

Chapter 1. Compound Interest

Ex 1.1

Answer 1.

1. Calculate the amount and the compound interest for each of the following:

a) Rs. 7,500 at 12% p.a. in 3 years.

Here, $P = \text{Rs.} 7,500$; $r = 12\% \text{ p.a.}$; $t = 3 \text{ years}$

For the first year: $t = 1 \text{ year}$

$$\text{S.I.} = \frac{P \times r \times t}{100}$$

$$\text{S.I.} = \text{Rs} \frac{7,500 \times 12 \times 1}{100}$$

$$\text{S.I.} = \text{Rs} 900$$

$$A = P + \text{S.I.}$$

$$= \text{Rs} (7,500 + 900) = \text{Rs} 8,400 = \text{new principal}$$

For the second year: $t = 1 \text{ year}$; $P = \text{Rs} 8,400$

$$\text{S.I.} = \frac{P \times r \times t}{100}$$

$$\text{S.I.} = \text{Rs} \frac{8,400 \times 12 \times 1}{100}$$

$$\text{S.I.} = \text{Rs} 1,008$$

$$A = P + \text{S.I.}$$

$$A = \text{Rs} (8,400 + 1,008) = \text{Rs} 9,408 = \text{new principal}$$

For the third year: $t = 1 \text{ year}$; $P = \text{Rs} 9,408$

$$\text{S.I.} = \frac{P \times r \times t}{100}$$

$$\text{S.I.} = \text{Rs} \frac{9,408 \times 12 \times 1}{100}$$

$$\text{S.I.} = \text{Rs} 1,128.96$$

$$A = P + \text{S.I.}$$

$$A = \text{Rs} (9,408 + 1,128.96) = \text{Rs} 10,536.96$$

C.I. = Interest in first year + interest in second year + interest in third year

$$\text{C.I.} = \text{Rs} (900 + 1,008 + 1,128.96) = \text{Rs} 3,036.96$$

b) Rs.13,500 at 10% p.a. in 2 years

Here, P = Rs.13,500 ; r = 10% p.a. ; t = 2 years

For the first year: t = 1 year

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = Rs \frac{13,500 \times 10 \times 1}{100}$$

$$S.I. = Rs 1,350$$

$$A = P + S.I.$$

$$= Rs (13,500 + 1,350) = Rs 14,850 = \text{new principal}$$

For the second year: t = 1 year; P = Rs 14,850

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = Rs \frac{14,850 \times 10 \times 1}{100}$$

$$S.I. = Rs 1,485$$

$$A = P + S.I.$$

$$A = Rs (14,850 + 1,485) = Rs 16,335$$

C.I. = Interest in first year + interest in second year

$$C.I. = Rs (1,350 + 1,485) = Rs 2,835$$

c) Rs.17,500 at 12% p.a. in 3 years

Here, P = Rs.17,500 ; r = 12% p.a. ; t = 3 years

For the first year: t = 1 year

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = Rs \frac{17,500 \times 12 \times 1}{100}$$

$$S.I. = Rs 2,100$$

$$A = P + S.I.$$

$$= Rs (17,500 + 2,100) = Rs 19,600 = \text{new principal}$$

For the second year: t = 1 year; P = Rs 19,600

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = Rs \frac{19,600 \times 12 \times 1}{100}$$

$$S.I. = Rs 2,352$$

$$A = P + S.I.$$

$$A = Rs (19,600 + 2,352) = Rs 21,952 = \text{new principal}$$

For the third year: $t = 1$ year; $P = Rs 21,952$

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = Rs \frac{21,952 \times 12 \times 1}{100}$$

$$S.I. = Rs 2,634.24$$

$$A = P + S.I.$$

$$A = Rs (21,952 + 2,634.24) = Rs 24,586.24$$

C.I. = Interest in first year + interest in second year + interest in third year

$$C.I. = Rs (2,100 + 2,352 + 2,634.24) = Rs 7,086.24$$

d) Rs.23,750 at 12% p.a. in $2\frac{1}{2}$ years

Here, $P = Rs 23,750$; $r = 12\%$ p.a. ; $t = 2\frac{1}{2}$ years

For the first year: $t = 1$ year

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = Rs \frac{23,750 \times 12 \times 1}{100}$$

$$S.I. = Rs 2,850$$

$$A = P + S.I.$$

$$= Rs (23,750 + 2,850) = Rs 26,600 = \text{new principal}$$

For the second year: $t = 1$ year; $P = Rs 26,600$

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = Rs \frac{26,600 \times 12 \times 1}{100}$$

$$S.I. = Rs 3,192$$

$$A = P + S.I.$$

$$A = \text{Rs } (26,600 + 3,192) = \text{Rs } 29,792 = \text{new principal}$$

For the third year: $t = 1/2$ year; $P = \text{Rs } 29,792$

$$\text{S.I.} = \frac{P \times r \times t}{100}$$

$$\text{S.I.} = \text{Rs } \frac{29,792 \times 12 \times 1}{100 \times 2}$$

$$\text{S.I.} = \text{Rs } 1,787.52$$

$$A = P + \text{S.I.}$$

$$A = \text{Rs } (29,792 + 1,787.52) = \text{Rs } 31,579.52$$

C.I. = Interest in first year + interest in second year + interest in third year

$$\text{C.I.} = \text{Rs } (2,850 + 3,192 + 1,787.52) = \text{Rs } 7,829.52$$

e) Rs.30,000 at 8% p.a. in $2\frac{1}{2}$ years

Here, $P = \text{Rs. } 30,000$; $r = 8\%$ p.a. ; $t = 2\frac{1}{2}$ years

For the first year: $t = 1$ year

$$\text{S.I.} = \frac{P \times r \times t}{100}$$

$$\text{S.I.} = \text{Rs } \frac{30,000 \times 8 \times 1}{100}$$

$$\text{S.I.} = \text{Rs } 2,400$$

$$A = P + \text{S.I.}$$

$$= \text{Rs } (30,000 + 2,400) = \text{Rs } 32,400 = \text{new principal}$$

For the second year: $t = 1$ year; $P = \text{Rs } 32,400$

$$\text{S.I.} = \frac{P \times r \times t}{100}$$

$$\text{S.I.} = \text{Rs } \frac{32,400 \times 8 \times 1}{100}$$

$$\text{S.I.} = \text{Rs } 2,592$$

$$A = P + \text{S.I.}$$

$$A = \text{Rs } (32,400 + 2,592) = \text{Rs } 34,992 = \text{new principal}$$

For the third year: $t = 1/2$ year ; $P = \text{Rs } 34,992$

For the third year: $t = 1/2$ year ; $P = \text{Rs } 34,992$

$$\text{S.I} = \frac{P \times r \times t}{100}$$

$$\text{S.I} = \text{Rs } \frac{34,992 \times 8 \times 1}{100 \times 2}$$

$$\text{S.I} = \text{Rs } 1,399.68$$

$$A = P + \text{S.I.}$$

$$A = \text{Rs } (34,992 + 1,399.68) = \text{Rs } 36,391.68$$

C.I. = Interest in first year + interest in second year + interest in third year

$$\text{C.I.} = \text{Rs } (2,400 + 2,592 + 1,399.68) = \text{Rs } 6,391.68$$

f) Rs.10,000 at 8% p.a. in $2\frac{1}{4}$ years

Here, $P = \text{Rs. } 10,000$; $r = 8\%$ p.a. ; $t = 2\frac{1}{4}$ years

For the first year: $t = 1$ year

$$\text{S.I.} = \frac{P \times r \times t}{100}$$

$$\text{S.I.} = \text{Rs } \frac{10,000 \times 8 \times 1}{100}$$

$$\text{S.I.} = \text{Rs } 800$$

$$A = P + \text{S.I.}$$

$$= \text{Rs } (10,000 + 800) = \text{Rs } 10,800 = \text{new principal}$$

For the second year: $t = 1$ year; $P = \text{Rs } 10,800$

$$\text{S.I.} = \frac{P \times r \times t}{100}$$

$$\text{S.I.} = \text{Rs } \frac{10,800 \times 8 \times 1}{100}$$

$$\text{S.I.} = \text{Rs } 864$$

$$A = P + \text{S.I.}$$

$$A = \text{Rs } (10,800 + 864) = \text{Rs } 11,664 = \text{new principal}$$

For the third year: $t = 1/4$ year ; $P = \text{Rs } 11,664$

$$\text{S.I.} = \frac{P \times r \times t}{100}$$

$$11,664 \times 8 \times 1$$

$$\text{S.I.} = \text{Rs} \frac{11,664 \times 8 \times 4}{100 \times 4}$$

$$\text{S.I.} = \text{Rs} 233.28$$

$$A = P + \text{S.I.}$$

$$A = \text{Rs} (11,664 + 233.28) = \text{Rs} 11,897.28$$

C.I. = Interest in first year + interest in second year + interest in third year

$$\text{C.I.} = \text{Rs} (800 + 864 + 233.28) = \text{Rs} 1,897.28$$

(g) Rs.20, 000 at 9% p.a. in $2\frac{1}{3}$ years

Here, $P = \text{Rs.} 20,000$; $r = 9\%$ p.a. ; $t = 2\frac{1}{3}$ years

For the first year: $t = 1$ year

$$\text{S.I.} = \frac{P \times r \times t}{100}$$

$$\text{S.I.} = \text{Rs} \frac{20,000 \times 9 \times 1}{100}$$

$$\text{S.I.} = \text{Rs} 1,800$$

$$A = P + \text{S.I.}$$

$$= \text{Rs} (20,000 + 1,800) = \text{Rs} 21,800 = \text{new principal}$$

For the second year: $t = 1$ year; $P = \text{Rs} 21,800$

$$\text{S.I.} = \frac{P \times r \times t}{100}$$

$$\text{S.I.} = \text{Rs} \frac{21,800 \times 9 \times 1}{100}$$

$$\text{S.I.} = \text{Rs} 1,962$$

$$A = P + \text{S.I.}$$

$$A = \text{Rs} (21,800 + 1,962) = \text{Rs} 23,762 = \text{new principal}$$

For the third year: $t = \frac{1}{3}$ year; $P = \text{Rs} 23,762$

$$\text{S.I.} = \frac{P \times r \times t}{100}$$

$$\text{S.I.} = \text{Rs} \frac{23,762 \times 9 \times 1}{100 \times 3}$$

$$\text{S.I.} = \text{Rs} 712.86$$

$$A = P + \text{S.I.}$$

$$A = \text{Rs} (23,762 + 712.86) = \text{Rs} 24,474.86$$

C.I. = Interest in first year + interest in second year + interest in third year

$$C.I. = \text{Rs } (1,800 + 1,962 + 712.86) = \text{Rs } 4,474.86$$

(h) Rs.25, 000 at $8\frac{2}{5}\%$ p.a. in $1\frac{1}{3}$ years

Here, $P = \text{Rs.}25, 000$; $r = 8\frac{2}{5}\%$ p.a. = $\frac{42}{5}\%$; $t = 1\frac{1}{3}$ years

For the first year: $t = 1$ year

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = \text{Rs} \frac{25,000 \times 42 \times 1}{100 \times 5}$$

$$S.I. = \text{Rs}2,100$$

$$A = P + S.I.$$

$$= \text{Rs } (25,000 + 2,100) = \text{Rs } 27,100 = \text{new principal}$$

For the second year: $t = 1/3$ year; $P = \text{Rs } 27,100$

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = \text{Rs} \frac{27,100 \times 42 \times 1}{100 \times 5 \times 3}$$

$$S.I. = \text{Rs}758.80$$

$$A = P + S.I.$$

$$A = \text{Rs } (27,100 + 758.80) = \text{Rs } 27,858.80$$

C.I. = Interest in first year + interest in second year

$$C.I. = \text{Rs } (2,100 + 758.80) = \text{Rs } 2,858.80$$

(i) Rs.40, 000 at $5\frac{1}{4}\%$ p.a. in $1\frac{1}{3}$ years

Here, $P = \text{Rs.}40, 000$; $r = 5\frac{1}{4}\%$ p.a. = $\frac{21}{4}\%$; $t = 1\frac{1}{3}$ years

For the first year: $t = 1$ year

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = \text{Rs} \frac{40,000 \times 21 \times 1}{100 \times 4}$$

$$S.I. = \text{Rs}2,100$$

$$A=P+S.I.$$

$$=Rs (40,000 + 2,100) = Rs 42,100 = \text{new principal}$$

For the second year: $t = 1/3$ year; $P=Rs 42,100$

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = Rs \frac{42,100 \times 21 \times 1}{100 \times 4 \times 3}$$

$$S.I. = Rs 736.75$$

$$A=P+S.I.$$

$$A=Rs (42,100 + 736.75) = Rs 42,836.75$$

C.I. = Interest in first year + interest in second year

$$C.I. = Rs (2,100 + 736.75) = Rs 2,836.75$$

(j) Rs.76, 000 at 10 % p.a. in $2\frac{1}{2}$ years

Here, $P = Rs.76, 000$; $r = 10 \% \text{ p.a.}$; $t = 2\frac{1}{2}$ years

For the first year: $t = 1$ year

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = Rs \frac{76,000 \times 10 \times 1}{100}$$

$$S.I. = Rs 7,600$$

$$A=P+S.I.$$

$$=Rs (76,000 + 7,600) = Rs 83,600 = \text{new principal}$$

For the second year: $t = 1$ year; $P=Rs 83,600$

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = Rs \frac{83,600 \times 10 \times 1}{100}$$

$$S.I. = Rs 8,360$$

$$A=P+S.I.$$

$$A=Rs (83,600 + 8,360) = Rs 91,960 = \text{new principal}$$

For the third year: $t = 1/2$ year; $P=Rs 91,960$

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = Rs \frac{100 \times 91,960 \times 10 \times 1}{100 \times 2}$$

$$S.I. = Rs 4,598$$

$$A = P + S.I.$$

$$A = Rs (91,960 + 4,598) = Rs 96,558$$

C.I. = Interest in first year + interest in second year + interest in third year

$$C.I. = Rs (7,600 + 8,360 + 4,598) = Rs 20,558$$

(k) Rs.22, 500 at 12 % p.a. in $1\frac{3}{4}$ years

Here, P = Rs.22, 500; r = 12 % p.a.; t = $1\frac{3}{4}$ years

For the first year: t = 1 year

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = Rs \frac{22,500 \times 12 \times 1}{100}$$

$$S.I. = Rs 2,700$$

$$A = P + S.I.$$

$$= Rs (22,500 + 2,700) = Rs 25,200 = \text{new principal}$$

For the second year: t = $\frac{3}{4}$ year; P = Rs 25,200

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = Rs \frac{25,200 \times 12 \times 3}{100 \times 4}$$

$$S.I. = Rs 2,268$$

$$A = P + S.I.$$

$$A = Rs (25,200 + 2,268) = Rs 27,468$$

C.I. = Interest in first year + interest in second year

$$C.I. = Rs (2,700 + 2,268) = Rs 4,968$$

(l) Rs.16, 000 at 15 % p.a. in $2\frac{2}{3}$ years

Here, P = Rs.16, 000 ; r = 15 % p.a. ; t = $2\frac{2}{3}$ years

For the first year: t = 1 year

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$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = Rs \frac{16,000 \times 15 \times 1}{100}$$

$$S.I. = Rs 2,400$$

$$A = P + S.I.$$

$$= Rs (16,000 + 2,400) = Rs 18,400 = \text{new principal}$$

For the second year: t = 1 year; P = Rs 18,400

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = Rs \frac{18,400 \times 15 \times 1}{100}$$

$$S.I. = Rs 2,760$$

$$A = P + S.I.$$

$$A = Rs (18,400 + 2,760) = Rs 21,160 = \text{new principal}$$

For the third year: t = 2/3 year; P = Rs 21,160

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = Rs \frac{21,160 \times 15 \times 2}{100 \times 3}$$

$$S.I. = Rs 2116$$

$$A = P + S.I.$$

$$A = Rs (21,160 + 2116) = Rs 23,276$$

C.I. = Interest in first year + interest in second year + interest in third year

$$C.I. = Rs (2,400 + 2,760 + 2116) = Rs 7,276$$

Answer 2.

