

Chapter 3. Compound Interest

Ex 3.1

Answer 1.

(i) Rs25000 for $1\frac{1}{2}$ years at 10% per annum.

Here $P = \text{Rs}25000$, $t = 1\frac{1}{2}$ years, $r = 10\%$

$$\begin{aligned}\text{Now, Amount after 1 year} &= P\left(1 + \frac{r}{100}\right) = 25000\left(1 + \frac{10}{100}\right) \\ &= 25000\left(1 + \frac{1}{10}\right) = 25000\left(\frac{11}{10}\right) \\ &= 27500\end{aligned}$$

Thus, principle for the next 6 months = Rs27500

$$\text{Interest for the next 6 months} = \frac{27500 \times 6 \times 10}{100 \times 12} = 1375$$

Therefore, amount after $1\frac{1}{2}$ years = Rs27500 + Rs1375 = Rs28875

And $CI = A - P = \text{Rs}28875 - \text{Rs}25000 = \text{Rs}3875$

(ii) Rs32000 for 2 years at $7\frac{1}{2}\%$ per annum.

Here $P_1 = \text{Rs}32000$ and $r = 7\frac{1}{2}\% = \frac{15}{2}\%$

$$\begin{aligned}\text{So, Amount after 1 year} &= P\left(1 + \frac{r}{100}\right) = 32000\left(1 + \frac{15}{2 \times 100}\right) \\ &= 32000\left(1 + \frac{3}{40}\right) = 32000\left(\frac{43}{40}\right) \\ &= 34400\end{aligned}$$

Thus, $P_2 = \text{Rs}34400$ and $r = \frac{15}{2}\%$

$$\begin{aligned}\text{So, Amount after 2 year} &= P\left(1 + \frac{r}{100}\right) = 34400\left(1 + \frac{15}{2 \times 100}\right) \\ &= 34400\left(1 + \frac{3}{40}\right) = 34400\left(\frac{43}{40}\right) \\ &= 36980\end{aligned}$$

Hence, Amount = Rs 36980

Also, $CI = A - P = \text{Rs} 36980 - \text{Rs} 32000 = \text{Rs} 4980$

(iii) Rs10000 for $2\frac{1}{2}$ years at 6% per annum.

Here $P_1 = \text{Rs}10000$ and $r = 6\%$

$$\begin{aligned}\text{So, Amount after 1 year} &= P\left(1 + \frac{r}{100}\right) = 10000\left(1 + \frac{6}{100}\right) \\ &= 10000 \times \frac{106}{100} = 10600\end{aligned}$$

Thus, $P_2 = \text{Rs}10600$ and $r = 6\%$

$$\begin{aligned}\text{Amount after 2 year} &= P\left(1 + \frac{r}{100}\right) = 10600\left(1 + \frac{6}{100}\right) \\ &= 10600 \times \frac{106}{100} = 11236\end{aligned}$$

Thus, principle for the next 6 months = Rs11236

$$\text{Interest for the next 6 months} = \frac{11236 \times 6 \times 6}{100 \times 12} = 337.08$$

Therefore, amount after $1\frac{1}{2}$ years = Rs11236 + Rs337.08 = Rs11573.08

And $CI = A - P = \text{Rs}11573.08 - \text{Rs}10000 = \text{Rs}1573.08$

(iv) Rs24000 for $1\frac{1}{2}$ years at $7\frac{1}{2}\%$ per annum.

Here $P = \text{Rs}24000$, $t = 1\frac{1}{2}$ years, $r = 7\frac{1}{2}\% = \frac{15}{2}\%$

$$\begin{aligned}\text{Now, Amount after 1 year} &= P\left(1 + \frac{r}{100}\right) = 24000\left(1 + \frac{15}{2 \times 100}\right) \\ &= 24000\left(1 + \frac{3}{40}\right) = 24000\left(\frac{43}{40}\right) \\ &= 25800\end{aligned}$$

Thus, principle for the next 6 months = Rs25800

$$\text{Interest for the next 6 months} = \frac{25800 \times 15 \times 6}{200 \times 12} = 967.50$$

Therefore, amount after $1\frac{1}{2}$ years = Rs25800 + Rs967.50 = Rs26767.50

And $CI = A - P = \text{Rs}26767.50 - \text{Rs}24000 = \text{Rs}2767.50$

Answer 2A.

