Compound Interest 18

INTRODUCTION

In the previous chapter, we discussed simple interest. A second method of paying interest is the *compound interest* method, where the interest for each period is added to the principal before interest is calculated for the next period. With this method, the principal grows as the interest is added to it. This method is used in investments, such as savings account and bonds. An understanding of compound interest is important not only for people planning careers with financial institutions, but also for anyone planning to invest money.

SOME BASIC FORMULAE

1. (a) The amount A due after t years, when a principal P is given on compound interest at the rate R% per annum is given by

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

(b) Compound interest (CI) $= A - P$

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

(c) Rate of interest $(R) = \left[\left(\frac{A}{P}\right)^{1/t} - 1\right]$ % p.a.

Note: Simple interest and compound interest for 1 year at a given rate of interest p.a. are always equal.

Illustration 1: Mohan invested an amount of ₹15000 at compound interest rate 5% p.a. for a period of 2 years. What amount will he receive at the end of 2 years?
Solution: Here, $P = 15000$, $R = 5$ and $t = 2$.

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

$$= 15000\left(1+\frac{5}{100}\right)^2 = 15000\left(1+\frac{1}{20}\right)^2$$

$$= \frac{15000\times 21\times 21}{20\times 20} = ₹16537.50.$$

Illustration 2: Find compound interest on ₹5000 for 2 years at 4% p.a.
Solution: Here, $P = 5000$, $R = 4$ and $t = 2$.

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

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

$$= 5000\left[\left(\frac{26}{25}\right)^2 - 1\right] = 5000((1.04)^2 - 1)$$

$$= 5000(1.0816 - 1) = ₹408$$

$\therefore$ The compound interest is ₹408.

Illustration 3: Rashi invested ₹16000 for two years at compound interest and received an amount of ₹17640 on maturity. What is the rate of interest?
Solution: Here, $P = 16000$, $t = 2$ and $A = 17640$.

$$\therefore \quad R = 100\left[\left(\frac{A}{P}\right)^{1/t} - 1\right] \text{ \% p.a.}$$

$$= 100\left[\left(\frac{17640}{16000}\right)^{1/2} - 1\right] \text{ \% p.a.}$$

$$= 100\left[\left(\frac{441}{400}\right)^{1/2} - 1\right] \text{ \% p.a.}$$

$$= 100\left[\left(\frac{21}{20}\right)^{2\times\frac{1}{2}} - 1\right] \text{ \% p.a.}$$

$$= 100 \times \frac{1}{20} = 5\% \text{ p.a.}$$

2. If the interest is compounded half–yearly, then

(a) Amount $(A) = P\left(1+\frac{R}{100\times 2}\right)^{2t}$

(b) Compound interest (CI)

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

(c) Rate $(R) = 2\times 100\left[\left(\frac{A}{P}\right)^{\frac{1}{t}\times 2}-1\right]$ % p.a.

Illustration 4: Find the amount of ₹8000 in $1\frac{1}{2}$ years at 5% per annum compound interest payable half-yearly.

Solution: Here, $P = 8000$, $R = 5$ and $t = \frac{2}{3}$.

$\therefore$ Amount $= P\left(1+\frac{R}{100\times 2}\right)^{2t}$

$= 8000\left(1+\frac{5}{100\times 2}\right)^{2\times\frac{3}{2}} = 8000\left(\frac{41}{40}\right)^{3}$

$= \frac{8000\times 41\times 41\times 41}{40\times 40\times 40} =$ ₹8615.13.

3. If the interest is compounded quarterly, then

(a) Amount $(A) = P\left(1+\frac{R}{100\times 4}\right)^{4t}$

(b) Compound interest (CI)

$= P\left[\left(1+\frac{R}{100\times 4}\right)^{4t}-1\right]$

(c) Rate $(R) = 4\times 100\left[\left(\frac{A}{P}\right)^{\frac{1}{t}\times 4}-1\right]$ % p.a.

4. In general, if the interest is compounded n times a year, then

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

(b) Compound interest (CI)

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

(c) Rate of interest (R)

$= n\times 100\left[\left(\frac{A}{P}\right)^{\frac{1}{t}\times n}-1\right]$ % p.a.

Illustration 5: Find the compound interest on ₹1000 at 40% per annum compounded quarterly for 1 year.

Solution: Here, $P = 1000$, $R = 40$ and $t = 1$.

$\therefore$ Compound interest (CI)

$= P\left[\left(1+\frac{R}{100\times 4}\right)^{4\times t}-1\right]$

$= 1000\left[\left(1+\frac{40}{100\times 4}\right)^{4\times 1}-1\right]$

$= 1000\left[\left(\frac{11}{10}\right)^{4}-1\right]$

$= 1000\left[\frac{14641-10000}{10000}\right]$

$=$ ₹464.10.

Illustration 6: Find the compound interest on ₹4000 at 24% per annum for 3 months, compounded monthly.

Solution: Here, $P = 4000$, $R = 24$ and $t = \frac{3}{12}$.

$\therefore$ CI $= P\left[\left(1+\frac{R}{100\times 12}\right)^{12\times t}-1\right]$

$= 4000\left[\left(1+\frac{24}{100\times 12}\right)^{12\times\frac{3}{12}}-1\right]$

$= 4000\left[\left(\frac{51}{50}\right)^{3}-1\right] = \frac{4000\times 7651}{50\times 50\times 50}$

$=$ ₹244.83.

SOME USEFUL SHORT CUT METHODS

1. When the rates of interest are different for different years, say R_1, R_2, R_3 per cent for first, second and third year respectively, then

$$\text{Amount} = P\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)\left(1+\frac{R_3}{100}\right).$$

Let the given sum of money be ₹P. Amount after first year $= P\left(1+\frac{R_1}{100}\right)$

This amount will be the principal for the second year.

∴ Amount after second year

$$= P\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)$$

This amount will be the principal for the third year.

∴ Amount after third year

$$= P\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)\left(1+\frac{R_3}{100}\right).$$

Illustration 7: Anu invests ₹5000 in a bond which gives interest at 4% per annum during the first year, 5% during the second year and 10% during the third year. How much does she get at the end of the third year.

Solution: Here, $P = 5000$, $R_1 = 4$, $R_2 = 5$ and $R_3 = 10$.

∴ Amount at the end of third year

$$= P\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)\left(1+\frac{R_3}{100}\right)$$

$$= 5000\left(1+\frac{4}{100}\right)\left(1+\frac{5}{100}\right)\left(1+\frac{10}{100}\right)$$

$$= 5000 \times \frac{26}{25}\times\frac{21}{20}\times\frac{11}{10} = ₹6006.$$

2. When the time is given in the form of fraction, say $3\frac{3}{4}$ years, then

$$\text{Amount} = P\left(1+\frac{R}{100}\right)^3 \times \left(1+\frac{\frac{3}{4}R}{100}\right).$$

Illustration 8: What will be the compound interest on ₹15625 for $2\frac{1}{2}$ years at 4% per annum?

Solution: $\text{CI} = 15625\left[\left(1+\frac{4}{100}\right)^2\left(1+\frac{4\times\frac{1}{2}}{100}\right)-1\right]$

$$= 15625\left[\frac{26}{25}\times\frac{26}{25}\times\frac{51}{50}-1\right]$$

$$= \frac{15625\times 3226}{31250} = ₹1613$$

3. (a) The difference between the compound interest and the simple interest on a certain sum of money for 2 years at R% per annum is given by

$$\text{CI} - \text{SI} = P\left(\frac{R}{100}\right)^2 \quad \text{[in terms of } P \text{ and } R\text{]}$$

$$\text{and, CI} - \text{SI} = \frac{R\times \text{SI}}{2\times 100} \quad \text{[in terms of SI and } R\text{]}$$

Let, ₹P be given sum of money. Simple interest on ₹P for 2 years at R% per annum

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

and compound interest on ₹P for 2 years at R% per annum

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

$$\therefore \quad \text{CI} - \text{SI} = P\left[\left(1+\frac{R}{100}\right)^2-1\right]-\frac{P\times R\times 2}{100}$$

$$= P\left[1+\frac{R^2}{10000}+\frac{2R}{100}-1-\frac{2R}{100}\right]$$

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

$$\text{Also, } CI - SI = P\left(\frac{R}{100}\right)^2 = \frac{R}{100\times 2}\times\left(\frac{P\times R\times 2}{100}\right)$$

$$= \frac{R\times SI}{2\times 100}.$$

(b) The difference between the compound interest and the simple interest on a certain sum of money for 2 years at R% per annum is given by

$$\text{CI} - \text{SI} = P\left[\left(\frac{R}{100}\right)^3 + 3\left(\frac{R}{100}\right)^2\right]$$

[in terms of P and R]

and, $$\text{CI} - \text{SI} = \frac{SI}{3}\left[\left(\frac{R}{100}\right)^2 + 3\left(\frac{R}{100}\right)\right]$$

[in terms of SI and R]

Let, ₹P be the given sum of money. Simple interest on ₹P for 3 years at R% per annum

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

and compound interest on ₹P for 3 years at R% per annum

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

$$\therefore \text{CI} - \text{SI} = P\left[\left(1+\frac{R}{100}\right)^3 - 1\right] - \frac{P \times R \times 3}{100}$$

$$= P\left[1 + \frac{R^3}{100000} + \frac{3R^2}{10000} + \frac{3R}{100} - 1 - \frac{3R}{100}\right]$$

$$= P\left[\frac{R^3}{1000000} + \frac{3R^2}{10000}\right]$$

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

$$= \frac{P \times R \times 3}{100} \times \frac{1}{3}\left[\left(\frac{R}{100}\right)^2 + 3\left(\frac{R}{100}\right)\right]$$

$$= \frac{SI}{3}\left[\left(\frac{R}{100}\right)^2 + 3\left(\frac{R}{100}\right)\right].$$

Illustration 9: What will be the difference between simple and compound interest on a sum of ₹4500 put for 2 years at 5% per annum?

Solution: Here, $P = 4500$ and $R = 5$.

$$\therefore \quad \text{CI} - \text{SI} = P\left(\frac{R}{100}\right)^2 = 4500\left(\frac{5}{100}\right)^2$$

$$= \frac{4500}{20 \times 20} = ₹11{\cdot}25.$$

Illustration 10: If the difference between the compound interest and simple interest on a certain sum of money for 3 years at 5% per annum is ₹61, find the sum.

Solution: Here, CI − SI = 61 and $R = 5$.

$$\therefore \quad \text{CI} - \text{SI} = P\left[\left(\frac{R}{100}\right)^3 + 3\left(\frac{R}{100}\right)^2\right]$$

$$\Rightarrow \quad 61 = P\left[\left(\frac{5}{100}\right)^3 + 3\left(\frac{5}{100}\right)^2\right]$$

$$= P\left[\left(\frac{1}{20}\right)^3 + 3\left(\frac{1}{20}\right)^2\right]$$

$$= P\left[\frac{1+3\times 20}{20\times 20\times 20}\right] = P\left(\frac{61}{20\times 20\times 20}\right)$$

$$\Rightarrow \quad P = ₹8000.$$

4. If a certain sum becomes n times in t years at compound interest, then the same sum becomes n^m times in mt years.

Let, ₹P be the given sum of money. We have,

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

Let the sum become n^m times in T years.