$$\text{Soln: (i) } C_1 = \frac{P \times R \times T}{100} = \frac{65,000 \times 8 \times 1}{100} = \text{Rs. } 5200$$

$$P_1 = 5200 + 65000 \\ = \text{Rs. } 70200$$

$$\text{ii) } C_2 = \frac{P \times R \times T}{100} = \text{Rs. } 5616$$

$$P_2 = \text{Rs. } 75,816$$

$$\text{iii) } C_1 + C_2 = 5200 + 5616 = 10,816$$

$$\text{iv) } C_3 = \frac{75816 \times 8 \times 1}{100} = 6065.28$$

Answer 3.

$$\text{Soln: i) } C_1 = \frac{P \times R \times T}{100} = \frac{75000 \times 1 \times 8}{100} = 6000$$

$$P_1 = 81000$$

$$C_2 = \frac{P \times R \times T}{100} = \frac{81000 \times 8 \times 1}{100} = 6480$$

$$P_2 = 87480$$

$$\text{ii) } C_3 = \frac{87480 \times 1 \times 8}{100} = 6998.4$$

$$P_3 = 94478.4$$

$$\text{iii) } C_3 = 6998.4$$

$$\text{iv) } C_4 = \frac{94478.4 \times 1 \times 8}{100} = 7558.272$$

Answer 4.

$$\text{Soln: i) } C_1 = \frac{36000 \times 1 \times 10}{100} = 3600$$

$$P_1 = 39600$$

$$\text{ii) } C_2 = \frac{39600 \times 1 \times 10}{200} = 1980$$

$$P_2 = 41580$$

Answer 5.

$$\text{Soln: i) } C_1 = \frac{P \times R \times T}{100} = \frac{24000 \times 1 \times 10}{100} = 2400$$

$$P_1 = 26400$$

$$C_2 = \frac{26400 \times 1 \times 10}{100} = 2640$$

$$P_2 = 29040$$

$$C_3 = \frac{29040 \times 1 \times 10}{200} = 2904$$

$$\therefore P_4 = 31944$$

ii)

$$\text{Total Interest} = 2400 + 2640 + 2904 = 7944$$

Answer 6.

$$\text{i) } C_1 = \frac{27500 \times 12 \times 1}{100} = 3300$$

$$P_1 = 30800$$

$$C_2 = \frac{30800 \times 12 \times 1}{100} = 3696$$

$$\text{Soln: } P_2 = 34496$$

$$C_3 = \frac{34496 \times 12 \times 1}{100} = 4139.52$$

$$P_3 = 38636$$

$$\text{ii) } C_{\text{total}} = 11136$$

$$\text{iii) } P_2 = 34496$$

Answer 7.

$$i) C_1 = \frac{60000 \times 15 \times 1}{100} = 9000$$

$$P_1 = 69000$$

$$C_2 = \frac{69000 \times 15 \times 1}{100} = 10350$$

$$P_2 = 79350$$

$$C_3 = \frac{79350 \times 1 \times 15}{100} = 1190.25$$

$$P_3 = 91252.5$$

$$ii) C_{total} = 20541$$

Answer 8.

$$C_1 = \frac{25000 \times 1 \times 10}{100} = 2500$$

$$P_1 = 27500$$

$$C_2 = \frac{27500 \times 10}{100} = 2750$$

$$P_2 = 30250$$

$$C_3 = \frac{30250 \times 1 \times 10}{100} = 3025$$

$$P_3 = 33275$$

$$C_4 = \frac{33275 \times 10 \times 1}{100} = 1663.75$$

$$P_4 = 34940$$

Answer 9.

Soln:

$$C_1 = \frac{16000 \times 15 \times 1}{100} = 2400$$

$$P_1 = 18400$$

$$C_2 = \frac{18400 \times 15 \times 1}{100} = 2760$$

$$P_2 = 21160$$

$$C_3 = \frac{21160 \times 15 \times 1}{400} = 7935$$

$$P_3 = 29095$$

Answer 10.

Soln:

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

$$Amount = 24000 \left(1 + \frac{10}{100} \right)^3 = 31944$$

Therefore, Shekhar received Rs.31944 at the time of maturity.

Answer 11.

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

$$Amount = 27500 \left(1 + \frac{8}{100} \right)^{1.75} = Rs.3,982$$

Answer 12.

Soln:

$$Amount = P \left(1 + \frac{r}{200} \right)^{2t}$$

$$Amount = 35000 \left(1 + \frac{12}{200} \right)^3 = Rs. 41685.56$$

Answer 13.

Soln:

$$Amount = P \left(1 + \frac{r}{200} \right)^{2t}$$

$$Amount = 40000 \left(1 + \frac{10}{200} \right)^4 = Rs. 48620.25$$

Answer 14.

Soln:

$$Amount = P \left(1 + \frac{r}{200} \right)^{2t}$$

$$Amount = 16000 \left(1 + \frac{15}{200} \right)^3 = Rs. 19876.75$$

$$C = 19876.75 - 16000 = 3876.75$$

Answer 15.

Soln:

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

$$Amount = 12500 \left(1 + \frac{16}{100} \right)^{15} = Rs. 15660$$

Ex 1.2

Answer 1.

(a) Rs 12,500 for 2 years at 8% for the first year and 10% for the second year.

Sol: P = Rs.12, 500;

(i) Interest for the first year

T = 1 year, R = 8 % for first year

$$\begin{aligned} &= \text{Rs} \frac{12,500 \times 8 \times 1}{100} \\ &= \text{Rs.}1,000 \end{aligned}$$

(ii) Principal for the second year
= Amount after one year

$$\begin{aligned} &= \text{Rs.}12,500 + \text{Rs.}1,000 \\ &= \text{Rs.}13,500 \end{aligned}$$

(iii) Interest for the second year

T = 1 year, R = 10 % for second year

$$\begin{aligned} &= \text{Rs} \frac{13,500 \times 10 \times 1}{100} \\ &= \text{Rs.}1,350 \end{aligned}$$

Therefore, Amount at the end of 2nd year

$$= \text{Rs.}1,350 + \text{Rs.}1,350$$

$$\text{Amount} = \text{Rs } 14,850$$

$$\text{C.I.} = A - P$$

$$= \text{Rs.} (14,850 - 12,500)$$

$$\text{C.I.} = \text{Rs. } 2,350$$

(b) Rs 15,000 for 2 years at 6% for the first year and 7% for the second year.

Sol: P = Rs.15, 000;

(i) Interest for the first year

T = 1 year, R = 6 % for first year

$$\begin{aligned} &= \text{Rs} \frac{15,000 \times 6 \times 1}{100} \\ &= \text{Rs}.900 \end{aligned}$$

(ii) Principal for the second year
= Amount after one year

$$\begin{aligned} &= \text{Rs}.15,000 + \text{Rs}.900 \\ &= \text{Rs}.15,900 \end{aligned}$$

(iii) Interest for the second year

T = 1 year, R = 7 % for second year

$$\begin{aligned} &= \text{Rs} \frac{15,900 \times 7 \times 1}{100} \\ &= \text{Rs}.1,113 \end{aligned}$$

Therefore Amount at the end of 2nd year

$$\begin{aligned} &= \text{Rs}.15,900 + \text{Rs}.1,113 \\ &= \text{Rs}.17,013 \end{aligned}$$

Amount = Rs 17,013

C.I. = A-P

$$= \text{Rs}. (17,013 - 15,000)$$

$$\text{C.I.} = \text{Rs}. 2,013$$

(c) Rs 12,500 for 3 years at 12% for the first year, 15% for the second year and 17% for the third year.

Sol: P = Rs.12, 500;

(i) Interest for the first year

T = 1 year, R = 12 % for first year

$$\begin{aligned} &= \text{Rs} \frac{12,500 \times 12 \times 1}{100} \\ &= \text{Rs}.1,500 \end{aligned}$$

(ii) Principal for the second year
= Amount after one year

$$= \text{Rs}.12,500 + \text{Rs}.1,500$$

$$= \text{Rs. } 12,500 + \text{Rs. } 1,500$$

$$= \text{Rs. } 14,000$$

(iii) Interest for the second year

T = 1 year, R = 15 % for second year

$$= \text{Rs. } \frac{14,000 \times 15 \times 1}{100}$$

$$= \text{Rs. } 2,100$$

(iv) Principal for the third year

= Amount after second year

$$= \text{Rs. } 14,000 + \text{Rs. } 2,100$$

$$= \text{Rs. } 16,100$$

(v) Interest for the third year

T = 1 year, R = 17 % for second year

$$= \text{Rs. } \frac{16,100 \times 17 \times 1}{100}$$

$$= \text{Rs. } 2,737$$

Therefore Amount at the end of 3rd year

$$= \text{Rs. } 16,100 + \text{Rs. } 2,737$$

$$= \text{Rs. } 18,837$$

Amount = Rs 18,837

$$\text{C.I.} = A - P$$

$$= \text{Rs. } (18,837 - 12,500)$$

$$\text{C.I.} = \text{Rs. } 6,337$$

(d) Rs 20,000 for 3 years at $7\frac{1}{2}\%$ for the first year, 8% for the second year and 10% for the third year.

Sol: P = Rs.20, 000;

(i) Interest for the first year

T = 1 year, R = $7\frac{1}{2}\%$ for first year = $\frac{15}{2}\%$

$$= \text{Rs. } \frac{20,000 \times \frac{15}{2} \times 1}{100}$$

$$= \text{Rs} \frac{20,000 \times 15 \times 1}{2 \times 100}$$

$$= \text{Rs.}1,500$$

(ii) Principal for the second year
= Amount after one year

$$= \text{Rs.}20,000 + \text{Rs.}1,500$$

$$= \text{Rs.}21,500$$

(iii) Interest for the second year

T = 1 year, R = 18 % for second year

$$= \text{Rs} \frac{21,500 \times 18 \times 1}{100}$$

$$= \text{Rs.}1,720$$

(iv) Principal for the third year
= Amount after second year

$$= \text{Rs.}21,500 + \text{Rs.}1,720$$

$$= \text{Rs.}23,220$$

(v) Interest for the third year

T = 1 year, R = 10 % for second year

$$= \text{Rs} \frac{23,220 \times 10 \times 1}{100}$$

$$= \text{Rs.}2,322$$

Therefore Amount at the end of 3rd year

$$= \text{Rs.}23,220 + \text{Rs.}2,322$$

$$= \text{Rs.}25,542$$

Amount = Rs 25,542

C.I. = A-P

$$= \text{Rs.} (25,542 - 20,000)$$

C.I. = Rs. 5,542

Answer 2.

P = Rs. 25,000, R = 10% p.a.

Interest for first year

$$\begin{aligned} &= \frac{\text{Rs}25,000 \times 10 \times 1}{100} \\ &= \text{Rs}2,500 \end{aligned}$$

Amount due after 1st year

$$\begin{aligned} &= \text{Rs. } 25,000 + \text{Rs. } 2,500 \\ &= \text{Rs } 27,500 \end{aligned}$$

Amount paid after 1st year = Rs. 7,500

$$\begin{aligned} \text{Balance amount} &= \text{Rs. } 27,500 - \text{Rs. } 7,500 \\ &= \text{Rs. } 20,000 \end{aligned}$$

Interest for second year

$$\begin{aligned} &= \frac{\text{Rs}20,000 \times 10 \times 1}{100} \\ &= \text{Rs}2,000 \end{aligned}$$

Amount due after 2nd year

$$\begin{aligned} &= \text{Rs. } 20,000 + \text{Rs. } 2,000 \\ &= \text{Rs } 22,000 \end{aligned}$$

Amount paid after 2nd year = Rs. 7,500

$$\begin{aligned} \text{Balance amount} &= \text{Rs. } 22,000 - \text{Rs. } 7,500 \\ &= \text{Rs. } 14,500 \end{aligned}$$

Interest for third year

$$\begin{aligned} &= \frac{\text{Rs}14,500 \times 10 \times 1}{100} \\ &= \text{Rs}1,450 \end{aligned}$$

Amount due after 3rd year

$$\begin{aligned} &= \text{Rs. } 14,500 + \text{Rs. } 1,450 \\ &= \text{Rs } 15,950 \end{aligned}$$

Amount paid after 3rd year = Rs. 7,500

$$\begin{aligned} \text{Balance amount} &= \text{Rs. } 15,950 - \text{Rs. } 7,500 \\ &= \text{Rs. } 8,450 \end{aligned}$$

Loan outstanding at the beginning of the fourth year = Rs 8,450.

Answer 3.

P = Rs. 90,000, R = 15 % p.a.