For 1st year: P = Rs. 16000, R = 15% and T = 1 year

$$\therefore \text{Interest} = \text{Rs.} \frac{16000 \times 15 \times 1}{100} = \text{Rs.} 2400$$

And, amount = Rs.16000 + Rs.2400 = Rs.18400

For 2nd year: P = Rs. 18400, R = 12% and T = 1 year

$$\therefore \text{Interest} = \text{Rs.} \frac{18400 \times 12 \times 1}{100} = \text{Rs.} 2208$$

And, amount = Rs.18400 + Rs.2208 = Rs.20608

\therefore Required amount = Rs. 20608

And, Compound Interest = A - P = Rs. 20608 - Rs. 16000 = Rs. 4608

Answer 2B.

For 1st year: P = Rs. 17500, R = 8% and T = 1 year

$$\therefore \text{Interest} = \text{Rs.} \frac{17500 \times 8 \times 1}{100} = \text{Rs.} 1400$$

And, amount = Rs.17500 + Rs.1400 = Rs.18900

For 2nd year: P = Rs. 18900, R = 10% and T = 1 year

$$\therefore \text{Interest} = \text{Rs.} \frac{18900 \times 10 \times 1}{100} = \text{Rs.} 1890$$

And, amount = Rs.18900 + Rs.1890 = Rs.20790

For 3rd year: P = Rs. 20790, R = 12% and T = 1 year

$$\therefore \text{Interest} = \text{Rs.} \frac{20790 \times 12 \times 1}{100} = \text{Rs.} 2494.80$$

And, amount = Rs.20790 + Rs.2494.80 = Rs.23284.80

\therefore Required amount = Rs. 23284.80

And, Compound Interest = A - P = Rs. 23284.80 - Rs. 17,500 = Rs.5784.80

Answer 3.

Here $P_1 = \text{Rs}20000$ and $r = 10\%$

$$\begin{aligned}\text{So, Amount after 1 year} &= P\left(1 + \frac{r}{100}\right) = 20000\left(1 + \frac{10}{100}\right) \\ &= 20000 \times \frac{110}{100} = 22000\end{aligned}$$

Thus, $P_2 = \text{Rs}22000$ and $r = 10\%$

$$\begin{aligned}\text{Amount after 2 year} &= P\left(1 + \frac{r}{100}\right) = 22000\left(1 + \frac{10}{100}\right) \\ &= 22000 \times \frac{110}{100} = 24200\end{aligned}$$

Thus, $P_3 = \text{Rs}24200$ and $r = 10\%$

$$\begin{aligned}\text{Amount after 3 year} &= P\left(1 + \frac{r}{100}\right) = 24200\left(1 + \frac{10}{100}\right) \\ &= 24200 \times \frac{110}{100} = 26620\end{aligned}$$

Hence, Amount = Rs 26620

Also, $CI = A - P = \text{Rs} 26620 - \text{Rs} 20000 = \text{Rs} 6620$

Answer 4.

For 1st year: $P = \text{Rs.} 5000$, $R = 10\%$ and $T = 1$ year

$$\therefore \text{Interest} = \text{Rs.} \frac{5000 \times 10 \times 1}{100} = \text{Rs.} 500$$

And, amount = Rs.5000 + Rs.500 = Rs.5500

For 2nd year: $P = \text{Rs.} 5500$, $R = 10\%$ and $T = 1$ year

$$\therefore \text{Interest} = \text{Rs.} \frac{5500 \times 10 \times 1}{100} = \text{Rs.} 550$$

And, amount = Rs.5500 + Rs.550 = Rs.6050

For 3rd year: $P = \text{Rs.} 6050$, $R = 10\%$ and $T = 1$ year

$$\therefore \text{Interest} = \text{Rs.} \frac{6050 \times 10 \times 1}{100} = \text{Rs.} 605$$

\therefore Compound interest for 3rd year is Rs. 605.

Answer 5.

