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 = Rs.7,500 ; r = 12% p.a. ; t = 3 years

For the first year: t = 1 year

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

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

$$S.I. = Rs900$$

A=P+S.I.

=Rs (7,500 + 900) = Rs 8,400 = new principal

For the second year: t = 1 year; P=Rs 8,400

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

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

$$S.I. = Rs1,008$$

A=P+S.I.

A=Rs (8,400 + 1,008) = Rs 9,408 = new principal

For the third year: t = 1 year; P=Rs 9,408

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

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

$$S.I. = Rs1,128.96$$

A=P+S.I.

A=Rs (9,408 + 1,128.96) = Rs 10,536.96

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

C.I.= Rs (900 + 1,008+1,128.96) = 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

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

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

$$S.I. = Rs1,350$$

A=P+S.I.

=Rs (13,500 + 1,350) = Rs 14,850 = new principal

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

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

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

$$S.I. = Rs1,485$$

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

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

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

$$S.I. = Rs2,100$$

A=P+S.I.

=Rs (17,500 + 2,100) = Rs 19,600 = new principal

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

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

$$S.I. = Rs\frac{19,600 \times 12 \times 1}{100}$$
$$S.I. = Rs2,352$$

A=P+S.I.

A=Rs (19,600 + 2,352) = Rs 21,952 = new principal

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

$$S.I. = \frac{P \times r \times t}{100}$$
$$S.I. = Rs\frac{21,952 \times 12 \times 1}{100}$$
$$S.I. = Rs2,634.24$$

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

$$S.I. = \frac{P \times r \times t}{100}$$
$$S.I. = Rs\frac{23,750 \times 12 \times 1}{100}$$
$$S.I. = Rs2,850$$

A=P+S.I.

=Rs (23,750 + 2,850) = Rs 26,600 = new principal

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

$$S.I. = \frac{P \times r \times t}{100}$$
$$S.I. = Rs\frac{26,600 \times 12 \times 1}{100}$$
$$S.I. = Rs3,192$$

A=P+S.I.

A=Rs (26,600 + 3,192) = Rs 29,792 = new principal

For the third year: t = 1/2 year; P=Rs 29,792

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

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

$$S.I. = Rs1,787.52$$

A=P+S.I.

A=Rs (29,792 + 1,787.52) = Rs 31,579.52

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

C.I.= Rs (2,850 + 3,192 +1,787.52) = Rs 7,829.52

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

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

For the first year: t = 1 year

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

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

$$S.I. = Rs2,400$$

A=P+S.I.

=Rs (30,000 + 2,400) = Rs 32,400 = new principal

For the second year: t = 1 year; P=Rs 32,400

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

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

$$S.I. = Rs2,592$$

A=P+S.I.

A=Rs (32,400 + 2,592) = Rs 34,992 = new principal

For the third year: t = 1/2 year ; P=Rs 34,992

For the third year: t = 1/2 year ; P=Rs 34,992

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

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

$$S.I = Rs1,399.68$$

A=P+S.I.

A=Rs (34,992 + 1,399.68) = Rs 36,391.68

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

C.I.= Rs (2,400 + 2,592 +1,399.68) = Rs 6,391.68

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

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

For the first year: t = 1 year

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

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

$$S.I. = Rs800$$

A=P+S.I.

=Rs (10,000 + 800) = Rs 10,800 = new principal

For the second year: t = 1 year; P=Rs 10,800

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

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

$$S.I. = Rs864$$

A=P+S.I.

A=Rs (10,800 + 864) = Rs 11,664 = new principal

For the third year: t = 1/4 year ; P=Rs 11,664

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

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

$$S.I. = Rs\frac{11,664 \times 8 \times 1}{100 \times 4}$$

$$S.I. = Rs233.28$$

A=P+S.I.

A=Rs (11,664 + 233.28) = Rs 11,897.28

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

C.I.= Rs (800 + 864 +233.28) = Rs 1,897.28

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

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

For the first year: t = 1 year

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

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

$$S.I. = Rs1,800$$

A=P+S.I.

=Rs (20,000 + 1,800) = Rs 21,800 = new principal

For the second year: t = 1 year; P=Rs 21,800

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

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

$$S.I. = Rs1,962$$

A=P+S.I.

A=Rs (21,800 + 1,962) = Rs 23,762 = new principal

For the third year: t = 1/3 year; P=Rs 23,762

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

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

$$S.I. = Rs712.86$$

A=P+S.I.

A=Rs (23,762 + 712.86) = Rs 24,474.86

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

C.I.= Rs (1,800 + 1,962 +712.86) = Rs 4,474.86

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

Here, P = 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

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

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

$$S.I. = Rs2,100$$

A=P+S.I.

=Rs (25,000 + 2,100) = Rs 27,100 = new principal

For the second year: t = 1/3 year; P=Rs 27,100

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

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

$$S.I. = Rs758.80$$

A=P+S.I.

A=Rs (27,100 + 758.80) = Rs 27,858.80

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

C.I.= Rs (2,100 + 758.80) = Rs 2,858.80

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

Here, P = 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

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

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

$$S.I. = Rs2,100$$

A=P+S.I.

=Rs (40,000 + 2,100) = Rs 42,100 = new principal

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

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

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

$$\text{S.I.} = \text{Rs}736.75$$

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 % p.a.; t = $2\frac{1}{2}$ years

For the first year: t = 1 year

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

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

$$\text{S.I.} = \text{Rs}7,600$$

A=P+S.I.

=Rs (76,000 + 7,600) = Rs 83,600 = new principal

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

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

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

$$\text{S.I.} = \text{Rs}8,360$$

A=P+S.I.

A=Rs (83,600 + 8,360) = Rs 91960= new principal

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

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

100

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

$$S.I. = Rs4,598$$

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

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

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

$$S.I. = Rs2,700$$

A=P+S.I.

=Rs (22,500 + 2,700) = Rs 25,200 = new principal

For the second year: t = 3/4 year; P=Rs 25,200

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

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

$$S.I. = Rs2,268$$

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

For the first year: t = 1 year

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

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

$$S.I. = Rs2,400$$

A=P+S.I.

=Rs (16,000 + 2,400) = Rs 18,400 = new principal

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

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

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

$$S.I. = Rs2,760$$

A=P+S.I.

A=Rs (18,400 + 2,760) = Rs 21,160 = new principal

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

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

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

$$S.I. = Rs2116$$

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.

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

$P_1 = 5200 + 65000$

$= \text{Rs. } 70200$

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

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

iii) $C_1 + C_2 = 5200 + 5616 = 10,816$

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

Answer 3.

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

$P_1 = 81000$

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

$P_2 = 87480$

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

$P_3 = 94478.4$

iii) $C_3 = 6998.4$

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

Answer 4.

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

$P_1 = 39600$

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

$P_2 = 41580$

Answer 5.

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)

Total Interest = 2400+2640+2904=7944

Answer 6.

Soln:

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

$P_1 = 30800$

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

$P_2 = 34496$

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

$P_3 = 38636$

$ii) C_{total} = 11136$

$iii) P_2 = 34496$

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.