Interest for first year

$$\begin{aligned} &= \frac{\text{Rs}90,000 \times 15 \times 1}{100} \\ &= \text{Rs}13,500 \end{aligned}$$

Amount due after 1st year

$$\begin{aligned} &= \text{Rs. } 90,000 + \text{Rs. } 13,500 \\ &= \text{Rs } 103,500 \end{aligned}$$

Amount paid after 1st year = Rs. 35,000

$$\begin{aligned} \text{Balance amount} &= \text{Rs. } 103,500 - \text{Rs. } 35,000 \\ &= \text{Rs. } 68,500 \end{aligned}$$

Interest for second year

$$\begin{aligned} &= \frac{\text{Rs}68,500 \times 15 \times 1}{100} \\ &= \text{Rs}10,275 \end{aligned}$$

Amount due after 2nd year

$$\begin{aligned} &= \text{Rs. } 68,500 + \text{Rs. } 10,275 \\ &= \text{Rs } 78,775 \end{aligned}$$

Amount paid after 2nd year = Rs. 35,000

$$\begin{aligned} \text{Balance amount} &= \text{Rs. } 78,775 - \text{Rs. } 35,000 \\ &= \text{Rs. } 43,775 \end{aligned}$$

Interest for third year

$$\begin{aligned} &= \frac{\text{Rs } 43,775 \times 15 \times 1}{100} \\ &= \text{Rs } 6,566.25 \end{aligned}$$

Amount due after 3rd year

$$\begin{aligned} &= \text{Rs. } 43,775 + \text{Rs. } 6,566.25 \\ &= \text{Rs } 50,341.25 \end{aligned}$$

Amount paid after 3rd year = Rs.35, 000

$$\begin{aligned} \text{Balance amount} &= \text{Rs. } 50,341.25 - \text{Rs.}35, 000 \\ &= \text{Rs. } 15,341.25 \end{aligned}$$

Loan outstanding at the beginning of the fourth year = Rs 15,341.25

Answer 4.

P = Rs. 15,000, R = 11 % p.a.

Interest for first year

$$\begin{aligned} &= \frac{\text{Rs}15,000 \times 11 \times 1}{100} \\ &= \text{Rs}1,650 \end{aligned}$$

Amount due after 1st year
= Rs. 15,000 + Rs. 1,650
= Rs 16,650

Amount paid after 1st year = Rs. 7,550

Balance amount = Rs. 16,650 – Rs. 7,550
= Rs. 9,100

Interest for second year

$$\begin{aligned} &= \frac{\text{Rs}9,100 \times 11 \times 1}{100} \\ &= \text{Rs}1,001 \end{aligned}$$

Amount paid after 2nd year = Rs. 6,101

Balance amount = Rs. 10,101 – Rs. 6,101
= Rs. 4,000

Interest for third year

$$\begin{aligned} &= \frac{\text{Rs}4,000 \times 11 \times 1}{100} \\ &= \text{Rs}440 \end{aligned}$$

Amount due after 3rd year
= Rs. 4,000 + Rs. 440
= Rs 4,440

Pooja needs to pay Rs 4,440 to Sonali at the end of third year to clear her debt.

Answer 5.

P = Rs. 18,000, R = 12 % p.a.

Interest for first year

$$= \frac{\text{Rs}18,000 \times 12 \times 1}{100}$$

$$= \frac{\quad}{100}$$
$$= \text{Rs}2,160$$

Amount due after 1st year
= Rs. 18,000 + Rs. 2,160
= Rs 20,160

Amount paid after 1st year = Rs. 5,250

Balance amount = Rs. 20,160 – Rs. 5,250
= Rs. 14,910

Interest for second year

$$= \frac{\text{Rs}14,910 \times 12 \times 1}{100}$$
$$= \text{Rs}1,789.20$$

Amount due after 2nd year
= Rs. 14,910 + Rs. 1,789.20
= Rs 16,699.20

Amount paid after 2nd year = Rs. 5,875

Balance amount = Rs. 16,699.20– Rs. 5,875
= Rs. 10,824.20

Interest for third year

$$= \frac{\text{Rs}10,824.20 \times 12 \times 1}{100}$$
$$= \text{Rs}1,298.904$$

Amount due after 3rd year
= Rs. 10,824.20 + Rs. 1,298.904
= Rs 12,123.10

Amount paid after 3rd year = Rs. 6,875

Balance amount = Rs. 12,123.10– Rs. 6,875
= Rs. 5,248.104

Interest for fourth year

$$= \frac{\text{Rs}5,248.104 \times 12 \times 1}{100}$$
$$= \text{Rs}629.7725$$

Amount due after 4th year
= Rs. 5,248.104 + Rs. 629.7725
= Rs 5877.876

$$=Rs\ 5877.87$$

Archana needs to pay Rs 5877.87 to Ritu at the end of 4th year to clear

Answer 6.

Here, $P = Rs\ 15,000$; $r = 12\%$ p.a.; $t = 2$ years

$$\begin{aligned}\therefore A &= P \left(1 + \frac{r}{100} \right)^n \\ &= Rs. 15,000 \left(1 + \frac{12}{100} \right)^2 \\ &= Rs. 15,000 \left(\frac{112}{100} \right)^2 \\ &= Rs. 15,000 \left(\frac{28}{25} \right)^2 \\ &= Rs. 15,000 \times \frac{28}{25} \times \frac{28}{25} \\ \therefore A &= Rs. 18,816\end{aligned}$$

Hence, amount due after 2 years = Rs 18,816

Amount paid after 2 years = Rs 7,500

Balance amount = Amount due after 2 years – amount paid after 2 years = cost of the scooter = Rs (18,816 – 7,500)

Cost of the scooter = Rs 11,316

Answer 7.

Here, $P = \text{Rs } 25,000$; $r = 8.4\% \text{ p.a.}$; $t = 2 \text{ years}$

$$\begin{aligned}\therefore A &= P \left(1 + \frac{r}{100} \right)^n \\&= \text{Rs. } 25,000 \left(1 + \frac{8.4}{100} \right)^2 \\&= \text{Rs. } 25,000 \left(1 + \frac{84}{100 \times 10} \right)^2 \\&= \text{Rs. } 25,000 \left(\frac{271}{250} \right)^2 \\&= \text{Rs. } 25,000 \times \frac{271}{250} \times \frac{271}{250} \\ \therefore A &= \text{Rs } 29,376.40\end{aligned}$$

Hence, amount due after 2 years = Rs 29,376.40

Amount paid after 2 years = Rs 17,500

Balance amount = Amount due after 2 years – amount paid after 2 years = cost of the motorcycle = Rs (29,376.40 – 17,500)

Cost of the motorcycle = Rs 11,876.40

Answer 8.

$P = \text{Rs. } 10,000$, $R = 6\% \text{ p.a.}$

Interest for first year

$$\begin{aligned} &= \frac{\text{Rs}10,000 \times 6 \times 1}{100} \\ &= \text{Rs}600 \end{aligned}$$

Amount due after 1st year
= Rs. 10,000 + Rs. 600
= Rs 10,600

Amount paid after 1st year = Rs. 5,600

Balance amount = Rs. 10,600 – Rs. 5,600
= Rs. 5,000

Interest for second year when $r = 8\% \text{ p.a.}$

$$\begin{aligned} &= \frac{\text{Rs}5,000 \times 8 \times 1}{100} \\ &= \text{Rs}400 \end{aligned}$$

Amount due after 2nd year
= Rs. 5,000 + Rs. 400
= Rs 5,400

Prakash has to return Rs 5,400 to Rajesh at the end of second year.

Answer 9.

$P = \text{Rs. } 12,500$, $R = 8 \% \text{ p.a.}$

Interest for first year

$$\begin{aligned} &= \frac{\text{Rs}12,500 \times 8 \times 1}{100} \\ &= \text{Rs}1,000 \end{aligned}$$

Amount due after 1st year

$$\begin{aligned} &= \text{Rs. } 12,500 + \text{Rs. } 1,000 \\ &= \text{Rs } 13,500 \end{aligned}$$

Amount paid after 1st year = Rs. 7,500

$$\begin{aligned} \text{Balance amount} &= \text{Rs. } 13,500 - \text{Rs. } 7,500 \\ &= \text{Rs. } 6,000 \end{aligned}$$

Interest for second year when $r = 10\% \text{ p.a.}$

$$\begin{aligned} &= \frac{\text{Rs}6,000 \times 10 \times 1}{100} \\ &= \text{Rs}600 \end{aligned}$$

Amount due after 2nd year

$$\begin{aligned} &= \text{Rs. } 6,000 + \text{Rs. } 600 \\ &= \text{Rs } 6,600 \end{aligned}$$

Meera has to return Rs 6,600 to Rajeev at the end of second year

Answer 10.

$$P = \text{Rs. } 50,000, R = 7\frac{1}{2}\% \text{ p.a.} = \frac{15}{2}\% \text{ p.a.}$$

Interest for first year

$$\begin{aligned} &= \frac{\text{Rs}50,000 \times \frac{15}{2} \times 1}{100} \\ &= \frac{\text{Rs}50,000 \times 15 \times 1}{2 \times 100} \\ &= \text{Rs}3,750 \end{aligned}$$

$$\begin{aligned} \text{Amount due after 1}^{\text{st}} \text{ year} \\ &= \text{Rs. } 50,000 + \text{Rs. } 3,750 \\ &= \text{Rs } 53,750 \end{aligned}$$

$$\text{Amount paid after 1}^{\text{st}} \text{ year} = \text{Rs. } 27,750$$

$$\begin{aligned} \text{Balance amount} &= \text{Rs. } 53,750 - \text{Rs. } 27,750 \\ &= \text{Rs. } 26,000 \end{aligned}$$

$$\text{Interest for second year when } r = 9\frac{1}{4}\% \text{ p.a.} = \frac{37}{4}\% \text{ p.a.}$$

$$\begin{aligned} &= \frac{\text{Rs}26,000 \times \frac{37}{4} \times 1}{100} \\ &= \frac{\text{Rs}26,000 \times 37 \times 1}{4 \times 100} \\ &= \text{Rs}2,405 \end{aligned}$$

$$\begin{aligned} \text{Amount due after 2}^{\text{nd}} \text{ year} \\ &= \text{Rs. } 26,000 + \text{Rs. } 2,405 \\ &= \text{Rs } 28,405 \end{aligned}$$

Mr. Chatterjee has to return Rs 28,405 to Mr. Patel at the end of second year to clear his loan.

Ex 1.3**Answer 1.**

Here $P = x$; $A = \text{Rs } 9,447.84$; $t = 3$ years; $r = 8\%$ p.a.

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

$$\Rightarrow \text{Rs } 9,447.84 = x \left(1 + \frac{8}{100} \right)^3$$

$$\Rightarrow \text{Rs } 9,447.84 = x \left(\frac{108}{100} \right)^3$$

$$\Rightarrow \text{Rs } 9,447.84 = x \times \frac{27}{25} \times \frac{27}{25} \times \frac{27}{25}$$

$$\Rightarrow \text{Rs } 9,447.84 = x \times \frac{19,683}{15,625}$$

$$\Rightarrow x = \text{Rs } \frac{9,447.84 \times 15,625}{19,683}$$

$$\Rightarrow x = \text{Rs } 7,500$$

The sum of money will be Rs 7,500.

Answer 2.

Here $P = x$; $A = \text{Rs } 16,637.50$; $t = 3$ years; $r = 10\%$ p.a.

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

$$\Rightarrow \text{Rs } 16,637.50 = x \left(1 + \frac{10}{100} \right)^3$$

$$\Rightarrow \text{Rs } 16,637.50 = x \left(\frac{11}{10} \right)^3$$

$$\Rightarrow \text{Rs } 16,637.50 = x \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}$$

$$\Rightarrow \text{Rs } 16,637.50 = x \times \frac{1,331}{1,000}$$

$$\Rightarrow x = \text{Rs } \frac{16,637.50 \times 1,000}{1,331}$$

$$\Rightarrow x = \text{Rs } 12,500$$

The sum of money will be Rs 12,500.

Answer 3.

For the second year

Here $P = x$; $A = \text{Rs } 7,128$; $t = 1$ year; $r = 10\%$ p.a.

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

$$\Rightarrow \text{Rs } 7,128 = x \left(1 + \frac{10}{100} \right)^1$$

$$\Rightarrow \text{Rs } 7,128 = x \left(\frac{11}{10} \right)$$

$$\Rightarrow x = \text{Rs } \frac{7,128 \times 10}{11}$$

$$\Rightarrow x = \text{Rs } 6,480$$

The sum of money will be Rs 6,480 at the end of the first year or beginning of the second year.

For the first year

Here $P = x$; $A = \text{Rs } 6,480$; $t = 1$ year; $r = 8\%$ p.a.

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

$$\Rightarrow \text{Rs } 6,480 = x \left(1 + \frac{8}{100} \right)^1$$

$$\Rightarrow \text{Rs } 6,480 = x \left(\frac{108}{100} \right)$$

$$\Rightarrow x = \text{Rs } \frac{6,480 \times 100}{108}$$

$$\Rightarrow x = \text{Rs } 6,000$$

The sum of money will be Rs 6,000 at the beginning of the first year.

Answer 4.

For the third year

Here $P = x$; $A = \text{Rs } 3,326.40$; $t = 1$ year; $r = 12\%$ p.a.

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

$$\Rightarrow \text{Rs } 3,326.40 = x \left(1 + \frac{12}{100} \right)^1$$

$$\Rightarrow \text{Rs } 3,326.40 = x \left(\frac{112}{100} \right)$$

$$\Rightarrow x = \text{Rs} \frac{3,326.40 \times 100}{112}$$

$$\Rightarrow x = \text{Rs} 2,970$$

The sum of money will be Rs 2,970 at the end of the second year or beginning of the third year.

For the second year

Here $P = x$; $A = \text{Rs } 2,970$; $t = 1$ year; $r = 10\%$ p.a.

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

$$\Rightarrow \text{Rs} 2,970 = x \left(1 + \frac{10}{100} \right)^1$$

$$\Rightarrow \text{Rs} 2,970 = x \left(\frac{11}{10} \right)$$

$$\Rightarrow x = \text{Rs} \frac{2,970 \times 10}{11}$$

$$\Rightarrow x = \text{Rs} 2700$$

The sum of money will be Rs 2,700 at the end of the first year or beginning of the second year.

For the first year

Here $P = x$; $A = \text{Rs } 2,700$; $t = 1$ year; $r = 8\%$ p.a.

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

$$\Rightarrow \text{Rs} 2,700 = x \left(1 + \frac{8}{100} \right)^1$$

$$\Rightarrow \text{Rs} 2,700 = x \left(\frac{108}{100} \right)$$

$$\Rightarrow x = \text{Rs} \frac{2,700 \times 100}{108}$$

$$\Rightarrow x = \text{Rs} 2500$$

The sum of money will be Rs 2,500 at the beginning of the first year.

Answer 5.

For the third year

Here $P = x$; $A = \text{Rs } 13,675.20$; $t = 1$ year; $r = 12\%$ p.a.