Then, $$n^m = \left(1+\frac{R}{100}\right)^T$$

or, $$n = \left(1+\frac{R}{100}\right)^{T/m} \qquad \cdots(2)$$

On comparing equations (1) and (2), we get

$T/m = t$ or $T = mt$ years.

Therefore, the sum becomes n^m times in mt years.

Illustration 11: A sum of money placed at compound interest doubles in 3 years. In how many years will it become four times?

Solution: Here, $n = 2$, $t = 3$ and $m = 2$

$\therefore$ The given sum of money will become four times itself in mt, i.e., $2 \times 3 = 6$ years.

5. If a certain sum becomes n times in t years, then the rate of compound interest is given by

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

Illustration 12: At what rate per cent compound interest does a sum of money become four–fold in 2 years?

Solution: The required rate per cent is

$$R = 100[(n)^{1/t} - 1] = 100[(4)^{1/2} - 1]$$
$$= 100(2 - 1) = 100\%$$

[Here, $n = 4$ and $t = 2$]

6. If a certain sum of money at compound interest amounts to ₹x in A years and to ₹y in B years, then the rate of interest per annum is

$$R = \left[\left(\frac{y}{x}\right)^{1/B-A} - 1\right] \times 100\%.$$

Let the principal be ₹P and the rate of interest be R% p.a.

Given: $x = P\left(1+\frac{R}{100}\right)^A$ and $y = P\left(1+\frac{R}{100}\right)^B$

$$\therefore \quad \frac{y}{x} = \frac{\left(1+\frac{R}{100}\right)^B}{\left(1+\frac{R}{100}\right)^A} = \left(1+\frac{R}{100}\right)^{B-A}$$

$$\therefore \quad \left(\frac{y}{x}\right)^{1/B-A} = 1+\frac{R}{100} \quad \text{or} \quad \frac{R}{100} = \left(\frac{y}{x}\right)^{1/B-A} - 1$$

$$\text{or,} \quad R = \left[\left(\frac{y}{x}\right)^{1/B-A} - 1\right] \times 100.$$

Illustration 13: A sum of money at compound interest amounts to ₹4050 in one year and to ₹4723.92 in 3 years. Find the rate of interest per annum.

Solution: Here, $x = 4050$, $y = 4723.92$, $A = 1$ and $B = 3$.

$$\therefore \quad R = \left[\left(\frac{y}{x}\right)^{1/B-A} - 1\right] \times 100\%$$
$$= \left[\left(\frac{4723\cdot92}{4050}\right)^{1/2} - 1\right] \times 100\%$$
$$= \left(\frac{27}{25} - 1\right) \times 100\% = 8\%$$

7. If a loan of ₹P at R% compound interest per annum is to be repaid in n equal yearly instalments, then the value of each instalment is given by

$$₹\frac{P}{\left(\frac{100}{100+R}\right)+\left(\frac{100}{100+R}\right)^2+\cdots\left(\frac{100}{100+R}\right)^n}.$$

Let each instalment be of ₹X.

$\therefore$ Principal for the amount of ₹X due at end of first year at R%

$$= \frac{100X}{100+R}$$

Principal for the amount of ₹X due at the end of second year at R%

$$= \left(\frac{100}{100+R}\right)^2 X$$

$\vdots \qquad \vdots \qquad \vdots$

Principal for the amount of ₹X due at the end of nth year at R%

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

$$\therefore \quad \frac{100X}{100+R} + \left(\frac{100}{100+R}\right)^2 X + \ldots \left(\frac{100}{100+R}\right)^n X = P$$

$$\text{or,} \quad X = ₹\frac{P}{\left(\frac{100}{100+R}\right)+\left(\frac{100}{100+R}\right)^2+\cdots\left(\frac{100}{100+R}\right)^n}.$$

Illustration 14: If a sum of ₹13040 is to be paid back in two equal annual instalments at $3\frac{3}{4}$% per annum, what is the amount of each instalment?

Solution: Each instalment $= \frac{P}{\left(\frac{100}{100+R}\right)+\left(\frac{100}{100+R}\right)^2}$

$$= \frac{13040}{\left(\frac{100}{100+\frac{15}{4}}\right)+\left(\frac{100}{100+\frac{15}{4}}\right)^2}$$

$$\left[\text{Here, } P = 13040 \text{ and } R = \frac{15}{4}\right]$$

$$= \frac{13040}{\frac{400}{415}+\left(\frac{400}{415}\right)^2} = \frac{13040}{\frac{400}{415}\left(1+\frac{400}{415}\right)}$$

$$= 13040 \times \frac{415}{400} \times \frac{815}{400}$$

$$= ₹6889.$$

EXERCISE-I

1. Nikita invested ₹8000 for 3 years at 5% CI in a post office. If the interest is compounded once in a year, what sum will she get after 3 years?

(a) ₹9261 (b) ₹8265
(c) ₹9365 (d) None of these

2. The compound interest on ₹2000 at 5% per annum, compounded yearly, for 2 years is:

(a) ₹315 (b) ₹425
(c) ₹205 (d) None of these

3. At what rate per cent per annum will ₹1000 amount to ₹1331 in 3 years? The interest is compounded yearly.

(a) 10% p.a. (b) 12% p.a.
(c) 13% p.a. (d) None of these

4. Find the present worth of ₹9261 due 3 years, hence at 5% per annum compounded yearly.

(a) ₹7000 (b) ₹8000
(c) ₹9000 (d) None of these

5. The compound interest on ₹10000 at 20% per annum at the end of 1 year 6 months if the interest is calculated half-yearly will be:

(a) ₹5320 (b) ₹3310
(c) ₹4340 (d) None of these

6. A sum put out at 4% compound interest payable half-yearly amounts to ₹6632.55 in $1\frac{1}{2}$ years. The sum is:

(a) ₹6530 (b) ₹6250
(c) ₹6470 (d) None of these

7. The compound interest on ₹12000 for 9 months at 20% per annum, interest being compounded quarterly, is:

(a) ₹1891.50 (b) ₹1901.50
(c) ₹1791.50 (d) None of these

8. The difference of compound interest on ₹800 for 1 year at 20% per annum when compounded half-yearly and quarterly is:

(a) ₹4.40 (b) Nil
(c) ₹6.40 (d) None of these

9. The difference between the simple interest and the compound interest on ₹60 for 1 year at 10% per annum, reckoned half-yearly is:

(a) ₹1 (b) ₹$1\frac{1}{2}$
(c) ₹2 (d) None of these

10. ₹800 at 5% per annum compound interest amount to ₹882 in:

(a) 6 years (b) 2 years
(c) 4 years (d) None of these

11. What will be the compound interest on a sum of ₹1875 after 2 years if the rate of interest for the first year is 4% and that for the second year is 8%?

(a) ₹231 (b) ₹341
(c) ₹241 (d) None of these

12. What will be the amount if a sum of ₹5000 is placed at compound interest for 3 years while rate of interest for the first, second and third years is 2, 3 and 4 per cent, respectively?

(a) ₹5643.12 (b) ₹5463.12
(c) ₹6413.12 (d) None of these

13. What sum will amount to ₹15916.59 in 3 years at compound interest, the interest for first, second and third year being 3, 2 and 1 per cent, respectively?

(a) ₹18000 (b) ₹12000
(c) ₹15000 (d) None of these

14. The compound interest on ₹800 in $2\frac{1}{2}$ years at 5% is:

(a) ₹105.05 (b) ₹104.05
(c) ₹106.05 (d) None of these

15. On what sum will the compound interest for $2\frac{1}{2}$ years at 10% amount to ₹6352.50?

(a) ₹7000 (b) ₹8000
(c) ₹5000 (d) None of these

16. The compound interest on a sum of money for 3 years at 5% is ₹1324.05. What is the simple interest?

(a) ₹1460 (b) ₹1365
(c) ₹1260 (d) None of these

17. The simple interest on a certain sum at 4% per annum for 2 years is ₹80. The compound interest on the same sum for the same period is:

(a) ₹91.60 (b) ₹81.60
(c) ₹71.60 (d) None of these

18. If the compound interest on a certain sum for 2 years is ₹60·60 and the simple interest is ₹60, then the rate of interest per annum is:

(a) 2% (b) 3%
(c) 4% (d) None of these

19. If the compound interest on a certain sum for 2 years is ₹105 and simple interest is ₹100, then the sum is:

(a) ₹300 (b) ₹500
(c) ₹400 (d) None of these

20. The difference between simple interest and compound interest on ₹1250 for 2 years at 4% p.a. is:

(a) ₹3 (b) ₹4
(c) ₹2 (d) None of these

21. On a certain sum of money, the simple interest for 2 years is ₹200 at the rate of 7% per annum. Find the difference in *CI* and *SI*.

(a) ₹7 (b) ₹9
(c) ₹11 (d) None of these

22. The difference between the compound interest and simple interest on a certain sum at 5% for 2 years is ₹1.50. The sum is:

(a) ₹700 (b) ₹600
(c) ₹500 (d) None of these

23. The difference between the compound interest and simple interest on a certain sum at 3% per annum for 3 years is ₹27.27. The sum is:

(a) ₹12000
(b) ₹15000
(c) ₹10000
(d) None of these

24. The difference between the compound interest and the simple interest on ₹8000 for 3 years at 5% per annum is:

(a) ₹61 (b) ₹63
(c) ₹65 (d) None of these

25. If a sum of money at compound interest amounts to thrice itself in 3 years, then in how many years will it be 9 times itself?

(a) 9 years
(b) 6 years
(c) 7 years
(d) None of these

26. At what rate per cent compound interest does a sum of money become 16 times in 4 years?

(a) 75% (b) 100%
(c) 50% (d) None of these

27. A certain sum of money at compound interest grows up to ₹12960 in 2 years and up to ₹13176 in 3 years. Find the rate per cent per annum.

(a) $1\frac{1}{3}\%$ (b) $2\frac{1}{3}$

(c) $1\frac{2}{3}\%$ (d) None of these

28. What sum of money at compound interest will amount to ₹650 at the end of the first year and ₹676 at the end of the second year?

(a) ₹825 (b) ₹925
(c) ₹625 (d) None of these

29. A sum of ₹1260 is borrowed from a money lender at 10% p.a. compounded annually. If the amount is to be paid back in two equal annual instalments, find out the annual instalment.