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

$$P_1 = 27500$$

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

$$P_2 = 30250$$

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

$$P_3 = 33275$$

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

$$P_4 = 34940$$

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:

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

$$Amount = 12500\left(1+\frac{16}{100}\right)^{1.5} = Rs.15660$$

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

$$= Rs\frac{12,500 \times 8 \times 1}{100}$$
$$= Rs.1,000$$

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

$$= Rs.12,500 + Rs.1,000$$
$$= Rs.13,500$$

(iii) Interest for the second year

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

$$= Rs\frac{13,500 \times 10 \times 1}{100}$$
$$= Rs.1,350$$

Therefore, Amount at the end of 2nd year

$$= Rs.1,3500 + Rs.1,350$$

Amount = Rs 14,850

C.I. = A-P

=Rs. (14,850 – 12,500)

C.I. = 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

$$= Rs\frac{15,000 \times 6 \times 1}{100}$$

$$= Rs.900$$

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

$$= Rs.15,000 + Rs.900$$

$$= Rs.15,900$$

(iii) Interest for the second year

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

$$= Rs\frac{15,900 \times 7 \times 1}{100}$$

$$= Rs.1,113$$

Therefore Amount at the end of 2nd year

$$= Rs.15,900 + Rs.1,113$$

$$= Rs.17,013$$

Amount = Rs 17,013

C.I. = A-P

=Rs. (17,013 – 15,000)

C.I. =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

$$= Rs\frac{12,500 \times 12 \times 1}{100}$$

$$= Rs.1,500$$

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

$= Rs.12,500 + Rs.1,500$

$= Rs.14,000$

(iii) Interest for the second year

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

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

$= Rs.2,100$

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

$= Rs.14,000 + Rs.2,100$

$= Rs.16,100$

(v) Interest for the third year

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

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

$= Rs.2,737$

Therefore Amount at the end of 3rd year

$= Rs\,16,100 + Rs\,2,737$

$= Rs\,18,837$

Amount = Rs 18,837

C.I. = A-P

=Rs. (18,837 – 12,500)

C.I.=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 = $\frac{15}{2}$ %

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

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

$= Rs.1,500$

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

$= Rs.20,000 + Rs.1,500$

$= Rs.21,500$

(iii) Interest for the second year

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

$$= Rs\frac{21,500 \times 8 \times 1}{100}$$

$= Rs.1,720$

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

$= Rs.21,500 + Rs.1,720$

$= Rs.23,220$

(v) Interest for the third year

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

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

$= Rs.2,322$

Therefore Amount at the end of 3rd year

$= Rs.23,220 + Rs.2,322$

$= Rs.25,542$

Amount = Rs 25,542

C.I. = A-P

=Rs. (25,542 – 20,000)

C.I.=Rs. 5,542

Answer 2.

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

Interest for first year

$$= \frac{Rs25,000 \times 10 \times 1}{100}$$
$$= Rs2,500$$

Amount due after 1st year
= Rs. 25,000 + Rs. 2,500
= Rs 27,500

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

Balance amount = Rs. 27,500 – Rs. 7,500
= Rs. 20,000

Interest for second year

$$= \frac{Rs20,000 \times 10 \times 1}{100}$$
$$= Rs2,000$$

Amount due after 2nd year
= Rs. 20,000 + Rs. 2,000
= Rs 22,000

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

Balance amount = Rs. 22,000 – Rs. 7,500
= Rs. 14,500

Interest for third year

$$= \frac{Rs14,500 \times 10 \times 1}{100}$$
$$= Rs1,450$$

Amount due after 3rd year
= Rs. 14,500 + Rs. 1,450
= Rs 15,950

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

Balance amount = Rs. 15,950 – Rs. 7,500
= Rs. 8,450

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

$$= \frac{Rs\,90,000 \times 15 \times 1}{100}$$

$$= Rs\,13,500$$

Amount due after 1st year
= Rs. 90,000 + Rs. 13,500
= Rs 103,500

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

Balance amount = Rs. 103,500 – Rs. 35,000
= Rs. 68,500

Interest for second year

$$= \frac{Rs\,68,500 \times 15 \times 1}{100}$$

$$= Rs\,10,275$$

Amount due after 2nd year
= Rs. 68,500 + Rs. 10,275
= Rs 78,775

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

Balance amount = Rs. 78,775 – Rs. 35,000
= Rs. 43,775

Interest for third year

$$= \frac{Rs\,43,775 \times 15 \times 1}{100}$$

$$= Rs\,6,566.25$$

Amount due after 3rd year
= Rs. 43,775 + Rs. 6,566.25
= Rs 50,341.25

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

Balance amount = Rs. 50,341.25 – Rs.35, 000
= Rs. 15,341.25

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

$$= \frac{Rs\,15,000 \times 11 \times 1}{100}$$
$$= Rs\,1,650$$

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

$$= \frac{Rs\,9,100 \times 11 \times 1}{100}$$
$$= Rs\,1,001$$

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

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

Interest for third year

$$= \frac{Rs\,4,000 \times 11 \times 1}{100}$$
$$= Rs\,440$$

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

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

$$= \frac{}{100}$$

$= Rs2,160$

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

$$= \frac{Rs14,910 \times 12 \times 1}{100}$$

$= Rs1,789.20$

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

$$= \frac{Rs10,824.20 \times 12 \times 1}{100}$$

$= Rs1,298.904$

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

$$= \frac{Rs5,248.104 \times 12 \times 1}{100}$$

$= Rs629.7725$

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

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

$$= Rs.15,000\left(1+\frac{12}{100}\right)^2$$

$$= Rs.15,000\left(\frac{112}{100}\right)^2$$

$$= Rs.15,000\left(\frac{28}{25}\right)^2$$

$$= Rs.15,000 \times \frac{28}{25} \times \frac{28}{25}$$

$$\therefore A = Rs.18,816$$

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 = Rs 25,000; r = 8.4 % p.a.; t = 2 years

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

$$= Rs.25,000\left(1+\frac{8.4}{100}\right)^2$$

$$= Rs.25,000\left(1+\frac{84}{100\times 10}\right)^2$$

$$= Rs.25,000\left(\frac{271}{250}\right)^2$$

$$= Rs.25,000\times\frac{271}{250}\times\frac{271}{250}$$

$$\therefore A = Rs29,376.40$$

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 = Rs. 10,000, R = 6 % p.a.

Interest for first year

$$= \frac{Rs10,000 \times 6 \times 1}{100}$$
$$= Rs600$$

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% p.a.

$$= \frac{Rs5,000 \times 8 \times 1}{100}$$
$$= Rs400$$

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 = Rs. 12,500, R = 8 % p.a.

Interest for first year

$$= \frac{Rs12,500 \times 8 \times 1}{100}$$

$$= Rs1,000$$

Amount due after 1st year
= Rs. 12,500 + Rs. 1,000
= Rs 13,500

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

Balance amount = Rs. 13,500 – Rs. 7,500
= Rs. 6,000

Interest for second year when r = 10% p.a.

$$= \frac{Rs6,000 \times 10 \times 1}{100}$$

$$= Rs600$$

Amount due after 2nd year
= Rs. 6,000 + Rs. 600
= Rs 6.600

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

Answer 10.

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

Interest for first year

$$= \frac{Rs50,000 \times \frac{15}{2} \times 1}{100}$$

$$= \frac{Rs50,000 \times 15 \times 1}{2 \times 100}$$

$$= Rs3,750$$

Amount due after 1st year
= Rs. 50,000 + Rs. 3,750
= Rs 53,750

Amount paid after 1st year = Rs. 27,750

Balance amount = Rs. 53,750 – Rs. 27,750
= Rs. 26,000

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

$$= \frac{Rs26,000 \times \frac{37}{4} \times 1}{100}$$

$$= \frac{Rs26,000 \times 37 \times 1}{4 \times 100}$$

$$= Rs2,405$$

Amount due after 2nd year
= Rs. 26,000 + Rs. 2,405
= Rs 28,405

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 = Rs 9, 447.84; t = 3 years; r = 8 % p.a.