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

$$\Rightarrow Rs13,675.20 = x \left(1 + \frac{12}{100}\right)^1$$

$$\Rightarrow Rs13,675.20 = x \left(\frac{112}{100}\right)$$

$$\Rightarrow x = Rs \frac{13,675.20 \times 100}{112}$$

$$\Rightarrow x = Rs12,210$$

The sum of money will be Rs 12,210 at the end of the second year or beginning of the third year.

For the second year

Here $P = x$; $A = Rs\ 12,210$; $t = 1$ year; $r = 11\%$ p.a.

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

$$\Rightarrow Rs12,210 = x \left(1 + \frac{11}{100}\right)^1$$

$$\Rightarrow Rs12,210 = x \left(\frac{111}{100}\right)$$

$$\Rightarrow x = Rs \frac{12,210 \times 100}{111}$$

$$\Rightarrow x = Rs\ 11,000$$

The sum of money will be Rs 11,000 at the end of the first year or beginning of the second year.

For the first year

Here $P = x$; $A = Rs\ 11,000$; $t = 1$ year; $r = 10\%$ p.a.

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

$$\Rightarrow Rs11,000 = x \left(1 + \frac{10}{100}\right)^1$$

$$\Rightarrow Rs11,000 = x \left(\frac{11}{10}\right)$$

$$\Rightarrow x = Rs \frac{11,000 \times 10}{11}$$

$$\Rightarrow x = Rs10,000$$

The sum of money will be Rs 10,000 at the beginning of the first year.

Answer 6.

P = Rs. 4,000; R = 10% p.a.; T = 3 years

Interest for the 1st year

$$\begin{aligned} &= \text{Rs } \frac{4,000 \times 10 \times 1}{100} \\ &= \text{Rs } 400 \end{aligned}$$

Principal for the second year

$$\begin{aligned} &= \text{Amount at the end of one year} + \text{his new savings} \\ &= \text{Rs. } 4,000 + \text{Rs. } 400 + \text{Rs. } 4,000 \\ &= \text{Rs. } 8,400 \end{aligned}$$

Interest for the second year

$$\begin{aligned} &= \text{Rs } \frac{8,400 \times 10 \times 1}{100} \\ &= \text{Rs } 840 \end{aligned}$$

Compound interest for second year

$$= \text{Rs. } 840$$

Principal for the third year

$$\begin{aligned} &= \text{Amount at the end of two years} + \text{his new savings} \\ &= \text{Rs. } 8400 + \text{Rs. } 840 + \text{Rs. } 4000 \\ &= \text{Rs. } 13,240 \end{aligned}$$

Interest for the third year

$$\begin{aligned} &= \text{Rs } \frac{13,240 \times 10 \times 1}{100} \\ &= \text{Rs } 1,324 \end{aligned}$$

Sum due at the end of third year = his savings at the end of third year = Rs.
13,240 + Rs. 1,324 = Rs 14,564

Answer 7.

P = Rs. 5,000; R = 12% p.a.; T = 3 years

Interest for the 1st year

$$= \text{Rs} \frac{5,000 \times 12 \times 1}{100}$$

$$= \text{Rs} 600$$

Principal for the second year

= Amount at the end of one year + his new savings

$$= \text{Rs. } 5,000 + \text{Rs. } 600 + \text{Rs. } 5,000$$

$$= \text{Rs. } 10,600$$

Interest for the second year

$$= \text{Rs} \frac{10,600 \times 12 \times 1}{100}$$

$$= \text{Rs} 1,272$$

Compound interest for second year

$$= \text{Rs. } 1,272$$

Principal for the third year

= Amount at the end of two years + his new savings

$$= \text{Rs. } 10,600 + \text{Rs. } 1,272 + \text{Rs. } 5,000$$

$$= \text{Rs. } 16,872$$

Interest for the third year

$$= \text{Rs} \frac{16,872 \times 12 \times 1}{100}$$

$$= \text{Rs} 2,024.64$$

Sum due at the end of third year = his savings at the end of third year = Rs.
 $16,872 + \text{Rs. } 2,024.64 = \text{Rs } 18,896.64$

Answer 8.

P = Rs. 500; R = 10% p.a.; T = 3 years

Interest for the 1st year

$$= \text{Rs} \frac{500 \times 10 \times 1}{100}$$
$$= \text{Rs} 50$$

Principal for the second year

= Amount at the end of one year + his new saving
= Rs. 500 + Rs. 50 + Rs. 550
= Rs. 1,100

Interest for the second year

$$= \text{Rs} \frac{1,100 \times 10 \times 1}{100}$$
$$= \text{Rs} 110$$

Compound interest for second year

= Rs. 110

Principal for the third year

= Amount at the end of two years + his new savings
= Rs. 1,100 + Rs. 110 + Rs. 600
= Rs. 1,810

Interest for the third year

$$= \text{Rs} \frac{1,810 \times 10 \times 1}{100}$$
$$= \text{Rs} 181$$

Sum due at the end of third year = his savings at the end of third year = Rs 1,810 + Rs. 181 = Rs 1,991

Answer 9.

P = Rs. 4,000; R = 15% p.a.; T = 3 years

Interest for the 1st year

$$\begin{aligned} &= \text{Rs} \frac{4,000 \times 15 \times 1}{100} \\ &= \text{Rs} 600 \end{aligned}$$

Principal for the second year

$$\begin{aligned} &= \text{Amount at the end of one year} + \text{her new savings} \\ &= \text{Rs. } 4,000 + \text{Rs. } 600 + \text{Rs. } 5,000 \\ &= \text{Rs. } 9,600 \end{aligned}$$

Interest for the second year

$$\begin{aligned} &= \text{Rs} \frac{9,600 \times 15 \times 1}{100} \\ &= \text{Rs} 1,440 \end{aligned}$$

Compound interest for second year

$$= \text{Rs. } 1,440$$

Principal for the third year

$$\begin{aligned} &= \text{Amount at the end of two years} + \text{her new savings} \\ &= \text{Rs. } 9,600 + \text{Rs. } 1,440 + \text{Rs. } 6,000 \\ &= \text{Rs. } 17,040 \end{aligned}$$

Interest for the third year

$$\begin{aligned} &= \text{Rs} \frac{17,040 \times 15 \times 1}{100} \\ &= \text{Rs} 2,556 \end{aligned}$$

Sum due at the end of third year = her savings at the end of third year = Rs.
 $17,040 + \text{Rs. } 2,556 = \text{Rs } 19,596$

Answer 10.

Let value of car be Rs x .

$V_0 = \text{Rs } x$; $n = 3$; $r = 10\%$ for first 2 years and 8% for 3rd year.

$$\therefore V_t = V_0 \times \left(1 - \frac{r}{100}\right)^n$$

$$\Rightarrow V_t = \text{Rs. } x \times \left(1 - \frac{10}{100}\right)^2 \left(1 - \frac{8}{100}\right)$$

$$\Rightarrow V_t = \text{Rs. } x \times \frac{9}{10} \times \frac{9}{10} \times \frac{23}{25}$$

$$\Rightarrow V_t = \text{Rs. } x \times \frac{1863}{2500}$$

$$\Rightarrow V_t = \text{Rs. } 0.7452x$$

Depreciation in the value of car = Rs $(x - 0.7452x) = \text{Rs } 0.2548x$

Percentage change in depreciation

$$= \frac{0.2548x}{x} \times 100$$

$$= 25.48\%$$

Percentage change = 25.48%

Answer 11.

Let value of machine be Rs x .

$V_0 = \text{Rs } x$; $n = 3$; $r = 10\%$ for first year, 12% for 2nd year and 15% for 3rd year.

$$\therefore V_t = V_0 \times \left(1 - \frac{r}{100}\right)^n$$

$$\Rightarrow V_t = \text{Rs. } x \times \left(1 - \frac{10}{100}\right) \left(1 - \frac{12}{100}\right) \left(1 - \frac{15}{100}\right)$$

$$\Rightarrow V_t = \text{Rs. } x \times \frac{9}{10} \times \frac{22}{25} \times \frac{17}{20}$$

$$\Rightarrow V_t = \text{Rs. } x \times \frac{3366}{5000}$$

$$\Rightarrow V_t = \text{Rs. } 0.6732x$$

Depreciation in the value of car = Rs $(x - 0.6732x) = \text{Rs } 0.3268x$

Percentage change in depreciation

$$= \frac{0.3268x}{x} \times 100$$

$$= 32.68\%$$

Percentage change = 32.68%

Answer 12.

Let value of the scooter be Rs x .

$$V_0 = \text{Rs } x; n = 2; r = 12\%$$

Depreciation in the first year =

$$\therefore V_t = V_0 \times \left(1 - \frac{r}{100}\right)^n$$

$$\Rightarrow V_t = \text{Rs. } x \times \left(1 - \frac{12}{100}\right)$$

$$\Rightarrow V_t = \text{Rs. } x \times \frac{22}{25}$$

$$\Rightarrow V_t = \text{Rs } 0.88x$$

Depreciation in the second year =

$$\therefore V_t = V_0 \times \left(1 - \frac{r}{100}\right)^n$$

$$\Rightarrow V_t = \text{Rs } 0.88x \times \left(1 - \frac{12}{100}\right)$$

$$\Rightarrow V_t = \text{Rs } 0.88x \times \frac{22}{25}$$

$$\Rightarrow V_t = \text{Rs } 0.7744x$$

Depreciation in the value of scooter in the second year

$$= \text{Rs } (0.88x - 0.7744x) = \text{Rs } 2,640$$

$$\Rightarrow 0.1056x = \text{Rs } 2,640$$

$$\Rightarrow x = \text{Rs } 25,000$$

The original value of the scooter was Rs 25,000.

Answer 13.

Let value of the refrigerator be Rs x .

$$V_0 = \text{Rs } x; n = 2; r = 8\%$$

Depreciation in the first year =

$$\therefore V_t = V_0 \times \left(1 - \frac{r}{100}\right)^n$$

$$\Rightarrow V_t = \text{Rs. } x \times \left(1 - \frac{8}{100}\right)$$

$$\Rightarrow V_t = \text{Rs. } x \times \frac{23}{25}$$

$$\Rightarrow V_t = \text{Rs } 0.92x$$

Depreciation in the second year =

$$\therefore V_t = V_0 \times \left(1 - \frac{r}{100}\right)^n$$

$$\Rightarrow V_t = \text{Rs } 0.92x \times \left(1 - \frac{8}{100}\right)$$

$$\Rightarrow V_t = \text{Rs } 0.92x \times \frac{23}{25}$$

$$\Rightarrow V_t = \text{Rs } 0.8464x$$

Depreciation in the value of refrigerator in the second year

$$= \text{Rs } (0.92x - 0.8464x) = \text{Rs } 2,392$$

$$\Rightarrow 0.0736x = \text{Rs } 2,392$$

$$\Rightarrow x = \text{Rs } 32,500$$

The original value of the refrigerator was Rs 32,500.

Answer 14.

Let value of the machine be Rs x .

$$V_0 = \text{Rs } x; n = 2; r = 15\%$$

Depreciation in the first year =

$$\therefore V_t = V_0 \times \left(1 - \frac{r}{100}\right)^n$$

$$\Rightarrow V_t = \text{Rs. } x \times \left(1 - \frac{15}{100}\right)$$

$$\Rightarrow V_t = \text{Rs. } x \times \frac{17}{20}$$

$$\Rightarrow V_t = \text{Rs } 0.85x$$

Depreciation in the second year when r is 12% =

$$\therefore V_t = V_0 \times \left(1 - \frac{r}{100}\right)^n$$

$$\Rightarrow V_t = \text{Rs } 0.85x \times \left(1 - \frac{12}{100}\right)$$

$$\Rightarrow V_t = \text{Rs } 0.85x \times \frac{22}{25}$$

$$\Rightarrow V_t = \text{Rs } 0.748x$$

Depreciation in the value of machine in the second year

$$= \text{Rs } (0.85x - 0.748x) = \text{Rs } 1,632$$

$$\Rightarrow 0.102x = \text{Rs } 1,632$$

$$\Rightarrow x = \text{Rs } 16,000$$

The original value of the machine was Rs 16,000.

Answer 15.

Let value of the bike be Rs x .

$$V_0 = \text{Rs } x; n = 2; r = 16\%$$

Depreciation in the first year =

$$\therefore V_t = V_0 \times \left(1 - \frac{r}{100}\right)^n$$

$$\Rightarrow V_t = \text{Rs. } x \times \left(1 - \frac{16}{100}\right)$$

$$\Rightarrow V_t = \text{Rs. } x \times \frac{21}{25}$$

$$\Rightarrow V_t = \text{Rs } 0.84x$$

Depreciation in the second year when r is 13% =

$$\therefore V_t = V_0 \times \left(1 - \frac{r}{100}\right)^n$$

$$\Rightarrow V_t = \text{Rs } 0.84x \times \left(1 - \frac{13}{100}\right)$$

$$\Rightarrow V_t = \text{Rs } 0.84x \times 0.87$$

$$\Rightarrow V_t = \text{Rs } 0.7308x$$

Depreciation in the value of bike in the second year

$$= \text{Rs } (0.84x - 0.7308x) = \text{Rs } 7,098$$

$$\Rightarrow 0.1092x = \text{Rs } 7,098$$

$$\Rightarrow x = \text{Rs } 65,000$$

The original value of the bike was Rs 65,000.

Ex 1.4

Answer 1.

For the second year:

$A = \text{Rs } 648$; $P = \text{Rs } 600$; $n = 1$; $r = ?$

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

$$\Rightarrow 648 = 600 \left(1 + \frac{r}{100} \right)^1$$

$$\Rightarrow 648 = 600 + 6r$$

$$\Rightarrow 6r = 48$$

$$\Rightarrow r = 8$$

Hence, rate of interest = 8%

For the first year:

$I = \text{Rs } 600$; $r = 8\%$; $n = 1$; $P = ?$

$$I = \frac{P \times r \times n}{100}$$

$$\text{Rs } 600 = \text{Rs } \frac{P \times 8 \times 1}{100}$$

$$P = \text{Rs } \frac{60000}{8}$$

$$P = \text{Rs } 7,500$$

The sum invested = Rs 7,500.

Answer 2.