(a) ₹726 (b) ₹626
(c) ₹526 (d) None of these

30. A tree increases annually by $\frac{1}{8}$ of its height. By how much will it increase after 2 years, if it stands today 64 cm. high?

(a) 72 cm (b) 74 cm
(c) 75 cm (d) 81 cm

31. The least number of completed years in which a sum of money put out at 20% CI will be more than doubled is:

(a) 3 (b) 4
(c) 5 (d) 6

32. A man borrows ₹4000 from a bank at $7\frac{1}{2}\%$ compound interest. At the end of every year he pays ₹1500 as part repayment of loan and interest. How much does he still owe to the bank after three such instalments?

(a) ₹123.25 (b) ₹125
(c) ₹400 (d) ₹469.18

33. If in a certain number of years, ₹3000 amounts to ₹4320 at a compound interest, in half that time ₹3000 will amount to:

(a) ₹3400 (b) ₹3600
(c) ₹3800 (d) ₹3520

34. ₹3757 is to be divided between A and B such that A's share at the end of 7 years may be equal to B's share at the end of 9 years. If rate per cent be 10% p.a. compound interest, B's share is:

(a) ₹1700 (b) ₹1500
(c) ₹2057 (d) ₹1400

EXERCISE-2
(BASED ON MEMORY)

1. A sum of money becomes ₹4500 after two years and ₹6750 after 4 years on compound interest. The sum is:
(a) ₹4000 (b) ₹2500
(c) ₹3000 (d) ₹3050
[SSC (GL) Prel. Examination, 2005]

2. At what rate per cent per annum will ₹2304 amount to ₹2500 in 2 years at compound interest?
(a) $4\frac{1}{2}\%$ (b) $4\frac{1}{5}\%$
(c) $4\frac{1}{6}\%$ (d) $4\frac{1}{3}\%$
[SSC (GL) Prel. Examination, 2005]

3. The difference between simple interest and compound interest on a certain sum of money for 2 years at 4 per cent per annum is ₹1. The sum of money is:
(a) ₹600 (b) ₹625
(c) ₹560 (d) ₹650
[SSC (GL) Prel. Examination, 2005]

4. A sum of money invested at compound interest doubles itself in 6 years. At the same rate of interest, it will amount to eight times of itself in:
(a) 15 years (b) 12 years
(c) 18 years (d) 10 years
[SSC (GL) Prel. Examination, 2005]

5. Mr 'X' invested certain amounts in two different schemes 'A' and 'B'. Scheme 'A' offers simple interest @ 12 percent p.a. and scheme 'B' offers compound interest @ 10 per cent p.a. Interest accrued on the amount invested in scheme 'A' in 2 years was ₹3600 and the total amount invested was ₹35000. What was interest accrued on the amount invested in scheme 'B'?
(a) ₹4800 (b) ₹4200
(c) ₹4000 (d) Cannot be determined
(e) None of these
[SBI PO, 2005]

6. The difference between the simple interest and compound interest obtained on a principal amount at 5 per cent p.a. after 2 years is ₹35. What is the principal amount?
(a) ₹15000 (b) ₹10000
(c) ₹14000 (d) ₹13000
[Bank of Maharashtra, SO 2006]

7. What would be the compound interest accrued on an amount of ₹15000 at the rate of 15 per cent p.a. at the end of three years?
(a) ₹7813.125 (b) ₹7762.50
(c) ₹7762.125 (d) ₹11235.09375
(e) None of these
[IOB PO, 2006]

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

9. The simple interest accrued on an amount of ₹15500 at the end of three years is ₹5580. What would be the compound interest accrued on the same amount at the same rate in the same period?
(a) ₹6726.348 (b) ₹6276.384
(c) ₹6267.834 (d) ₹6627.438
(e) None of these
[Corporation Bank PO, 2007]

10. What approximate compound interest can be obtained on an amout of ₹3980 after 2 years at 8 per cent p.a.?
(a) ₹650 (b) ₹680
(c) ₹600 (d) ₹5905
(e) ₹665
[Allahabad Bank SO, 2007]

11. What will be the difference in simple and compound interest @ 12% per annum on a sum of ₹960 after 2 years?
(a) ₹13.824 (b) ₹24.04
(c) ₹20.224 (d) ₹31
(e) None of these
[Andhra Bank PO, 2007]

12. The simple interest accrued on an amount of ₹14800 at the end of three years is ₹6216. What would be the compound interest accrued on the same amount at the same rate in the same period?
(a) ₹6986.1142 (b) ₹7042.2014
(c) ₹7126.8512 (d) ₹8321.4166
(e) None of these
[Corporation Bank PO, 2006]

13. What approximate amount of compound interest can be obtained on an amount of ₹4890 at the rate of 5 per cent p.a. at the end of two years?
(a) ₹4522 (b) ₹4893
(c) ₹515 (d) ₹5205
(e) ₹501
[LIC ADO, 2007]

14. Mr Rao invests a sum of ₹41250 at the rate of 6 per cent p.a. What approximate amount of compound interest will he obtain at the end of 3 years?
(a) ₹8100 (b) ₹7425
(c) ₹8210 (d) ₹7879
(e) ₹7295
[SBI PO, 2008]

15. What will be the difference between the simple interest and compound interest earned on a sum of ₹985 @ 14 per cent p.a. at the end of two years?
(a) ₹16.408 (b) ₹14.214
(c) ₹19.218 (d) ₹17.405
(e) ₹19.306
[Bank of Maharashtra PO, 2007]

16. If the difference between the simple interest and compound interest earned on an amount @ 15 per cent p.a. at the end of 3 years is ₹595.35, what is the amount?
(a) ₹8400 (b) ₹9200
(c) ₹6800 (d) Cannot be determined
(e) None of these
[Allahabad Bank PO, 2007]

17. A builder 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) ₹1352 (b) ₹1377
(c) ₹1275 (d) ₹1283
[SSC (GL) Prel. Examination, 2000]

18. At what per cent per annum will ₹3000 amount to ₹3993 in 3 years if the interest is compounded annually?
(a) 9% (b) 10%
(c) 11% (d) 13%
[SSC (GL) Prel. Examination, 2000]

19. What annual payment will discharge a debt of ₹1025 due in 2 years at the rate of 5% compound interest?
(a) ₹551.25 (b) ₹550.00
(c) ₹560.00 (d) ₹560.75
[SSC (GL) Prel. Examination, 2000]

20. The compound interest on ₹10000 in 2 years at 4% per annum, the interest being compounded half-yearly, is:
(a) ₹636.80 (b) ₹824.32
(c) ₹912.86 (d) ₹828.82
[SSC (GL) Prel. Examination, 2000]

21. If the difference between the compound interest compounded every six months and the simple interest on a certain sum of money at the rate of 12% per annum for one year is ₹36, the sum is:
(a) ₹10000 (b) ₹12000
(c) ₹15000 (d) ₹9000
[SSC (GL) Prel. Examination, 2000]

22. In how many years will ₹2000 amount to ₹2420 at 10% per annum compound interest?
(a) 3 (b) $2\frac{1}{2}$
(c) 2 (d) $1\frac{1}{2}$
[SSC (GL) Prel. Examination, 2000]

23. What is the difference between compound interest on ₹5000 for $1\frac{1}{2}$ years at 40% per annum according as the interest is compounded yearly or half yearly?
(a) ₹2.04 (b) ₹3.06
(c) ₹8.30 (d) ₹4.80
(e) None of these
[SSC (GL) Prel. Examination, 2000]

24. The principal that amounts to `4913 in 3 years at $6\frac{1}{4}$% per annum compound interest compounded annually is:
(a) ₹4096 (b) ₹4085
(c) ₹4076 (d) ₹3096
[SSC (GL) Prel. Examination, 2000]

25. What sum lent at 5% per annum compound interest will amount to ₹441 in 2 years?
(a) ₹390 (b) ₹395
(c) ₹400 (d) ₹405
[SSC (GL) Prel. Examination, 2000]

26. The compound interest on a certain sum for two years is ₹618 whereas the simple interest on the same sum at the same rate for two years is ₹600. The rate of interest per annum is:
(a) 18% (b) 9%
(c) 6% (d) 3%
[SSC (GL) Prel. Examination, 2000]

27. The effective annual rate of interest corresponding to a nominal rate of 6% per annum payable half-yearly is:
(a) 6.06% (b) 6.07%
(c) 6.08% (d) 6.09%
[SSC (GL) Prel. Examination, 2000]

28. The difference between the simple and compound interest on a certain sum of money for 2 years at 4% per annum is ₹1. The sum is:

(a) ₹676 (b) ₹675
(c) ₹625 (d) ₹700

[SSC (GL) Prel. Examination, 2002]

29. A sum of money doubles itself in 4 years at compound interest. It will amount to 8 times itself at the same rate of interest in:

(a) 18 years (b) 12 years
(c) 16 years (d) 24 years

[SSC (GL) Prel. Examination, 2002]

30. The difference between the simple and compound interest on a certain sum of money at 5% rate of interest per annum for 2 years is ₹15. The sum is:

(a) ₹6500 (b) ₹5500
(c) ₹6000 (d) ₹7000

[SSC (GL) Prel. Examination, 2002]

31. A sum borrowed under compound interest doubles itself in 10 years. When will it become fourfold of itself at the same rate of interest?

(a) 15 years (b) 20 years
(c) 24 years (d) 40 years

[SSC (GL) Prel. Examination, 2002]

32. A sum of money invested at compound interest amounts in 3 years to ₹2400 and in 4 years to ₹2520. The interest rate per annum is:

(a) 5% (b) 6%
(c) 10% (d) 12%

[SSC (GL) Prel. Examination, 2002]

33. A sum of money placed at compound interest doubles itself in 5 years. It will amount to eight times itself at the same rate of interest in:

(a) 10 years (b) 15 years
(c) 7 years (d) 20 years

[SSC (GL) Prel. Examination, 2002]

34. A sum of money invested at compound interest amounts to ₹800 in 3 years and to ₹840 in 4 years. The rate of interest per annum is:

(a) $2\frac{1}{2}\%$ (b) 4%
(c) 5% (d) $6\frac{2}{3}\%$

[SSC (GL) Prel. Examination, 2002]

35. In what time will ₹1000 amount to ₹1331 at 20% per annum, compounded half-yearly?

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

[SSC (GL) Prel. Examination, 2003]

36. The difference between simple and compound interest (compounded annually) on a sum of money for 2 years at 10% per annum is ₹65. The sum is:

(a) ₹6505 (b) ₹6566
(c) ₹6565 (d) ₹6500

[SSC (GL) Prel. Examination, 2003]

37. A man gets a simple interest of ₹1000 on a certain principal at the rate of 5% per annum in 4 years. What compound interest will the man get on twice the principal in two years at the same rate?

