹ 696.30, the rate of interest being the same in both the cases. The rate of interest is

(*a*) 10%   (*b*) 10.5%

(*c*) 12%   (*d*) None of these

44. The effective annual rate of interest corresponding to a nominal rate of 6% per annum payable half-yearly is   **(S.S.C., 2005)**

(*a*) 6.06%   (*b*) 6.07%

(*c*) 6.08%   (*d*) 6.09%

45. A person lent out a certain sum on simple interest and the same sum on compound interest at a certain rate of interest per annum. He noticed that the ratio between the difference of compound interest and simple interest of 3 years and that of 2 years is 25 : 8. The rate of interest per annum is   **(M.A.T., 2005)**

(*a*) 10%   (*b*) 11%

(*c*) 12%   (*d*) $12\frac{1}{2}$%

46. A father left a will of ₹ 16400 for his two sons aged 17 and 18 years. They must get equal amounts when they are 20 years, at 5% compound interest. Find the present share of the younger son.   **(R.R.B., 2008)**

(*a*) ₹ 8000   (*b*) ₹ 8200

(*c*) ₹ 8400   (*d*) ₹ 8800

47. Divide ₹ 8840 between A and B so that the amount received by A at the end of 8 years may be equal to the amount received by B at the end of 10 years, compound interest being at 10% per annum.   **(S.S.C., 2007)**

(*a*) ₹ 4640, ₹ 4200   (*b*) ₹ 4840, ₹ 4000

(*c*) ₹ 5000, ₹ 3840   (*d*) ₹ 5240, ₹ 3600

48. Mr. Dua invested money in two schemes A and B offering compound interest @ 8 p.c.p.a. and 9 p.c.p.a. respectively. If the total amount of interest accrued through two schemes together in two years was ₹ 4818.30 and the total amount invested was ₹ 27,000, what was the amount invested in Scheme A?

(*a*) ₹ 12,000   (*b*) ₹ 13,500

(*c*) ₹ 15,000

(*d*) Cannot be determined

(*e*) None of these

49. A sum of money put at compound interest amounts in 2 years to ₹ 672 and in 3 years to ₹ 714. The rate of interest per annum is   **(P.C.S., 2009)**

(*a*) 5.5%   (*b*) 6.0%

(*c*) 6.25%   (*d*) 6.75%

50. A sum of money invested at compound interest amounts to ₹ 4624 in 2 years and to ₹ 4913 in 3 years. The sum of money is :

(*a*) ₹ 4096   (*b*) ₹ 4260

(*c*) ₹ 4335   (*d*) ₹ 4360

51. A sum of ₹ 12,000 deposited at compound interest becomes double after 5 years. After 20 years, it will become :   **(S.S.C., 2010)**

(*a*) ₹ 96,000   (*b*) ₹ 1,20,000

(*c*) ₹ 1,24,000   (*d*) ₹ 1,92,000

52. A sum of money at compound interest doubles itself in 15 years. It will become eight times of itself in   **(S.S.C., 2010)**

(*a*) 45 years   (*b*) 48 years

(*c*) 54 years   (*d*) 60 years

53. A finance company declares that, at a certain compound interest rate, a sum of money deposited by anyone will become 8 times in 3 years. If the same amount is deposited at the same compound rate of interest, then in how many years will it become 16 times?   **(M.A.T., 2007)**

(*a*) 4 years   (*b*) 5 years

(*c*) 6 years   (*d*) 7 years

54. A sum of money lent out at compound interest increases in value by 50% in 5 years. A person wants to lend three different sums x, y and z for 10, 15 and 20 years respectively at the above rate in such a way that he gets back equal sums at the end of their respective periods. The ratio $x : y : z$ is

(A.O. Exam, 2010)

(a) 6 : 9 : 4　　　　　　(b) 9 : 4 : 6
(c) 9 : 6 : 4　　　　　　(d) 6 : 4 : 9

55. The least number of complete years in which a sum of money put out at 20% compound interest will be more than doubled is　　**(N.I.F.T., 2003)**

(a) 3　　　　　　(b) 4
(c) 5　　　　　　(d) 6

56. A man borrows ₹ 2550 to be paid back with compound interest at the rate of 4% per annum by the end of 2 years in two equal yearly instalments. How much will each instalment be?

(a) ₹ 1275　　　　　(b) ₹ 1283
(c) ₹ 1352　　　　　(d) ₹ 1377

57. Under the Rural Housing Scheme, the Delhi Development Authority (DDA) allotted a house to Kamal Raj for ₹ 1,26,100. This payment is to be made in three equal annual instalments. If the money is reckoned at 5% per annum compound interest, then how much is to be paid by Kamal Raj in each instalment?

(M.A.T., 2006)

(a) ₹ 45205　　　　　(b) ₹ 46305
(c) ₹ 47405　　　　　(d) ₹ 48505

58. A taperecorder is sold for ₹ 3500 cash, or ₹ 1000 cash down payment and the balance in three equal easy instalments. If $12\frac{1}{2}$ % is the rate of interest compounded annually, find the amount of instalment. **(R.R.B., 2005)**

(a) ₹ 1000.35　　　　(b) ₹ 1049.85
(c) ₹ 1050.65　　　　(d) ₹ 1100.45

59. One can purchase a flat from a house building society for ₹ 55000 cash or on the terms that he should pay ₹ 4275 as cash down payment and the rest in three equal instalments. The society charges interest at the rate of 16% per annum compounded half-yearly. If the flat is purchased under instalment plan, find the value of each instalment.　　**(N.M.A.T., 2005)**

(a) ₹ 18756　　　　　(b) ₹ 19292
(c) ₹ 19683　　　　　(d) ₹ 20285

60. What annual payment will discharge a debt of ₹ 1025 due in 2 years at the rate of 5% compound interest?

(a) ₹ 550　　　　　(b) ₹ 551.25
(c) ₹ 560　　　　　(d) ₹ 560.75

61. A man borrows ₹ 12,500 at 20% compound interest. At the end of every year he pays ₹ 2000 as part repayment. How much does he still owe after three such instalments?

(a) ₹ 12,000　　　　(b) ₹ 12,864
(c) ₹ 15,600　　　　(d) None of these

62. A sum of money is borrowed and paid back in two annual instalments of ₹ 882 each allowing 5% compound interest. The sum borrowed was

(a) ₹ 1620　　　　　(b) ₹ 1640
(c) ₹ 1680　　　　　(d) ₹ 1700

63. The sum of money which when given on compound interest at 18% per annum would fetch ₹ 960 more when the interest is payable half yearly than when it was payable annually for 2 years is

[SSC—CHSL (10+2) Exam, 2015]

(a) ₹ 60,000　　　　(b) ₹ 30,000
(c) ₹ 40,000　　　　(d) ₹ 50,000

64. On what sum of money will the difference between simple interest and compound interest for 2 years at 5% per annum be equal to ₹ 63?

[SSC—CHSL (10 + 2) Exam, 2015]

(a) ₹ 24600　　　　(b) ₹ 24800
(c) ₹ 25200　　　　(d) ₹ 25500

65. At what rate of compound interest per annum will a sum of ₹ 1200 become ₹ 1348.32 in 2 years?

[SSC—CHSL (10+2) Exam, 2015]

(a) 7.5%　　　　　(b) 6.5%
(c) 7%　　　　　　(d) 6%

66. The compound interest on a certain sum of money for 2 years at 10% per annum is ₹ 525. The simple interest on the same sum of money for double the time at half the rate percent per annum is?

[RBI Gr. 'B' (Phase I) Exam, 2015]

(a) ₹ 1000　　　　(b) ₹ 500
(c) ₹ 200　　　　　(d) ₹ 800

67. Shashi had a certain amount of money. He invested $\frac{2}{3}$ of the total money in scheme A for 6 years and rest of the money he invested in scheme B for 2 years. scheme A offers simple interest at a rate of 12% p.a. and scheme B offers compound interest (compounded annually) at a rate of 10% p.a. if the total interest obtained from both the schemes is ₹ 2,750, what was the total amount invested by him in scheme A and scheme B together? (Approximate value)　　**[IBPS—Bank Spl. Officers (IT) Exam, 2015]**

(a) ₹ 4500　　　　(b) ₹ 4200
(c) ₹ 4050　　　　(d) ₹ 5000

68. The difference between CI and SI on a certain sum of money for 3 years at 5% p.c.p.a. is ₹ 122. Find the sum invested.

[IBPS—RRB Office Assistant (Online) Exam, 2015]

(a) ₹ 10000   (b) ₹ 12000

(c) ₹ 16000   (d) ₹ 20000

69. What is the difference between the compound interests on ₹ 5000 for 1 year at 4% per annum compounded yearly and half yearly?

[SSC—Junior Associates (Pre.) Exam, 2016]

(a) 2   (b) 3

(c) 4   (e) None of these

ANSWERS

1. (b)	**2.** (b)	**3.** (b)	**4.** (a)	**5.** (c)	**6.** (a)	**7.** (c)	**8.** (b)	**9.** (a)	**10.** (c)
11. (c)	**12.** (e)	**13.** (a)	**14.** (d)	**15.** (d)	**16.** (b)	**17.** (b)	**18.** (a)	**19.** (a)	**20.** (a)
21. (e)	**22.** (c)	**23.** (b)	**24.** (d)	**25.** (d)	**26.** (c)	**27.** (b)	**28.** (b)	**29.** (d)	**30.** (b)
31. (c)	**32.** (c)	**33.** (d)	**34.** (d)	**35.** (b)	**36.** (b)	**37.** (c)	**38.** (c)	**39.** (b)	**40.** (a)
41. (b)	**42.** (b)	**43.** (d)	**44.** (d)	**45.** (d)	**46.** (a)	**47.** (b)	**48.** (a)	**49.** (c)	**50.** (a)
51. (d)	**52.** (a)	**53.** (a)	**54.** (c)	**55.** (b)	**56.** (c)	**57.** (b)	**58.** (b)	**59.** (c)	**60.** (b)
61. (d)	**62.** (b)	**63.** (d)	**64.** (c)	**65.** (d)	**66.** (b)	**67.** (d)	**68.** (c)	**69.** (a)	

SOLUTIONS

1. Amount $= ₹ \left[8000 \times \left(1 + \frac{15}{100} \right)^3 \right]$

$= ₹ \left(8000 \times \frac{23}{20} \times \frac{23}{20} \times \frac{23}{20} \right) = ₹ 12167.$