For 1st year: $P = \text{Rs. } 25600$, $R = 5\%$ and $T = 1$ year

$$\therefore \text{Interest} = \text{Rs. } \frac{25600 \times 5 \times 1}{100} = \text{Rs. } 1280$$

And, amount = $\text{Rs. } 25600 + \text{Rs. } 1280 = \text{Rs. } 26880$

For 2nd year: $P = \text{Rs. } 26880$, $R = 5\%$ and $T = 1$ year

$$\therefore \text{Interest} = \text{Rs. } \frac{26880 \times 5 \times 1}{100} = \text{Rs. } 1344$$

And, amount = $\text{Rs. } 26880 + \text{Rs. } 1344 = \text{Rs. } 28224$

\therefore Amount at the end of 2nd year is $\text{Rs. } 28224$.

Answer 6.

Here $P_1 = \text{Rs. } 7500$ and rate of interest for half year (r) = 4%

$$\begin{aligned} \text{So, Amount after } \frac{1}{2} \text{ year} &= P \left(1 + \frac{r}{100} \right) = 7500 \left(1 + \frac{4}{100} \right) \\ &= 7500 \times \frac{104}{100} = 7800 \end{aligned}$$

Thus, $P_2 = \text{Rs. } 7800$ and $r = 4\%$

$$\begin{aligned} \text{Amount after 1 year} &= P \left(1 + \frac{r}{100} \right) = 7800 \left(1 + \frac{4}{100} \right) \\ &= 7800 \times \frac{104}{100} = 8112 \end{aligned}$$

Thus, $P_3 = \text{Rs. } 8112$ and $r = 4\%$

$$\begin{aligned} \text{Amount after } 1\frac{1}{2} \text{ year} &= P \left(1 + \frac{r}{100} \right) = 8112 \left(1 + \frac{4}{100} \right) \\ &= 8112 \times \frac{104}{100} = 8436.48 \end{aligned}$$

Hence, Amount = $\text{Rs. } 8436.48$

Also, $CI = A - P = \text{Rs. } 8436.48 - \text{Rs. } 7500 = \text{Rs. } 936.48$

Answer 7.

$$\text{Since, Amount after 1 year} = P\left(1 + \frac{r}{100}\right)$$

$$\Rightarrow 27600 = 24000\left(1 + \frac{r}{100}\right)$$

$$\Rightarrow 1 + \frac{r}{100} = \frac{27600}{24000} = \frac{23}{20}$$

$$\Rightarrow \frac{r}{100} = \frac{23}{20} - 1 = \frac{3}{20}$$

$$\Rightarrow r = \frac{100 \times 3}{20} = 15$$

$$\begin{aligned}\text{Amount after 2 year} &= P\left(1 + \frac{r}{100}\right) = 27600\left(1 + \frac{15}{100}\right) \\ &= 27600 \times \frac{115}{100} = 31740\end{aligned}$$

Answer 8.

Here $P_1 = \text{Rs}14000$ and $r = 5\%$

$$\begin{aligned}\text{So, Amount after 1 year} &= P\left(1 + \frac{r}{100}\right) = 14000\left(1 + \frac{5}{100}\right) \\ &= 14000 \times \frac{105}{100} = 14700\end{aligned}$$

Thus, $P_2 = \text{Rs}14700$ and $r = 8\%$

$$\begin{aligned}\text{Amount after 2 year} &= P\left(1 + \frac{r}{100}\right) = 14700\left(1 + \frac{8}{100}\right) \\ &= 14700 \times \frac{108}{100} = 15876\end{aligned}$$

Hence, Amount = Rs 15876

Answer 9.

Here $P_1 = \text{Rs}17500$ and $r = 4\%$

$$\begin{aligned}\text{So, Amount after 1 year} &= P\left(1 + \frac{r}{100}\right) = 17500\left(1 + \frac{4}{100}\right) \\ &= 17500 \times \frac{104}{100} = 18200\end{aligned}$$

Thus, $P_2 = \text{Rs}18200$ and $r = 5\%$

$$\begin{aligned}\text{Amount after 2 year} &= P\left(1 + \frac{r}{100}\right) = 18200\left(1 + \frac{5}{100}\right) \\ &= 18200 \times \frac{105}{100} = 19110\end{aligned}$$

Thus, $P_3 = \text{Rs}19110$ and $r = 6\%$

$$\begin{aligned}\text{Amount after 3 year} &= P\left(1 + \frac{r}{100}\right) = 19110\left(1 + \frac{6}{100}\right) \\ &= 19110 \times \frac{106}{100} = 20256.60\end{aligned}$$

Hence, Amount = Rs 20256.60

Also, $CI = A - P = \text{Rs } 20256.60 - \text{Rs } 17500 = \text{Rs}2756.60$

Answer 10.