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

$$\Rightarrow Rs9,447.84 = x\left(1+\frac{8}{100}\right)^3$$

$$\Rightarrow Rs9,447.84 = x\left(\frac{108}{100}\right)^3$$

$$\Rightarrow Rs9,447.84 = x \times \frac{27}{25} \times \frac{27}{25} \times \frac{27}{25}$$

$$\Rightarrow Rs9,447.84 = x \times \frac{19,683}{15,625}$$

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

$$\Rightarrow x = Rs7,500$$

The sum of money will be Rs 7,500.

Answer 2.

Here P = x; A = Rs 16, 637.50; t = 3 years; r = 10 % p.a.

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

$$\Rightarrow Rs16,637.50 = x\left(1+\frac{10}{100}\right)^3$$

$$\Rightarrow Rs16,637.50 = x\left(\frac{11}{10}\right)^3$$

$$\Rightarrow Rs16,637.50 = x \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}$$

$$\Rightarrow Rs16,637.50 = x \times \frac{1,331}{1,000}$$

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

$$\Rightarrow x = Rs12,500$$

The sum of money will be Rs 12,500.

Answer 3.

For the second year

Here P = x; A = Rs 7,128; t = 1 year; r = 10 % p.a.

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

$$\Rightarrow Rs7,128 = x\left(1 + \frac{10}{100}\right)^1$$

$$\Rightarrow Rs7,128 = x\left(\frac{11}{10}\right)$$

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

$$\Rightarrow x = Rs6,480$$

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 = Rs 6,480; t = 1 year; r = 8 % p.a.

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

$$\Rightarrow Rs6,480 = x\left(1 + \frac{8}{100}\right)^1$$

$$\Rightarrow Rs6,480 = x\left(\frac{108}{100}\right)$$

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

$$\Rightarrow x = Rs6,000$$

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 = Rs 3,326.40; t = 1 year; r = 12 % p.a.

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

$$\Rightarrow Rs3,326.40 = x\left(1 + \frac{12}{100}\right)^1$$

$$\Rightarrow Rs3,326.40 = x\left(\frac{112}{100}\right)$$

$$\Rightarrow x = Rs\frac{3,326.40 \times 100}{112}$$
$$\Rightarrow x = Rs2,970$$

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 = Rs 2,970; t = 1 year; r = 10 % p.a.

$$\therefore A = P\left(1+\frac{r}{100}\right)^n$$
$$\Rightarrow Rs2,970 = x\left(1+\frac{10}{100}\right)^1$$
$$\Rightarrow Rs2,970 = x\left(\frac{11}{10}\right)$$
$$\Rightarrow x = Rs\frac{2,970 \times 10}{11}$$
$$\Rightarrow x = Rs2700$$

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 = Rs 2,700; t = 1 year; r = 8 % p.a.

$$\therefore A = P\left(1+\frac{r}{100}\right)^n$$
$$\Rightarrow Rs2,700 = x\left(1+\frac{8}{100}\right)^1$$
$$\Rightarrow Rs2,700 = x\left(\frac{108}{100}\right)$$
$$\Rightarrow x = Rs\frac{2,700 \times 100}{108}$$
$$\Rightarrow x = Rs2500$$

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 = 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

$$= Rs\ \frac{4,000 \times 10 \times 1}{100}$$

$$= Rs\ 400$$

Principal for the second year
= Amount at the end of one year + his new savings
= Rs. 4,000 + Rs. 400 +Rs. 4,000
= Rs. 8,400

Interest for the second year

$$= Rs\ \frac{8,400 \times 10 \times 1}{100}$$

$$= Rs\ 840$$

Compound interest for second year
= Rs. 840

Principal for the third year
= Amount at the end of two years + his new savings
= Rs. 8400 + Rs. 840 + Rs. 4000
= Rs. 13,240

Interest for the third year

$$= Rs\ \frac{13,240 \times 10 \times 1}{100}$$

$$= Rs\ 1,324$$

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

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

$$= Rs600$$

Principal for the second year

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

= Rs. 5,000 + Rs. 600 +Rs. 5,000

= Rs. 10,600

Interest for the second year

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

$$= Rs1,272$$

Compound interest for second year

= Rs. 1,272

Principal for the third year

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

= Rs. 10,600 + Rs. 1,272 + Rs. 5,000

= Rs. 16,872

Interest for the third year

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

$$= Rs2,024.64$$

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

Answer 8.

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

Interest for the 1st year

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

$$= Rs 50$$

Principal for the second year
= Amount at the end of one year + his new savin
= Rs. 500 + Rs. 50 +Rs. 550
= Rs. 1,100

Interest for the second year

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

$$= Rs 110$$

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

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

$$= Rs 181$$

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

$$= Rs\frac{4,000 \times 15 \times 1}{100}$$

$$= Rs600$$

Principal for the second year
= Amount at the end of one year + her new savings
= Rs. 4,000 + Rs. 600 +Rs. 5,000
= Rs. 9,600

Interest for the second year

$$= Rs\frac{9,600 \times 15 \times 1}{100}$$

$$= Rs1,440$$

Compound interest for second year
= Rs. 1,440

Principal for the third year
= Amount at the end of two years + her new savings
= Rs. 9,600 + Rs. 1,440 + Rs. 6000
= Rs. 17.040

Interest for the third year

$$= Rs\frac{17,040 \times 15 \times 1}{100}$$

$$= Rs2,556$$

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

Answer 10.

Let value of car be Rs x.

V_0 =Rs x; n = 3; r = 10% for first 2 years and 8% for 3rd year.

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

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

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

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

$$\Rightarrow V_t = RS.0.7452x$$

Depreciation in the value of car = Rs (x-0.7452x) = 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 =Rs x; n = 3; r = 10% for first year, 12% for 2nd year and 15% for 3rd year.

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

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

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

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

$$\Rightarrow V_t = Rs.0.6732x$$

Depreciation in the value of car = Rs (x-0.6732x) = 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 =Rs x; n = 2; r = 12%

Depreciation in the first year =

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

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

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

$$\Rightarrow V_t = Rs0.88x$$

Depreciation in the second year =

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

$$\Rightarrow V_t = Rs0.88x \times \left(1 - \frac{12}{100}\right)$$

$$\Rightarrow V_t = Rs0.88x \times \frac{22}{25}$$

$$\Rightarrow V_t = Rs0.7744x$$

Depreciation in the value of scooter in the second year

= Rs (0.88x-0.7744x) = Rs 2,640

⇨ 0.1056x = Rs 2,640

⇨ x = 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 =Rs x; n = 2; r = 8%

Depreciation in the first year =

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

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

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

$$\Rightarrow V_t = Rs0.92x$$

Depreciation in the second year =

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

$$\Rightarrow V_t = Rs0.92x \times \left(1 - \frac{8}{100}\right)$$

$$\Rightarrow V_t = Rs0.92x \times \frac{23}{25}$$

$$\Rightarrow V_t = Rs0.8464x$$

Depreciation in the value of refrigerator in the second year

= Rs (0.92x-0.8464x) = Rs 2,392

⇨ 0.0736x = Rs 2,392

⇨ x = 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 =Rs x; n = 2; r = 15%

Depreciation in the first year =

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

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

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

$$\Rightarrow V_t = Rs0.85x$$

Depreciation in the second year when r is 12% =

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

$$\Rightarrow V_t = Rs0.85x \times \left(1 - \frac{12}{100}\right)$$

$$\Rightarrow V_t = Rs0.85x \times \frac{22}{25}$$

$$\Rightarrow V_t = Rs0.748x$$

Depreciation in the value of machine in the second year

= Rs (0.85x-0.748x) = Rs 1,632

⇨ 0.102x = Rs 1,632

⇨ x = 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 =Rs x; n = 2; r = 16%

Depreciation in the first year =

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

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

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

$$\Rightarrow V_t = Rs0.84x$$

Depreciation in the second year when r is 13% =

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

$$\Rightarrow V_t = Rs0.84x \times \left(1 - \frac{13}{100}\right)$$

$$\Rightarrow V_t = Rs0.84x \times 0.87$$

$$\Rightarrow V_t = Rs0.7308x$$

Depreciation in the value of bike in the second year

= Rs (0.84x-0.7308x) = Rs 7,098

⇨ 0.1092x = Rs 7,098

⇨ x = Rs 65,000

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

Ex 1.4

Answer 1.