∴ C.I. $= ₹ (12167 - 8000) = ₹ 4167.$

2. Amount $= ₹ \left[8400 \times \left(1 + \frac{25}{2 \times 100} \right)^3 \right] = ₹ \left(8400 \times \frac{9}{8} \times \frac{9}{8} \times \frac{9}{8} \right)$

$= ₹ \left(\frac{382725}{32} \right) = ₹ 11960.156 \approx ₹ 11960.16.$

∴ C.I. $= ₹ (11960.16 - 8400) = ₹ 3560.16.$

3. Amount $= ₹ \left[2800 \times \left(1 + \frac{10}{100} \right) \left(1 + \frac{5}{100} \right) \right]$

$= ₹ \left(2800 \times \frac{11}{10} \times \frac{21}{20} \right) = ₹ 3234.$

∴ C.I. $= ₹ (3234 - 2800) = ₹ 434.$

4. Time $= 2\frac{73}{365}$ years $= 2\frac{1}{5}$ years.

∴ Amount $= ₹ \left[20480 \times \left(1 + \frac{25}{4 \times 100} \right)^2 \left(1 + \frac{\frac{1}{5} \times \frac{25}{4}}{100} \right) \right]$

$= ₹ \left(20480 \times \frac{17}{16} \times \frac{17}{16} \times \frac{81}{80} \right) = ₹ 23409.$

∴ C.I. $= ₹ (23409 - 20480) = ₹ 2929.$

5. Amount

$= ₹ \left[200 \left(1 + \frac{5}{100} \right)^3 + 200 \left(1 + \frac{5}{100} \right)^2 + 200 \left(1 + \frac{5}{100} \right) \right]$

$= ₹ \left[200 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} + 200 \times \frac{21}{20} \times \frac{21}{20} + 200 \times \frac{21}{20} \right]$

$= ₹ \left[200 \times \frac{21}{20} \left(\frac{21}{20} \times \frac{21}{20} + \frac{21}{20} + 1 \right) \right] = ₹ 662.02.$

6. Amount $= ₹ 10000 \left[\left(1 + \frac{4}{100} \right) \left(1 + \frac{5}{100} \right) \left(1 + \frac{6}{100} \right) \right]$

$= ₹ \left(10000 \times \frac{26}{25} \times \frac{21}{20} \times \frac{53}{50} \right) = ₹ \left(\frac{57876}{5} \right) = ₹ 11575.20$

∴ C.I. $= ₹ (11575.20 - 10000) = ₹ 1575.20.$

7. $P = ₹ 10000, R = 20\%$ p.a. $= 10\%$ per half-year; $T = 2$ years $= 4$ half-years.

Amount $= ₹ \left[10000 \times \left(1 + \frac{10}{100} \right)^4 \right]$

$= ₹ \left(10000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} \right) = ₹ 14641.$

∴ C. I. $= ₹ (14641 - 10000) = ₹ 4641.$

8. Amount $= ₹ \left[1600 \times \left(1 + \frac{5}{2 \times 100} \right)^2 + 1600 \times \left(1 + \frac{5}{2 \times 100} \right) \right]$

$= ₹ \left[1600 \times \frac{41}{40} \times \frac{41}{40} + 1600 \times \frac{41}{40} \right]$

$= ₹ \left[1600 \times \frac{41}{40} \left(\frac{41}{40} + 1 \right) \right] = ₹ \left(\frac{1600 \times 41 \times 81}{40 \times 40} \right)$

$= ₹ 3321.$

∴ C.I. $= ₹ (3321 - 3200) = ₹ 121.$

9. C.I. when interest is compounded yearly

$= ₹ \left[5000 \times \left(1 + \frac{4}{100} \right) \times \left(1 + \frac{\frac{1}{2} \times 4}{100} \right) \right]$

$= ₹ \left(5000 \times \frac{26}{25} \times \frac{51}{50} \right) = ₹ 5304.$

C.I. when interest is compounded half-yearly

$= ₹ \left[5000 \times \left(1 + \frac{2}{100} \right)^3 \right] = ₹ \left(5000 \times \frac{51}{50} \times \frac{51}{50} \times \frac{51}{50} \right)$

$= ₹ 5306.04.$

∴ Difference $= ₹ (5306.04 - 5304) = ₹ 2.04.$

10. Amount = ₹ $\left[20000\left(1+\dfrac{10}{100}\right)^2\left(1+\dfrac{20}{100}\right)\right]$

= ₹ $\left(20000\times\dfrac{11}{10}\times\dfrac{11}{10}\times\dfrac{6}{5}\right)$ = ₹ 29040.

∴ C. I. = ₹ (29040 − 20000) = ₹ 9040.

11. P = ₹ 15625, n = 9 months = 3 quarters, R = 16% p.a.

= 4% per quarter.

Amount = ₹ $\left[15625\times\left(1+\dfrac{4}{100}\right)^3\right]$

= ₹ $\left(15625\times\dfrac{26}{25}\times\dfrac{26}{25}\times\dfrac{26}{25}\right)$ = ₹ 17576.

∴ C.I. = ₹ (17576 − 15625) = ₹ 1951.

12. Principal = ₹ $\left(\dfrac{100\times1000}{5\times4}\right)$ = ₹ 5000.

Now, P = ₹ 10000, T = 2 years, R = 5%.

Amount = ₹ $\left[10000\left(1+\dfrac{5}{100}\right)^2\right]$

= ₹ $\left(10000\times\dfrac{21}{20}\times\dfrac{21}{20}\right)$ = ₹ 11025.

∴ C.I. = ₹ (11025 − 10000) = ₹ 1025.

13. Rate = $\left(\dfrac{100\times7200}{20000\times3}\right)$% = 12%

Now, = ₹ 20000, R = 12%, T = 3 years.

Amount = ₹ $\left[20000\left(1+\dfrac{12}{100}\right)^3\right]$

= ₹ $\left(20000\times\dfrac{28}{25}\times\dfrac{28}{25}\times\dfrac{28}{25}\right)$

= ₹ $\left(\dfrac{702464}{25}\right)$ = ₹ 28098.56.

∴ C.I. = ₹ (28098.56 − 20000) = ₹ 8098.56.

14. S.I. = ₹ $\left(\dfrac{P\times R\times2}{100}\right)$ = ₹ $\left(\dfrac{2PR}{100}\right)$.

C.I. = ₹ $\left[P\times\left(1+\dfrac{R}{100}\right)^2 - P\right]$ = ₹ $\left[\dfrac{PR^2}{(100)^2}+\dfrac{2PR}{100}\right]$.

∴ Difference = ₹ $\left[\left\{\dfrac{PR^2}{(100)^2}+\dfrac{2PR}{100}\right\}-\dfrac{2PR}{100}\right]$ = ₹ $\left[\dfrac{PR^2}{(100)^2}\right]$.

15. S.I. = ₹ $\left(\dfrac{19200\times12\times3}{100}\right)$ = ₹ 6912.

C.I. = ₹ $\left[19200\times\left(1+\dfrac{12}{100}\right)^3 - 19200\right]$

= ₹ $\left[\left(19200\times\dfrac{28}{25}\times\dfrac{28}{25}\times\dfrac{28}{25}\right)-19200\right]$

= ₹ $\left(\dfrac{16859136}{625}-19200\right)$

= ₹ (26974.6176 − 19200) = ₹ 7774.6176.

∴ Difference = ₹ (7774.6176 − 6912) = ₹ 862.6176.

16. S.I. = ₹ $\left(15000\times\dfrac{25}{2}\times2\times\dfrac{1}{100}\right)$ = ₹ 3750.

C.I. = ₹ $\left[15000\left(1+\dfrac{25}{2\times100}\right)^2 - 15000\right]$

= ₹ $\left(15000\times\dfrac{9}{8}\times\dfrac{9}{8}-15000\right)$

= ₹ (18984.375 − 15000) = ₹ 3984.375.

∴ Difference = ₹ (3984.375 − 3750) = ₹ 234.375.

17. S.I. = ₹ $\left(\dfrac{1200\times10\times1}{100}\right)$ = ₹ 120.

C.I. = ₹ $\left[1200\times\left(1+\dfrac{5}{100}\right)^2 - 1200\right]$ = ₹ 123.

Difference = ₹ (123 − 120) = ₹ 3.

18. Amount after 1st year = ₹ $\left[4000\left(1+\dfrac{15}{100}\right)-1500\right]$

= ₹ $\left[\left(4000\times\dfrac{23}{20}\right)-1500\right]$

= ₹ (4600 − 1500) = ₹ 3100.

Amount after 2nd year = ₹ $\left[3100\left(1+\dfrac{15}{100}\right)-1500\right]$

= ₹ $\left[\left(3100\times\dfrac{23}{20}\right)-1500\right]$

= ₹ (3565 − 1500) = ₹ 2065.

Amount after 3rd year = ₹ $\left[2065\left(1+\dfrac{15}{100}\right)-1500\right]$

= ₹ $\left[\left(2065\times\dfrac{23}{20}\right)-1500\right]$

= ₹ (2374.75 − 1500) = ₹ 874.75.

19. C.I. earned during 1st year = ₹ $\left[5000\left(1+\dfrac{5}{100}\right)-5000\right]$

= ₹ (5250 − 5000) = ₹ 250.

Amount after 1st year = ₹ (5250 − 20% of 250)

= ₹ (5250 − 50) = ₹ 5200.

C.I. earned during 2nd year = ₹ $\left[5200\left(1+\dfrac{5}{100}\right)-5200\right]$

= ₹ (5460 − 5200) = ₹ 260.

Amount after 2nd year = ₹ (5460 − 20% of 260)

= ₹ (5460 − 52) = ₹ 5408.

C.I. earned during 3rd year = ₹ $\left[5408\left(1+\dfrac{5}{100}\right)-5408\right]$

= ₹ (5678.40 − 5408) = ₹ 270.40.

Amount after 3rd year = ₹ (5678.40 − 20% of 270.40)

= ₹ (5678.40 − 54.08) = ₹ 5624.32.

20. Amount = ₹ (30000 + 4347) = ₹ 34347.

Let the time be n years.

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

$\Leftrightarrow \left(\dfrac{107}{100}\right)^n = \dfrac{34347}{30000} = \dfrac{11449}{10000} = \left(\dfrac{107}{100}\right)^2.$

$\therefore n = 2$ years.