For 1st half-year: $P = \text{Rs. } 4000$, $R = 14\%$ and $T = \frac{1}{2}$ year

$$\text{Interest} = \text{Rs. } \frac{4000 \times 14 \times 1}{100 \times 2} = \text{Rs. } 280$$

And, amount = Rs. 4000 + Rs. 280 = Rs. 4280

For 2nd half-year: $P = \text{Rs. } 4280$, $R = 14\%$ and $T = \frac{1}{2}$ year

$$\text{Interest} = \text{Rs. } \frac{4280 \times 14 \times 1}{100 \times 2} = \text{Rs. } 299.60$$

And, amount = Rs. 4280 + Rs. 299.60 = Rs. 4579.60

For 3rd half-year: $P = \text{Rs. } 4579.60$, $R = 14\%$ and $T = \frac{1}{2}$ year

$$\text{Interest} = \text{Rs. } \frac{4579.60 \times 14 \times 1}{100 \times 2} = \text{Rs. } 320.572$$

And, amount = Rs. 4579.60 + Rs. 320.572 = Rs. 4900.172

Thus, the amount to be paid at the end of $1\frac{1}{2}$ years is Rs. 4900.172.

Answer 11.

Here $P_1 = \text{Rs}42000$ and rate of interest for half year = 4%, $t = 4$ half years

$$\begin{aligned}\text{So, Amount after } \frac{1}{2} \text{ year} &= P \left(1 + \frac{r}{100}\right) = 42000 \left(1 + \frac{4}{100}\right) \\ &= 42000 \times \frac{104}{100} = 43680\end{aligned}$$

Thus, $P_2 = \text{Rs}43680$

$$\begin{aligned}\text{Amount after 1 year} &= P \left(1 + \frac{r}{100}\right) = 43680 \left(1 + \frac{4}{100}\right) \\ &= 43680 \times \frac{104}{100} = 45427.20\end{aligned}$$

Thus, $P_3 = \text{Rs}45427.20$

$$\begin{aligned}\text{Amount after } 1\frac{1}{2} \text{ year} &= P \left(1 + \frac{r}{100}\right) = 45427.20 \left(1 + \frac{4}{100}\right) \\ &= 45427.20 \times \frac{104}{100} = 47244.29\end{aligned}$$

Thus, $P_4 = \text{Rs}47244.29$

$$\begin{aligned}\text{Amount after 2 year} &= P \left(1 + \frac{r}{100}\right) = 47244.29 \left(1 + \frac{4}{100}\right) \\ &= 47244.29 \times \frac{104}{100} = 49134.06\end{aligned}$$

Hence, Amount = Rs 49134.06

Also, $\text{CI} = A - P = \text{Rs} 49134.06 - \text{Rs} 42000 = \text{Rs} 7134.06$

Answer 12.

Case I:

Here $P = \text{Rs}15000$ and $r = 10.5\%$

$$\begin{aligned}\text{So, Amount after 1 year} &= P \left(1 + \frac{r}{100}\right) = 15000 \left(1 + \frac{10.5}{100}\right) \\ &= 15000 \times \frac{110.5}{100} = 16575\end{aligned}$$

Case II:

Here $P_1 = \text{Rs}15000$ and rate of interest for half year (r) = 5%

$$\begin{aligned}\text{So, Amount after } \frac{1}{2} \text{ year} &= P \left(1 + \frac{r}{100}\right) = 15000 \left(1 + \frac{5}{100}\right) \\ &= 15000 \times \frac{105}{100} = 15750\end{aligned}$$

Thus, $P_2 = \text{Rs}15750$ and $r = 5\%$

$$\begin{aligned}\text{Amount after 1 year} &= P \left(1 + \frac{r}{100}\right) = 15750 \left(1 + \frac{5}{100}\right) \\ &= 15750 \times \frac{105}{100} = 16537.50\end{aligned}$$

Hence the first man gains by $\text{Rs}16575 - \text{Rs}16537.50 = \text{Rs}37.50$

Answer 13.