For the second year:

$A = \text{Rs } 940.80$; $P = \text{Rs } 840$; $n = 1$; $r = ?$

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

$$940.80 = 840 \left(1 + \frac{r}{100} \right)^1$$

$$94080 = 84000 + 840r$$

$$840r = 10080$$

$$r = 12$$

Hence, rate of interest = 12%

For the first year:

$I = \text{Rs } 840$; $r = 12\%$; $n = 1$; $P = ?$

$$I = \frac{P \times r \times n}{100}$$

$$\text{Rs } 840 = \text{Rs } \frac{P \times 12 \times 1}{100}$$

$$P = \text{Rs } \frac{84000}{12}$$

$$P = \text{Rs } 7,000$$

The sum invested = Rs 7,000.

Answer 3.

The extra interest earned = C.I. – S.I. = Rs (1,365 – 1,300) = Rs 65.

The interest for the first year = S.I. for 2 years / 2 = Rs $\frac{1300}{2}$ = Rs 650

Therefore, the rate of interest = $\frac{65}{650} \times 100$
= 10%

Now,

$$S.I. = \frac{P \times r \times t}{100}$$

$$\Rightarrow Rs1,300 = \frac{P \times 10 \times 2}{100}$$

$$\Rightarrow P = Rs1300 \times 5$$

$$\Rightarrow P = Rs6,500$$

The rate of interest was 10% and the original sum was Rs 6,500.

Answer 4.

The extra interest earned = C.I. – S.I. = Rs (8,640 – 8,000) = Rs 640.

The interest for the first year = S.I. for 2 years / 2 = Rs $\frac{8000}{2}$ = Rs 4000

Therefore, the rate of interest = $\frac{640}{4,000} \times 100$
= 16%

Now,

$$S.I. = \frac{P \times r \times t}{100}$$

$$\Rightarrow Rs8,000 = \frac{P \times 16 \times 2}{100}$$

$$\Rightarrow P = Rs \frac{8,000 \times 100}{32}$$

$$\Rightarrow P = Rs25,000$$

The rate of interest was 16% and the original sum was Rs 25,000.

Answer 5.

Here, $r = ?$ $P = x$ (say)

$T = 2$ years and 3 years

$A = \text{Rs } 5,082$ in 2 years and $\text{Rs } 5,590.20$ in 3 years.

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

$$5,082 = x \left(1 + \frac{r}{100} \right)^2 \dots\dots\dots(i)$$

$$5,590.20 = x \left(1 + \frac{r}{100} \right)^3 \dots\dots\dots(ii)$$

Dividing (ii) by (i)

$$\frac{x \left(1 + \frac{r}{100} \right)^3}{x \left(1 + \frac{r}{100} \right)^2} = \frac{5,590.20}{5,082}$$

$$\Rightarrow 1 + \frac{r}{100} = \frac{5,590.20}{5,082}$$

$$\Rightarrow \frac{r}{100} = \frac{5,590.20}{5,082} - 1$$

$$\Rightarrow \frac{r}{100} = \frac{5,590.20 - 5,082}{5,082}$$

$$\Rightarrow \frac{r}{100} = \frac{508.20}{5,082}$$

$$\Rightarrow r = \frac{508.20}{5,082} \times 100$$

$$\Rightarrow r = 10\%$$

using (i)

$$x \left(1 + \frac{r}{100} \right)^2 = \text{Rs } 5,082$$

$$x \left(1 + \frac{10}{100} \right)^2 = \text{Rs } 5,082$$

$$x \times \frac{11}{10} \times \frac{11}{10} = \text{Rs } 5,082$$

$$x \times \frac{121}{100} = \text{Rs } 5,082$$

$$x = \text{Rs } \frac{5,082 \times 100}{121}$$

$$x = \text{Rs } 4,200$$

Hence, rate of interest = 10% and sum invested = $\text{Rs } 4,200$.

Answer 6.

Here, $r = ?$ $P = x$ (say)

$T = 2$ years and 3 years

$A = \text{Rs } 26,450$ in 2 years and $\text{Rs } 30,417.50$ in 3 years.

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

$$26,450 = x \left(1 + \frac{r}{100} \right)^2 \dots\dots\dots(i)$$

$$30,417.50 = x \left(1 + \frac{r}{100} \right)^3 \dots\dots\dots(ii)$$

Dividing (ii) by (i)

$$\frac{x \left(1 + \frac{r}{100} \right)^3}{x \left(1 + \frac{r}{100} \right)^2} = \frac{30,417.50}{26,450}$$

$$\Rightarrow 1 + \frac{r}{100} = \frac{30,417.50}{26,450}$$

$$\Rightarrow \frac{r}{100} = \frac{30,417.50}{26,450} - 1$$

$$\Rightarrow \frac{r}{100} = \frac{30,417.50 - 26,450}{26,450}$$

$$\Rightarrow \frac{r}{100} = \frac{3967.50}{26,450}$$

$$\Rightarrow r = \frac{3967.50}{26,450} \times 100$$

$$\Rightarrow r = 15\%$$

using (i)

$$x \left(1 + \frac{r}{100} \right)^2 = \text{Rs } 26,450$$

$$x \left(1 + \frac{15}{100} \right)^2 = \text{Rs } 26,450$$

$$x \times \frac{23}{20} \times \frac{23}{20} = \text{Rs } 26,450$$

$$x \times \frac{529}{400} = \text{Rs } 26,450$$

$$x = \text{Rs } \frac{26,450 \times 400}{529}$$

$$x = \text{Rs } 20,000$$

Hence, rate of interest = 15% and sum invested = $\text{Rs } 20,000$.

Answer 7.

Here, $P = \text{Rs } 5,000$; $r = 8\%$; $t = 2 \text{ years}$

For simple interest:

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = \text{Rs } \frac{5,000 \times 8 \times 2}{100}$$

$$S.I. = \text{Rs } 800$$

For compound interest:

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

$$A = \text{Rs } 5,000 \left(1 + \frac{8}{100} \right)^2$$

$$A = \text{Rs } 5,000 \times \frac{108}{100} \times \frac{108}{100}$$

$$A = \text{Rs } 5,832$$

$$C.I. = A - P$$

$$C.I. = \text{Rs } (5,832 - 5,000)$$

$$C.I. = \text{Rs } 832$$

The difference in the compound interest and the simple interest = $\text{Rs } (832 - 800)$
= $\text{Rs } 32$.

Answer 8.

Here, $P = \text{Rs } 15,000$; $r = 8\%$; $t = 3$ years

For simple interest:

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = \text{Rs } \frac{15,000 \times 8 \times 3}{100}$$

$$S.I. = \text{Rs } 3,600$$

For compound interest:

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

$$A = \text{Rs } 15,000 \left(1 + \frac{8}{100} \right)^3$$

$$A = \text{Rs } 15,000 \times \frac{108}{100} \times \frac{108}{100} \times \frac{108}{100}$$

$$A = \text{Rs } 18,895.68$$

$$C.I. = A - P$$

$$C.I. = \text{Rs } (18,895.68 - 15,000)$$

$$C.I. = \text{Rs } 3,895.68$$

The difference in the compound interest and the simple interest = $\text{Rs } (3,895.68 - 3,600) = \text{Rs } 295.68$

Answer 9.

Here, $P = \text{Rs } 20,000$; $t = 3$ years

For simple interest: $r = 9\%$

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = \text{Rs } \frac{20,000 \times 9 \times 3}{100}$$

$$S.I. = \text{Rs } 5,400$$

For compound interest: $r = 8\frac{1}{2}\%$

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

$$A = \text{Rs } 20,000 \left(1 + \frac{17}{2 \times 100} \right)^3$$

$$A = \text{Rs } 20,000 \times \frac{217}{200} \times \frac{217}{200} \times \frac{217}{200}$$

$$A = \text{Rs } 25,545.70$$

$$C.I. = A - P$$

$$C.I. = \text{Rs } (25,545.70 - 20,000)$$

$$C.I. = \text{Rs } 5,545.70$$

The difference in the compound interest and the simple interest = $\text{Rs } (5,545.70 - 5,400) = \text{Rs } 145.70$

Anand gained Rs 145.70

Answer 10.

Here, $P = \text{Rs } 35,000$; $t = 3$ years

For simple interest: $r = 12.5\%$

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = \text{Rs } \frac{35,000 \times 12.5 \times 3}{100}$$

$$S.I. = \text{Rs } 13,125$$

For compound interest: $r = 12\%$

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

$$A = \text{Rs } 35,000 \left(1 + \frac{12}{100} \right)^3$$

$$A = \text{Rs } 35,000 \times \frac{112}{100} \times \frac{112}{100} \times \frac{112}{100}$$

$$A = \text{Rs } 49,172.48$$

$$C.I. = A - P$$

$$C.I. = \text{Rs } (49,172.48 - 35,000)$$

$$C.I. = \text{Rs } 14,172.48$$

The difference in the compound interest and the simple interest = $\text{Rs } (14,172.48 - 13,125) = \text{Rs } 1,047.48$

Meera gained Rs 1,047.48

Answer 11.

(a) The rate of depreciation.

Difference in the depreciation = Rs (5,100-4,335) = Rs 765

Rate of depreciation =

$$\frac{765}{5,100} \times 100$$
$$= 15\%$$

Rate of depreciation = 15%

(b) The original cost of the scooter.

Depreciation for first year = Rs 5,100 + 15% of Rs 5,100

Here, 15% of Rs 5,100 = Rs 765

Hence, Depreciation for first year = Rs 5,100 + Rs 765 = Rs 5,865

Total depreciation for 3 years = Rs (5,865 + 5,100 + 4335) = Rs 15,300

$A = P - \text{Rs } 15,300$; $P = x$

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

$$x - 15,300 = x \left(1 - \frac{15}{100} \right)^3$$

$$x - 15,300 = x \times 0.85 \times 0.85 \times 0.85$$

$$x(1 - 0.614) = \text{Rs } 15,300$$

$$x = \text{Rs } \frac{15,300}{0.386}$$

$$x = \text{Rs } 39,637.31$$

$$\Rightarrow x = \text{Rs } 40,000 (\text{approx})$$

Original cost of scooter = Rs 40,000

(c) The cost of the scooter at the end of the third year.

Here, $P = \text{Rs } 40,000$; $r = 15\%$; $t = 3$ years

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

$$A = \text{Rs } 40,000 \left(1 - \frac{15}{100} \right)^3$$

$$A = \text{Rs } 40,000 \times 0.85 \times 0.85 \times 0.85$$

$$A = \text{Rs } 24,565$$

Cost of the scooter at the end of third year = Rs 24,565

Answer 12.

(a) The rate of depreciation.

Difference in the depreciation = Rs (2,592-2,332.80) = Rs 259.20

Rate of depreciation =

$$\frac{259.20}{2,592} \times 100$$

$$= 10\%$$

Rate of depreciation = 10%

(b) The original cost.

Depreciation for second year = Rs 2,592 + 10% of Rs 2,592

Here, 10% of Rs 2,592 = Rs 259.20

Hence, Depreciation for second year = Rs 2,592 + Rs 259.20 = Rs 2,851.20

Depreciation for first year = Rs 2,851.20 + 10% of Rs 2,851.20

Here, 10% of Rs 2,851.20 = Rs 285.12

Hence, Depreciation for first year = Rs 2,851.20 + Rs 285.12 = Rs 3,136.32

Total depreciation for 4 years = Rs (3,136.32 + 2,851.20 + 2,592 + 2,332.80)
= Rs 10,912.32

$A = P - \text{Rs } 10,912.32$; $P = x$

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

$$x - 10,912.32 = x \left(1 - \frac{10}{100} \right)^4$$

$$x - 10,912.32 = x \times 1.1 \times 1.1 \times 1.1 \times 1.1$$

$$x(1 - 0.6561) = \text{Rs } 10,912.32$$

$$x = \text{Rs } \frac{10,912.32}{0.3439}$$

$$x = \text{Rs } 31,731.08$$

$$\Rightarrow x = \text{Rs } 32,000 (\text{approx})$$

Original cost = Rs 32,000

(c) The cost at the end of the fourth year.

Here, $P = \text{Rs } 32,000$; $r = 10\%$; $t = 4$ years

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

$$A = \text{Rs } 32,000 \left(1 - \frac{10}{100} \right)^4$$

$$A = Rs32,000 \times 0.9 \times 0.9 \times 0.9 \times 0.9$$

$$A = Rs20,995.20$$

Cost at the end of the fourth year = Rs 20,995.20

Ex 1.5**Answer 1.**

Interest for first year:

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = \frac{12,000 \times 15 \times 1}{100}$$

$$S.I. = 1800$$

Principal amount for second year = Rs (12,000 + 1800) = Rs 13,800

Ramesh paid = Rs x (say)

Therefore, new principal = Rs 13,800 - x

A = Rs 9,200; r = 15%; n = 1 year

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

$$Rs 9,200 = Rs(13,800 - x) \left(1 + \frac{15}{100} \right)$$

$$Rs 9,200 = Rs(13,800 - x) \times 1.15$$

$$Rs 9,200 = Rs 15,870 - Rs 1.15x$$

$$1.15x = Rs(15,870 - 9,200)$$

$$x = \frac{Rs 6,670}{1.15}$$

$$x = Rs 5,800$$

Therefore, Amount Ramesh paid at the end of first year = Rs 5,800

Answer 2.

Interest for first year:

$$S.I. = \frac{P \times r \times t}{100}$$

$$S.I. = \frac{32,000 \times 12 \times 1}{100}$$

$$S.I. = 3,840$$

Principal amount for second year = Rs (32,000 + 3,840) = Rs 35,840

Rajan paid = Rs x (say)

Therefore, new principal = Rs 35,840 - x

A = Rs 17,920; r = 12%; n = 1 year

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

$$Rs 17,920 = Rs(35,840 - x) \left(1 + \frac{12}{100} \right)$$

$$Rs 17,920 = Rs(35,840 - x) \times 1.12$$

$$Rs 17,920 = Rs 40,140.80 - Rs 1.12x$$

$$1.12x = Rs(40,140.80 - 17,920)$$

$$x = \frac{Rs 22,220.80}{1.12}$$

$$x = Rs 19,840$$

Therefore, Amount Rajan paid at the end of first year = Rs 19,840

Answer 3.

Let the sum be P

Interest for first year:

$$P \left(1 + \frac{8}{100} \right) - P \dots \dots \dots (i)$$

Interest for third year:

$$P \left(1 + \frac{8}{100} \right)^3 - P \left(1 + \frac{8}{100} \right)^2 \dots \dots \dots (ii)$$

Subtracting (ii) from (i)

$$P \left(1 + \frac{8}{100} \right)^3 - P \left(1 + \frac{8}{100} \right)^2 - P \left(1 + \frac{8}{100} \right) + P = Rs 166.40$$

$$Rs 166.40 = 1.259712P - 1.1664P - 1.08P + P$$

$$Rs 166.40 = 0.013312P$$

$$P = Rs 12,500$$

Hence the sum is Rs 12,500

Answer 3.