21. Let the rate be $R\%$ p.a.

Then, $26500\left(1+\dfrac{R}{100}\right)^2 = 26500 + 9775.85 = 36275.85$

$\Rightarrow \left(1+\dfrac{R}{100}\right)^2 = \dfrac{3627585}{2650000} = \dfrac{13689}{10000} = \left(\dfrac{117}{100}\right)^2$

$\Rightarrow 1+\dfrac{R}{100} = \dfrac{117}{100} \Rightarrow \dfrac{R}{100} = \dfrac{17}{100} \Rightarrow R = 17\%.$

22. Let the rate be R% p.a.

Then, $2000\left(1+\dfrac{R}{100}\right)^2 = 2226.05$

$\Rightarrow \left(1+\dfrac{R}{100}\right)^2 = \dfrac{222605}{200000} = \dfrac{44521}{40000} = \left(\dfrac{211}{200}\right)^2$

$\Rightarrow 1+\dfrac{R}{100} = \dfrac{211}{200} \Rightarrow \dfrac{R}{100} = \dfrac{11}{200} \Rightarrow R = \dfrac{11}{2}\% = 5.5\%.$

23. Let the rate be R% p.a.

Then, $4000\left(1+\dfrac{R}{100}\right) = 4320$

$\Rightarrow 1+\dfrac{R}{100} = \dfrac{4320}{4000} = \dfrac{108}{100} \Rightarrow \dfrac{R}{100} = \dfrac{8}{100} \Rightarrow R = 8.$

$\therefore$ Amount after 3 years $= ₹ \left[4000\left(1+\dfrac{8}{100}\right)^3\right]$

$= ₹ \left(4000 \times \dfrac{27}{25} \times \dfrac{27}{25} \times \dfrac{27}{25}\right) = ₹ \left(\dfrac{629856}{125}\right)$

$= ₹ 5038.848 \approx 5039.$

24. Let the rate be R% p.a. Then, $10000\left(1+\dfrac{R}{2\times100}\right)^4 = 14641$

$\Rightarrow \left(1+\dfrac{R}{200}\right)^4 = \dfrac{14641}{10000} = \left(\dfrac{11}{10}\right)^4 \Rightarrow 1+\dfrac{R}{200} = \dfrac{11}{10}$

$\Rightarrow \dfrac{R}{200} = \dfrac{1}{10} \Rightarrow R = 20\%.$

25. Principal $= ₹ \left[\dfrac{4913}{\left(1+\dfrac{25}{4\times100}\right)^3}\right]$

$= ₹ \left(4913 \times \dfrac{16}{17} \times \dfrac{16}{17} \times \dfrac{16}{17}\right) = ₹ 4096.$

26. Present worth $= ₹ \left[\dfrac{169}{\left(1+\dfrac{4}{100}\right)^2}\right]$

$= ₹ \left(169 \times \dfrac{25}{26} \times \dfrac{25}{26}\right) = ₹ 156.25.$

27. Let the sum be $₹ x$. Then,

$x\left(1+\dfrac{15}{100}\right)^3 - x = 6500.52$

$\Rightarrow x \times \dfrac{23}{20} \times \dfrac{23}{20} \times \dfrac{23}{20} - x = 6500.52$

$\Rightarrow \dfrac{12167}{8000}x - x = 6500.52$

$\Rightarrow \dfrac{4167x}{8000} = 6500.52$

$\Rightarrow x = \left(\dfrac{6500.52 \times 8000}{4167}\right) = 12480.$

28. Let the time be n years. Then,

$800 \times \left(1+\dfrac{5}{100}\right)^{2n} = 926.10$ or $\left(1+\dfrac{5}{100}\right)^{2n} = \dfrac{9261}{8000}$

or $\left(\dfrac{21}{20}\right)^{2n} = \left(\dfrac{21}{20}\right)^3$ or $2n = 3$ or $n = \dfrac{3}{2}.$

$\therefore n = 1\dfrac{1}{2}$ years.

29. Let the sum be $₹ P$. Then,

$\left[P\left(1+\dfrac{25}{2\times100}\right)^2 - P\right] = 510$

$\Rightarrow P\left[\left(\dfrac{9}{8}\right)^2 - 1\right] = 510 \Rightarrow P = \left(\dfrac{510\times64}{17}\right) = 1920.$

$\therefore$ Sum $= ₹ 1920.$

So, S.I. $= ₹ \left(\dfrac{1920\times25\times2}{2\times100}\right) = ₹ 480.$

30. Let the sum be $₹ P$.

Then, $\left[P\left(1+\dfrac{10}{100}\right)^2 - P\right] = 525$

$\Rightarrow P\left[\left(\dfrac{11}{10}\right)^2 - 1\right] = 525$

$\Rightarrow P = \left(\dfrac{525\times100}{21}\right) = 2500.$ $\therefore$ Sum $= ₹ 2500.$

So, S.I. $= ₹ \left(\dfrac{2500\times5\times4}{100}\right) = ₹ 500.$

31. C.I. $= ₹ \left[4000\times\left(1+\dfrac{10}{100}\right)^2 - 4000\right]$

$= ₹ \left(4000\times\dfrac{11}{10}\times\dfrac{11}{10} - 4000\right) = ₹ 840.$

$\therefore$ Sum $= ₹ \left(\dfrac{420\times100}{3\times8}\right) = ₹ 1750.$

32. Let $P = ₹ 100$. Then, S.I. $= ₹ 60$ and $T = 6$ years.

$\therefore R = \dfrac{100\times60}{100\times6} = 10\%$ p.a.

Now, $P = ₹ 12000$, $T = 3$ years and $R = 10\%$ p.a.

$\therefore$ C.I. $= ₹ \left[12000\times\left\{\left(1+\dfrac{10}{100}\right)^3 - 1\right\}\right] = ₹ \left(12000\times\dfrac{331}{1000}\right)$

$= ₹ 3972.$

33. Let the sum be ₹ P. Then,

$$P\left(1+\frac{8}{100}\right)^2 - P = 1414.40$$

$$\Rightarrow \left(P\times\frac{27}{25}\times\frac{27}{25}\right) - P = 1414.40$$

$$\Rightarrow \frac{729}{625}P - P = 1414.40$$

$$\Rightarrow \frac{104}{625}P = 1414.40$$

$$\Rightarrow P = \left(\frac{1414.40\times625}{104}\right) = 8500.$$

Hence, total amount = ₹ (8500 + 1414.40) = ₹ 9914.40.

34. Let the rate be ₹ R% p.a. Then,

$$25500\left(1+\frac{R}{100}\right)^3 = 25500 + 8440.50 = 33940.50$$

$$\Rightarrow \left(1+\frac{R}{100}\right)^3 = \frac{33940.50}{25500} = \frac{1331}{1000} = \left(\frac{11}{10}\right)^3$$

$$\Rightarrow 1+\frac{R}{100} = \frac{11}{10} \Rightarrow \frac{R}{100} = \frac{1}{10} \Rightarrow R = 10\%.$$

$$\therefore \text{S.I.} = ₹\left(\frac{25500\times10\times3}{100}\right) = ₹ 7650.$$

35. Let each sum be ₹ P. Then,

$$P\left(1+\frac{10}{100}\right)^2 - P = 63$$

$$\Rightarrow \left(P\times\frac{11}{10}\times\frac{11}{10}\right) - P = 63$$

$$\Rightarrow \frac{121}{100}P - P = 63$$

$$\Rightarrow \frac{21}{100}P = 63$$

$$\Rightarrow P = \left(\frac{63\times100}{21}\right) = 300.$$

Hence, C.I. = ₹ $\left[300\left(1+\frac{12}{100}\right)^2 - 300\right]$

$$= ₹\left[\left(300\times\frac{28}{25}\times\frac{28}{25}\right) - 300\right] = ₹ 76.32.$$

36. Let the rate be R% p.a. Then

$$\left[26000\times\left(1+\frac{R}{100}\right)^3 - 26000\right] - \left(\frac{26000\times R\times3}{100}\right) = 2994.134$$

$$\Rightarrow 26000\left[\left(1+\frac{R}{100}\right)^3 - 1 - \frac{3R}{100}\right] = 2994.134$$

$$\Rightarrow 26000\left[\frac{(100+R)^3 - 1000000 - 30000R}{1000000}\right] = 2994.134$$

$$\Rightarrow 26\{[1000000 + R^3 + 300R\,(100+R)\} - 1000000 - 30000R\}$$
$$= 2994134$$

$$\Rightarrow R^3 + 300R^2 = \frac{2994134}{26} = 115159$$

$$\Rightarrow R^2\,(R + 300) = 115159 \Rightarrow R = 19\%.$$

37. Let the sum be ₹ x. Then,

$$\text{C.I.} = ₹\left[x\left(1+\frac{8}{100}\right)^2 - x\right]$$

$$= ₹\left(\frac{729}{625}x - x\right) = ₹\left(\frac{104x}{625}\right).$$

$$\text{S.I.} = ₹\left(\frac{x\times8\times2}{100}\right) = ₹\left(\frac{4x}{25}\right).$$

$$\therefore \frac{104x}{625} - \frac{4x}{25} = 768$$

$$\Rightarrow \frac{4x}{625} = 768$$

$$\Rightarrow x = \left(\frac{768\times625}{4}\right) = 120000.$$

38. Difference in C.I. and S.I. for 2 years = ₹ 32.

S.I. for 1 year = ₹ 400.

$\therefore$ S.I. on ₹ 400 for one year = ₹ 32.

So, Rate = $\left(\frac{100\times32}{400\times1}\right)\% = 8\%.$

Hence, difference in C.I. and S.I. for 3rd year = S.I. on

₹ 832 = ₹ $\left(\frac{832\times8\times1}{100}\right)$ = ₹ 66.56.

Total difference = ₹ (32 + 66.56) = ₹ 98.56.

39. Let the sum be ₹ P. Then

$$P\left[\left(1+\frac{5}{100}\right)^4 - 1\right] - \frac{P\times10\times2}{100} = 124.05$$

$$\Rightarrow P\left[\left(\frac{21}{20}\right)^4 - 1 - \frac{1}{5}\right] = 124.05$$

$$\Rightarrow P\left[\frac{194481}{160000} - \frac{6}{5}\right] = \frac{12405}{100}$$

$$\Rightarrow P\left[\frac{194481 - 192000}{160000}\right] = \frac{12405}{100}$$

$$\Rightarrow P = \left(\frac{12405}{100}\times\frac{160000}{2481}\right) = 8000.$$

40. For first year, S.I. = C.I.

Now, ₹ 16 is the S.I. on S.I. for 1 year.

₹ 10 is S.I. on ₹ 100.

$\therefore$ ₹ 16 is S.I. on ₹ $\left(\frac{100}{10}\times16\right)$ = ₹ 160.

So, S.I. on principal for 1 year at 10% is ₹ 160.