Case I:

Here $P_1 = \text{Rs}20000$ and $r = 12\%$

$$\begin{aligned}\text{So, Amount after 1 year} &= P\left(1 + \frac{r}{100}\right) = 20000\left(1 + \frac{12}{100}\right) \\ &= 20000 \times \frac{112}{100} = 22400\end{aligned}$$

Thus, $P_2 = \text{Rs}22400$ and $r = 12\%$

$$\begin{aligned}\text{Amount after 2 year} &= P\left(1 + \frac{r}{100}\right) = 22400\left(1 + \frac{12}{100}\right) \\ &= 22400 \times \frac{112}{100} = 25088\end{aligned}$$

Thus, $P_3 = \text{Rs}25088$ and $r = 12\%$

$$\begin{aligned}\text{Amount after 3 year} &= P\left(1 + \frac{r}{100}\right) = 25088\left(1 + \frac{12}{100}\right) \\ &= 25088 \times \frac{112}{100} = 28098.56\end{aligned}$$

Hence, Amount = Rs 28098.56

Also, $CI = A - P = \text{Rs } 28098.56 - \text{Rs } 20000 = \text{Rs } 8098.56$

Case II:

$$\text{Simple interest} = \frac{20000 \times 12 \times 3}{100} = 7200$$

Difference between C.I. and S.I. = Rs 8098.56 – Rs 7200 = Rs 898.56

Answer 14.

$$\text{Since, Simple interest} = \frac{P \times r \times t}{100}$$

$$\Rightarrow 1500 = \frac{P \times 4 \times 2}{100} \Rightarrow P = \frac{150000}{8} = 18750$$

Now for CI, $P = \text{Rs } 18750$, $r = 4\%$, $t = 2$ year

Here $P_1 = \text{Rs } 18750$ and $r = 4\%$

$$\begin{aligned}\text{So, Amount after 1 year} &= P\left(1 + \frac{r}{100}\right) = 18750\left(1 + \frac{4}{100}\right) \\ &= 18750 \times \frac{104}{100} = 19500\end{aligned}$$

Thus, $P_2 = \text{Rs}19500$ and $r = 4\%$

$$\begin{aligned}\text{Amount after 2 year} &= P\left(1 + \frac{r}{100}\right) = 19500\left(1 + \frac{4}{100}\right) \\ &= 19500 \times \frac{104}{100} = 20280\end{aligned}$$

Hence, Amount = Rs 20280

Also, $CI = A - P = \text{Rs } 20280 - \text{Rs } 18750 = \text{Rs } 1530$

Answer 15.

Case I:

Here $P_1 = \text{Rs } 5000$ and $r = 6\%$

$$\begin{aligned} \text{So, Amount after 1 year} &= P \left(1 + \frac{r}{100} \right) = 5000 \left(1 + \frac{6}{100} \right) \\ &= 5000 \times \frac{106}{100} = 5300 \end{aligned}$$

$$\begin{aligned} \text{Amount after 2 year} &= P \left(1 + \frac{r}{100} \right) = 5300 \left(1 + \frac{6}{100} \right) \\ &= 5300 \times \frac{106}{100} = 5618 \end{aligned}$$

Thus, $P_3 = \text{Rs } 5618$ and $r = 6\%$

$$\begin{aligned} \text{Amount after 3 year} &= P \left(1 + \frac{r}{100} \right) = 5618 \left(1 + \frac{6}{100} \right) \\ &= 5618 \times \frac{106}{100} = 5955.08 \end{aligned}$$

Hence, Amount = Rs 5955.08

Also, $CI = A - P = \text{Rs } 5955.08 - \text{Rs } 5000 = \text{Rs } 955.08$

Case II:

$$\text{Simple interest} = \frac{5000 \times 6 \times 3}{100} = 900$$

Difference between C.I. and S.I. = Rs 955.08 – Rs 900 = Rs 55.08

Answer 16.

$$\begin{aligned} \text{Since Simple interest} &= \frac{P \times r \times t}{100} \\ \Rightarrow 450 &= \frac{P \times 4 \times 2}{100} \Rightarrow P = \frac{45000}{8} = 5625 \end{aligned}$$