Let the sum be P

Interest for first year:

$$P\left(1 + \frac{8}{100}\right) - P \dots\dots\dots(i)$$

Interest for third year:

$$P\left(1 + \frac{8}{100}\right)^3 - P\left(1 + \frac{8}{100}\right)^2 \dots\dots\dots(ii)$$

Subtracting (ii) from (i)

$$P\left(1 + \frac{8}{100}\right)^3 - P\left(1 + \frac{8}{100}\right)^2 - P\left(1 + \frac{8}{100}\right) + P = Rs166.40$$

$$Rs166.40 = 1.259712P - 1.1664P - 1.08P + P$$

$$Rs166.40 = 0.013312P$$

$$P = Rs12,500$$

Hence the sum is Rs 12,500

Answer 4.

Let the sum be P

Interest for first year:

$$P\left(1 + \frac{25}{2 \times 100}\right) - P \dots\dots\dots(i)$$

Interest for third year:

$$P\left(1 + \frac{25}{2 \times 100}\right)^3 - P\left(1 + \frac{25}{2 \times 100}\right)^2 \dots\dots\dots(ii)$$

Subtracting (ii) from (i)

$$P\left(1 + \frac{25}{2 \times 100}\right)^3 - P\left(1 + \frac{25}{2 \times 100}\right)^2 - P\left(1 + \frac{25}{2 \times 100}\right) + P = Rs531.25$$

$$Rs531.25 = 1.423828P - 1.265625P - 1.125P + P$$

$$Rs531.25 = 0.033203P$$

$$P = Rs16,000$$

Hence the sum is Rs 16,000

Answer 5.

Here, $P = ?$; $t = 2$ years; $r = 8\%$ p.a.

$$S.I. = Rs320$$

$$P = Rs \frac{S.I. \times 100}{r \times t}$$

$$P = Rs \frac{320 \times 100}{8 \times 2}$$

$$P = Rs2,000$$

Now, $P = Rs\ 2,000$; $t = 1$ year

$$n = 2t = 2 \times 1 = 2$$

$$r = \frac{1}{2} \times 8\% = 4\% \text{ Per conversion period.}$$

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

$$A = Rs2,000 \left(1 + \frac{4}{100} \right)^2$$

$$= Rs2,000 \times 1.04 \times 1.04$$

$$= Rs2,163.20$$

$$C.I. = A - P$$

$$= Rs (2,163.20 - 2,000)$$

$$= Rs\ 163.20$$

Hence, compound interest = Rs 163.20

Ex 1.6

Answer 1.

(a) Rs 12,000 for 3 years at 15% p.a.

$P = \text{Rs } 12,000$; $t = 3$ years; $r = 15\%$ p.a.

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

$$A = \text{Rs } 12,000 \left(1 + \frac{15}{100} \right)^3$$

$$= \text{Rs } 12,000 \times 1.15 \times 1.15 \times 1.15$$

$$= \text{Rs } 18,250.50$$

$$C.I. = A - P$$

$$= \text{Rs } (18,250.50 - 12,000)$$

$$= \text{Rs } 6,250.50$$

Hence, Amount = Rs 18,250.50 and C.I. = Rs 6,250.50

(b) Rs 25,000 for 3 years at 8% p.a.

$P = \text{Rs } 25,000$; $t = 3$ years; $r = 8\%$ p.a.

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

$$A = \text{Rs } 25,000 \left(1 + \frac{8}{100} \right)^3$$

$$= \text{Rs } 25,000 \times 1.08 \times 1.08 \times 1.08$$

$$= \text{Rs } 31,492.80$$

$$C.I. = A - P$$

$$= \text{Rs } (31,492.80 - 25,000)$$

$$= \text{Rs } 6,492.80$$

Hence, Amount = Rs 31,492.80 and C.I. = Rs 6,492.80

(c) Rs 16,000 for 3 years at $7\frac{1}{2}\%$ p.a.

$P = \text{Rs } 16,000$; $t = 3$ years; $r = 7\frac{1}{2}\%$ p.a.

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

$$A = \text{Rs } 16,000 \left(1 + \frac{15}{100} \right)^3$$

$$\begin{aligned}
 &= Rs16,000 \left(1 + \frac{7.5}{100} \right)^3 \\
 &= Rs16,000 \times 1.075 \times 1.075 \times 1.075 \\
 &= Rs19,876.75
 \end{aligned}$$

$$\begin{aligned}
 C.I. &= A - P \\
 &= Rs(19,876.75 - 16,000) \\
 &= Rs3,876.75
 \end{aligned}$$

Hence, Amount = Rs 19,876.75 and C.I. = Rs 3,876.75

(d) Rs 20,000 for 2 years at $12\frac{1}{2}\%$ p.a.

P=Rs 20,000; t=2 years; r= $12\frac{1}{2}\%$ p.a.

$$\begin{aligned}
 A &= P \left(1 + \frac{r}{100} \right)^n \\
 A &= Rs20,000 \left(1 + \frac{25}{2 \times 100} \right)^2 \\
 &= Rs20,000 \times 1.125 \times 1.125 \\
 &= Rs25,312.50
 \end{aligned}$$

$$\begin{aligned}
 C.I. &= A - P \\
 &= Rs(25,312.50 - 20,000) \\
 &= Rs5,312.50
 \end{aligned}$$

Hence, Amount = Rs 25,312.50 and C.I. = Rs 5,312.50

(e) Rs 8,000 for $1\frac{1}{2}$ years at 12% p.a.

P=Rs 8,000; t= $1\frac{1}{2}$ years; r=12 % p.a.

$$\begin{aligned}
 A &= P \left(1 + \frac{r}{100} \right)^n \\
 A &= Rs8,000 \left(1 + \frac{12}{100} \right) \left(1 + \frac{12}{100} \right)^{\frac{1}{2}} \\
 &= Rs8,000 \times 1.12 \times \left(1 + \frac{1}{2} \times \frac{12}{100} \right) \\
 &= Rs8,000 \times 1.12 \times 1.06 \\
 &= Rs9,497.60
 \end{aligned}$$

$$\begin{aligned}
 C.I. &= A - P \\
 &= Rs(9,497.60 - 8,000) \\
 &= Rs1,497.60
 \end{aligned}$$

Hence, Amount = Rs 9,497.60 and C.I. = Rs 1,497.60

(f) Rs 7,500 for $2\frac{1}{2}$ years; $r=16\%$ p.a.

$P=\text{Rs } 7,500$; $t=2\frac{1}{2}$ years; $r=16\%$ p.a.

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

$$A = \text{Rs}7,500 \left(1 + \frac{16}{100} \right)^2 \left(1 + \frac{16}{100} \right)^{\frac{1}{2}}$$

$$= \text{Rs}7,500 \times 1.16 \times 1.16 \times \left(1 + \frac{1}{2} \times \frac{16}{100} \right)$$

$$= \text{Rs}7,500 \times 1.16 \times 1.16 \times 1.08$$

$$= \text{Rs}10,899.36$$

$$C.I. = A - P$$

$$= \text{Rs}(10,899.36 - 7,500)$$

$$= \text{Rs}3,399.36$$

Hence, Amount = Rs 10,899.36 and C.I. = Rs 3,399.36

Answer 2.

(a) Rs 6,000 for $1\frac{1}{2}$ years at 10% p.a.

$P = \text{Rs } 6,000$; $t = 1\frac{1}{2}$ years; $r = 10\% \text{ p.a.} = 5\% \text{ half-yearly.}$

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

$$\begin{aligned} A &= \text{Rs } 6,000 \left(1 + \frac{5}{100} \right)^2 \left(1 + \frac{10}{100} \right)^{\frac{1}{2}} \\ &= \text{Rs } 6,000 \times 1.05 \times 1.05 \times \left(1 + \frac{1}{2} \times \frac{10}{100} \right) \\ &= \text{Rs } 6,000 \times 1.05 \times 1.05 \times 1.05 \\ &= \text{Rs } 6,945.75 \end{aligned}$$

$$C.I. = A - P$$

$$\begin{aligned} &= \text{Rs } (6,945.75 - 6,000) \\ &= \text{Rs } 945.75 \end{aligned}$$

Hence, Amount = Rs 6,945.75 and C.I. = Rs 945.75

(b) Rs 25,000 for $1\frac{1}{2}$ years at 12%

$P = \text{Rs } 25,000$; $t = 1\frac{1}{2}$ years; $r = 12\% \text{ p.a.} = 6\% \text{ half-yearly.}$

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

$$\begin{aligned} A &= \text{Rs } 25,000 \left(1 + \frac{6}{100} \right)^2 \left(1 + \frac{12}{100} \right)^{\frac{1}{2}} \\ &= \text{Rs } 25,000 \times 1.06 \times 1.06 \times \left(1 + \frac{1}{2} \times \frac{12}{100} \right) \\ &= \text{Rs } 25,000 \times 1.06 \times 1.06 \times 1.06 \\ &= \text{Rs } 29,775.40 \end{aligned}$$

$$C.I. = A - P$$

$$\begin{aligned} &= \text{Rs } (29,775.40 - 25,000) \\ &= \text{Rs } 4,775.40 \end{aligned}$$

Hence, Amount = Rs 29,775.40 and C.I. = Rs 4,775.40

Answer 3.

(a) Rs 9,125 for 2 years if the rates of interest are 12% and 14% for the successive years.

P=Rs 9,125; t=2 years; r = 12% and 14% successively.

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

$$A = \text{Rs}9,125 \left(1 + \frac{12}{100} \right) \left(1 + \frac{14}{100} \right)$$

$$= \text{Rs}9,125 \times 1.12 \times 1.14$$

$$= \text{Rs}11,650.80$$

$$C.I. = A - P$$

$$= \text{Rs}(11,650.80 - 9,125)$$

$$= \text{Rs}2,525.80$$

Hence, Amount = Rs 11,650.80 and C.I. = Rs 2,525.80

(b) Rs 20,000 for 2 years if the rates of interest are $12\frac{1}{4}\%$ and $5\frac{1}{2}\%$ for the successive years.

P=Rs 20,000; t=2 years; r = $12\frac{1}{4}\%$ and $5\frac{1}{2}\%$ successively = $\frac{49}{4}\%$ and $\frac{11}{2}\%$ successively.

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

$$A = \text{Rs}20,000 \left(1 + \frac{49}{4 \times 100} \right) \left(1 + \frac{11}{2 \times 100} \right)$$

$$= \text{Rs}20,000 \times 1.1225 \times 1.055$$

$$= \text{Rs}23,684.75$$

$$C.I. = A - P$$

$$= \text{Rs}(23,684.75 - 20,000)$$

$$= \text{Rs}3,684.75$$

Hence, Amount = Rs 23,684.75 and C.I. = Rs 3,684.75.

(c) Rs 12,500 for 3 years if the rates for the successive years are 8%, 9% and 10% respectively.

P=Rs 12,500; t=3 years; r = 8%, 9% and 10% successively.

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

$$A = \text{Rs}12,500 \left(1 + \frac{8}{100} \right) \left(1 + \frac{9}{100} \right) \left(1 + \frac{10}{100} \right)$$

$$= \text{Rs}12,500 \times 1.08 \times 1.09 \times 1.1$$

$$= \text{Rs}16,186.50$$

$$C.I. = A - P$$

$$C.I. = A - P$$

$$= Rs(16,186.50 - 12,500)$$

$$= Rs3,686.50$$

Hence, Amount = Rs 16,186.50 and C.I. = Rs 3,686.50

(d) Rs 10,000 for 3 years if the rates of interest are 10%, 11% and 12% for the successive years.

P=Rs 10,000; t=3 years; r = 10%, 11% and 12% successively.

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

$$A = Rs10,000 \left(1 + \frac{10}{100} \right) \left(1 + \frac{11}{100} \right) \left(1 + \frac{12}{100} \right)$$

$$= Rs10,000 \times 1.1 \times 1.11 \times 1.12$$

$$= Rs13,675.20$$

$$C.I. = A - P$$

$$= Rs(13,675.20 - 10,000)$$

$$= Rs3,675.20$$

Hence, Amount = Rs 13,675.20 and C.I. = Rs 3,675.20

Answer 4.

(a) Rs 15,000 for $1\frac{1}{2}$ years at 12% p.a.

P=Rs 15,000; t= $1\frac{1}{2}$ years

When compounded yearly: r = 12% p.a.

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

$$A = Rs15,000 \left(1 + \frac{12}{100} \right) \left(1 + \frac{12}{100} \right)^{\frac{1}{2}}$$

$$= Rs15,000 \times 1.12 \times \left(1 + \frac{1}{2} \times \frac{12}{100} \right)$$

$$= Rs15,000 \times 1.12 \times 1.06$$

$$= Rs17,808$$

$$C.I. = A - P$$

$$= Rs(17,808 - 15,000)$$

$$= Rs2,808$$

When compounded half-yearly:

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

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

$$\begin{aligned} A &= \text{Rs}15,000 \left(1 + \frac{6}{100} \right)^3 \\ &= \text{Rs}15,000 \times 1.06 \times 1.06 \times 1.06 \\ &= \text{Rs}17,865.24 \end{aligned}$$

$$\begin{aligned} C.I. &= A - P \\ &= \text{Rs}(17,865.24 - 15,000) \\ &= \text{Rs}2,865.24 \end{aligned}$$

Hence the difference in the interest = Rs (2,865.24 - 2,808) = Rs 57.24

(b) Rs 20,000 for $1\frac{1}{2}$ years at 16% p.a.

$$P = \text{Rs } 20,000; t = 1\frac{1}{2} \text{ years}$$

When compounded yearly: $r = 16\%$ p.a.

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

$$\begin{aligned} A &= \text{Rs}20,000 \left(1 + \frac{16}{100} \right) \left(1 + \frac{16}{100} \right)^{\frac{1}{2}} \\ &= \text{Rs}20,000 \times 1.16 \times \left(1 + \frac{1}{2} \times \frac{16}{100} \right) \\ &= \text{Rs}20,000 \times 1.16 \times 1.08 \\ &= \text{Rs}25,056 \end{aligned}$$

$$\begin{aligned} C.I. &= A - P \\ &= \text{Rs}(25,056 - 20,000) \\ &= \text{Rs}5,056 \end{aligned}$$

When compounded half-yearly:

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

$$\begin{aligned} A &= \text{Rs}20,000 \left(1 + \frac{8}{100} \right)^3 \\ &= \text{Rs}20,000 \times 1.08 \times 1.08 \times 1.08 \\ &= \text{Rs}25,194.24 \end{aligned}$$

$$\begin{aligned} C.I. &= A - P \\ &= \text{Rs}(25,194.24 - 20,000) \\ &= \text{Rs}5,194.24 \end{aligned}$$

Hence the difference in the interest = Rs (5,194.24 - 5,056) = Rs 138.24

Find the difference in the interest Rs 8,073 and Rs 6,000 ; t = 2 years .