For the second year:

A=Rs 648; P=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=Rs 600; r=8%; n=1; P=?

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

$$Rs600 = Rs\frac{P \times 8 \times 1}{100}$$

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

$$P = Rs7,500$$

The sum invested = Rs 7,500.

Answer 2.

For the second year:

A=Rs 940.80; P=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=Rs 840; r=12%; n=1; P=?

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

$$Rs840 = Rs\frac{P \times 12 \times 1}{100}$$

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

$$P = Rs7,000$$

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 $\frac{1300}{2} = Rs650$

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 = Rs 5,082 in 2 years and Rs 5,590.20 in 3 years.

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

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

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

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)

$$x\left(1+\frac{r}{100}\right)^2 = Rs5,082$$

$$x\left(1+\frac{10}{100}\right)^2 = Rs5,082$$

$$x \times \frac{11}{10} \times \frac{11}{10} = Rs5,082$$

$$x \times \frac{121}{100} = Rs5,082$$

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

$$x = Rs4,200$$

Hence, rate of interest = 10% and sum invested = Rs 4,200.

Answer 6.

Here, r =? P = x (say)

T = 2 years and 3 years

A = Rs 26,450 in 2 years and Rs 30,417.50 in 3 years.

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

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

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

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)

$$x\left(1+\frac{r}{100}\right)^2 = Rs26,450$$

$$x\left(1+\frac{15}{100}\right)^2 = Rs26,450$$

$$x \times \frac{23}{20} \times \frac{23}{20} = Rs26,450$$

$$x \times \frac{529}{400} = Rs26,450$$

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

$$x = Rs20,000$$

Hence, rate of interest = 15% and sum invested = Rs 20,000.

Answer 7.

Here, P=Rs 5,000; r=8%; t=2years

For simple interest:

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

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

$$S.I. = Rs\,800$$

For compound interest:

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

$$A = Rs5,000(1 + \frac{8}{100})^2$$

$$A = Rs5,000 \times \frac{108}{100} \times \frac{108}{100}$$

$$A = Rs5,832$$

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

$$C.I. = RS(5,832 - 5,000)$$

$$C.I. = Rs832$$

The difference in the compound interest and the simple interest = Rs(832-800)
= Rs 32.

Answer 8.

Here, P=Rs 15,000; r=8%; t=3 years

For simple interest:

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

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

$$S.I. = Rs3,600$$

For compound interest:

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

$$A = Rs15,000(1 + \frac{8}{100})^3$$

$$A = Rs15,000 \times \frac{108}{100} \times \frac{108}{100} \times \frac{108}{100}$$

$$A = Rs18,895.68$$

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

$$C.I. = Rs(18,895.68 - 15,000)$$

$$C.I. = Rs3,895.68$$

The difference in the compound interest and the simple interest = Rs (3,895.68-3.600) = Rs 295.68

Answer 9.

Here, P=Rs 20,000; t=3 years

For simple interest: r=9%

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

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

$$S.I. = Rs5,400$$

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

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

$$A = Rs20,000(1 + \frac{17}{2 \times 100})^3$$

$$A = Rs20,000 \times \frac{217}{200} \times \frac{217}{200} \times \frac{217}{200}$$

$$A = Rs25,545.70$$

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

$$C.I. = Rs(25,545.70 - 20,000)$$

$$C.I. = Rs5,545.70$$

The difference in the compound interest and the simple interest = Rs(5,545.70- 5,400) = Rs 145.70

Anand gained Rs 145.70

Answer 10.

Here, P=Rs 35,000; t=3 years

For simple interest: r=12.5%

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

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

$$S.I. = Rs13,125$$

For compound interest: r=12%

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

$$A = Rs35,000(1 + \frac{12}{100})^3$$

$$A = Rs35,000 \times \frac{112}{100} \times \frac{112}{100} \times \frac{112}{100}$$

$$A = Rs49,172.48$$

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

$$C.I. = Rs(49,172.48 - 35,000)$$

$$C.I. = Rs14,172.48$$

The difference in the compound interest and the simple interest = Rs(14,172.48- 13,125) = 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 - Rs 15,300; P = x

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

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

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

$$x(1 - 0.614) = Rs15,300$$

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

$$x = Rs39,637.31$$

$$\Rightarrow x = Rs40,000(approx)$$

Original cost of scooter = Rs 40,000

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

Here, P = Rs 40,000; r = 15%; t = 3 years

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

$$A = Rs40,000\left(1 - \frac{15}{100}\right)^3$$

$$A = Rs40,000 \times 0.85 \times 0.85 \times 0.85$$

$$A = Rs24,565$$

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 - Rs 10,912.32; P = x

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

$$x - 10,912,32 = x\left(1 - \frac{10}{100}\right)^4$$

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

$$x(1 - 0.6561) = Rs10,912.32$$

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

$$x = Rs31731.08$$

$$\Rightarrow x = Rs32,000(approx)$$

Original cost = Rs 32,000

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

Here, P = Rs 32,000; r = 10%; t = 4 years

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

$$A = Rs32,000\left(1 - \frac{10}{100}\right)^4$$

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

$A = Rs20,995.20$

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

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

$$Rs9,200 = Rs(13,800 - x)\left(1 + \frac{15}{100}\right)$$

$$Rs9,200 = Rs(13,800 - x) \times 1.15$$

$$Rs9,200 = Rs15,870 - Rs1.15x$$

$$1.15x = Rs(15870 - 9,200)$$

$$x = \frac{Rs6,670}{1.15}$$

$$x = Rs5,800$$

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

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

$$Rs17,920 = Rs(35,840 - x)\left(1 + \frac{12}{100}\right)$$

$$Rs17,920 = Rs(35,840 - x) \times 1.12$$

$$Rs17,920 = Rs40,140.80 - Rs1.12x$$

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

$$x = \frac{Rs22220.80}{1.12}$$

$$x = Rs19,840$$

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

Answer 3.

Let the sum be P

Interest for first year:

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

Interest for third year:

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

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 3.

Let the sum be P

Interest for first year:

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

Interest for third year:

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

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:

$$P\left(1+\frac{25}{2\times100}\right)-P.....(i)$$

Interest for third year:

$$P\left(1+\frac{25}{2\times100}\right)^{3}-P\left(1+\frac{25}{2\times100}\right)^{2}.....(ii)$$

Subtracting (ii) from (i)

$$P\left(1+\frac{25}{2\times100}\right)^{3}-P\left(1+\frac{25}{2\times100}\right)^{2}-P\left(1+\frac{25}{2\times100}\right)+P=Rs531.25$$

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

$$Rs531.25=0.033203P$$

$$P=Rs16,000$$

Hence the sum is Rs 16,000

Answer 5.