(a) ₹1050 (b) ₹1005
(c) ₹11025 (d) None of these

[Punjab and Sind Bank PO, 2010]

38. Sonika invested an amount of ₹5800 for 2 years. At what rate of compound interest will she get an amount of ₹594.5 at the end of two years?

(a) 5% per annum
(b) 4% per annum
(c) 6% per annum
(d) 8% per annum

[Corporation Bank PO, 2010]

39. The simple interest accrued on an amount of ₹27500 at the end of three years is ₹10230. What would be the approximate compound interest accrued on the same amount at the same rate in the same period?

(a) ₹11550 (b) ₹12620
(c) ₹10950 (d) ₹11900

[New Indian Insurance PO, 2009]

40. Mr Duggal invested ₹20000 with rate of interest @ 20% per annum. 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 two years?

(a) ₹8800 (b) ₹9040
(c) ₹8040 (d) ₹9800

[United Bank of India PO, 2009]

41. In how many years will a sum of ₹800 at 10% per annum compound interest, compounded semi-annually becomes ₹926.10?

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

[SSC (GL), 2010]

42. Kruti took a loan at simple interest rate of 6% in the first year with an increase of 0.5% in each subsequent year. She paid interest of ₹3375 after four years. How much loan did she take?

(a) ₹12500 (b) ₹33250
(c) ₹15800 (d) Cannot be determined

[Dena Bank PO, 2008]

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

(a) 12 years (b) 13 years
(c) 8 years (d) 16 years

[SSC (GL), 2011]

44. A sum of ₹12,000 deposited at compound interest becomes double after 5 years. After 20 years, it will become:

(a) ₹48,000 (b) ₹96,000
(c) ₹1,90,000 (d) ₹1,92,000

[SSC (GL), 2011]

45. If the difference between S.I. and CI for 2 years on a sum of money lent at 5% is ₹6, then the sum is:

(a) ₹2200 (b) ₹2400
(c) ₹2600 (d) ₹2000

[SSC (GL), 2011]

46. A sum of money at compound interest doubles itself in 15 years. It will become eight times of itself in:

(a) 45 years (b) 48 years
(c) 54 years (d) 60 years

[SSC (GL), 2010]

47. A person takes ₹10,000 loan at the rate of 10% interest compounding yearly for the period of 4 years. How much interest he has to pay?

(a) ₹4,371 (b) ₹4,581
(c) ₹14,641 (d) ₹4,641

[UPPCS, 2012]

48. Rohit invested some amount at the rate of 6 per cent pa and at the end of 3 years he got ₹8730 simple interest. How much compound interest he will get on same amount and same rate of interest after 2 years.

(a) ₹5820 (b) ₹5949.60
(c) ₹5900 (d) ₹5994.60

[Syndicate Bank PO, 2010]

49. If the compound interest on a certain sum of money for 2 years at 5% is ₹328, then the sum is:

(a) ₹3000 (b) ₹3600
(c) ₹3200 (d) ₹3400

[SSC, 2014]

50. A man borrows money at 3% per annum interest payable yearly and lend it immediately at 5% interest (compound) payable half-yearly and thereby gains ₹330 at the end of the year. The sum borrowed is:

(a) ₹17,000 (b) ₹16,500
(c) ₹15,000 (d) ₹16,000

[SSC, 2014]

51. If the compound interest on a sum for 2 years at $12\frac{1}{2}\%$ per cent is ₹510, the simple interest on the same sum at the same rate for same period of time is:

(a) ₹400 (b) ₹450
(c) ₹460 (d) ₹480

[SSC, 2014]

52. The compound interest on ₹5,000 for 3 years at 10% per cent will amount to:

(a) ₹1,654 (b) ₹1,655
(c) ₹1,600 (d) ₹1,565

[SSC, 2013]

53. What sum will give ₹244 as the difference between simple interest and compound interest at 10% in $1\frac{1}{2}$ years compounded half-yearly?

(a) ₹40,000 (b) ₹36,000
(c) ₹32,000 (d) ₹28,000

[SSC, 2013]

54. A sum of ₹3,200 invested at 10% per cent compounded quarterly amounts to ₹3,362. Compute the time period.

(a) $\frac{1}{2}$ year (b) 1 year
(c) 2 years (d) $\frac{3}{4}$ year

[SSC, 2013]

55. If a sum of money compounded annually becomes 1.44 times of itself in 2 years, then the rate of interest per annum is:

(a) 25% (b) 22%
(c) 21% (d) 20%

[SSC, 2013]

56. An amount of money at compound interest grows up to ₹3,840 in 4 years and up to ₹3,936 in 5 years. Find the rate of interest.

(a) 2.5% (b) 2%
(c) 3.5% (d) 2.05%

[SSC, 2012]

57. A sum of money at compound interest amounts to thrice itself in 3 years. In how many years will it be 9 times itself?

(a) 9 (b) 27
(c) 6 (d) 3

[SSC, 2012]

58. Sita deposited ₹5,000 at 10% simple interest for 2 years. How much more money will Sita have in her account at the end of two years, if it is compounded semi-annually?

(a) ₹50 (b) ₹40
(c) ₹77.50 (d) ₹85.50

[SSC, 2012]

59. If a sum of money placed at compound interest, compounded annually, doubles itself in 5 years, then the same amount of money will be 8 times of itself in

(a) 25 years (b) 20 years
(c) 15 years (d) 10 years

[SSC, 2011]

60. The compound interest on ₹6250 at 12% per annum for 1 year, compounded half-yearly is:

(a) ₹772.50 (b) ₹772
(c) ₹672.50 (d) ₹672

[SSC, 2010]

61. A sum of money lent at compound interest amounts to ₹1460 in 2 years and to ₹1606 in 3 years. The rate of interest per annum is:

(a) 12% (b) 11%
(c) 10.5% (d) 10%

[SSC, 2010]

62. A sum of money, deposited at some rate per cent per annum of compound interest, doubles itself in 4 years. In how many years will it become 16 times of itself at the same rate?

(a) 16 (b) 12
(c) 10 (d) 8

[SSC, 2010]

63. What is the difference between the compound interest and simple interest on ₹4000 at 5% per annum for 2 years?

(a) 10 (b) 11
(c) 20 (d) 100

[SSC, 2010]

64. The simple and compound interests on a sum of money for 2 years are ₹8400 and ₹8652 respectively. The rate of interest per annum is:

(a) 6% (b) 7.5%
(c) 9% (d) 4.5%

[SSC, 2010]

65. Raghu invested a certain sum in Scheme X for 4 years.Scheme X offers simple interest at 12 per cent pa for the firsttwo years and compound interest (compounded annually) at 20 per cent pa for the next two years. The totalinterest earned by him after 4 years is ₹11016. What was the sum invested by Raghu in Scheme X?

(a) ₹17400 (b) ₹18400
(c) ₹16200 (d) ₹11400
(e) ₹9400

[IBPS PO/MT, 2014]

66. What is the difference between the simple and the compound interest on ₹7,300 at the rate of 6 per cent p.a. in 2 years?

(a) ₹29.37 (b) ₹26.28
(c) ₹31.41 (d) ₹23.22
(e) ₹21.34

[IBPS PO/MT, 2012]

Directions: In this, question is given followed by data in three statements I, II and III. You have to study the question and the data in statements and decide the question can be answered with data in which of the statements and mark your answer accordingly.

67. What is the rate of interest percent p.a.?

Statements:

I. The difference between the compound interest and simple interest earned in two years on the amount invested is ₹100.

II. The amount becomes ₹19,500 in three years on simple interest.

III. The simple interest accrued in two years on the same amount at the same rate of interest is ₹3,000.

(a) Only I and II
(b) Only I and III
(c) Only II and III
(d) Only I and either II or III
(e) None of these

[SBI Associates Banks PO, 2011]

68. The simple interest accrued on a certain principal is ₹2,000 in five years at the rate of 4 percent p.a. What would be the compound interest accrued on the same principal at the same rate in two years?

(a) ₹716 (b) ₹724
(c) ₹824 (d) ₹816
(e) None of these

[Corporation Bank PO, 2011]

69. Sonika invested an amount of ₹5800 for 2 years. At what rate of compound interest will she get an amount of ₹594.50 at the end of two years?

(a) 5 Percent Pa (b) 4 Percent Pa
(c) 6 Percent Pa (d) 8 Percent Pa
(e) None of these

[Corporation Bank PO, 2010]

70. What would be the compound interest accrued on an amount of ₹7,400 @ 13.5 per cent pa. at the end of two years? (rounded off to two digits after decimal)

(a) ₹2,136.87 (b) ₹2,306.81
(c) ₹2,032.18 (d) ₹2,132.87
(e) None of these

[Indian Bank PO, 2010]

71. If the compound interest accrued on an amount of ₹14,500 in two years is ₹4676.25, what is the rate of interest per cent p.a.?

(a) 11 (b) 9
(c) 15 (d) 18
(e) None of these

[IDBI Bank PO, 2009]

72. What would be the compound interest accrued on an amount of ₹8000 at the rate of 15 per cent p.a. in three years?

(a) ₹4283 (b) ₹4051
(c) ₹4167 (d) ₹4325
(e) None of these

[Oriental Bank of Commerce PO, 2009]

73. Manisha invests an amount of ₹39,300 for 4 years atthe rate of 4 per cent p.a. What amount of approximate compound interest will she obtain at the end of 4 years?

(a) ₹6,675 (b) ₹6,650
(c) ₹6,288 (d) ₹6,356
(e) ₹6,450

[NABARD Bank Officer, 2009]

ANSWER KEYS

EXERCISE–1

1. (a)	**2.** (c)	**3.** (a)	**4.** (b)	**5.** (b)	**6.** (b)	**7.** (a)	**8.** (a)	**9.** (b)	**10.** (b)	**11.** (a)	**12.** (b)	**13.** (c)
14. (b)	**15.** (c)	**16.** (c)	**17.** (b)	**18.** (a)	**19.** (b)	**20.** (c)	**21.** (a)	**22.** (b)	**23.** (c)	**24.** (a)	**25.** (b)	**26.** (b)
27. (a)	**28.** (c)	**29.** (a)	**30.** (d)	**31.** (b)	**32.** (a)	**33.** (b)	**34.** (a)					

EXERCISE–2

1. (c)	**2.** (c)	**3.** (b)	**4.** (c)	**5.** (b)	**6.** (c)	**7.** (a)	**8.** (c)	**9.** (b)	**10.** (b)	**11.** (a)	**12.** (c)	**13.** (e)
14. (d)	**15.** (e)	**16.** (a)	**17.** (a)	**18.** (b)	**19.** (a)	**20.** (b)	**21.** (a)	**22.** (c)	**23.** (e)	**24.** (a)	**25.** (c)	**26.** (c)
27. (d)	**28.** (c)	**29.** (b)	**30.** (c)	**31.** (b)	**32.** (a)	**33.** (b)	**34.** (c)	**35.** (a)	**36.** (d)	**37.** (d)	**38.** (a)	**39.** (a)
40. (b)	**41.** (a)	**42.** (a)	**43.** (c)	**44.** (d)	**45.** (b)	**46.** (a)	**47.** (d)	**48.** (d)	**49.** (c)	**50.** (d)	**51.** (d)	**52.** (b)
53. (c)	**54.** (a)	**55.** (d)	**56.** (a)	**57.** (c)	**58.** (c)	**59.** (c)	**60.** (a)	**61.** (d)	**62.** (a)	**63.** (a)	**64.** (a)	**65.** (c)
66. (b)	**67.** (c)	**68.** (d)	**69.** (a)	**70.** (d)	**71.** (c)	**72.** (c)	**73.** (a)					

EXPLANATORY ANSWERS

EXERCISE-I

1. (a) Here, $P = 8000$, $t = 3$ and $R = 5$.