Answer 5.

Here $P = ?$; $t = 2$ years; $r = 15\%$ and 17% successively; $A = \text{Rs } 8,073$

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

$$\text{Rs } 8,073 = P \left(1 + \frac{15}{100} \right) \left(1 + \frac{17}{100} \right)$$

$$\text{Rs } 8,073 = P \times 1.15 \times 1.17$$

$$\text{Rs } 8,073 = 1.3455P$$

$$P = \text{Rs } \frac{8,073}{1.3455}$$

$$P = \text{Rs } 6,000$$

Hence, the sum of money is Rs 6,000.

Answer 6.

Here $P = ?$; $t = 2$ years; $r = 12\%$ and 14% successively; $A = \text{Rs } 22,344$

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

$$\text{Rs } 22,344 = P \left(1 + \frac{12}{100} \right) \left(1 + \frac{14}{100} \right)$$

$$\text{Rs } 22,344 = P \times 1.12 \times 1.14$$

$$\text{Rs } 22,344 = 1.2768P$$

$$P = \text{Rs } \frac{22,344}{1.2768}$$

$$P = \text{Rs } 17,500$$

Hence, the principal is Rs 17,500.

Answer 7.

Here $P = ?$; $t = 3$ years; $r = 10\%$, 11% and 12% successively; $A = \text{Rs } 10,256.40$

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

$$\text{Rs } 10,256.40 = P \left(1 + \frac{10}{100} \right) \left(1 + \frac{11}{100} \right) \left(1 + \frac{12}{100} \right)$$

$$\text{Rs } 10,256.40 = P \times 1.1 \times 1.11 \times 1.12$$

$$\text{Rs } 10,256.40 = 1.36752P$$

$$P = \text{Rs } \frac{10,256.40}{1.36752}$$

$$P = \text{Rs } 7,500$$

Hence, the sum of money is Rs 7,500.

Answer 8.

$P = ?$; $A = \text{Rs } 18,792$; $t = 1\frac{1}{2}$ years; $r = 16\%$

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

$$\Rightarrow \text{Rs } 18,972 = P \left(1 + \frac{16}{100} \right) \left(1 + \frac{16}{100} \right)^{\frac{1}{2}}$$

$$\Rightarrow \text{Rs } 18,972 = P \left(1 + \frac{16}{100} \right) \left(1 + \frac{1}{2} \times \frac{16}{100} \right)$$

$$\Rightarrow \text{Rs } 18,972 = P \times 1.16 \times 1.08$$

$$\Rightarrow \text{Rs } 18,972 = 1.2528P$$

$$\Rightarrow P = \text{Rs } \frac{18,972}{1.2528}$$

$$\Rightarrow P = \text{Rs } 15,143.68$$

Hence, the sum of money will be Rs 15,143.68

Answer 9.

$$P = ? ; A = \text{Rs } 15,746.40; t = \frac{1}{2} \text{ years}; r = 16\%$$

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

$$\text{Rs } 15,746.40 = P \left(1 + \frac{16}{100} \right)^{\frac{1}{2}}$$

$$\text{Rs } 15,746.40 = P \left(1 + \frac{1}{2} \times \frac{16}{100} \right)$$

$$\text{Rs } 15,746.40 = P \times 1.08$$

$$P = \text{Rs } \frac{15,746.40}{1.08}$$

$$P = \text{Rs } 14,580$$

Hence, the sum of money will be Rs 14,580.

Answer 10.

$$P = x; t = 2 \text{ years}; r = 8\%; A = \text{Rs } (x + 1399.68)$$

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

$$\text{Rs } (x + 1399.68) = x \left(1 + \frac{8}{100} \right)^2$$

$$\text{Rs } (x + 1399.68) = x \times 1.08 \times 1.08$$

$$\text{Rs } (x + 1399.68) = 1.1664x$$

$$0.1664x = \text{Rs } 1399.68$$

$$x = \text{Rs } 8,411.538$$

On Rs 8,411.538 the C.I. for 2 years at 8% will be Rs 1399.68

Answer 11.

$$P = x; t = 2\frac{1}{2} \text{ years}; r = 12\%; A = \text{Rs } (x + 8,241.60)$$

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

$$\text{Rs}(x + 8,241.60) = x \left(1 + \frac{12}{100} \right)^2 \left(1 + \frac{12}{100} \right)^{\frac{1}{2}}$$

$$\text{Rs}(x + 8,241.60) = x \times 1.12 \times 1.12 \times \left(1 + \frac{1}{2} \times \frac{12}{100} \right)$$

$$\text{Rs}(x + 8,241.60) = x \times 1.12 \times 1.12 \times 1.06$$

$$\text{Rs}(x + 8,241.60) = 1.329664x$$

$$0.329664x = \text{Rs}8,241.60$$

$$x = \text{Rs}25,000$$

On Rs 25,000 the C.I. for $2\frac{1}{2}$ years at 12% will be Rs 8241.60.

Answer 12.

$$P = x; t = 2\frac{1}{2} \text{ years}; r = 12\frac{1}{2}\% = \frac{25}{2}\%; A = \text{Rs } (x + 82,734.37)$$

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

$$\text{Rs}(x + 82,734.37) = x \left(1 + \frac{25}{2 \times 100} \right)^2 \left(1 + \frac{25}{2 \times 100} \right)^{\frac{1}{2}}$$

$$\text{Rs}(x + 82,734.37) = x \left(1 + \frac{25}{2 \times 100} \right)^2 \left(1 + \frac{25}{2 \times 100} \right)^{\frac{1}{2}}$$

$$\text{Rs}(x + 82,734.37) = x \times 1.125 \times 1.125 \times \left(1 + \frac{1}{2} \times \frac{1}{8} \right)$$

$$\text{Rs}(x + 82,734.37) = x \times 1.125 \times 1.125 \times 1.0625$$

$$\text{Rs}(x + 82,734.37) = 1.344727x$$

$$0.344727x = \text{Rs}82,734.37$$

$$x = \text{Rs}2,39,999.7 = \text{Rs}2,40,000$$

On Rs 2,40,000 the C.I. for $2\frac{1}{2}$ years at $12\frac{1}{2}\%$ will be Rs 82,734.37

Answer 13.

$P = x$; $t = 1\frac{1}{2}$ years = 3×6 months; $r = 16\%$ compounded half-yearly =

$$\frac{16}{2}\% = 8\% ; A = \text{Rs } (x + 649.28)$$

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

$$\text{Rs}(x + 649.28) = x \left(1 + \frac{8}{100} \right)^3$$

$$\text{Rs}(x + 649.28) = x \times 1.08 \times 1.08 \times 1.08$$

$$\text{Rs}(x + 649.28) = 1.259712x$$

$$0.259712x = \text{Rs}649.28$$

$$x = \text{Rs}2,500$$

On Rs 2,500 the C.I. for $1\frac{1}{2}$ years at 16% compounded half-yearly will be Rs 649.28

Answer 14.

$P = x$; $t = 2$ years = 4×6 months; $r = 10\%$ compounded half-yearly =

$$\frac{10}{2}\% = 5\% ; A = \text{Rs } (x + 3,448.10)$$

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

$$\text{Rs}(x + 3,448.10) = x \left(1 + \frac{5}{100} \right)^4$$

$$\text{Rs}(x + 3,448.10) = x \times 1.05 \times 1.05 \times 1.05 \times 1.05$$

$$\text{Rs}(x + 3,448.10) = 1.215506x$$

$$0.215506x = \text{Rs}3,448.10$$

$$x = \text{Rs}16,000.02 = \text{Rs}16,000$$

On Rs 16,000 the C.I. for 2 years at 10% compounded half-yearly will be Rs 3,448.10

Answer 15.

P = Rs 12,250; A = Rs (12,250+3,116.40) = Rs 15,366.40; t = 2 years;
r=?

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

$$\text{Rs}15,366.40 = \text{Rs}12250 \left(1 + \frac{r}{100} \right)^2$$

$$\frac{15,366.40}{12250} = \left(1 + \frac{r}{100} \right)^2$$

$$\frac{(196)^2}{(175)^2} = \left(1 + \frac{r}{100} \right)^2$$

$$\frac{196}{175} = 1 + \frac{r}{100}$$

$$\frac{r}{100} = \frac{196}{175} - 1 = \frac{196 - 175}{175} = \frac{21}{175}$$

$$r = \frac{2100}{175} = 12\%$$

Hence, r=12%

Answer 16.

P = Rs 15,000; A = Rs (15,000+8,413.44) = Rs 23,413.44; t = 3 years;
r=?

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

$$\text{Rs}23,413.44 = \text{Rs}15,000 \left(1 + \frac{r}{100} \right)^3$$

$$\frac{23,413.44}{15,000} = \left(1 + \frac{r}{100} \right)^3$$

$$\frac{(29)^3}{(25)^3} = \left(1 + \frac{r}{100} \right)^3$$

$$\frac{29}{25} = 1 + \frac{r}{100}$$

$$\frac{r}{100} = \frac{29}{25} - 1 = \frac{29 - 25}{25} = \frac{4}{25}$$

$$r = \frac{400}{25} = 16\%$$

Hence, r=16%

Answer 17.

$P = \text{Rs } 16,000$; $A = \text{Rs } (16,000 + 3,876.75) = \text{Rs } 19,876.75$; $t = 3$ years;
 $r = ?$

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

$$\text{Rs } 19,876.75 = \text{Rs } 16,000 \left(1 + \frac{r}{100} \right)^3$$

$$\frac{19,876.75}{16,000} = \left(1 + \frac{r}{100} \right)^3$$

$$\frac{(27.08)^3}{(25.19)^3} = \left(1 + \frac{r}{100} \right)^3$$

$$\frac{2708}{2519} = 1 + \frac{r}{100}$$

$$\frac{r}{100} = \frac{2708}{2519} - 1 = \frac{2708 - 2519}{2519} = \frac{189}{2519}$$

$$r = \frac{18900}{2519} = 7.5\%$$

Hence, $r = 7.5\%$

Answer 18.

$P = \text{Rs } 8,000$; $A = \text{Rs } 12,167$; $r = 15\%$; $t = ?$

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

$$\text{Rs } 12,167 = \text{Rs } 8,000 \left(1 + \frac{15}{100} \right)^t$$

$$\frac{12,167}{8,000} = \left(1 + \frac{15}{100} \right)^t$$

$$\frac{(23)^3}{(20)^3} = \left(\frac{23}{20} \right)^t$$

$$t = 3$$

$T = 3$ years

Answer 19.

$P = \text{Rs } 50,000$; $A = \text{Rs } (50,000 + 32,151.60) = \text{Rs } 82,151.60$; $r = 18\%$;
 $t = ?$

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

$$\text{Rs } 82,151.60 = \text{Rs } 50,000 \left(1 + \frac{18}{100} \right)^t$$

$$\frac{82,151.60}{50,000} = \left(1 + \frac{18}{100} \right)^t$$

$$\frac{82,151.60}{50,000 \times 100} = \left(1 + \frac{18}{100} \right)^t$$

$$\frac{2,05379}{1,25,000} = \left(1 + \frac{18}{100} \right)^t$$

$$\frac{(59)^t}{(50)^t} = \left(\frac{59}{50} \right)^t$$

$$t = 3$$

$T = 3$ years

Answer 20.

$$P = x; t = 2 \text{ years}; r = 7\frac{1}{2}\% = \frac{15}{2}\%$$

For S.I.:

$$\begin{aligned} I &= \frac{P \times r \times t}{100} \\ &= \frac{x \times \frac{15}{2} \times 2}{100} \\ &= \frac{3x}{20} \end{aligned}$$

For C.I.:

$$\begin{aligned} C.I. &= P \left(1 + \frac{r}{100} \right)^t - P \\ &= x \left(1 + \frac{\frac{15}{2}}{100} \right)^2 - x \\ &= x \left(1 + \frac{15}{2 \times 100} \right)^2 - x \\ &= x \left(1 + \frac{3}{40} \right)^2 - x \\ &= (x \times 1.075 \times 1.075) - x \\ &= 1.155625x - x \\ &= 0.155625x \end{aligned}$$

Given C.I.- S.I. = Rs 22.50

$$\Rightarrow 0.155625x - \frac{3x}{20} = \text{Rs}22.50$$

$$\Rightarrow 0.155625x - 0.15x = \text{Rs}22.50$$

$$\Rightarrow 0.005625x = \text{Rs}22.50$$

$$\Rightarrow x = \text{Rs}4,000$$

Hence, sum = Rs 4,000

Answer 21.

$P = x$; $t = 3$ years; $r = 12\%$

For S.I.:

$$\begin{aligned}I &= \frac{P \times r \times t}{100} \\&= \frac{x \times 12 \times 3}{100} \\&= \frac{9x}{25}\end{aligned}$$

For C.I.:

$$\begin{aligned}C.I. &= P \left(1 + \frac{r}{100}\right)^t - P \\&= x \left(1 + \frac{12}{100}\right)^3 - x \\&= x \left(1 + \frac{3}{25}\right)^3 - x \\&= (x \times 1.12 \times 1.12 \times 1.12) - x \\&= 1.404928x - x \\&= 0.404928x\end{aligned}$$

Given $C.I. - S.I. = \text{Rs } 22.50$

$$\Rightarrow 0.404928x - \frac{9x}{25} = \text{Rs } 1,123.20$$

$$\Rightarrow 0.404928x - 0.36x = \text{Rs } 1,123.20$$

$$\Rightarrow 0.044928x = \text{Rs } 1,123.20$$

$$\Rightarrow x = \text{Rs } 25,000$$

Hence, sum = Rs 25,000

Answer 22.