Here, P =?; t = 2 years; r = 8% p.a.

$S.I. = Rs320$

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

$P = Rs\dfrac{320 \times 100}{8 \times 2}$

$P = Rs2,000$

Now, P = Rs 2,000; t = 1 year

$n = 2t = 2 \times 1 = 2$

$r = \dfrac{1}{2} \times 8\% = 4\%$ Per conversion period.

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

$A = Rs2,000\left(1 + \dfrac{4}{100}\right)^2$

$= Rs2,000 \times 1.04 \times 1.04$

$= Rs2,163.20$

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=Rs 12,000; t=3 years; r=15% p.a.

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

$$A = Rs12,000\left(1+\frac{15}{100}\right)^3$$

$$= Rs12,000 \times 1.15 \times 1.15 \times 1.15$$

$$= Rs18,250.50$$

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

$$= Rs(18,250.50 - 12,000)$$

$$= Rs6,250.50$$

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=Rs 25,000; t=3 years; r=8% p.a.

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

$$A = Rs25,000\left(1+\frac{8}{100}\right)^3$$

$$= Rs25,000 \times 1.08 \times 1.08 \times 1.08$$

$$= Rs31,492.80$$

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

$$= Rs(31,492.80 - 25,000)$$

$$= Rs6,492.80$$

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=Rs 16,000; t=3 years; r=$7\frac{1}{2}$ % p.a.

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

$$A = Rs16,000\left(1+\frac{15}{\quad}\right)^3$$

$= Rs16,000 \times 1.075 \times 1.075 \times 1.075$

$= Rs19,876.75$

$C.I. = A - P$

$= Rs(19,876.75 - 16,000)$

$= Rs3,876.75$

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.

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

$$A = Rs20,000\left(1 + \frac{25}{2 \times 100}\right)^2$$

$= Rs20,000 \times 1.125 \times 1.125$

$= Rs25,312.50$

$C.I. = A - P$

$= Rs(25,312.50 - 20,000)$

$= Rs5,312.50$

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.

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

$$A = Rs8,000\left(1 + \frac{12}{100}\right)\left(1 + \frac{12}{100}\right)^{\frac{1}{2}}$$

$$= Rs8,000 \times 1.12 \times \left(1 + \frac{1}{2} \times \frac{12}{100}\right)$$

$= Rs8,000 \times 1.12 \times 1.06$

$= Rs9,497.60$

$C.I. = A - P$

$= Rs(9,497.60 - 8,000)$

$= Rs1,497.60$

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=Rs 7,500; t=$2\frac{1}{2}$ years; r=16 % p.a.

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

$$A = Rs7,500\left(1+\frac{16}{100}\right)^2\left(1+\frac{16}{100}\right)^{\frac{1}{2}}$$

$$= Rs7,500 \times 1.16 \times 1.16 \times \left(1+\frac{1}{2}\times\frac{16}{100}\right)$$

$$= Rs7,500 \times 1.16 \times 1.16 \times 1.08$$

$$= Rs10,899.36$$

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

$$= Rs(10,899.36 - 7,500)$$

$$= Rs3,399.36$$

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=Rs 6,000; t=$1\frac{1}{2}$ years; r = 10% p.a. = 5 % half –yearly.

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

$$A = Rs6,000\left(1+\frac{5}{100}\right)^2\left(1+\frac{10}{100}\right)^{\frac{1}{2}}$$

$$= Rs6,000 \times 1.05 \times 1.05 \times \left(1+\frac{1}{2}\times\frac{10}{100}\right)$$

$$= Rs6,000 \times 1.05 \times 1.05 \times 1.05$$

$$= Rs6,945.75$$

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

$$= Rs(6,945.75 - 6,000)$$

$$= Rs945.75$$

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=Rs 25,000; t=$1\frac{1}{2}$ years; r = 12% p.a. = 6 % half–yearly.

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

$$A = Rs25,000\left(1+\frac{6}{100}\right)^2\left(1+\frac{12}{100}\right)^{\frac{1}{2}}$$

$$= Rs25,000 \times 1.06 \times 1.06 \times \left(1+\frac{1}{2}\times\frac{12}{100}\right)$$

$$= Rs25,000 \times 1.06 \times 1.06 \times 1.06$$

$$= Rs29,775.40$$

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

$$= Rs(29,775.40 - 25,000)$$

$$= Rs4,775.40$$

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.

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

$$A = Rs9,125\left(1+\frac{12}{100}\right)\left(1+\frac{14}{100}\right)$$

$$= Rs9,125 \times 1.12 \times 1.14$$

$$= Rs11,650.80$$

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

$$= Rs(11,650.80 - 9,125)$$

$$= Rs2,525.80$$

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.

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

$$A = Rs20,000\left(1+\frac{49}{4\times 100}\right)\left(1+\frac{11}{2\times 100}\right)$$

$$= Rs20,000 \times 1.1225 \times 1.055$$

$$= Rs23,684.75$$

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

$$= Rs(23,684.75 - 20,000)$$

$$= Rs3,684.75$$

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.

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

$$A = Rs12,500\left(1+\frac{8}{100}\right)\left(1+\frac{9}{100}\right)\left(1+\frac{10}{100}\right)$$

$$= Rs12,500 \times 1.08 \times 1.09 \times 1.1$$

$$= Rs16,186.50$$

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

$C.I. = A - P$

$= Rs(16,186.50 - 12,500)$

$= Rs3,686.50$

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:

$$\left(\quad \frac{r}{\quad}\right)^n$$

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

$$A = Rs15,000\left(1+\frac{6}{100}\right)^3$$

$$= Rs15,000 \times 1.06 \times 1.06 \times 1.06$$

$$= Rs17,865.24$$

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

$$= Rs(17,865.24 - 15,000)$$

$$= Rs2,865.24$$

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=Rs 20,000; t=$1\frac{1}{2}$ years

When compounded yearly: r = 16% p.a.

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

$$A = Rs20,000\left(1+\frac{16}{100}\right)\left(1+\frac{16}{100}\right)^{\frac{1}{2}}$$

$$= Rs20,000 \times 1.16 \times \left(1+\frac{1}{2}\times\frac{16}{100}\right)$$

$$= Rs20,000 \times 1.16 \times 1.08$$

$$= Rs25,056$$

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

$$= Rs(25,056 - 20,000)$$

$$= Rs5,056$$

When compounded half-yearly:

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

$$A = Rs20,000\left(1+\frac{8}{100}\right)^3$$

$$= Rs20,000 \times 1.08 \times 1.08 \times 1.08$$

$$= Rs25,194.24$$

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

$$= Rs(25,194.24 - 20,000)$$

$$= Rs5,194.24$$

Hence the difference in the interest=Rs (5,194.24-5,056) = Rs 138.24

Answer 5.

Here P=? ; t = 2 years; r = 15% and 17% successively; A = Rs 8,073

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

$$Rs8,073 = P\left(1+\frac{15}{100}\right)\left(1+\frac{17}{100}\right)$$

$$Rs8,073 = P \times 1.15 \times 1.17$$

$$Rs8,073 = 1.3455P$$

$$P = Rs\,\frac{8,073}{1.3455}$$

$$P = Rs6,000$$

Hence, the sum of money is Rs 6,000.

Answer 6.