$\therefore$ Amount $= P\left(1+\frac{R}{100}\right)^t = 8000\left(1+\frac{5}{100}\right)^3$

$= 8000\left(\frac{21}{20}\right)^3 = \frac{8000\times21\times21\times21}{20\times20}$

$= ₹9261.$

$\therefore$ Nikita will get ₹9261 after 3 years.

2. (c) Here, $P = 2000$, $R = 5$ and $t = 2$.

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

$= 2000\left[\left(\frac{21}{20}\right)^2 - 1\right] = 2000\left[\left(\frac{21}{20}\right)^2 - 1\right]$

$= 2000\left(\frac{441}{400} - 1\right) = 2000 \times \frac{41}{400} = ₹205.$

3. (a) Here, $P = 1000$, $A = 1331$ and $t = 3$.

$P = 100\left[\left(\frac{A}{P}\right)^{1/t} - 1\right]$ % p.a.

$= 100\left[\left(\frac{1331}{1000}\right)^{1/3} - 1\right]$ % p.a.

$= 100\left[\left(\frac{11}{10}\right)^{3\times\frac{1}{3}} - 1\right] = 100 \times \frac{1}{10} = 10\%$ p.a.

4. (b) Here, $A = 9261$, $t = 3$ and $R = 5$.

$\therefore$ $P = \frac{A}{\left(1+\frac{R}{100}\right)^t} = \frac{9261}{\left(1+\frac{5}{100}\right)^3}$

$= \frac{9261\times20\times20\times20}{21\times21\times21} = ₹8000.$

5. (b) Here, $P = 10000$, $R = 20$ and $t = \frac{3}{2}$.

$\therefore$ $\text{CI} = P\left[\left(1+\frac{R}{100\times2}\right)^{2t} - 1\right]$

$= 10000\left[\left(1+\frac{20}{100\times2}\right)^{2\times\frac{3}{2}} - 1\right]$

$= 10000\left[\left(\frac{11}{10}\right)^3 - 1\right]$

$= 10000\left(\frac{11\times11\times11}{10\times10\times10} - 1\right)$

$= \frac{10000\times331}{1000} = ₹3310.$

6. (b) Let ₹x be the sum. Then,

$6632.55 = x\left(1+\frac{4}{2\times100}\right)^{2\times\frac{3}{2}} = x\left(\frac{51}{50}\right)^3$

$\therefore$ $x = \frac{6632\cdot55\times50\times50\times50}{51\times51\times51} = ₹6250.$

7. (a) Here, $P = 12000$, $R = 20$ and $t = \frac{9}{12}$

$\therefore$ $\text{CI} = P\left[\left(1+\frac{R}{100\times4}\right)^{4\times t} - 1\right]$

$= 12000\left[\left(1+\frac{20}{100\times4}\right)^{4\times\frac{9}{12}} - 1\right]$

$= 12000\left[\left(1+\frac{1}{20}\right)^3 - 1\right] = \frac{12000\times1261}{20\times20\times20}$

$= ₹1891{\cdot}50.$

8. (a) When compounded half-yearly:

Here, $P = 800$, $R = 20$ and $t = 1$.

$\therefore$ $\text{CI} = P\left[\left(1+\frac{R}{100\times2}\right)^{2\times t} - 1\right]$

$= 800\left[\left(1+\frac{20}{100\times2}\right)^{2\times1} - 1\right]$

$= 800\left[\left(\frac{11}{10}\right)^2 - 1\right] = \frac{800\times21}{10\times10} = ₹168.$

When compounded quarterly:

Here, $P = 8000$, $R = 20$ and $t = 1$.

$\therefore$ $\text{CI} = P\left[\left(1+\frac{R}{100\times4}\right)^{4\times t} - 1\right]$

$= 800\left[\left(1+\frac{20}{100\times4}\right)^{4\times1} - 1\right]$

$= 800\left[\left(\frac{21}{20}\right)^4 - 1\right] = \frac{800\times34481}{20\times20\times20\times20}$

$= ₹172.40.$

$\therefore$ Difference $= ₹(172.40 - 168) = ₹4.40.$

9. (b) SI = $\frac{600\times10\times1}{100}$ = ₹60.

$$CI = 600\left[\left(1+\frac{10}{100\times2}\right)^{2\times1}-1\right]$$

$$= 600\left[\left(\frac{21}{20}\right)^{2}-1\right]=\frac{600\times41}{20\times20} = ₹61{\cdot}50$$

$\therefore$ Difference = ₹(61.50 − 60) = ₹1.50.

10. (b) Let the time be t years. Then,

$$882 = 800\left(1+\frac{5}{100}\right)^{t} \Rightarrow \frac{882}{800}=\left(\frac{21}{20}\right)^{t}$$

$$\Rightarrow \left(\frac{21}{20}\right)^{2}=\left(\frac{21}{20}\right)^{t}$$

$\Rightarrow t = 2$ years.

11. (a) Here, $P = 1875$, $R_1 = 4$ and $R_2 = 8$.

$$\therefore \text{ CI} = P\left[\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)-1\right]$$

$$= 1875\left[\left(1+\frac{4}{100}\right)\left(1+\frac{8}{100}\right)-1\right]$$

$$= 1875\left[\frac{26}{25}\times\frac{27}{25}-1\right]$$

$$= \frac{1875\times77}{625} = ₹231.$$

12. (b) Here, $P = 5000$, $R_1 = 2$, $R_2 = 3$ and $R_3 = 4$.

$\therefore$ Amount after 3 years

$$= P\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)\left(1+\frac{R_3}{100}\right)$$

$$= 5000\left(1+\frac{2}{100}\right)\left(1+\frac{3}{100}\right)\left(1+\frac{4}{100}\right)$$

$$= 5000\times\frac{51}{50}\times\frac{103}{100}\times\frac{26}{25}$$

= ₹5463·12.

13. (c) Let, ₹P be the required sum.

Then, $15916.59 = P\left(1+\frac{3}{100}\right)\left(1+\frac{2}{100}\right)\left(1+\frac{1}{100}\right)$

$$= P\left(\frac{103}{100}\times\frac{102}{100}\times\frac{101}{100}\right).$$

$$\therefore \quad P = \frac{1591659\times100\times100}{103\times102\times101}$$

= ₹15000.

14. (b) $$CI = 800\left[\left(1+\frac{5}{100}\right)^{2}\left(1+\frac{\frac{1}{2}\times5}{100}\right)-1\right]$$

$$= 800\left[\frac{21\times21\times41}{20\times20\times40}-1\right] = \frac{800\times2081}{16000}$$

= ₹104.05.

15. (c) We have, $6352{\cdot}50 = P\left(1+\frac{10}{100}\right)^{2}\left(1+\frac{\frac{1}{2}\times10}{100}\right)$

$$= P\left(\frac{11}{10}\right)^{2}\left(\frac{21}{20}\right)$$

$$\Rightarrow P = \frac{6352\cdot50\times10\times10\times20}{11\times11\times21} = ₹5000.$$

16. (c) We have, $CI - SI = \frac{SI}{3}\left[\left(\frac{R}{100}\right)^{2}+3\left(\frac{R}{100}\right)\right]$

$$\Rightarrow 11324{\cdot}05 - SI = \frac{SI}{3}\left[\left(\frac{5}{100}\right)^{2}+3\left(\frac{5}{100}\right)\right]$$

$$= \frac{SI}{3}\left[\frac{1+60}{20\times20}\right]=\frac{61SI}{1200}$$

$$\Rightarrow \left(1+\frac{61}{1200}\right)SI = 1324{\cdot}05$$

$$\Rightarrow SI = \frac{1324\cdot05\times1200}{1261} = ₹1260.$$

17. (b) We have, $CI - SI = \frac{R\times SI}{200}$

$$\Rightarrow CI = SI + \frac{R\times SI}{200} = SI\left(1+\frac{R}{200}\right) = 80\left(1+\frac{4}{200}\right)$$

[Here, $R = 4$ and $SI = 80$]

$$= \frac{80\times51}{50} = ₹81.60.$$

18. (a) We have,

$$CI - SI = \frac{R\times SI}{200}$$

$$\Rightarrow 60.60 - 60 = \frac{R\times60}{200}$$

$$\Rightarrow R = \frac{0\cdot60\times200}{60} = 2\%$$

19. (b) We have,

$$CI - SI = \frac{R\times SI}{200} \Rightarrow 105 - 100 = \frac{R\times100}{200}$$

$$\Rightarrow R = 10.$$

Also, $CI - SI = P\left(\frac{R}{100}\right)^{2} \Rightarrow 105 - 100 = P\left(\frac{10}{100}\right)^{2}$

$$\Rightarrow P = ₹500.$$

20. (c) We have,

$$\text{CI} - \text{SI} = P\left(\frac{R}{100}\right)^2 = 1250\left(\frac{4}{100}\right)^2$$

[Here, $P = 1250$ and $R = 4$]

$$= \frac{1250}{15\times 25} = ₹2.$$

21. (a) We have,

$$\text{CI} - \text{SI} = \frac{R\times \text{SI}}{200} = \frac{7\times 200}{200}$$

[Here, $R = 7$ and $SI = 200$]

$$= ₹7.$$

22. (b) We have,

$$\text{CI} - \text{SI} = P\left(\frac{R}{100}\right)^2$$

$$\Rightarrow \quad \frac{3}{2} = P\left(\frac{5}{100}\right)^2 \qquad \left[\text{Here, CI} - \text{SI} = \frac{3}{2} \text{ and } R = 5\right]$$

$$\Rightarrow \quad P = \frac{3\times 20\times 20}{2} = ₹600.$$

23. (c) We have, $\text{CI} - \text{SI} = P\left[\left(\frac{R}{100}\right)^3 + 3\left(\frac{R}{100}\right)^2\right]$

$$\Rightarrow \quad 27.27 = P\left[\left(\frac{3}{100}\right)^3 + 3\left(\frac{3}{100}\right)^2\right]$$

[Here, CI – SI = 27–27 and $R = 3$]

$$= P\left[\frac{27+2700}{100\times 100\times 100}\right]$$

$$\Rightarrow \quad P = \frac{27\cdot 27\times 100\times 100\times 100}{2727}$$

$$= ₹10000.$$

24. (a) We have,

$$\text{CI} - \text{SI} = P\left[\left(\frac{R}{100}\right)^3 + 3\left(\frac{R}{100}\right)^2\right]$$

$$= 8000\left[\left(\frac{5}{100}\right)^3 + 3\left(\frac{5}{100}\right)^2\right]$$

[Here, $P = 8000$ and $R = 5$]

$$= 8000\left[\frac{125+7500}{100\times 100\times 100}\right] = ₹61.$$

25. (b) Here, $n = 3$, $t = 3$ and $m = 2$.