$\therefore$ Principal = ₹ $\left(\frac{100\times160}{10\times1}\right)$ = ₹ 1600.

Amount for 2 years compounded half yearly

$$= ₹\left[1600\times\left(1+\frac{5}{100}\right)^4\right] = ₹ 1944.81.$$

$\therefore$ C.I. = ₹ (1944.81 − 1600) = ₹ 344.81.

S.I. = ₹ $\left(\frac{1600\times10\times2}{100}\right)$ = ₹ 320.

$\therefore$ (C.I.) − (S.I.) = ₹ (344.81 − 320) = ₹ 24.81.

41. Let the sum be ₹ x. Then

C.I. when compounded half-yearly = ₹ $\left[x \times \left(1 + \dfrac{3}{100}\right)^2 - x \right]$

$= ₹ \left(\dfrac{10609}{10000} x - x \right) = ₹ \left(\dfrac{609x}{10000} \right)$.

C.I. when compounded yearly = ₹ $\left[x\left(1 + \dfrac{4}{100}\right) - x \right]$

$= ₹ \left(\dfrac{26x}{25} - x \right) = ₹ \left(\dfrac{x}{25} \right)$.

$\therefore \dfrac{609x}{10000} - \dfrac{x}{25} = 104.50$

$\Rightarrow \dfrac{209x}{10000} = 104.50$

$\Rightarrow x = \left(\dfrac{104.50 \times 10000}{209} \right) = 5000.$

42. Let the sum be ₹ x. Then,

C.I. when compounded half-yearly

$= \left[x \times \left(1 + \dfrac{10}{100}\right)^4 - x \right] = \dfrac{4641}{10000} x.$

C.I. when compounded annually

$= \left[x \times \left(1 + \dfrac{20}{100}\right)^2 - x \right] = \dfrac{11}{25} x.$

$\therefore \dfrac{4641}{10000} x - \dfrac{11}{25} x = 482$

or $x = \dfrac{482 \times 10000}{241} = 20000.$

43. Difference in C.I. and S.I. for 2 years
$= ₹ (696.30 - 660) = ₹ 36.30.$
S.I. for one year = ₹ 330.
$\therefore$ S.I. on ₹ 330 for 1 year = ₹ 36.30.
$\therefore$ Rate $= \left(\dfrac{100 \times 36.30}{330 \times 1} \right) \% = 11\%.$

44. Amount of ₹ 100 for 1 year when compounded half-

yearly = ₹ $\left[100 \times \left(1 + \dfrac{3}{100}\right)^2 \right] = ₹ 106.09.$

$\therefore$ Effective rate = $(106.09 - 100)\% = 6.09\%.$

45. Let the principal be ₹ P and the rate of interest be $R\%$ per annum.
Difference of C.I. and S.I. for 2 years

$= \left[P \times \left(1 + \dfrac{R}{100}\right)^2 - P \right] - \left(\dfrac{P \times R \times 2}{100} \right) = \dfrac{PR^2}{10^4}.$

Difference of C.I. and S.I. for 3 years

$= \left[P \times \left(1 + \dfrac{R}{100}\right)^3 - P \right] - \left(\dfrac{P \times R \times 3}{100} \right)$

$= \dfrac{PR^2}{10^4} \left(\dfrac{300 + R}{100} \right).$

$\therefore \dfrac{\dfrac{PR^2}{10^4} \left(\dfrac{300 + R}{100} \right)}{\dfrac{PR^2}{10^4}} = \dfrac{25}{8}$

$\Rightarrow \left(\dfrac{300 + R}{100} \right) = \dfrac{25}{8}$

$\Rightarrow R = \dfrac{100}{8} = 12\dfrac{1}{2}\%.$

46. Let the shares of the younger and elder sons be ₹ x and ₹ $(16400 - x)$.
Then, Amount of ₹ x after 3 years = Amount of ₹ $(16400 - x)$ after 2 years

$\Rightarrow x\left(1 + \dfrac{5}{100}\right)^3 = (16400 - x) \left(1 + \dfrac{5}{100}\right)^2$

$\Rightarrow x\left(1 + \dfrac{5}{100}\right) = (16400 - x)$

$\Rightarrow \dfrac{21x}{20} + x = 16400$

$\Rightarrow \dfrac{41x}{20} = 16400$

$\Rightarrow x = \left(\dfrac{16400 \times 20}{41} \right) = 8000.$

47. Let A's share = ₹ x and B's share = ₹ $(8840 - x)$.

$\therefore x \left(1 + \dfrac{10}{100}\right)^8 = (8840 - x) \left(1 + \dfrac{10}{100}\right)^{10}$

$\Rightarrow x = (8840 - x) \left(1 + \dfrac{10}{100}\right)^2$

$\Rightarrow x = \dfrac{121}{100} (8840 - x)$

$\Rightarrow 221x = 121 \times 8840$

$\Rightarrow x = \left(\dfrac{121 \times 8840}{221} \right) = 4840.$

Hence, the two parts are ₹ 4840 and ₹ 4000.

48. Let the investment in scheme A be ₹ x.
Then, investment in scheme B = ₹ $(27000 - x)$.

$\therefore \left[x \times \left\{ \left(1 + \dfrac{8}{100}\right)^2 - 1 \right\} + (27000 - x) \left\{ \left(1 + \dfrac{9}{100}\right)^2 - 1 \right\} \right]$

$= 4818.30$

$\Leftrightarrow \left(x \times \dfrac{104}{625} \right) + \dfrac{1881(27000 - x)}{10000} = \dfrac{481830}{100}$

$\Leftrightarrow 1664x + 1881 (27000 - x) = 48183000$

$\Leftrightarrow (1881x - 1664x) = (50787000 - 48183000)$

$\Leftrightarrow 217x = 2604000$

$\Leftrightarrow x = \dfrac{2604000}{217} = 12000.$

49. S.I. on ₹ 672 for 1 year
$= ₹ (714 - 672) = ₹ 42.$
$\therefore$ Rate $= \left(\dfrac{100 \times 42}{672 \times 1} \right) \% = 6.25\%.$

50. S.I. on ₹ 4624 for 1 year = ₹ (4913 − 4624) = ₹ 289.

$$\therefore \text{ Rate} = \left(\frac{100 \times 289}{4624 \times 1}\right)\% = 6\frac{1}{4}\%.$$

Now, $x\left(1 + \frac{25}{4 \times 100}\right)^2 = 4624$ or $x \times \frac{17}{16} \times \frac{17}{16} = 4624$

or $x = \left(4624 \times \frac{16}{17} \times \frac{16}{17}\right) = ₹ 4096.$

51. $12000 \times \left(1 + \frac{R}{100}\right)^5 = 24000 \Rightarrow \left(1 + \frac{R}{100}\right)^5 = 2$

$$\therefore \left[\left(1 + \frac{R}{100}\right)^5\right]^4 = 2^4 = 16$$

$$\Rightarrow \left(1 + \frac{R}{100}\right)^{20} = 16$$

$$\Rightarrow P\left(1 + \frac{R}{100}\right)^{20} = 16P$$

$$\Rightarrow 12000\left(1 + \frac{R}{100}\right)^{20} = 16 \times 12000 = 192000.$$

52. $P\left(1 + \frac{R}{100}\right)^{15} = 2P \Rightarrow \left(1 + \frac{R}{100}\right)^{15} = 2$ ...(i)

Let $P\left(1 + \frac{R}{100}\right)^n = 8P$

$$\Rightarrow \left(1 + \frac{R}{100}\right)^n = 8 = 2^3 = \left\{\left(1 + \frac{R}{100}\right)^{15}\right\}^3$$

$$\Rightarrow \left(1 + \frac{R}{100}\right)^n = \left(1 + \frac{R}{100}\right)^{45} \Rightarrow n = 45.$$

∴ Required time = 45 years.

53. $P\left(1 + \frac{R}{100}\right)^3 = 8P \Rightarrow \left(1 + \frac{R}{100}\right)^3 = 8$.

Let $P\left(1 + \frac{R}{100}\right)^n = 16P \Rightarrow \left(1 + \frac{R}{100}\right)^n = 16 = 2^4 = (2^3)^{4/3}$

$$\Rightarrow \left(1 + \frac{R}{100}\right)^n = (8)^{4/3} = \left\{\left(1 + \frac{R}{100}\right)^3\right\}^{4/3} = \left(1 + \frac{R}{100}\right)^4.$$

$\Rightarrow n = 4.$

∴ Required time = 4 years.

54. $P\left(1 + \frac{R}{100}\right)^5 = 150\%$ of $P = \frac{3}{2}P \Rightarrow \left(1 + \frac{R}{100}\right)^5 = \frac{3}{2}$.

$$x\left(1 + \frac{R}{100}\right)^{10} = y\left(1 + \frac{R}{100}\right)^{15} = z\left(1 + \frac{R}{100}\right)^{20}$$

$$\Rightarrow x\left\{\left(1 + \frac{R}{100}\right)^5\right\}^2 = y\left\{\left(1 + \frac{R}{100}\right)^5\right\}^3 = z\left\{\left(1 + \frac{R}{100}\right)^5\right\}^4$$

$$\Rightarrow x \times \left(\frac{3}{2}\right)^2 = y \times \left(\frac{3}{2}\right)^3 = z \times \left(\frac{3}{2}\right)^4$$

$$\Rightarrow \frac{9x}{4} = \frac{27y}{8} = \frac{81z}{16} = k \text{ (say)}$$

$$\Rightarrow x = \frac{4k}{9}, \ y = \frac{8k}{27}, \ z = \frac{16k}{81}$$

$$\Rightarrow x : y : z = \frac{4k}{9} : \frac{8k}{27} : \frac{16k}{81}$$

$$= 36 : 24 : 16 = 9 : 6 : 4.$$

55. $P\left(1 + \frac{20}{100}\right)^n > 2P$ or $\left(\frac{6}{5}\right)^n > 2.$

Now, $\left(\frac{6}{5} \times \frac{6}{5} \times \frac{6}{5} \times \frac{6}{5}\right) > 2.$ So, $n = 4$ years.

56. Let the value of each instalment be ₹ x. Then,
(P.W. of ₹ x due 1 year hence)
+ (P.W. of ₹ x due 2 years hence) = ₹ 2550

$$\Leftrightarrow \frac{x}{\left(1 + \frac{4}{100}\right)} + \frac{x}{\left(1 + \frac{4}{100}\right)^2} = 2550$$

$$\Leftrightarrow \frac{25x}{26} + \frac{625x}{676} = 2550$$

$$\Leftrightarrow 1275x = 2550 \times 676$$

$$\Leftrightarrow x = \left(\frac{2550 \times 676}{1275}\right) = 1352.$$

∴ Value of each instalment = ₹ 1352.