Here P=? ; t = 2 years; r = 12% and 14% successively; A = Rs 22,344

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

$$Rs22,344 = P\left(1+\frac{12}{100}\right)\left(1+\frac{14}{100}\right)$$

$$Rs22,344 = P \times 1.12 \times 1.14$$

$$Rs22,344 = 1.2768P$$

$$P = Rs\,\frac{22,344}{1.2768}$$

$$P = Rs17,500$$

Hence, the principal is Rs 17,500.

Answer 7.

Here P= ?; t = 3 years; r = 10%, 11% and 12% successively; A = Rs 10.256.40

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

$$Rs10,256.40 = P\left(1+\frac{10}{100}\right)\left(1+\frac{11}{100}\right)\left(1+\frac{12}{100}\right)$$

$$Rs10,256.40 = P \times 1.1 \times 1.11 \times 1.12$$

$$Rs10,256.40 = 1.36752P$$

$$P = Rs\frac{10,256.40}{1.36752}$$

$$P = Rs7,500$$

Hence, the sum of money is Rs 7,500.

Answer 8.

P =? ; A= Rs 18,792; t = $1\frac{1}{2}$ years; r = 16%

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

$$\Rightarrow Rs18,972 = P\left(1+\frac{16}{100}\right)\left(1+\frac{16}{100}\right)^{\frac{1}{2}}$$

$$\Rightarrow Rs18,972 = P\left(1+\frac{16}{100}\right)\left(1+\frac{1}{2}\times\frac{16}{100}\right)$$

$$\Rightarrow Rs18,972 = P \times 1.16 \times 1.08$$

$$\Rightarrow Rs18,972 = 1.2528P$$

$$\Rightarrow P = Rs\frac{18,972}{1.2528}$$

$$\Rightarrow P = Rs15,143.68$$

Hence, the sum of money will be Rs 15,143.68

Answer 9.

P =? ; A= Rs 15,746.40; t = $\frac{1}{2}$ years; r = 16%

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

$$Rs15,746.40 = P\left(1+\frac{16}{100}\right)^{\frac{1}{2}}$$

$$Rs15,746.40 = P\left(1+\frac{1}{2}\times\frac{16}{100}\right)$$

$$Rs15,746.40 = P\times 1.08$$

$$P = Rs\,\frac{15,746.40}{1.08}$$

$$P = Rs14,580$$

Hence, the sum of money will be Rs 14,580.

Answer 10.

P =x; t= 2 years; r = 8%; A=Rs (x+1399.68)

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

$$Rs(x+1399.68) = x\left(1+\frac{8}{100}\right)^{2}$$

$$Rs(x+1399.68) = x\times 1.08\times 1.08$$

$$Rs(x+1399.68) = 1.1664x$$

$$0.1664x = Rs1399.68$$

$$x = Rs8,411.538$$

On Rs 8,411.538 the C.I. for 2 years at 8% will be Rs 1399.68

Answer 11.

P =x; t= $2\frac{1}{2}$ years; r = 12%; A=Rs (x+8,241.60)

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

$$Rs(x+8,241.60) = x\left(1+\frac{12}{100}\right)^2\left(1+\frac{12}{100}\right)^{\frac{1}{2}}$$

$$Rs(x+8,241.60) = x \times 1.12 \times 1.12 \times \left(1+\frac{1}{2}\times\frac{12}{100}\right)$$

$$Rs(x+8,241.60) = x \times 1.12 \times 1.12 \times 1.06$$

$$Rs(x+8,241.60) = 1.329664x$$

$$0.329664x = Rs8,241.60$$

$$x = Rs25,000$$

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= $2\frac{1}{2}$ years; r = $12\frac{1}{2}\% = \frac{25}{2}\%$; A=Rs (x+82,734.37)

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

$$Rs(x+82,734.37) = x\left(1+\frac{25}{2\times 100}\right)^2\left(1+\frac{25}{2\times 100}\right)^{\frac{1}{2}}$$

$$Rs(x+82,734.37) = x\left(1+\frac{25}{2\times 100}\right)^2\left(1+\frac{25}{2\times 100}\right)^{\frac{1}{2}}$$

$$Rs(x+82,734.37) = x \times 1.125 \times 1.125 \times \left(1+\frac{1}{2}\times\frac{1}{8}\right)$$

$$Rs(x+82,734.37) = x \times 1.125 \times 1.125 \times 1.0625$$

$$Rs(x+82,734.37) = 1.344727x$$

$$0.344727x = Rs82,734.37$$

$$x = Rs2,39,999.7 = Rs2,40,000$$

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 x 6 months; r = 16% compounded half-yearly = $\frac{16}{2}\% = 8\%$; A=Rs (x+649.28)

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

$$Rs(x+649.28) = x\left(1+\frac{8}{100}\right)^3$$

$$Rs(x+649.28) = x \times 1.08 \times 1.08 \times 1.08$$

$$Rs(x+649.28) = 1.259712x$$

$$0.259712x = Rs649.28$$

$$x = Rs2,500$$

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 x 6 months; r = 10% compounded half-yearly = $\frac{10}{2}\% = 5\%$; A=Rs (x+3,448.10)

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

$$Rs(x+3,448.10) = x\left(1+\frac{5}{100}\right)^4$$

$$Rs(x+3,448.10) = x \times 1.05 \times 1.05 \times 1.05 \times 1.05$$

$$Rs(x+3,448.10) = 1.215506x$$

$$0.215506x = Rs3,448.10$$

$$x = Rs16,000.02 = Rs16,000$$

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=?

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

$$Rs15,366.40 = Rs12250\left(1+\frac{r}{100}\right)^2$$

$$\frac{15,366.40}{12250} = \left(1+\frac{r}{100}\right)^2$$

$$\frac{(196)^2}{(175)^2} = \left(1+\frac{r}{100}\right)^2$$

$$\frac{196}{175} = 1+\frac{r}{100}$$

$$\frac{r}{100} = \frac{196}{175} - 1 = \frac{196-175}{175} = \frac{21}{175}$$

$$r = \frac{2100}{175} = 12\%$$

Hence, r=12%

Answer 16.

P = Rs 15,000; A = Rs (15,000+8,413.44) = Rs 23,413.44; t = 3 years; r=?

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

$$Rs23,413.44 = Rs15,000\left(1+\frac{r}{100}\right)^3$$

$$\frac{23,413.44}{15,000} = \left(1+\frac{r}{100}\right)^3$$

$$\frac{(29)^3}{(25)^3} = \left(1+\frac{r}{100}\right)^3$$

$$\frac{29}{25} = 1+\frac{r}{100}$$

$$\frac{r}{100} = \frac{29}{25} - 1 = \frac{29-25}{25} = \frac{4}{25}$$

$$r = \frac{400}{25} = 16\%$$

Hence, r=16%

Answer 17.

P = Rs 16,000; A = Rs (16,000+3,876.75) = Rs 19,876.75; t = 3 years; r=?

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

$$Rs19,876.75 = Rs16,000\left(1+\frac{r}{100}\right)^3$$

$$\frac{19,876.75}{16,000} = \left(1+\frac{r}{100}\right)^3$$

$$\frac{(27.08)^3}{(25.19)^3} = \left(1+\frac{r}{100}\right)^3$$

$$\frac{2708}{2519} = 1+\frac{r}{100}$$

$$\frac{r}{100} = \frac{2708}{2519} - 1 = \frac{2708-2519}{2519} = \frac{189}{2519}$$

$$r = \frac{18900}{2519} = 7.5\%$$

Hence, r=7.5%

Answer 18.