Now for CI, $P = \text{Rs } 5625$, $r = 4$, $t = 1$ yearHere $P_1 = \text{Rs } 5625$ and rate of interest for half-yearly = 2%

$$\begin{aligned} \text{So, Amount after } \frac{1}{2} \text{ year} &= P \left(1 + \frac{r}{100} \right) = 5625 \left(1 + \frac{2}{100} \right) \\ &= 5625 \times \frac{102}{100} = 5737.50 \end{aligned}$$

Thus, $P_2 = \text{Rs } 5737.50$ and $r = 2\%$

$$\begin{aligned} \text{Amount after 1 year} &= P \left(1 + \frac{r}{100} \right) = 5737.50 \left(1 + \frac{2}{100} \right) \\ &= 5737.50 \times \frac{102}{100} = 5852.25 \end{aligned}$$

Hence, Amount = Rs 5852.25

Also, $CI = A - P = \text{Rs } 5852.25 - \text{Rs } 5625 = \text{Rs } 227.25$

Answer 17.

Case I:

$$\text{Simple interest} = \frac{62500 \times 8 \times 2}{100} = 10000$$

$$\text{Amount} = \text{Rs } 62500 + \text{Rs } 10000 = \text{Rs } 72500$$

Case II:

Here $P_1 = \text{Rs } 62500$ and $r = 8\%$

$$\begin{aligned}\text{So, Amount after 1 year} &= P \left(1 + \frac{r}{100} \right) = 62500 \left(1 + \frac{8}{100} \right) \\ &= 62500 \times \frac{108}{100} = 67500\end{aligned}$$

Thus, $P_2 = \text{Rs } 67500$ and $r = 8\%$

$$\begin{aligned}\text{Amount after 2 year} &= P \left(1 + \frac{r}{100} \right) = 67500 \left(1 + \frac{8}{100} \right) \\ &= 67500 \times \frac{108}{100} = 72900\end{aligned}$$

Hence, Amount = Rs 72900

Thus, gain in amount = Rs 72900 – Rs 72500 = Rs 400

Answer 18.

For 1st year: $P = \text{Rs. } 100$, $R = 10\%$ and $T = 1$ year

$$\text{Interest} = \text{Rs. } \frac{100 \times 10 \times 1}{100} = \text{Rs. } 10$$

$$\text{Amount} = \text{Rs. } 100 + \text{Rs. } 10 = \text{Rs. } 110$$

For 2nd year: $P = \text{Rs. } 110$, $R = 15\%$ and $T = 1$ year

$$\text{Interest} = \text{Rs. } \frac{110 \times 15 \times 1}{100} = \text{Rs. } 16.50$$

$$\text{Amount} = \text{Rs. } 110 + \text{Rs. } 16.50 = \text{Rs. } 126.50$$

When amount is Rs. 126.50, Principal is Rs. 100.

Hence, when amount is Rs. 10120,

$$\text{Principal} = \text{Rs. } \frac{10120 \times 100}{126.50} = \text{Rs. } 8000$$

Answer 19.

To calculate the S.I. paid by Sunil :

$$P = \text{Rs.}50000, R = 10\% \text{ and } T = 1\frac{1}{2} \text{ years} = \frac{3}{2} \text{ years}$$

$$\therefore \text{S.I.} = \text{Rs.} \frac{50000 \times 10 \times 3}{100 \times 2} = \text{Rs.} 7500$$

To calculate the C.I. earned by Sunil:

For 1st year: $P = \text{Rs.}50000, R = 10\% \text{ and } T = 1 \text{ year}$

$$\therefore \text{Interest} = \text{Rs.} \frac{50000 \times 10 \times 1}{100} = \text{Rs.} 5000$$

And, amount = $\text{Rs.}50000 + \text{Rs.}5000 = \text{Rs.}55000$

For next half year: $P = \text{Rs.}55000, R = 10\% \text{ and } T = \frac{1}{2} \text{ year}$

$$\therefore \text{Interest} = \text{Rs.} \frac{55000 \times 10 \times 1}{100 \times 2} = \text{Rs.} 2750$$

And, amount = $\text{Rs.}55000 + \text{Rs.}2750 = \text{Rs.}57750$

\therefore Total C.I. earned = $\text{Rs.} 57750 - \text{Rs.} 50000 = \text{Rs.} 7750$

$$\begin{aligned} \Rightarrow \text{Sunil's gain in } 1\frac{1}{2} \text{ years} &= \text{C.I. earned} - \text{S.I. paid} \\ &= \text{Rs.} 7750 - \text{Rs.} 7500 \\ &= \text{Rs.} 250 \end{aligned}$$

Answer 20.