$\therefore$ The given sum will become 9 times itself in mt, i.e., $2 \times 3 = 6$ years.

26. (b) The required rate per cent is

$R = 100[(n)^{1/t} - 1] = 100[(16)^{1/4} - 1]$

[Here, $n = 16$ and $t = 4$]

$= 100(2 - 1) = 100\%$.

27. (a) Here, $x = 12960$, $y = 13176$, $A = 2$ and $B = 3$.

$$\therefore \quad R = \left[\left(\frac{y}{x}\right)^{1/B-A} - 1\right] \times 100\%$$

$$= \left(\frac{13176}{12960} - 1\right) \times 100\%$$

$$= \left(\frac{216}{12960}\times 100\right)\%$$

$$= \frac{4}{3}\% \text{ or } 1\frac{1}{3}\%$$

28. (c) Here, $x = 650$, $y = 676$, $A = 1$ and $B = 2$.

$$\therefore \text{ Rate of interest}(R) = \left[\left(\frac{y}{x}\right)^{1/B-A} - 1\right] \times 100\%$$

$$= \left[\frac{676}{650} - 1\right] \times 100\%$$

$$= \frac{26}{650} \times 100\% = 4\%.$$

$$\therefore \quad 650 = P\left(1 + \frac{4}{100}\right) \quad \Rightarrow P = \frac{650\times 25}{26} = ₹625.$$

29. (a) Here, $P = 1260$ and $R = 10$.

$\therefore$ Annual instalment

$$= \frac{P}{\left(\frac{100}{100+R}\right) + \left(\frac{100}{100+R}\right)^2} = \frac{1260}{\frac{100}{110} + \left(\frac{100}{110}\right)^2}$$

$$= \frac{1260}{\frac{100}{110}\left(1 + \frac{100}{110}\right)} = 1260\times\frac{110}{100}\times\frac{110}{210} = ₹726.$$

30. (d) Increase % $= \left(\frac{1}{8}\times 100\right)\% = 12.5\%$

$$\text{Height after 2 years} = 64 \times \left(1 + \frac{25}{2\times 100}\right)^2 = 64 \times \frac{9}{8}\times\frac{9}{8}$$

$$= 81 \text{ cm}.$$

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

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

32. (a) Balance $= ₹\left[\left\{4000\times\left(1 + \frac{15}{2\times 100}\right)^3\right\}\right.$

$$\left. - \left\{1500\times\left(1 + \frac{15}{2\times 100}\right)^2 + 1500\times\left(1 + \frac{15}{2\times 100}\right) + 1500\right\}\right]$$

$= ₹123{\cdot}25$.

33. (b) Let, $r\%$ be the rate and n years be the time.

Then, $4320 = 3000\left(1 + \frac{r}{100}\right)^n$

$\therefore \quad \left(1+\frac{r}{100}\right)^{n} = \frac{4320}{3000} = 1.44$

$\therefore \quad \left(1+\frac{r}{100}\right)^{n/2} = \sqrt{1.44} = 1.2$

$\therefore$ In $\frac{n}{2}$ years, ₹3000 will amount to

$3000\left(1+\frac{r}{100}\right)^{n/2} = 3000 \times 1.2$

$= ₹3600.$

34. (a) Let A's share = ₹x

B's share = ₹$(3757 - x)$

$x\left(1+\frac{10}{100}\right)^{7} = (3757 - x)\left(1+\frac{10}{100}\right)^{9}$

$x = (3757 - x)\left(\frac{11}{10}\right)^{2}$

$\therefore \quad x\left(1+\frac{121}{100}\right) = \frac{3757\times121}{100}$

$\therefore \quad x = \frac{375\times121}{221}$

$= ₹2057$

$\therefore$ B's share = ₹$(3757 - 2057)$ = ₹1700.

EXERCISE-2
(BASED ON MEMORY)

1. (c) Let the sum be ₹x

$\therefore \quad x\left(1+\frac{R}{100}\right)^{2} = 4500 \quad \cdots(1)$

$x\left(1+\frac{R}{100}\right)^{4} = 6750$

$\therefore \quad \left(1+\frac{R}{100}\right)^{2} = \frac{6750}{4500}$

$\left(1+\frac{R}{100}\right)^{2} = \frac{135}{90} = \frac{3}{2} \quad \cdots(2)$

(1) and (2)

$\Rightarrow \quad \frac{4500}{x} = \frac{3}{2} \Rightarrow x = 3000$

2. (c) $\Rightarrow \left(1+\frac{R}{100}\right)^{2} = \frac{2500}{2304} = \frac{1250}{1152} = \frac{625}{576}$

$\Rightarrow 1+\frac{R}{100} = \frac{25}{4} \Rightarrow \frac{R}{100} = \frac{1}{24}$

$\Rightarrow R = \frac{100}{24} = \frac{25}{6} = 4\frac{1}{6}\%$

3. (b) Let the sum be ₹100

$\therefore$ SI = $\frac{100\times2\times4}{100} = ₹8$

CI = $100\left(1+\frac{4}{100}\right)^{2} - 100$

$= 100\times\frac{26}{25}\times\frac{26}{25} - 100$

$= \frac{100\times51}{25\times25} = \frac{204}{25}$

CI − SI = $\frac{204}{25} - 8 = \frac{4}{25}$

If the difference is ₹$\frac{4}{25}$,

then the sum = ₹100

If the difference is ₹1, then

the sum = $\frac{100\times25}{4} = 625$

5. (b) Let the money invested by M_{nx} in scheme 'A' be ₹K

$\therefore$ Money invested in 'B' = ₹$(35000 - K)$

$\because \quad \frac{K\times12\times2}{100} = 3600$

$\therefore \quad K = \frac{3600\times100}{12\times2} = ₹15000$

$\Rightarrow \quad 35000 - K = ₹20000$

$\therefore$ Interest accrued in scheme 'B'

$= 20000\left[\left(1+\frac{10}{100}\right)^{2} - 1\right]$

$= 20000\times\frac{121-100}{100} = ₹4200$

6. (c) In case of simple interest, the total interest for two years is (5 + 5 =) 10% of the principal amount, whereas at conpound interest the total interest for two years is $\left(5+5+\frac{5\times5}{100}=\right)$ 10.25% of the principal amount.

Hence we can conclude that ₹35 is (10.25 − 10=) 0.25% of the principal amount.

Hence the required amount

$= \frac{35\times100}{0.25} =$ ₹14000

7. (a) The required interest

$$= 15000\left(1+\frac{15}{100}\right)^3 - 15000$$

$$= 15000 \times \frac{23\times 23\times 23}{20\times 20\times 20} - 15000$$

$= 15000 \times 0.520875 = ₹7813.125$

8. (c) Under the scheme X, the interest obtained is $\left(10+10+\frac{10\times 10}{100}=\right)21\%$ of the sum.

Whereas under the scheme Y, the interest obtained is $\left(12+12+\frac{12\times 12}{100}=\right)25.44\%$ of the sum.

Now, 21% of the sum = ₹63

$\therefore$ 25.44% of the sum = $\frac{63}{21}\times 25.44 = ₹76.32$

9. (b) Rate of interest $= \frac{5580\times 100}{15500\times 3} = 12\%$

After compounding 12% for 3 years, the equivalent rate of simple interest = 40.4928%.

Now, $(12\times 3=)\,36\% = 5580$

$\therefore$ $40.4918\% = \frac{5580}{36}\times 40.4928 = ₹6276.384$

Note

Remember that at the rate of 12% the difference in SI and CI after 3 years = 40.4928 − 36 = 4.4928% of the principal.

10. (b) Equivalent % interest for compound rate of interest of 8% for 2 years

$$= 2\times 8 + \frac{8^2}{100} = 16.64\%$$

So, interest = 16.64% of $3980 \approx 665$

11. (a) Required difference = 12% of 12% of 960

$$= \frac{12}{100}\times\frac{12}{100}\times 960 = ₹13.824$$

12. (c) We know Rate %

$$= \frac{\text{Interest}\times 100}{\text{Amount}\times\text{Time}} = \frac{6216\times 100}{14800\times 3} = 14\%$$

Now the required compound interest

$$= 14800\times\left(1+\frac{14}{100}\right)^3 - 14800$$

$= ₹7126.8512$

13. (e) 5% rate of CI for 2 years $= 5\times 2 + \frac{5\times 5}{100}$

= 10.25% rate of SI for 1 year.

$\therefore$ 10.25% of 4890 = 10% of 4890 + 0.25% of

$$4890 = 489 + 0.25\times 48.9 = 489 + \frac{48.9}{4} \approx 501$$

14. (d) CI $= 41250\left[\left(1+\frac{6}{100}\right)^3 - 1\right]$

$$= 41250\left[\left(\frac{53}{50}\right)^3 - 1\right]$$

$$= 41250\left(\frac{53\times 53\times 53 - 50\times 50\times 50}{50\times 50\times 50}\right)$$

$$= 41250\left(\frac{148857 - 125000}{125000}\right)$$

$$= \frac{41250\times 23877}{125000} = ₹7879$$

15. (e) We know that for 2 years the difference in CI from SI is due to interest on interest of first year. That is, the difference

= 14% of 14% of 985

$$= \frac{14\times 14\times 985}{100\times 100} = ₹19.306$$

16. (a) Simple interest equivalent to compound interest for 3 years @ 15% is calculated as follows:

For 2 years

$$= 2\times 15 + \frac{15^2}{100} = 30 + 2.25 = 32.25$$

For 3 years $= 32.25 + 15 + \frac{32.25\times 15}{100}$

= 47.25 + 4.8375 = 52.0875%

$\therefore$ % difference in CI and SI

$= 52.0875 - 15\times 3 = 7.0875\%$

$\Rightarrow$ 7.0875% of amount = 595.35

$\therefore$ Amount $= \frac{595.35\times 100}{7.0875} = ₹8400$

17. (a) Let each instalment be ₹x

$\therefore$ $x = P_1\left(1+\frac{4}{100}\right)^t \Rightarrow P_1 = \left(\frac{25}{26}\right)^2 x$

Similarly, $P_2 = \left(\frac{25}{26}\right)^2 . x$

$\therefore$ $\left(\frac{25}{26}\right)x + \left(\frac{25}{26}\right)^2 x = 2550 \Rightarrow x = \frac{2550\times 26\times 26}{25\times 51}$

x = ₹1352.