57. Let the value of each instalment be ₹ x. Then,
(P.W. of ₹ x due 1 year hence) + (P.W. of ₹ x due 2 years hence) + (P.W. of ₹ x due 3 years hence) = ₹ 126100

$$\Rightarrow \frac{x}{\left(1 + \frac{5}{100}\right)} + \frac{x}{\left(1 + \frac{5}{100}\right)^2} + \frac{x}{\left(1 + \frac{5}{100}\right)^3} = 126100$$

$$\Rightarrow \frac{20x}{21} + \frac{400x}{441} + \frac{8000x}{9261} = 126100$$

$$\Rightarrow \frac{8820x + 8400x + 8000x}{9261} = 126100$$

$$\Rightarrow \frac{25220x}{9261} = 126100 \Rightarrow x = \left(\frac{126100 \times 9261}{25220}\right) = 46305.$$

58. Total cost of taperecorder = ₹ 3500.
Down payment = ₹ 1000.
Balance = ₹ (3500 − 1000) = ₹ 2500.
Let the value of each instalment be ₹ x.
P.W. of ₹ x due 1 year hence + P.W. of ₹ x due 2 years hence + P.W. of ₹ x due 3 years hence = 2500

$$\Rightarrow \frac{x}{\left(1 + \frac{25}{2 \times 100}\right)} + \frac{x}{\left(1 + \frac{25}{2 \times 100}\right)^2} + \frac{x}{\left(1 + \frac{25}{2 \times 100}\right)^3} = 2500$$

$$\Rightarrow \frac{8x}{9} + \frac{64x}{81} + \frac{512x}{729} = 2500 \Rightarrow \frac{1736x}{729} = 2500$$

$$\Rightarrow x = \frac{2500 \times 729}{1736} = 1049.83 \approx 1049.85.$$

59. Total cost of the flat = ₹ 55000.
Down payment = ₹ 4275.

Balance = ₹ (55000 − 4275) = ₹ 50725.

Rate of interest = 8% per half-year.

Let the value of each instalment be ₹ x.

P.W. of ₹ x due 6 months hence + P.W. of ₹ x due 1 year hence + P.W. of ₹ x due $1\frac{1}{2}$ years hence = 50725

$$\Rightarrow \frac{x}{\left(1+\frac{8}{100}\right)} + \frac{x}{\left(1+\frac{8}{100}\right)^2} + \frac{x}{\left(1+\frac{8}{100}\right)^3} = 50725$$

$$\Rightarrow \frac{25x}{27} + \frac{625x}{729} + \frac{15625x}{19683} = 50725$$

$$\Rightarrow \frac{50725x}{19683} = 50725$$

$$\Rightarrow x = \left(\frac{50725 \times 19683}{50725}\right) = 19683.$$

60. Let each instalment be ₹ x. Then,

$$\frac{x}{\left(1+\frac{5}{100}\right)} + \frac{x}{\left(1+\frac{5}{100}\right)^2} = 1025$$

$$\Leftrightarrow \frac{20x}{21} + \frac{400x}{441} = 1025$$

$$\Leftrightarrow 820x = 1025 \times 441$$

$$\Leftrightarrow x = \left(\frac{1025 \times 441}{820}\right) = 551.25.$$

So, value of each instalment = ₹ 551.25.

61. Balance

$$= ₹ \left[\left\{12500 \times \left(1+\frac{20}{100}\right)^3\right\} - \left\{\begin{array}{c}2000 \times \left(1+\frac{20}{100}\right)^2 \\ + 2000 \times \left(1+\frac{20}{100}\right) + 2000\end{array}\right\}\right]$$

$$= ₹ \left[\left(12500 \times \frac{6}{5} \times \frac{6}{5} \times \frac{6}{5}\right) - \left(\begin{array}{c}2000 \times \frac{6}{5} \times \frac{6}{5} \\ + 2000 \times \frac{6}{5} + 2000\end{array}\right)\right]$$

$$= ₹ [21600 − (2880 + 2400 + 2000)] = ₹ 14320.$$

62. Principal

= (P.W. of ₹ 882 due 1 year hence)

+ (P.W. of ₹ 882 due 2 years hence)

$$= \left[\frac{882}{\left(1+\frac{5}{100}\right)} + \frac{882}{\left(1+\frac{5}{100}\right)^2}\right]$$

$$= \left(\frac{882 \times 20}{21} + \frac{882 \times 400}{441}\right) = ₹ 1640.$$

63. Rate of interest = 18%

Time = 2 years

When the interest is payable half yearly.

Then, rate of interest = 9% per half annum.

Time = 4 half years.

Let the principal be ₹ x

$$\therefore \text{C.I.} = x\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$= x\left[\left(1+\frac{9}{100}\right)^4 - 1\right]$$

$$= x\left[\left(\frac{109}{100}\right)^4 - 1\right]$$

$$= x[1.4116 − 1] = ₹ 0.4116x$$

According to the question.

$$= x\left[\left(1+\frac{18}{100}\right)^2 - 1\right]$$

$$= x\left[\left(\frac{118}{100}\right)^2 - 1\right]$$

$$= x\left[(1.18)^2 - 1\right]$$

$$= x (1.3924 − 1) = ₹ 0.3924\, x$$

According to the question.

$$0.4116x − 0.3924x = 960$$

$$\Rightarrow 0.0192x = 960$$

$$\Rightarrow x = \frac{960}{0.0192}$$

$$x = \frac{960 \times 10000}{192} = ₹ 50,000$$

Hence, sum of money = ₹ 50,000

64. Time = 2 years

Rate of interest = 5% per annum

According to question,

$$P\left[\left(1+\frac{r}{100}\right)^n - 1\right] - \frac{P \times r \times t}{100} = 63$$

$$P\left[\left(1+\frac{5}{100}\right)^2 - 1\right] - \frac{P \times 5 \times 2}{100} = 63$$

$$\Rightarrow P\left[\left(1+\frac{5}{100}\right)^2 - 1\right] - \frac{10P}{100} = 63$$

$$\Rightarrow P\left[\left(\frac{105}{100}\right)^2 - 1\right] - \frac{10P}{100} = 63$$

$$\Rightarrow P\left(\frac{11025 - 10000}{10000}\right) - \frac{10P}{100} = 63$$

$$\Rightarrow \frac{1025P}{10000} - \frac{10P}{100} = 63$$

$$\Rightarrow \frac{1025P - 1000P}{10000} = 63$$

$$\Rightarrow 25P = ₹ 630000$$

$$\Rightarrow P = \frac{630000}{25} = ₹ 25200$$

Hence, sum = ₹ 25200

65. Given amount = ₹ 1348.32

Principal = ₹ 1200

And time = 2 years

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

$$\Rightarrow 1348.32 = 1200\left(1+\frac{R}{100}\right)^2$$

$$\Rightarrow \frac{1348.32}{1200} = \left(1+\frac{R}{100}\right)^2$$

$$\Rightarrow \frac{134832}{120000} = \left(1+\frac{R}{100}\right)^2$$

$$\Rightarrow \frac{11236}{10000} = \left(1+\frac{R}{100}\right)^2$$

$$\Rightarrow \left(\frac{106}{100}\right)^2 = \left(1+\frac{R}{100}\right)^2$$

$$\Rightarrow 1+\frac{6}{100} = 1+\frac{R}{100}$$

$$\Rightarrow R = 6\% \text{ per annum.}$$

66. Let the sum of money be ₹ P

$$\text{Then } \left[P\left(1+\frac{R}{100}\right)^t - P\right] = CI$$

$$\left[P\left(1+\frac{10}{100}\right)^2 - P\right] = 525$$

$$\Rightarrow \left(\frac{11}{10}\right)^2 - 1 = 525$$

$$\Rightarrow P\left(\frac{121}{100}-1\right) = 525$$

$$\Rightarrow P\left(\frac{21}{100} = 525\right)$$

$$\Rightarrow P = \left(\frac{525\times100}{21}\right) = ₹ 2500$$

∴ Sum of money = ₹ 2500.

Simple interest on the same sum ₹ 2500 for 4 (double the time) years at 5% (half the rate of percent per annum) is

So, S.I. = ₹ $\left(\frac{2500\times5\times4}{100}\right)$ = ₹ 500

67. Let the total sum of money invested by Shashi be ₹ x.
In scheme A money invested at simple interest for 6 years at a rate of 12% p.a.

∴ $\frac{2}{3}$ of $x \times \frac{12\times6}{100} = \frac{48x}{100}$ ...(i)

In scheme B money invested at compound interest for

2 years at a rate of 10% p.a. $\frac{x}{3}\left(1+\frac{10}{100}\right)^2 - \frac{x}{3}$

$$\Rightarrow \frac{x}{3}\left(1+\frac{10}{100}\right)^2 - \frac{x}{3} = \frac{7x}{100}$$

According to given information we get

$$\Rightarrow \frac{48x}{100} + \frac{7x}{100} = 2750$$

$$55x = 2750\times100$$

$$x = \frac{2750\times100}{55}$$

$$x = ₹ 5000$$

68. Rate of interest = 5% p.c.p.a.

If time 3 years then CI − SI = $P\left[\left(\frac{R}{100}\right)^3 + 3\left(\frac{R}{100}\right)^2\right]$

$$\Rightarrow 122 = P\left[\left(\frac{5}{100}\right)^3 + 3\left(\frac{5}{100}\right)^2\right]$$

$$\Rightarrow 122 = P\left(\frac{125}{1000000} + \frac{75}{10000}\right)$$

$$\Rightarrow 122 = P\left[\frac{125+7500}{1000000}\right]$$

$$\Rightarrow 122 = P\left[\frac{7525}{1000000}\right]$$

$$\Rightarrow P = \frac{122\times1000000}{7625}$$

$$= ₹ 16000$$

69. Interest compounded half yearly = $5000\left(1+\frac{2}{100}\right)^2$

$$= 5000\left(\frac{102}{100}\right)^2$$

$$= 5000(1.02)^2 \text{ .....(i)}$$

As we know A = $P\left(1+\frac{R}{100}\right)^t$

Interest compounded yearly = $5000\left(1+\frac{4}{100}\right)^1$

$$= 5000\left(\frac{104}{100}\right) = 5000(1.04) \text{ ....(ii)}$$

From (i) and (ii)

Required difference = $5000(1.02)^2 - 5000(1.04)^1$

$$= 5000(1.0404) - 5000(1.04)$$

$$= 5202 - 5200 = ₹ 2$$

EXERCISE

(DATA SUFFICIENCY TYPE QUESTIONS)

1. The difference between the compound interest and the simple interest earned on a sum of money at the end of 4 years is ₹ 256.40. To find out the sum, which of the following informations given in the statements P and Q is/are necessary?