P = Rs 8,000; A = Rs 12,167; r = 15%; t=?

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

$$Rs12,167 = Rs8,000\left(1+\frac{15}{100}\right)^t$$

$$\frac{12,167}{8,000} = \left(1+\frac{15}{100}\right)^t$$

$$\frac{(23)^3}{(20)^3} = \left(\frac{23}{20}\right)^t$$

$$t = 3$$

T = 3 years

Answer 19.

P = Rs 50,000; A = Rs (50,000 + 32,151.60) = Rs 82,151.60; r = 18%; t=?

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

$$Rs72,151.60 = Rs50,000\left(1+\frac{18}{100}\right)^{t}$$

$$\frac{82,151.60}{50,000} = \left(1+\frac{18}{100}\right)^{t}$$

$$\frac{82,15160}{50,000\times 100} = \left(1+\frac{18}{100}\right)^{t}$$

$$\frac{2,05379}{1,25,000} = \left(1+\frac{18}{100}\right)^{t}$$

$$\frac{(59)^{3}}{(50)^{3}} = \left(\frac{59}{50}\right)^{t}$$

$t = 3$

T = 3 years

Answer 20.

P = x; t = 2 years; r = $7\frac{1}{2}\% = \frac{15}{2}\%$

For S.I.:

$$I = \frac{P \times r \times t}{100}$$
$$= \frac{x \times \frac{15}{2} \times 2}{100}$$
$$= \frac{3x}{20}$$

For C.I.:

$$C.I. = P\left(1 + \frac{r}{100}\right)^t - P$$
$$= x\left(1 + \frac{\frac{15}{2}}{100}\right)^2 - x$$
$$= x\left(1 + \frac{15}{2 \times 100}\right)^2 - x$$
$$= x\left(1 + \frac{3}{40}\right)^2 - x$$
$$= (x \times 1.075 \times 1.075) - x$$
$$= 1.155625x - x$$
$$= 0.155625x$$

Given C.I.- S.I. = Rs 22.50

$$\Rightarrow 0.155625x - \frac{3x}{20} = Rs22.50$$
$$\Rightarrow 0.155625x - 0.15x = Rs22.50$$
$$\Rightarrow 0.005625x = Rs22.50$$
$$\Rightarrow x = Rs4,000$$

Hence, sum = Rs 4,000

Answer 21.

P = x; t = 3 years; r = 12%

For S.I.:

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

$$= \frac{x \times 12 \times 3}{100}$$

$$= \frac{9x}{25}$$

For C.I.:

$$C.I. = P\left(1 + \frac{r}{100}\right)^t - P$$

$$= x\left(1 + \frac{12}{100}\right)^3 - x$$

$$= x\left(1 + \frac{3}{25}\right)^3 - x$$

$$= (x \times 1.12 \times 1.12 \times 1.12) - x$$

$$= 1.404928x - x$$

$$= 0.404928x$$

Given C.I.-S.I. = Rs 22.50

$$\Rightarrow 0.404928x - \frac{9x}{25} = Rs1,123.20$$

$$\Rightarrow 0.404928x - 0.36x = Rs1,123.20$$

$$\Rightarrow 0.044928x = Rs1,123.20$$

$$\Rightarrow x = Rs25,000$$

Hence, sum = Rs 25,000

Answer 22.

P = x; r = ? ; t= 2 and 3 years; A = Rs 47,610 (2 years)
(3 years)

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

$$47,610 = x\left(1+\frac{r}{100}\right)^2 \ldots\ldots\ldots\ldots(i)$$

$$54,751.50 = x\left(1+\frac{r}{100}\right)^3 \ldots\ldots\ldots\ldots(ii)$$

$$\therefore \frac{x\left(1+\frac{r}{100}\right)^3}{x\left(1+\frac{r}{100}\right)^2} = \frac{54,751.50}{47,610}$$

$$\Rightarrow \left(1+\frac{r}{100}\right) = \frac{54,751.50}{47,610}$$

$$\Rightarrow \frac{r}{100} = \frac{54,751.50}{47,610} - 1$$

$$\Rightarrow \frac{r}{100} = \frac{54,751.50 - 47,610}{47,610}$$

$$r = \frac{7141.50}{47,610} \times 100$$

$$r = 15\%$$

Using (i)

$$x\left(1+\frac{r}{100}\right)^2 = Rs\,47,610$$

$$x\left(1+\frac{15}{100}\right)^2 = Rs\,47,610$$

$$x\left(\frac{115}{100}\right)^2 = Rs\,47,610$$

$$1.3225x = Rs\,47,610$$

$$x = Rs\,36,000$$

The sum = Rs 36,000 and rate of interest = 15%

Answer 23.

P = x; r = ?; t= 2 and 3 years; A = Rs 31,360 (2 years) and Rs 35,123.20 (3 years)

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

$$31,360 = x\left(1+\frac{r}{100}\right)^2 \ldots\ldots\ldots\ldots(i)$$

$$35,123.20 = x\left(1+\frac{r}{100}\right)^3 \ldots\ldots\ldots\ldots(ii)$$

$$\therefore \frac{x\left(1+\frac{r}{100}\right)^3}{x\left(1+\frac{r}{100}\right)^2} = \frac{35,123.20}{31,360}$$

$$\Rightarrow \left(1+\frac{r}{100}\right) = \frac{35,123.20}{31,360}$$

$$\Rightarrow \frac{r}{100} = \frac{35,123.20}{31,360} - 1$$

$$\Rightarrow \frac{r}{100} = \frac{35,123.20 - 31,360}{31,360}$$

$$r = \frac{3,763.20}{31,360} \times 100$$

$$r = 12\%$$

Using (i)

$$x\left(1+\frac{r}{100}\right)^2 = Rs\,31,360$$

$$x\left(1+\frac{12}{100}\right)^2 = Rs\,31,360$$

$$x\left(\frac{112}{100}\right)^2 = Rs\,31,360$$

$$1.2544x = Rs\,31,360$$

$$x = Rs\,25,000$$

The sum = Rs 25,000 and rate of interest = 12%

Answer 24.

P = x; r = ?; t= 2 and 4 years; A = Rs 26,460 (2 years) and Rs 29,172.15 (4 years)

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

$$26,460 = x\left(1+\frac{r}{100}\right)^2 \ldots\ldots\ldots\ldots(i)$$

$$29,172.15 = x\left(1+\frac{r}{100}\right)^4 \ldots\ldots\ldots\ldots(ii)$$

$$\therefore \frac{x\left(1+\frac{r}{100}\right)^4}{x\left(1+\frac{r}{100}\right)^2} = \frac{29,172.15}{26,460}$$

$$\Rightarrow \left(1+\frac{r}{100}\right)^2 = \frac{1,94,481}{1,76,400}$$

$$\Rightarrow \left(1+\frac{r}{100}\right)^2 = \left(\frac{441}{420}\right)^2$$

$$\Rightarrow 1+\frac{r}{100} = \frac{441}{420}$$

$$\Rightarrow \frac{r}{100} = \frac{441}{420} - 1$$

$$\Rightarrow \frac{r}{100} = \frac{441-420}{420}$$

$$r = \frac{21}{420} \times 100$$

$$r = 5\%$$

Using (i)

$$x\left(1+\frac{r}{100}\right)^2 = Rs\,26,460$$

$$x\left(1+\frac{5}{100}\right)^2 = Rs\,26,460$$

$$x\left(\frac{105}{100}\right)^2 = Rs\,26,460$$

$$1.1025x = Rs\,26,460$$

$$x = Rs\,24,000$$

The sum = Rs 24,000 and rate of interest = 5%

Answer 25.