18. (b) $3993 = 3000\left(1+\frac{R}{100}\right)^3$

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

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

$\Rightarrow \quad \frac{R}{100} = \frac{1}{10}$

$\Rightarrow R = 10.$

19. (a) Let instalment = ₹x

$\therefore \quad \left(\frac{20}{21}\right)x + \left(\frac{20}{21}\right)^2 x = 1025$

$\Rightarrow \quad \left(\frac{20}{21}\right)x\left[1 + \frac{20}{21}\right] = 1025$

$\Rightarrow \quad x = \frac{1025 \times 21 \times 21}{20 \times 41} = ₹551.25.$

20. (b) $A = P\left(1 + \frac{R}{100}\right)^n = 10000\left(1 + \frac{2}{100}\right)^4$

$= 10000 \times \frac{51}{50} \times \frac{51}{50} \times \frac{51}{50} \times \frac{51}{50}$

= ₹10824.32

Compound Interest = ₹10824.32 − ₹10000

= ₹824.32.

21. (a) Compound interest in one year

$= P\left(1 + \frac{6}{100}\right)^2 - P$

$= \frac{2809}{2500}P - P = \frac{309}{2500}P$

Simple interest in one year = $\frac{P \times 12 \times 1}{100} = \frac{2}{25}P$

Then, $\frac{309}{2500}P - \frac{3}{25}P = 36 = \frac{309P - 300P}{2500} = 26$

$= \frac{9}{2500}P = 36$

$\therefore \quad P = \frac{36 \times 2500}{9}$

= ₹10000.

23. (e) Required difference

$= 5000\left(1 + \frac{2}{100}\right)^3 - 5000\left(1 + \frac{4}{100}\right)^{3/2}$

= 5306.04 − 5252 = ₹54.04.

24. (a) $P\left(1 + \frac{25}{400}\right)^3 = 4913$

$\Rightarrow \quad P = 4913 \times \frac{16}{17} \times \frac{16}{17} \times \frac{16}{17} = 4096.$

25. (c) $P\left(1 + \frac{5}{100}\right)^2 = 441$

$\Rightarrow \quad P = 441 \times \frac{20}{21} \times \frac{20}{21} = 400.$

26. (c) $P\left(1 + \frac{R}{100}\right)^2 - P = 618$

$\frac{P \times R \times 2}{100} = 600$

Solving these equations, we get $R = 6$.

27. (d) $100\left(1 + \frac{3}{100}\right)^2 = 100 \times \frac{103}{100} \times \frac{103}{100} = 106.09.$

28. (c) Sum = Difference$\left(\frac{100}{R}\right)^2$

$\therefore \quad$ Sum $= 1\left(\frac{100}{R}\right)^2 = ₹625.$

29. (b) $P\left(1 + \frac{R}{100}\right)^4 = 2P$

$\therefore \quad \left(1 + \frac{R}{100}\right)^4 = 2$

Cubing both sides, we get

$\left(1 + \frac{R}{100}\right)^{12} = 8 \quad$ or, $\quad P\left(1 + \frac{R}{100}\right)^{12} = 8P.$

30. (c) Let the sum be P

$\left[P\left(1 + \frac{5}{100}\right)^2 - P\right] - \frac{P \times 2 \times 5}{100} = 15$

$\therefore \quad P = ₹6000.$

31. (b) Let the sum be P, rate be r% and required time be t years.

Then, from the equation,

$2P = P\left(1 + \frac{R}{100}\right)^{10}$ or, $\left(1 + \frac{R}{100}\right)^{10} = 2$

Again, $4P = P\left(1 + \frac{R}{100}\right)^t$ or, $4 = \left[\left(1 + \frac{R}{100}\right)^{10}\right]^{\frac{t}{10}}$

or $\quad 2^{\frac{t}{10}} = 4 = 2^2 \quad$ or, $\quad \frac{t}{10} = 2$

$\therefore \quad t = 20$ years.

32. (a) $2400 = P\left(1 + \frac{R}{100}\right)^3 \quad \cdots(1)$

$2520 = P\left(1 + \frac{R}{100}\right)^4 \quad \cdots(2)$

Equation (1) ÷ Equation (2), gives

$\frac{2400}{2520} = \frac{\left(1 + \frac{R}{100}\right)^3}{\left(1 + \frac{R}{100}\right)^4}$

or, $\frac{20}{21} = \frac{1}{1+\frac{R}{100}}$ or, $20 + \frac{R}{5} = 21$

$\therefore \quad R = 5\%$

34. (c) Interest on ₹800 is ₹40 (after 1 year).

35. (a) Let time be n years

i.e., $1000\left(1+\frac{10}{100}\right)^{2n} = 1331$

or, $\left(\frac{11}{10}\right)^{2n} = \frac{1331}{1000} = \left(\frac{11}{10}\right)^3$

or, $2n = 3$ or, $n = 1\frac{1}{2}$ years.

36. (d) Sum = Difference $\left(\frac{100}{R}\right)^2 = 65\left(\frac{100}{10}\right)^2$

$= 65(100) = ₹6500.$

37. (d) Principle = $\frac{1000\times100}{5\times4} = ₹5000$

Compound interest = $10000\left[\left(1+\frac{5}{100}\right)^2 - 1\right]$

$= 10000 \times \frac{41}{100} = ₹1025$

38. (a) $594.5 = 5800\left[\left(1+\frac{r}{100}\right)^2\right] - 1$

$\frac{594.5}{5800} = \left(1+\frac{r}{100}\right)^2 - 1$

$0.1025 + 1 = \left(1+\frac{r}{100}\right)^2$

$1.1025 = \frac{(100+r)^2}{10000}$

$1.1025 \times 10000 = (100+r)^2$

$11025 = (100+r)^2$

$(105)^2 = (100+r)^2$

$105 = 100 + r$

$r = 5\%$

39. (a) $R = \frac{\text{S.I.}\times100}{P\times T}$

$= \frac{10230\times100}{27500\times3} = 12.4\%$ p.q.

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

$= 27500\left[\left(1+\frac{12.4}{100}\right)^3 - 1\right]$

$= 27500\left[\left(\frac{112.4}{100}\right)^3 - 1\right]$

$= 27500\left[\frac{112.4\times112.4\times112.4}{100\times100\times100} - \frac{100\times100\times100}{100\times100\times100}\right]$

$= 27500\left[\frac{1420034.624 + 1000000}{1000000}\right]$

$= 27500\left[\frac{420034.624}{1000000}\right]$

$= 27500 \times 0.42$

$= ₹11550$

40. (b) When interest was compounded half-yearly then

$R = \frac{20}{2} = 10\%$

$T = 2$ units for 1 year

Accumalated interest in 2 years

$= \left\{20000\left(1+\frac{10}{100}\right)^2\left(1+\frac{20}{100}\right)\right\} - 20000$

$= \left\{20000\times\frac{11}{10}\times\frac{11}{10}\times\frac{6}{5}\right\} - 20000$

$= 29040 - 20000$

$= ₹9040$

41. (a) Rate of interest = 10% per annum. So, rate of interest for half-yearly = 5%

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

$926.10 = 800\frac{(1+5)^T}{100}$

$926.10 = 800\frac{(100+5)^T}{100}$

$926.10 = 800\frac{(21)^T}{20}$

$\frac{926.1\times10}{8000\times10} = \left(\frac{21}{20}\right)^T$

$\frac{9261}{8000} = \left(\frac{21}{20}\right)^T$

$\left(\frac{21}{20}\right)^3 = \left(\frac{21}{20}\right)^T$

Hence, time = 3 half-years

$= 1\frac{1}{2}$ years

42. (a) Suppose the principle is ₹x.

$x\left[\frac{6}{100} + \frac{6.5}{100} + \frac{7.0}{100} + \frac{7.5}{100}\right] = 3375$

$\frac{x}{100}\times27 = 3375$

$x = \dfrac{3375 \times 100}{27}$

= ₹12500

43. **(c)** Required time = $\dfrac{4 \times \log 4}{\log 2}$ = 8 years

44. **(d)** $A = P\left(1+\dfrac{R}{100}\right)^T$

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

$\Rightarrow \quad 2 = \left(1+\dfrac{R}{100}\right)^S$

$\Rightarrow \quad 2^4 = \left(1+\dfrac{R}{100}\right)^{20}$

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

Hence, the principal will become 16 times in 20 years.

= ₹(16 × 12000)

= ₹1,92,000

45. **(b)** Difference = $\left(\dfrac{Pr^2}{100}\right)$

$\Rightarrow \quad 6 \times \dfrac{P \times 5 \times 5}{10000} \quad \Rightarrow \quad 25P = 6000$

$\Rightarrow \quad P = \dfrac{6000}{25}$ = ₹2400

46. **(a)** It becomes 2 times in 15 years.
It becomes 4 times in 30 years.
It becomes 8 times in 45 years.

47. **(d)** Required interest

$= 10000\left(1+\dfrac{10}{100}\right)^4 - 10000$

$= ₹10000 \times \dfrac{(11)^4}{10000} 10000$

= ₹(14641 − 10000)

= ₹4641

48. **(d)** Principle = $\dfrac{8730 \times 100}{6 \times 3}$ = 48500

Compound interest

$= 48500\left[\left(1+\dfrac{6}{100}\right)^2 - 1\right]$

= 48500 × 0.1236

= ₹5994.60

49. **(c)** Let the principal be ₹*P*. Then,

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

$\Rightarrow \quad 328 = P\left[\left(1+\dfrac{5}{100}\right)^2 - 1\right] = P\left[\left(\dfrac{21}{20}\right)^2 - 1\right]$

$\Rightarrow \quad 328 = P\left(\dfrac{441}{400} - 1\right) \quad = P\left(\dfrac{441-400}{400}\right) = P\left(\dfrac{41}{400}\right)$

$\Rightarrow \quad P = \dfrac{328 \times 400}{41}$ = ‘3200

50. **(d)** Let the amount borrowed be ₹*x*.

$\therefore$ Interest to be paid = ₹$\dfrac{x \times 3}{100}$ = ₹$\dfrac{3x}{100}$

Case II,

Rate = $\dfrac{5}{2}$% per half-year

Time = 2 half-years

$\therefore \quad \text{CI} = P\left[\left(1+\dfrac{R}{100}\right)^T - 1\right]$

$= x\left[\left(1+\dfrac{5}{200}\right)^2 - 1\right] = x\left[\left(1+\dfrac{1}{40}\right)^2 - 1\right]$

$= x\left[\left(\dfrac{41}{40}\right)^2 - 1\right] = x\left[\left(\dfrac{1681}{1600} - 1\right)\right]$

$= x\left(\dfrac{1681-1600}{1600}\right) = ₹\dfrac{81x}{1600}$

$\text{Difference} = \dfrac{81x}{1600} - \dfrac{3x}{100}$

$= \dfrac{81x - 48x}{1600} = ₹\dfrac{33x}{1600}$

$\therefore \quad \dfrac{33x}{1600} = 330$

$\Rightarrow \quad x = \dfrac{1600 \times 330}{33}$ = ₹16000

51. **(d)** Let the principal be ₹*P*.