P : Amount of simple interest accrued after 4 years.

Q : Rate of interest per annum.

(a) Only P is necessary

(b) Only Q is necessary

(c) Either P or Q is necessary

(d) Neither P nor Q is necessary

(e) Both P and Q are necessary

Directions (*Questions 2 to 15*): *Each of the questions given below consists of a statement and/or a question and two statements numbered I and II given below it. You have to decide whether the data provided in the statement(s) is/are sufficient to answer the given question. Read both the statements and:*

*Give answer (**a**) if the data in Statement I alone are sufficient to answer the question, while the data in Statement II alone are not sufficient to answer the question;*

*Give answer (**b**) if the data in Statement II alone are sufficient to answer the question, while the data in Statement I alone are not sufficient to answer the question;*

*Give answer (**c**) if the data either in Statement I or in Statement II alone are sufficient to answer the question;*

*Give answer (**d**) if the data even in both Statements I and II together are not sufficient to answer the question;*

*Give answer (**e**) if the data in both Statements I and II together are necessary to answer the question.*

2. What is the rate of compound interest?

    (Bank P.O., 2003)

    I. The principal was invested for 4 years.
    II. The earned interest was ₹ 1491.

3. What will be the compounded amount?
    I. ₹ 200 were borrowed for 192 months at 6% compounded annually.
    II. ₹ 200 were borrowed for 16 years at 6%.

4. What is the compound interest earned by Robert at the end of 2 years?
    I. Simple interest at the same rate for one year is ₹ 1020 and the rate of interest is 12 p.c.p.a.
    II. The amount invested is ₹ 8500.

5. What is the rate of compound interest on a sum of money? (Bank P.O., 2009)
    I. The total simple interest at the same rate on ₹ 6000 at the end of 3 years is ₹ 1800.
    II. The total compound interest on ₹ 6000 at the end of 2 years is ₹ 1260.

6. What is the total compound interest accrued on a sum of money after 5 years ?
    I. The sum was ₹ 20,000.
    II. The total amount of simple interest on the sum after 5 years was ₹ 4000.

7. What was the total compound interest on a sum after 3 years?
    I. The interest after one year was ₹ 100 and the sum was ₹ 1000.
    II. The difference between simple and compound interest on a sum of ₹ 1000 at the end of 2 years was ₹ 10.

8. What will be the compound interest after 3 years?

    I. Rate of interest is 5 percent.
    II. The difference between the total simple interest and the total compound interest after 2 years is ₹ 20.

9. What is the rate of interest? (Bank Recruitment, 2007)
    I. Simple interest accrued on an amount of ₹ 25000 in 2 years is less than the compound interest for the same period by ₹ 250.
    II. Simple interest accrued in 10 years is equal to the principal.

10. An amount of money was lent for 3 years. What will be the difference between the simple and the compound interest earned on it at the same rate?
    I. The rate of interest was 8 p.c.p.a.
    II. The total amount of simple interest was ₹ 1200.

11. What is the rate of interest p.c.p.a.? (Bank P.O. 2004)
    I. Difference between compound interest and the simple interest accrued on an amount of ₹ 15000 in 3 years is ₹ 673.92.
    II. In 2 years, an amount of ₹ 6500 fetches simple interest of ₹ 1560.

12. What is the rate of interest p.c.p.a.? (Bank P.O., 2005)
    I. The amount doubles itself on simple interest in 10 years.
    II. Compound interest on any amount in 2 years is more than the simple interest in 2 years by an amount equal to 1% of the principal amount.

13. What was the rate of interest on a sum of money?
    I. The sum fetched a total of ₹ 2522 as compound interest at the end of 3 years.
    II. The difference between the simple interest and the compound interest at the end of 2 years at the same rate was ₹ 40.

14. What is the total compound interest accrued on a sum of money after 10 years? (Bank P.O., 2010)
    I. The difference between the simple and compound interest at the end of 2 years was ₹ 200.
    II. The total amount of simple interest at the same rate at the end of 10 years was ₹ 20000.

15. What is the rate of compound interest on a sum of money? (M.A.T., 2006)
    I. The difference between C.I. and S.I. at the same rate of interest for two years is ₹ 43.20 and S.I. at the end of five years is ₹ 3600.
    II. The difference between C.I. and S.I. at the same rate of interest on ₹ 12000 for 3 years is ₹ 132.192.

Directions (*Questions 16 to 22*): *Each of the questions given below consists of a question followed by three statements. You have to study the question and the statements and decide which of the statement(s) is/are necessary to answer the question.*

16. What is the rate of interest p.c.p.a.? **(Bank P.O., 2006)**

I. Simple interest earned per annum is ₹ 5300.

II. The difference between the compound and simple interest on an amount is ₹ 1060 at the end of 2 years.

III. An amount doubles itself in 5 years with simple interest.

(*a*) All of these   (*b*) Only III

(*c*) Either II or III   (*d*) Only III or I and II

(*e*) Question cannot be answered even with the information

17. What is the rate of interest p.c.p.a.? **(Bank P.O. 2005)**

I. Difference between compound inteest and simple interest for 2 years is ₹ 100.

II. The amount doubles itself in 10 years on simple interest.

III. The amount invested is ₹ 10000.

(*a*) Only I and II   (*b*) Only I and III

(*c*) Only III and either I or II

(*d*) Either only II or only I and III

(*e*) None of these

18. What is the rate of interest p.c.p.a.? **(Bank P.O. 2009)**

I. I.An amount doubles itself at simple interest in 10 years.

II. Difference between the compound interest and simple interest on an amount of ₹ 15000 in 2 years is ₹ 150.

III. The compound interest accrued in 8 years is more than the principal.

(*a*) Only I   (*b*) Only II

(*c*) Only either I or II   (*d*) Only II and III

(*e*) Only I and III

19. A sum of money is put at compound interest. What is the rate of interest?

I. The sum amounts to ₹ 5290 in 2 years.

II. The sum amounts to ₹ 6083.50 in 3 years.

III. The sum is ₹ 4000.

(*a*) I and II only   (*b*) II and III only

(*c*) I and III only

(*d*) Any two of the three

(*e*) I and III only, or II and III only

20. What will be the compound interest earned on an amount of ₹ 5000 in 2 years?

I. The simple interest on the same amount at the same rate of interest in 5 years is ₹ 2000.

II. The compound interest and the simple interest earned in one year is the same.

III. The amount becomes more than double on compound interest in 10 years.

(*a*) I only   (*b*) I and II only

(*c*) II and III only   (*d*) I and III only

(*e*) None of these

21. What will be the difference between the total simple interest and the total compound interest at the end of 8 years on a certain sum at the same rate of interest?

I. The total simple interest on the same sum at the end of 3 years is ₹ 750.

II. The total compound interest on the same sum at the end of 2 years is ₹ 512.50.

III. The rate of interest is 5 p.c.p.a.

(*a*) I and II only   (*b*) II and III only

(*c*) Any two of I, II and III

(*d*) All I, II and III are required

(*e*) None of these

22. A sum of money is placed at compound interest. In how many years will it amount to sixteen times of itself?

I. The sum doubles itself in 4 years.

II. The sum amounts to eight times of itself in 12 years.

III. The sum amounts to four times of itself in 8 years.

(*a*) I only   (*b*) I and II only

(*c*) II and III only   (*d*) I and III only

(*e*) Any one of the three

Directions (*Questions 23 to 27*) : *In each of the following questions, a question is asked and is followed by three statements. While answering the question, you may or may not require the data provided in all the statements. You have to read the question and the three statements and then decide whether the question can be answered with any one or two of the statements or all the three statements are required to answer the question. The answer number bearing the statements, which can be dispensed with, if any, while answering the question is your answer.*

23. What would be the difference between the simple interest and the compound interest on a sum of money at the end of four years ?

I. The rate of interest is 5 p.c.p.a.

II. The sum fetches a total of ₹ 2000 as simple interest at the end of 8 years.

III. The difference between the simple interest and the compound interest at the end of 2 years is ₹ 12.50.

(*a*) II only   (*b*) III only

(c) II or III only

(d) All I, II and III are required

(e) None of these

24. Mr. Gupta borrowed a sum of money on compound interest. What will be the amount to be repaid if he is repaying the entire amount at the end of 2 years?

   I. The rate of interest is 5% p.a.

   II. Simple interest fetched on the same amount in one year is ₹ 600.

   III. The amount borrowed is 10 times the simple interest in 2 years.

   (a) I only   (b) III only

   (c) I or II only   (d) I or III only

   (e) All I, II and III are required

25. What is the total compound interest earned at the end of 3 years?

   I. Simple interest earned on that amount at the same rate and for the same period is ₹ 4500.

   II. The rate of interest is 10 p.c.p.a.

   III. Compound interest for 3 years is more than the simple interest for that period by ₹ 465.

   (a) I and II only   (b) II and III only

(c) I and III only   (d) Either II or III only

(e) Any two of the three

26. What is the rate of interest per annum?

   I. The amount becomes ₹ 11,025 with compound interest after 2 years.

   II. The same amount with simple interest becomes ₹ 11,000 after 2 years.

   III. The amount invested is ₹ 10,000.

   (a) I or II only   (b) II or III only

   (c) I or III only   (d) I or II or III only

   (e) All I, II and III are required

27. The difference between the compound interest and the simple interest at the same rate on a certain amount at the end of 2 years is ₹ 12.50. What is the rate of interest?

   I. Simple interest for 2 years is ₹ 500.

   II. Compound interest for 2 years is ₹ 512.50.

   III. Amount on simple interest after 2 years becomes ₹ 5500.

   (a) I or II only   (b) III only

   (c) I or III only

   (d) Any two of I, II and III

   (e) Any two of I, II and III

ANSWERS

1. (b)	**2.** (d)	**3.** (c)	**4.** (a)	**5.** (c)	**6.** (e)	**7.** (c)	**8.** (e)	**9.** (c)	**10.** (e)
11. (c)	**12.** (c)	**13.** (e)	**14.** (e)	**15.** (c)	**16.** (d)	**17.** (d)	**18.** (c)	**19.** (d)	**20.** (a)
21. (c)	**22.** (e)	**23.** (c)	**24.** (d)	**25.** (d)	**26.** (d)	**27.** (d)			

SOLUTIONS

1. To find the sum, difference between C.I. and S.I., the time and the rate of interest are needed.

∴ Only Q is necessary. So correct answer is (b).