P =x; t= 2 years; r = 5%; A=Rs (x+512.50)

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

$$Rs(x + 512.50) = x\left(1 + \frac{5}{100}\right)^2$$

$$Rs(x + 512.50) = x \times 1.05 \times 1.05$$

$$Rs(x + 512.50) = 1.1025x$$

$$0.1025x = Rs512.50$$

$$x = Rs5,000$$

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

$$I = Rs\frac{5,000 \times 6 \times 3}{100}$$

$$I = Rs900$$

Simple interest will be Rs 900

Answer 26.

P =x; t= 3 years; r = 10%; A=Rs (x+4,965)

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

$$Rs(x + 4,965) = x\left(1 + \frac{10}{100}\right)^3$$

$$Rs(x + 4,965) = x \times 1.1 \times 1.1 \times 1.1$$

$$Rs(x + 4,965) = 1.331x$$

$$0.331x = Rs4,965$$

$$x = Rs15,000$$

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

$$I = Rs\frac{15,000 \times 11 \times 3}{100}$$

$$I = Rs4,950$$

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_o=40,000; r = ? ; t = 3 years

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

$$46,305 = 40,000\left(1+\frac{r}{100}\right)^3$$

$$\frac{46,305}{40,000} = \left(1+\frac{r}{100}\right)^3$$

$$\frac{21^3}{20^3} = \left(1+\frac{r}{100}\right)^3$$

$$\left(1+\frac{r}{100}\right) = \frac{21}{20}$$

$$\frac{r}{100} = \frac{21}{20} - 1$$

$$\frac{r}{100} = \frac{1}{20}$$

$$r = \frac{1}{20} \times 100$$

$$r = 5\%$$

The annual rate of growth of scooters is 5%.

Answer 5.

V_n =? ; V_o=1, 1 5,200; r = $6\frac{2}{3}\% = \frac{20}{3}\%$; t = 2 years

$$V_n = V_o\left(1+\frac{r}{100}\right)$$

$$V_n = 1,15,200\left(1+\frac{20}{100\times 3}\right)^2$$

$$V_n = 1,15,200 \times 1.06667 \times 1.06667$$

$$V_n = 1,31,072$$

The population 2 years later = 1, 31,072

(ii) Its population 2 years ago.

V_n =? ; V_o=1, 15,200; r = $6\frac{2}{3}\% = \frac{20}{3}\%$; t = 2 years

$$V_n = V_o\left(1-\frac{r}{100}\right)^t$$

$$V_n = 1,15,200\left(1-\frac{20}{100\times 3}\right)^2$$

$$V_n = 1,15,200 \times 0.933333 \times 0.933333$$

$$V_n = 1,00,352$$

The population 2 years ago was = 1, 00,352

Answer 6.

V_n =Rs 19,083.60; V_o=? ; r = 10%; t = 2 years

$$V_n = V_o\left(1-\frac{r}{100}\right)^t$$

$$Rs19,083.60 = V_o\left(1-\frac{10}{100}\right)^2$$

$$V_o = Rs19,083.60 \times \frac{10}{9} \times \frac{10}{9}$$

$$V_o = Rs23,560$$

The machine was purchased for Rs 23,560 i.e. Rs (23,560 – 19083.60) = Rs 4,476.40 more than the present value.

Answer 7.

V_n =27,783; V_o=24,000; r = ?; t = 3 years

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

$$27,783 = 24,000\left(1+\frac{r}{100}\right)^3$$

$$\frac{27,783}{24,000} = \left(1+\frac{r}{100}\right)^3$$

$$\frac{21^3}{20^3} = \left(1+\frac{r}{100}\right)^3$$

$$\left(1+\frac{r}{100}\right) = \frac{21}{20}$$

$$\frac{r}{100} = \frac{21}{20} - 1$$

$$\frac{r}{100} = \frac{1}{20}$$

$$r = \frac{1}{20} \times 100$$

$$r = 5\%$$

The rate of growth of population is 5%.

Answer 8.

V_n =27,040; V_o=25,000; r = ? ; t = 2 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=Rs 4, 00,000; r = 10%; t = 4 years

$$V_n = V_o\left(1-\frac{r}{100}\right)^t$$

$$V_n = Rs4,00,000\left(1-\frac{10}{100}\right)^4$$

$$V_n = Rs4,00,000 \times 0.9 \times 0.9 \times 0.9 \times 0.9$$

$$V_n = Rs2,62,440$$

The value of car after four years will be Rs 2, 62,440.

Answer 10.

V_n=Rs 44,540; V_o=? ; r = 5%; t = 3 years

$$V_n = V_o\left(1-\frac{r}{100}\right)^t$$

$$Rs44,540 = V_o\left(1-\frac{5}{100}\right)^3$$

$$V_o = Rs44,540 \times \frac{100}{95} \times \frac{100}{95} \times \frac{100}{95}$$

$$V_o = Rs44,540 \times 1.052632 \times 1.052632 \times 1.052632$$

$$V_o = Rs51,949.26$$

The original value of the property was Rs 51,949.26

Answer 11.

V_n=Rs 9,680; V_o=? ; r = 12%; t = 2 years

$$V_n = V_o\left(1-\frac{r}{100}\right)^t$$

$$Rs9,680 = V_o\left(1-\frac{12}{100}\right)^2$$

$$V_o = Rs9,680 \times \frac{100}{88} \times \frac{100}{88}$$

$$V_o = Rs9,680 \times 1.136364 \times 1.136364$$

$$V_o = Rs12,500$$

The refrigerator was purchased for Rs 12,500

Answer 12.

For the building:

$$V_n = V_o\left(1 - \frac{r}{100}\right)^t$$

$$V_n = Rs1,33,100\left(1 - \frac{10}{100}\right)^t$$

$$V_n = Rs1,33,100 \times (0.9)^t$$

For the plot:

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

$$V_n = Rs72,900\left(1 + \frac{10}{100}\right)^t$$

$$V_n = Rs72,900 \times (1.1)^t$$

Since, value becomes same:

$$1,33,100 \times (0.9)^t = 72,900 \times (1.1)^t \lim_{x \to \infty}$$

$$\frac{(1.1)^t}{(0.9)^t} = \frac{1,33,100}{72,900}$$

$$\frac{(11)^t}{(09)^t} = \frac{1331}{729} = \frac{11^3}{9^3}$$

$$t = 3$$

Hence, after 3 years value of both will be same.

Answer 13.

V_n=? ; V_o=Rs 17,000; t = 2 years (1 for increment and 1 for decrement); r = 5% for increase and 4% for decrease.

$$V_n = V_o\left(1 + \frac{r}{100}\right)^t\left(1 - \frac{r}{100}\right)^t$$

$$V_n = Rs17,000\left(1 + \frac{5}{100}\right)\left(1 - \frac{4}{100}\right)$$

$$V_n = Rs17,000 \times 1.05 \times 0.96$$

$$V_n = Rs17,136$$

The cost of the T.V. in 2001 is Rs 17,136.

Answer 14.

V_n = 1m 8cm = 108 cm; V_o=? ; t = 2 years; r = 20%

$$V_n = V_o\left(1 - \frac{r}{100}\right)^t$$

$$108cm = V_o\left(1 + \frac{20}{100}\right)^3$$

$$V_o = 108cm \times 0.8333 \times 0.8333 \times 0.8333$$

$$V_o = 62.5cm$$

The height of tree was 62.5 cm when planted.