$\therefore \quad \text{CI} = P\left[\left(1+\dfrac{R}{100}\right)^T - 1\right]$

$\Rightarrow \quad 510 = P\left[\left(1+\dfrac{25}{100}\right)^2 - 1\right]$

$\Rightarrow \quad 510 = P\left[\left(1+\dfrac{1}{8}\right)^2 - 1\right]$

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

$\Rightarrow \quad 510 = P\left(\dfrac{81}{64} - 1\right)$

$$\Rightarrow \quad 510 = P\left(\frac{81-64}{64}\right) = \frac{17P}{64}$$

$$\Rightarrow \quad P = \frac{510 \times 64}{17} = ₹1920$$

$$\therefore \quad \text{SI} = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$$

$$= \frac{1920 \times 2 \times 25}{100 \times 2} = ₹480$$

52. (b) $$\text{CI} = P\left[\left(1+\frac{R}{100}\right)^T - 1\right] = 5000\left[\left(1+\frac{10}{100}\right)^3 - 1\right]$$

$$= 5000\left[\left(\frac{11}{10}\right)^3 - 1\right] = \frac{5000 \times 331}{1000} = ₹1655$$

53. (c) $$\text{Difference} = P\left(\frac{r^3}{1000000} + \frac{3r^3}{10000}\right)$$

$$\Rightarrow \quad 244 = P\left(\frac{125}{1000000} + \frac{75}{10000}\right)$$

$$\Rightarrow \quad 244 = P\left(\frac{7625}{1000000}\right)$$

$$\Rightarrow \quad P = \frac{244 \times 1000000}{7625} = 32000$$

54. (a) $$A = P\left(1+\frac{R}{100}\right)^T \quad \Rightarrow \quad \frac{3362}{3200} = \left(1+\frac{10}{400}\right)^{4t}$$

$$\Rightarrow \quad \frac{1681}{1600} = \left(\frac{41}{40}\right)^{4t} \quad \Rightarrow \quad \left(\frac{41}{40}\right)^2 = \left(\frac{41}{40}\right)^{4t}$$

$$\Rightarrow \quad 4t = 2 \quad \Rightarrow \quad t = \frac{1}{2} \text{ year}$$

55. (d) $$A = P\left(1+\frac{R}{100}\right)^T \Leftrightarrow 1.44\,P = P\left(1+\frac{R}{100}\right)^2$$

$$\Rightarrow \quad (1.2)^2 = \left(1+\frac{R}{100}\right)^2$$

$$\Rightarrow \quad 1+\frac{R}{100} = 1.2 \quad \Leftrightarrow \quad R = 0.2 \times 100 = 20\%$$

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

$$\therefore \quad 3840 = P\left(1+\frac{R}{100}\right)^4 \qquad \cdots(1)$$

$$3936 = P\left(1+\frac{R}{100}\right)^5 \qquad \cdots(2)$$

Dividing equation (2) by equation (1), we have

$$\frac{3936}{3840} = 1+\frac{R}{100} \quad \Rightarrow \quad \frac{R}{100} = \frac{3936}{3840} - 1$$

$$= \frac{3936 - 3840}{3840} = \frac{96}{3840}$$

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

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

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

On squaring both sides,

$$9 = 1\left(1+\frac{R}{100}\right)^6$$

Clearly, the required time = 6 years

58. (c) Rate = 5%, Time = 4 half-years

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

$$= 5000\left[\left(1+\frac{5}{100}\right)^4 - 1\right]$$

$$= 5000\left(\frac{194481}{160000} - 1\right)$$

$$= \frac{5000 \times 34481}{160000} = ₹1077.5$$

$$\text{SI} = \frac{5000 \times 10 \times 2}{100} = ₹1000$$

Difference = 1077.5 − 1000 = ₹77.5

59. (c) Let the principal be ₹1.

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

$$\Rightarrow \quad 2 = 1\left(1+\frac{R}{100}\right)^5$$

Cubing both sides,

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

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

$$\therefore \quad \text{Time} = 15 \text{ years}$$

60. (a) $$R = \frac{12}{2}\% = 6\%$$

T = 1 × 2 = 2 half-yearly

$$\text{Interest} = 6250\left[\left(1+\frac{6}{100}\right)^2 - 1\right]$$

$$= 6250\left[\frac{(106)^2 - (100)^2}{10000}\right]$$

$= 6250 \times (106 + 100)\ (160 - 100)$

$= 6250 \times \frac{(206 \times 6)}{10000} = \frac{6250 \times 1236}{10000} = ₹772.50$

61. (d) Let the amount be A and the rate of interest be r% Then,

$$A\left(1+\frac{r}{100}\right)^2 = 1460 \quad \cdots(1)$$

$$A\left(1+\frac{r}{100}\right)^3 = 1606 \quad \cdots(2)$$

On dividing eqn. (1) by eqn.. (2), we get

$$1+\frac{r}{100} = \frac{1606}{1460}$$

$$\Rightarrow \frac{r}{100} = \frac{1606}{1460} - 1 = \frac{146}{1460} = \frac{1}{10}$$

$$\therefore r = \frac{100}{10}\% = 10\%$$

62. (a) Let the amount be A, rate of interest be rand the required time be t years.

Now, according to the question,

$$2A = A\left(1+\frac{r}{100}\right)^4$$

$$\Rightarrow 2 = \left(1+\frac{r}{100}\right)^4 \quad \cdots(1)$$

Again,

$$16A = A\left(1+\frac{r}{100}\right)^t$$

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

$$\Rightarrow (2)^4 = \left(1+\frac{r}{100}\right)^t \quad \cdots(2)$$

Now, putting the value of 2 from Eqn. (1) in Eqn. (2), we get

$$\left(1+\frac{r}{100}\right)^{4\times 4} = \left(1+\frac{r}{100}\right)^t$$

$\Rightarrow$ t = (4 × 4) = 16 years

63. (a) Compound amount

$$= 4000\left(1+\frac{5}{100}\right)^2 = ₹4410$$

$$\text{Simple interest} = \frac{4000 \times 5 \times 2}{100} = ₹400$$

Compound interest = $A - P$

= ₹(4410 − 4000) = ₹410

$\therefore$ Difference in CI and SI

= 410 − 400 = ₹10

Quicker Method:

$$\text{Difference} = \text{Sum}\left(\frac{r}{100}\right)^2 = 4000\left(\frac{5}{100}\right)^2$$

$$= \frac{4000}{400} = ₹10$$

64. (a) Quicker Method:

For 2 years

$$\because \text{ Simple interest } = \frac{200 \times \text{Rate}}{\text{Rate (Rate} + 200)} \times \text{CI}$$

$$\Rightarrow 8400 = \frac{200r}{r(r+200)} \times 8652$$

$$\Rightarrow 8400(r^2 + 200r) = 8652 \times 200r$$

$$\Rightarrow 8400r^2 = (8652 - 8400) \times 200r$$

$$\Rightarrow 42r = 252$$

$$\therefore r = 6\%$$

65. (c) Let the sum of money invested by Raghu be ₹P. Then,

$$\frac{P \times 12 \times 2}{100} + \left\{P\left(1+\frac{20}{100}\right)^2 - 1\right\} = 11016$$

$$\text{or, } \frac{24P}{100} + P\left\{\left(\frac{6}{5}\right)^2 - 1\right\} = 11016$$

$$\text{or, } \frac{24P}{100} + \frac{11P}{25} = 11016$$

$$\text{or, } \frac{24P + 44P}{100} = 11016$$

or, 68P = 11016 ₹100

$$\therefore P = \frac{11016 \times 100}{68} = ₹16200$$

66. (b) $\text{SI} = \frac{p \times r \times t}{2} = \frac{7300 \times 2 \times 6}{100} = 876$

$$CI = 7300\left[\left(1\frac{6}{100}\right)^2 - 1\right] = 7300\left[\left(\frac{53}{50}\right)^2_{-1}\right]$$

$$= 7300\left[\frac{2809 - 2500}{2500}\right] = 7300 \times \frac{309}{2500} = 902.28$$

$\therefore$ Difference = 902.28 − 876 = 26.28

Quicker Method:

$$\text{CI} = \left(6 + 6 + \frac{6 \times 6}{100}\right) - (6 + 6)$$

$= 12.36 - 12 = 0.36\%$

= 0.36 per cent of 7300 = 26.28

68. (d) $\text{Principal} = \dfrac{\text{Simple Interest} \times 100}{\text{Time} \times \text{Rate}}$

$= \dfrac{2000 \times 100}{5 \times 4} = ₹10,000$

$\therefore$ Compound Interest

$= \text{Principal}\left[\left(1 + \dfrac{\text{Rate}}{100}\right)^{\text{Time}} - 1\right]$

$= 1000\left[\left(1 + \dfrac{4}{100}\right)^2 - 1\right]$

$= 1000\left[\left(\dfrac{26}{25}\right)^2 - 1\right]$

$= \dfrac{10000 \times 51}{625} = ₹816$

69. (a) $\text{SI} = P\left[\left(1 + \dfrac{r}{100}\right)^t - 1\right]$

$\Rightarrow \quad 594.5 = 5800\left[\left(1 + \dfrac{r}{100}\right)^2 - 1\right]$

$\Rightarrow \quad \dfrac{594.5}{5800} + 1 = \left(1 + \dfrac{r}{100}\right)^2$

$\Rightarrow \quad \dfrac{6394.5}{5800} = \left(1 + \dfrac{r}{100}\right)^2$

$\Rightarrow \quad \dfrac{r}{100} = 1.05 - 1$

$\Rightarrow \quad \dfrac{r}{100} = 0.05 \quad \Rightarrow \quad r = 5\%$

70. (d) $\text{CI} = 7400\left[\left(1 + \dfrac{13.5}{100}\right)^2 - 1\right]$

$= 7400\ [1.288225 - 1]$

$= 7400 \times 0.288225 = ₹2132.87$

72. (c) $\text{Amount} = 8000\left(1 + \dfrac{15}{100}\right)^3$

$= 8000\left(\dfrac{20+3}{20}\right)^3 = 8000 \times \dfrac{23}{20} \times \dfrac{23}{20} \times \dfrac{23}{20}$

$= 23 \times 23 \times 23 = 12167$

CI = ₹12167 − 8000 = ₹4167