2. Let Principal = ₹ P and Rate = R% p.a. Then,

$$\text{C.I.} = P\left[\left(1+\frac{R}{100}\right)^4 - 1\right] \Rightarrow P\left[\left(1+\frac{R}{100}\right)^4 - 1\right] = 1491.$$

Clearly, it does not give the answer.

∴ Correct answer is (d).

3. Clearly, 192 months ≡ 16 years. So, both I and II provide the same information.

From each one of I and II, we have:

$$\text{Amount} = ₹\left[200 \times \left(1+\frac{6}{100}\right)^{16}\right].$$

Thus, I alone or II alone gives the answer.

∴ Correct answer is (c).

4. I. S.I. = ₹ 1020, R = 12% p.a. and T = 1 year.

$$\therefore P = \frac{100 \times S.I.}{R \times T}$$

$$\Rightarrow P = ₹\left(\frac{100 \times 1020}{12 \times 1}\right) = ₹\,8500.$$

∴ C.I. for 2 years = $₹\left[8500 \times \left\{\left(1+\frac{12}{100}\right)^2 - 1\right\}\right]$.

= ₹ 2162.40.

So, I alone gives the answer.

II. gives : only P and T.

∴ II alone does not give the answer.

∴ Correct answer is (a).

5. I. P = ₹ 6000, T = 3 yrs, S.I. = ₹ 1800.

∴ Rate = $\left(\frac{100 \times 1800}{6000 \times 3}\right)$% = 10%.

II. P = ₹ 6000, T = 2 yrs, C.I. = ₹ 1260.

$$6000\left(1+\frac{R}{100}\right)^2 = 6000 + 1260 = 7260$$

$$\Rightarrow \left(1+\frac{R}{100}\right)^2 = \frac{7260}{6000} = \frac{121}{100} = \left(\frac{11}{10}\right)^2 \Rightarrow 1+\frac{R}{100} = \frac{11}{10}$$

$$\Rightarrow \frac{R}{100} = \frac{1}{10} \Rightarrow R = 10\%.$$

Thus, either I alone or II alone gives the answer.

∴ Correct answer is (*c*).

6. Given : Time = 5 years.

   I. gives : Sum = ₹ 20000.

   II. gives : S.I. = ₹ 4000.

     Let the rate be R% p.a. Then,

$$R = \frac{100 \times S.I.}{P \times T} = \left(\frac{100 \times 4000}{5 \times 20000}\right) = 4\% \text{ p.a.}$$

∴ C.I. = ₹ $\left[20000 \times \left\{\left(1 + \frac{4}{100}\right)^5 - 1\right\}\right]$

∴ Both I and II are needed to get the answer.

   So, the correct answer is (*e*).

7. I. gives : P = ₹ 1000 and S.I. for 1 year = ₹ 100.

∴ Rate = $\frac{100 \times S.I.}{P \times T} = \left(\frac{100 \times 100}{1000 \times 1}\right) = 10\%$ p.a.

   Thus, P = ₹ 1000, T = 3 years and R = 10% p.a.

∴ C.I. may be obtained.

   II. Sum = ₹ 1000, [(C.I.) – (S.I.)] for 2 years = ₹ 10.

     Let the rate be R% p.a.

$$1000 \times \left[\left(1 + \frac{R}{100}\right)^2 - 1\right] - \left(\frac{1000 \times R \times 2}{100}\right) = 10.$$

   From this, we can find R.

   Thus P, T and R are given and therefore,

   C.I. may be calculated.

   Thus, I alone as well as II alone is sufficient to get the answer.

∴ Correct answer is (*c*).

8. I. R = 5%

   II. Let the sum be ₹ P. Then,

$$\left[P\left(1 + \frac{R}{100}\right)^2 - P\right] - \left(\frac{P \times R \times 2}{100}\right) = 20$$

⇒ $P + \frac{PR^2}{10000} + \frac{2PR}{100} - P - \frac{2PR}{100} = 20$

⇒ $\frac{PR^2}{10000} = 20 \Rightarrow P = \frac{20 \times 10000}{R^2} = \frac{20 \times 10000}{25} = 8000.$

∴ C.I. = ₹ $\left[8000\left(1 + \frac{5}{100}\right)^3 - 8000\right]$ = ₹ 1261.

   Thus, both I and II are required to get the answer.

∴ Correct answer is (*e*).

9. I. Let rate = R% p.a.

Then, $\left[25000\left(1 + \frac{R}{100}\right)^2 - 25000\right] - \left(\frac{25000 \times R \times 2}{100}\right) = 250$

⇒ $\frac{25000 \times R^2}{10000}$ = 250 ⇒ R^2 = 100 ⇒ R = 10%.

   II. Let Principal = ₹ P. Then, S.I. = ₹ P.

∴ Rate = $\left(\frac{100 \times P}{P \times 10}\right)\%$ = 10%.

Thus, I alone as well as II alone is sufficient to get the answer.

∴ Correct answer is (*c*).

10. Given : T = 3 years.

   I. gives : R = 8% p.a.

   II. gives : S.I. = ₹ 1200.

     Thus, P = ₹ 5000, R = 8% p.a. and T = 3 years.

∴ Difference between C.I. and S.I. may be obtained.

   So, the correct answer is (*e*).

11. I. C.I. – S.I. = ₹ 673.92

⇒ $\left[15000\left(1 + \frac{R}{100}\right)^3 - 15000\right] - \left(\frac{15000 \times R \times 3}{100}\right) = 673.92$

⇒ $\frac{15000}{1000000}$ $(100 + R)^3 - 15000 - 450R = 673.92$

⇒ $\frac{15}{1000}$ $(1000000 + R^3 + 30000R + 300R^2) - 15000$

                             – 450R = 673.92

⇒ $15R^3 + 4500R^2$ = 673920

⇒ $R^3 + 300R^2$ = 44928 = R = 12%.

   II. P = ₹ 6500, S.I. = ₹ 1560, T = 2 years

∴ $R = \left(\frac{100 \times 1560}{6500 \times 2}\right)\%$ = 12%.

Thus, I alone as well as II alone is sufficient to answer the question.

∴ Correct answer is (*c*).

12. I. Let sum = ₹ P. Then, S.I. = ₹ P, T = 10 years.

∴ Rate = $\left(\frac{100 \times P}{P \times 10}\right)\%$ = 10%.

   II. Let principal = ₹ P and rate = R% p.a. Then,

$$\left[P\left(1 + \frac{R}{100}\right)^2 - P\right] - \left(\frac{P \times R \times 2}{100}\right) = 1\% \text{ of } P$$

⇒ $\left(1 + \frac{R}{100}\right)^2 - 1 - \frac{2R}{100} = \frac{1}{100} \Rightarrow \frac{R^2}{10000} = \frac{1}{100}$

⇒ R^2 = 100 ⇒ R = 10%.

   Thus, I alone as well as II alone is sufficient to answer the question.

∴ Correct answer is (*c*).

13. I. gives : C.I. for 3 years = ₹ 2522.

   II. gives : (C.I.) – (S.I.) for 2 years at same rate is ₹ 40.

$$P\left[\left(1 + \frac{R}{100}\right)^3 - 1\right] = 2522 \qquad ...(i)$$

$$P\left[\left(1 + \frac{R}{100}\right)^2 - 1\right] - \frac{P \times R \times 2}{100} = 40 \qquad ...(ii)$$

On dividing (*i*) by (*ii*) we get:

$$\frac{\left(1 + \frac{R}{100}\right)^3 - 1}{\left(1 + \frac{R}{100}\right)^2 - 1 - \frac{R}{50}} = \frac{2522}{40}$$

$$\Rightarrow \dfrac{\dfrac{R^3}{1000000}+\dfrac{3R}{100}+\dfrac{3R^2}{10000}}{\dfrac{R^2}{10000}}=\dfrac{1261}{20}$$

$$\Rightarrow \dfrac{R}{100}+\dfrac{300}{R}=\dfrac{1201}{20} \Rightarrow R^2-6005R+30000=0$$

$$\Rightarrow R^2-6000R-5R+30000=0$$

$$\Rightarrow R(R-6000)-5(R-6000)=0$$

$$\Rightarrow (R-5)(R-6000)=0 \Rightarrow R=5.$$

∴ Both I and II are needed to get R.

∴ Correct answer is (e).

14. I. Let Principal = ₹ P and Rate = R% p.a.

Then, $\left[P\left(1+\dfrac{R}{100}\right)^2-P\right]-\left(\dfrac{P\times R\times 2}{100}\right)=200$

$$\Rightarrow \dfrac{PR^2}{10000}=200 \qquad ...(i)$$

II. $P=\left(\dfrac{100\times S.I.}{R\times T}\right)=\left(\dfrac{100\times 20000}{R\times 10}\right) \qquad ...(ii)$

From (i) and (ii) we have: $\left(\dfrac{100\times 20000}{R\times 10}\right)\times \dfrac{R^2}{10000}=200$

$$\Rightarrow 20R=200 \Rightarrow R=10\%.$$

Putting $R=10$ in (i), we get: $P=$ ₹ 20000.

∴ C.I. = ₹ $\left[20000\left(1+\dfrac{10}{100}\right)^{10}-20000\right]$.

Thus, both I and II together give the answer.

∴ Correct answer is (e).

15. I. Let Principal = ₹ P and Rate = R% p.a.

Then, $P=\left(\dfrac{100\times S.I.}{R\times T}\right)$

$$\Rightarrow P=\left(\dfrac{100\times 3600}{R\times 5}\right)=\dfrac{72000}{R} \qquad ...(i)$$

And, $\left[P\left(1+\dfrac{R}{100}\right)^2-P\right]-\left(\dfrac{P\times R\times 2}{100}\right)=43.20$

$$\Rightarrow \dfrac{PR^2}{10000}=43.20$$

$$\Rightarrow PR^2=432000$$

$$\Rightarrow \dfrac{72000}{R}\times R^2=432000$$

$$\Rightarrow R=\dfrac{432000}{72000}=6\%.$$

II. $12000\left(1+\dfrac{R}{100}\right)^3-12000-\left(\dfrac{12000\times 3\times R}{100}\right)=132.192$

$$\Rightarrow \dfrac{12000}{1000000}(100+R)^3-12000-360R=132.192$$

$$\Rightarrow 12R^3+3600R^2=132192$$

$$\Rightarrow R^3+300R^2=\dfrac{132192}{12}=11016$$

$$\Rightarrow R=6\%.$$

Thus, I alone as well as II alone is sufficient to answer the question.