$P = x$; $r = ?$; $t = 2$ and 3 years; $A = \text{Rs } 47,610$ (2 years)
(3 years)

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

$$47,610 = x \left(1 + \frac{r}{100} \right)^2 \dots\dots\dots(i)$$

$$54,751.50 = x \left(1 + \frac{r}{100} \right)^3 \dots\dots\dots(ii)$$

$$\therefore \frac{x \left(1 + \frac{r}{100} \right)^3}{x \left(1 + \frac{r}{100} \right)^2} = \frac{54,751.50}{47,610}$$

$$\Rightarrow \left(1 + \frac{r}{100} \right) = \frac{54,751.50}{47,610}$$

$$\Rightarrow \frac{r}{100} = \frac{54,751.50}{47,610} - 1$$

$$\Rightarrow \frac{r}{100} = \frac{54,751.50 - 47,610}{47,610}$$

$$r = \frac{7141.50}{47,610} \times 100$$

$$r = 15\%$$

Using (i)

$$x \left(1 + \frac{r}{100} \right)^2 = \text{Rs } 47,610$$

$$x \left(1 + \frac{15}{100} \right)^2 = \text{Rs } 47,610$$

$$x \left(\frac{115}{100} \right)^2 = \text{Rs } 47,610$$

$$1.3225x = \text{Rs } 47,610$$

$$x = \text{Rs } 36,000$$

The sum = Rs 36,000 and rate of interest = 15%

Answer 23.

$P = x$; $r = ?$; $t = 2$ and 3 years; $A = \text{Rs } 31,360$ (2 years) and $\text{Rs } 35,123.20$ (3 years)

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

$$31,360 = x \left(1 + \frac{r}{100} \right)^2 \dots\dots\dots(i)$$

$$35,123.20 = x \left(1 + \frac{r}{100} \right)^3 \dots\dots\dots(ii)$$

$$\therefore \frac{x \left(1 + \frac{r}{100} \right)^3}{x \left(1 + \frac{r}{100} \right)^2} = \frac{35,123.20}{31,360}$$

$$\Rightarrow \left(1 + \frac{r}{100} \right) = \frac{35,123.20}{31,360}$$

$$\Rightarrow \frac{r}{100} = \frac{35,123.20}{31,360} - 1$$

$$\Rightarrow \frac{r}{100} = \frac{35,123.20 - 31,360}{31,360}$$

$$r = \frac{3,763.20}{31,360} \times 100$$

$$r = 12\%$$

Using (i)

$$x \left(1 + \frac{r}{100} \right)^2 = \text{Rs } 31,360$$

$$x \left(1 + \frac{12}{100} \right)^2 = \text{Rs } 31,360$$

$$x \left(\frac{112}{100} \right)^2 = \text{Rs } 31,360$$

$$1.2544x = \text{Rs } 31,360$$

$$x = \text{Rs } 25,000$$

The sum = Rs 25,000 and rate of interest = 12%

Answer 24.

$P = x$; $r = ?$; $t = 2$ and 4 years; $A = \text{Rs } 26,460$ (2 years) and $\text{Rs } 29,172.15$ (4 years)

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

$$26,460 = x \left(1 + \frac{r}{100} \right)^2 \dots\dots\dots(i)$$

$$29,172.15 = x \left(1 + \frac{r}{100} \right)^4 \dots\dots\dots(ii)$$

$$\therefore \frac{x \left(1 + \frac{r}{100} \right)^4}{x \left(1 + \frac{r}{100} \right)^2} = \frac{29,172.15}{26,460}$$

$$\Rightarrow \left(1 + \frac{r}{100} \right)^2 = \frac{1,94,481}{1,76,400}$$

$$\Rightarrow \left(1 + \frac{r}{100} \right)^2 = \left(\frac{441}{420} \right)^2$$

$$\Rightarrow 1 + \frac{r}{100} = \frac{441}{420}$$

$$\Rightarrow \frac{r}{100} = \frac{441}{420} - 1$$

$$\Rightarrow \frac{r}{100} = \frac{441 - 420}{420}$$

$$r = \frac{21}{420} \times 100$$

$$r = 5\%$$

Using (i)

$$x \left(1 + \frac{r}{100} \right)^2 = \text{Rs } 26,460$$

$$x \left(1 + \frac{5}{100} \right)^2 = \text{Rs } 26,460$$

$$x \left(\frac{105}{100} \right)^2 = \text{Rs } 26,460$$

$$1.1025x = \text{Rs } 26,460$$

$$x = \text{Rs } 24,000$$

The sum = Rs 24,000 and rate of interest = 5%

Answer 25.

$P = x$; $t = 2$ years; $r = 5\%$; $A = \text{Rs } (x + 512.50)$

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

$$\text{Rs}(x + 512.50) = x \left(1 + \frac{5}{100} \right)^2$$

$$\text{Rs}(x + 512.50) = x \times 1.05 \times 1.05$$

$$\text{Rs}(x + 512.50) = 1.1025x$$

$$0.1025x = \text{Rs}512.50$$

$$x = \text{Rs}5,000$$

$$I = \frac{P \times r \times t}{100}$$

$$I = \text{Rs} \frac{5,000 \times 6 \times 3}{100}$$

$$I = \text{Rs}900$$

Simple interest will be Rs 900

Answer 26.

$P = x$; $t = 3$ years; $r = 10\%$; $A = \text{Rs } (x + 4,965)$

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

$$\text{Rs}(x + 4,965) = x \left(1 + \frac{10}{100} \right)^3$$

$$\text{Rs}(x + 4,965) = x \times 1.1 \times 1.1 \times 1.1$$

$$\text{Rs}(x + 4,965) = 1.331x$$

$$0.331x = \text{Rs}4,965$$

$$x = \text{Rs}15,000$$

$$I = \frac{P \times r \times t}{100}$$

$$I = \text{Rs} \frac{15,000 \times 11 \times 3}{100}$$

$$I = \text{Rs}4,950$$

Simple interest will be Rs 4,950

Ex 1.7

Answer 1.

$V_n = ?$; $V_o = 4,25,000$; $r = 4\%$; $t = 2$ years

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

$$V_n = 4,25,000 \left(1 + \frac{4}{100}\right)^2$$

$$V_n = 4,25,000 \times 1.04 \times 1.04$$

$$V_n = 4,59,680$$

The population in 2007 is 4, 59,680

Answer 2.

$V_n = ?$; $V_o = 1,25,000$; $r = 5.5\%$ (birth) and 3.5% (death); $t = 3$ years

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

$$V_n = 1,25,000 \left(1 + \frac{5.5}{100}\right)^3 \left(1 - \frac{3.5}{100}\right)^3$$

$$V_n = 1,25,000 \times 10.55 \times 10.55 \times 10.55 \times 9.65 \times 9.65 \times 9.65$$

$$V_n = 1,25,000 \times 1174.241 \times 898.6321$$

$$V_n = 1,32,651$$

The population in 2007 is 1, 32,651

Answer 3.

Rate of increase =

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

$V_n = 22,050$; $V_o = ?$; $r = 5\%$; $t = 2$ years

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

$$22,050 = V_o \left(1 + \frac{5}{100}\right)^2$$

$$22,050 = V_o \times 1.05 \times 1.05$$

$$V_o = \frac{22,050}{1.1025}$$

$$V_o = 20,000$$

The present population is 20,000.

Answer 4.

$$V_n = 46,305; V_0 = 40,000; r = ? ; t = 3 \text{ years}$$

$$V_n = V_0 \left(1 + \frac{r}{100} \right)^t$$

$$46,305 = 40,000 \left(1 + \frac{r}{100} \right)^3$$

$$\frac{46,305}{40,000} = \left(1 + \frac{r}{100} \right)^3$$

$$\frac{21^3}{20^3} = \left(1 + \frac{r}{100} \right)^3$$

$$\left(1 + \frac{r}{100} \right) = \frac{21}{20}$$

$$\frac{r}{100} = \frac{21}{20} - 1$$

$$\frac{r}{100} = \frac{1}{20}$$

$$r = \frac{1}{20} \times 100$$

$$r = 5\%$$

The annual rate of growth of scooters is 5%.

Answer 5.

$$V_n = ? ; V_0 = 1,15,200; r = 6\frac{2}{3}\% = \frac{20}{3}\% ; t = 2 \text{ years}$$

$$V_n = V_0 \left(1 + \frac{r}{100} \right)^t$$

$$V_n = 1,15,200 \left(1 + \frac{20}{100 \times 3} \right)^2$$

$$V_n = 1,15,200 \times 1.06667 \times 1.06667$$

$$V_n = 1,31,072$$

The population 2 years later = 1,31,072

(ii) Its population 2 years ago.

$$V_n = ? ; V_0 = 1,15,200; r = 6\frac{2}{3}\% = \frac{20}{3}\% ; t = 2 \text{ years}$$

$$V_n = V_0 \left(1 - \frac{r}{100} \right)^t$$

$$V_n = 1,15,200 \left(1 - \frac{20}{100 \times 3} \right)^2$$

$$V_n = 1,15,200 \times 0.933333 \times 0.933333$$

$$V_n = 1,00,352$$

The population 2 years ago was = 1,00,352

Answer 6.

$V_n = \text{Rs } 19,083.60$; $V_0 = ?$; $r = 10\%$; $t = 2$ years

$$V_n = V_0 \left(1 - \frac{r}{100}\right)^t$$

$$\text{Rs } 19,083.60 = V_0 \left(1 - \frac{10}{100}\right)^2$$

$$V_0 = \text{Rs } 19,083.60 \times \frac{10}{9} \times \frac{10}{9}$$

$$V_0 = \text{Rs } 23,560$$

The machine was purchased for Rs 23,560 i.e. Rs $(23,560 - 19,083.60) = \text{Rs } 4,476.40$ more than the present value.

Answer 7.

$V_n = 27,783$; $V_0 = 24,000$; $r = ?$; $t = 3$ years

$$V_n = V_0 \left(1 + \frac{r}{100}\right)^t$$

$$27,783 = 24,000 \left(1 + \frac{r}{100}\right)^3$$

$$\frac{27,783}{24,000} = \left(1 + \frac{r}{100}\right)^3$$

$$\frac{21^3}{20^3} = \left(1 + \frac{r}{100}\right)^3$$

$$\left(1 + \frac{r}{100}\right) = \frac{21}{20}$$

$$\frac{r}{100} = \frac{21}{20} - 1$$

$$\frac{r}{100} = \frac{1}{20}$$

$$r = \frac{1}{20} \times 100$$

$$r = 5\%$$

The rate of growth of population is 5%.

Answer 8.

$$V_n = 27,040; V_o = 25,000; r = ?; t = 2 \text{ years}$$

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

$$27,040 = 25,000 \left(1 + \frac{r}{100} \right)^2$$

$$\frac{27,040}{25,000} = \left(1 + \frac{r}{100} \right)^2$$

$$\left(\frac{164.43}{158} \right)^2 = \left(1 + \frac{r}{100} \right)^2$$

$$\left(1 + \frac{r}{100} \right) = \frac{164.43}{158}$$

$$\frac{r}{100} = \frac{164}{158} - 1$$

$$\frac{r}{100} = \frac{6.43}{158}$$

$$r = 0.040 \times 100$$

$$r = 4\%$$

The rate of growth in number of villages with electricity is 4%.

Answer 9.

$$V_n = ?; V_o = \text{Rs } 4,00,000; r = 10\%; t = 4 \text{ years}$$

$$V_n = V_o \left(1 - \frac{r}{100} \right)^t$$

$$V_n = \text{Rs } 4,00,000 \left(1 - \frac{10}{100} \right)^4$$

$$V_n = \text{Rs } 4,00,000 \times 0.9 \times 0.9 \times 0.9 \times 0.9$$

$$V_n = \text{Rs } 2,62,440$$

The value of car after four years will be Rs 2,62,440.

Answer 10.

$V_n = \text{Rs } 44,540$; $V_0 = ?$; $r = 5\%$; $t = 3$ years

$$V_n = V_0 \left(1 - \frac{r}{100}\right)^t$$

$$\text{Rs } 44,540 = V_0 \left(1 - \frac{5}{100}\right)^3$$

$$V_0 = \text{Rs } 44,540 \times \frac{100}{95} \times \frac{100}{95} \times \frac{100}{95}$$

$$V_0 = \text{Rs } 44,540 \times 1.052632 \times 1.052632 \times 1.052632$$

$$V_0 = \text{Rs } 51,949.26$$

The original value of the property was Rs 51,949.26

Answer 11.

$V_n = \text{Rs } 9,680$; $V_0 = ?$; $r = 12\%$; $t = 2$ years

$$V_n = V_0 \left(1 - \frac{r}{100}\right)^t$$

$$\text{Rs } 9,680 = V_0 \left(1 - \frac{12}{100}\right)^2$$

$$V_0 = \text{Rs } 9,680 \times \frac{100}{88} \times \frac{100}{88}$$

$$V_0 = \text{Rs } 9,680 \times 1.136364 \times 1.136364$$

$$V_0 = \text{Rs } 12,500$$

The refrigerator was purchased for Rs 12,500

Answer 12.

For the building:

$$V_n = V_o \left(1 - \frac{r}{100}\right)^t$$

$$V_n = \text{Rs}1,33,100 \left(1 - \frac{10}{100}\right)^t$$

$$V_n = \text{Rs}1,33,100 \times (0.9)^t$$

For the plot:

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

$$V_n = \text{Rs}72,900 \left(1 + \frac{10}{100}\right)^t$$

$$V_n = \text{Rs}72,900 \times (1.1)^t$$

Since, value becomes same:

$$1,33,100 \times (0.9)^t = 72,900 \times (1.1)^t \lim_{t \rightarrow \infty}$$

$$\frac{(1.1)^t}{(0.9)^t} = \frac{1,33,100}{72,900}$$

$$\frac{(11)^t}{(09)^t} = \frac{1331}{729} = \frac{11^3}{9^3}$$

$$t = 3$$

Hence, after 3 years value of both will be same.

Answer 13.

$V_n = ?$; $V_o = \text{Rs } 17,000$; $t = 2$ years (1 for increment and 1 for decrement);

$r = 5\%$ for increase and 4% for decrease.

$$V_n = V_o \left(1 + \frac{r}{100}\right)^t \left(1 - \frac{r}{100}\right)^t$$

$$V_n = \text{Rs}17,000 \left(1 + \frac{5}{100}\right) \left(1 - \frac{4}{100}\right)$$

$$V_n = \text{Rs}17,000 \times 1.05 \times 0.96$$

$$V_n = \text{Rs}17,136$$

The cost of the T.V. in 2001 is Rs 17,136.

Answer 14.

$$V_n = 1\text{ m } 8\text{ cm} = 108\text{ cm}; V_0 = ? ; t = 2\text{ years}; r = 20\%$$

$$V_n = V_0 \left(1 + \frac{r}{100} \right)^t$$

$$108\text{ cm} = V_0 \left(1 + \frac{20}{100} \right)^3$$

$$V_0 = 108\text{ cm} \times 0.8333 \times 0.8333 \times 0.8333$$

$$V_0 = 62.5\text{ cm}$$

The height of tree was 62.5 cm when planted.