∴ Correct answer is (c).

16. I. $\dfrac{P\times R\times 1}{100}=5300 \Rightarrow PR=530000.$

II. $P\left(1+\dfrac{R}{100}\right)^2-P-\dfrac{P\times R\times 2}{100}=1060 \Rightarrow PR^2=10600000.$

III. $\dfrac{P\times R\times 5}{100}=P \Rightarrow R=20\%.$

From I and II, we have: $\dfrac{PR^2}{PR}=\dfrac{10600000}{530000}$

$$\Rightarrow R=20\%.$$

Thus, III only or (I and II) give the answer.

∴ Correct answer is (d).

17. I. $P\left(1+\dfrac{R}{100}\right)^2-P-\dfrac{P\times R\times 2}{100}=100 \Rightarrow PR^2=1000000.$

II. $\dfrac{P\times R\times 10}{100}=P \Rightarrow R=10\%.$

III. $P=10000.$

From I and III, we have: $\dfrac{PR^2}{P}=\dfrac{1000000}{10000}$

$$\Rightarrow R^2=100 \Rightarrow R=10\%.$$

Thus, II only or (I and III) give the answer.

∴ Correct answer is (d).

18. I. $\dfrac{P\times R\times 10}{100}=P \Rightarrow R=10\%.$

II. $15000\left(1+\dfrac{R}{100}\right)^2-15000-\left(\dfrac{15000\times R\times 2}{100}\right)=150$

$\Rightarrow 15000R^2=1500000 \Rightarrow R^2=100 \Rightarrow R=10\%.$

III. $P\left(1+\dfrac{R}{100}\right)^2-P>P.$

Thus, either I alone or II alone gives the answer.

∴ Correct answer is (c).

19. I. $P\left(1+\dfrac{R}{100}\right)^2=5290 \qquad ...(i)$

II. $P\left(1+\dfrac{R}{100}\right)^3=6083.50 \qquad ...(ii)$

On dividing (ii) by (i), we get :

$$\left(1+\dfrac{R}{100}\right)=\dfrac{608350}{529000}=\dfrac{23}{20}$$

$$\Rightarrow \dfrac{R}{100}=\left(\dfrac{23}{20}-1\right)=\dfrac{3}{20} \Rightarrow R=15.$$

Thus, I and II together give the answer.

III. gives $P=4000.$

Putting this value of P in (i), we get the answer.

Putting this value of P in (ii), we get the answer.

∴ (I & II) or (I & III) or (II & III) all give the answer.

Hence, the correct answer is (d).

20. $P = ₹\ 5000\ \&\ T = 2$ years.

    I.   S.I. on ₹ 5000 in 5 years is ₹ 2000.

$$\frac{5000 \times R \times 5}{100} = 2000 \ \Rightarrow \ R = 8.$$

    II.   C.I. for 1 year = S.I. for 1 year, always holds true.

    III. $P\left(1 + \dfrac{R}{100}\right)^{10} > 2P.$

        Thus, only I alone gives the answer.

    $\therefore$ Correct answer is (a).

21. From I and III, we have: $P = \left(\dfrac{100 \times \text{S.I.}}{R \times T}\right)$

$$= ₹ \left(\frac{100 \times 750}{5 \times 3}\right) = ₹\ 5000.$$

    $\therefore$ Required difference

$$= ₹ \left[\left\{5000\left(1 + \frac{5}{100}\right)^{8} - 5000\right\} - \left(\frac{5000 \times 5 \times 8}{100}\right)\right].$$

    From II and III, we have: $P\left[\left(1 + \dfrac{5}{100}\right)^{2} - 1\right] = 512.50$

$$\Rightarrow \qquad = \frac{512.50 \times 400}{41} = 5000.$$

Agan, the difference between C.I. and S.I. may be calculated as above.

From I and II, we have: $P = \left(\dfrac{100 \times 750}{R \times 3}\right)$

$$\Rightarrow P = \frac{25000}{R}.$$

    And, $P\left[\left(1 + \dfrac{R}{100}\right)^{2} - 1\right] = 512.50$

$$\Rightarrow P\left[\frac{R^{2}}{10000} + \frac{2R}{100}\right] = 512.50$$

$$\Rightarrow \frac{25000}{R}\left(\frac{R^{2}}{10000} + \frac{2R}{100}\right) = 512.50$$

$$\Rightarrow \frac{5}{2}\ R = 12.50 \Rightarrow R = \frac{12.50 \times 2}{5} = 5\%.$$

$$\therefore\ P = \frac{25000}{5} = 5000.$$

Again, the difference between C.I. and S.I. may be calculated.

Thus, any two of the three together give the answer.

$\therefore$ Correct answer is (c).

22. **I.** $P\left(1 + \dfrac{R}{100}\right)^{4} = 2P \ \Rightarrow \ \left(1 + \dfrac{R}{100}\right)^{4} = 2$ ...(i)

    II. $P\left(1 + \dfrac{R}{100}\right)^{12} = 8P \ \Rightarrow \ \left(1 + \dfrac{R}{100}\right)^{12} = 8$ ...(ii)

    III. $P\left(1 + \dfrac{R}{100}\right)^{8} = 4P \ \Rightarrow \ \left(1 + \dfrac{R}{100}\right)^{8} = 4$ ...(iii)

    Let the given sum become 16 times in n years. Then,

$$P\left(1 + \frac{R}{100}\right)^{n} = 16P \ \Rightarrow \ \left(1 + \frac{R}{100}\right)^{n} = 16 \qquad ...(iv)$$

    $\therefore$ Any one of (i), (ii) and (iii) with (iv) will give the value of n.

    $\therefore$ Correct answer is (e).

23. I and II will give us, R, S.I. and T.

$$\therefore \qquad P = \frac{100 \times \text{S.I.}}{R \times T} = \left(\frac{100 \times 2000}{5 \times 8}\right) = 5000.$$

[(C.I.) − (S.I.)] for 4 years may be calculated. In this case, III is redundant.

I and III give us R and P, using

$$P\left[\left(1 + \frac{5}{100}\right)^{2} - 1\right] - \frac{P \times 5 \times 2}{100} = 12.50$$

So, [(C.I.) − (S.I.)] for 4 years may be calculated.

    $\therefore$ Correct answer is (c).

24. **I.**   gives, Rate = 5% p.a.

    II.   gives, S.I. for 1 year = ₹ 600.

    III. gives, sum = 10 × (S.I. for 2 years).

       Now, I and II give the sum.

       For this sum, C.I. and hence amount can be obtained. Thus, III is redundant.

       Again, II gives S.I. for 2 years = ₹ (600 × 2) = ₹ 1200.

       Now, from III, Sum = ₹ (10 × 1200) = ₹ 12000.

$$\text{Thus, Rate} = \frac{100 \times 1200}{2 \times 12000} = 5\%\ \text{p.a.}$$

       Thus, C.I. for 2 years and therefore, amount can be obtained. Thus, I is redundant.

       Hence, I or III is redundant.

    $\therefore$ Correct answer is (d).

25. **I.**   gives, S.I. for 3 years = ₹ 4500.

    II.   gives, Rate = 10% p.a.

    III. gives, (C.I.) − (S.I.) = ₹ 465.

       Clearly, using I and III we get C.I. = ₹ (465 + 4500). Thus, II is redundant.

       Also, from I and II, we get sum

$$= \left(\frac{100 \times 4500}{10 \times 3}\right) = 15000.$$

       Now C.I. on ₹ 15000 at 10% p.a. for 3 years may be obtained. Thus, III is redundant.

    $\therefore$ Either II or III is redundant.

    $\therefore$ Correct answer is (d).

26. **I.**   gives, Amount after 2 years

                        = ₹ 11025, when compounded.

    II.   gives, Amount after 2 years at S.I. = ₹ 11000.

    III. gives, Principal = ₹ 10000.

       From II and III, we have :

       Principal = ₹ 10000,

       S.I. = ₹ (11000 − 10000) = ₹ 1000 and Time = 2 years.

       Hence, Rate can be obtained.

    $\therefore$ I is redundant.

From I and III, we get $11025 = 10000 \times \left(1 + \dfrac{R}{100}\right)^2$.

This gives R.

∴   II is redundant.

From I and II, we have

$$P\left(1 + \dfrac{R}{100}\right)^2 = 1102 \qquad \qquad ...(i)$$

and $P\left[1 + \dfrac{R \times 2}{100}\right] = 11000 \qquad \qquad ...(ii)$

On dividing (i) by (ii), we get $\dfrac{\left(1 + \dfrac{R}{100}\right)^2}{(50 + R)} = \dfrac{11025}{550000}$.

This gives R. Thus, III is redundant.

Hence I or II or III is redundant.

∴   Correct answer is (d).

27. We have:

$$P\left(1 + \dfrac{R}{100}\right)^2 - P - \dfrac{P \times R \times 2}{100} = 12.50$$

$\Rightarrow \quad \dfrac{PR^2}{10000} = 12.50$

$\Rightarrow \quad PR^2 = 125000 \qquad \qquad ...(i)$

I. $P = \left(\dfrac{100 \times 500}{R \times 2}\right) = \dfrac{25000}{R} \qquad \qquad ...(ii)$

II. $P\left[\left(1 + \dfrac{R}{100}\right)^2 - 1\right] = 512.50$

$\Rightarrow \quad P = \dfrac{512.50 \times 400}{41} = 5000 \qquad \qquad ...(iii)$

III. $\dfrac{P \times R \times 2}{100} + P = 5500$

$\Rightarrow \quad 100\,P + 2PR = 550000$

$\Rightarrow P = \dfrac{550000}{100 + 2R} \qquad \qquad ...(iv)$

From (i) and (ii),

we have: $\dfrac{25000}{R} \times R^2 = 125000$

$\Rightarrow \quad R = 5\%$.

From (i) and (iii), we have: $R^2 = 25 \Rightarrow R = 5\%$.

From (i) and (iv), we have: $\left(\dfrac{550000}{100 + 2R}\right) \times R^2 = 125000$

$\Rightarrow \quad 550000\,R^2 = 12500000 + 250000\,R$

$\Rightarrow \quad 11\,R^2 - 5R\,250 = 0$

$\Rightarrow \quad (11R + 50)\,(R - 5) = 0 \Rightarrow R = 5\%$.

Thus, any one of the three statements gives the answer *i.e.*, any two of the three statements can be dispensed with.

∴   Correct answer is (d).