Let the value of mobile in the beginning be Rs. 100.

For 1st year, depreciation = 5% of Rs. 100 = $\frac{5}{100} \times 100 = \text{Rs.} 5$

Value of machine for second year = $\text{Rs.} 100 - \text{Rs.} 5 = \text{Rs.} 95$

For 2nd year, depreciation = 5% of Rs. 95 = $\frac{5}{100} \times 95 = \text{Rs.} 4.75$

Value of machine for third year = $\text{Rs.} 95 - \text{Rs.} 4.75 = \text{Rs.} 90.25$

For 3rd year, depreciation = 10% of Rs. 90.25 = $\frac{10}{100} \times 90.25 = \text{Rs.} 9.025$

Value of machine at the end of third year = $\text{Rs.} 90.25 - \text{Rs.} 9.025 = \text{Rs.} 81.225$

Net depreciation = $\text{Rs.} 100 - \text{Rs.} 81.225 = \text{Rs.} 18.775$ or 18.775%

Answer 21.

For 1st half year : P = Rs. 6500, R = 10% and T = $\frac{1}{2}$ year

$$\text{Interest} = \text{Rs. } \frac{6500 \times 10 \times 1}{100 \times 2} = \text{Rs. } 325$$

$$\text{Amount} = \text{Rs. } 6500 + \text{Rs. } 325 = \text{Rs. } 6825$$

Money paid at the end of 1st half year = Rs. 2000

$$\text{Balance money for 2nd half year} = \text{Rs. } 6825 - \text{Rs. } 2000 = \text{Rs. } 4825$$

For 2nd half year : P = Rs. 4825; R = 10% and T = $\frac{1}{2}$ year

$$\text{Interest} = \text{Rs. } \frac{4825 \times 10 \times 1}{100 \times 2} = \text{Rs. } 241.25$$

$$\text{Amount} = \text{Rs. } 4825 + \text{Rs. } 241.25 = \text{Rs. } 5066.25$$

Money paid at the end of 2nd half year = Rs. 2000

$$\text{Balance money for 3rd half year} = \text{Rs. } 5066.25 - \text{Rs. } 2000 = \text{Rs. } 3066.25$$

For 3rd half year : P = Rs. 3066.25; R = 10% and T = $\frac{1}{2}$ year

$$\text{Interest} = \text{Rs. } \frac{3066.25 \times 10 \times 1}{100 \times 2} = \text{Rs. } 153.3125$$

$$\text{Amount} = \text{Rs. } 3066.25 + \text{Rs. } 153.3125 = \text{Rs. } 3219.5625$$

Money paid at the end of 3rd half year = Rs. 2000

Amount outstanding at the end of 3rd payment

$$= \text{Rs. } 3219.5625 - \text{Rs. } 2000$$

$$= \text{Rs. } 1219.5625$$

$$= \text{Rs. } 1220 \text{ (nearest rupee)}$$

Answer 22.

For 1st half year : P = Rs. 20000, R = 10% and T = 1 year

$$\text{Interest} = \text{Rs. } \frac{20000 \times 10 \times 1}{100} = \text{Rs. } 2000$$

$$\text{Amount} = \text{Rs. } 20000 + \text{Rs. } 2000 = \text{Rs. } 22000$$

Money paid at the end of 1st half year = Rs. 5000

$$\text{Balance money for 2nd half year} = \text{Rs. } 22000 - \text{Rs. } 5000 = \text{Rs. } 17000$$

For 2nd half year : P = Rs. 17000; R = 10% and T = 1 year

$$\text{Interest} = \text{Rs. } \frac{17000 \times 10 \times 1}{100} = \text{Rs. } 1700$$

$$\text{Amount} = \text{Rs. } 17000 + \text{Rs. } 1700 = \text{Rs. } 18700$$

Money paid at the end of 2nd half year = Rs. 10000

$$\text{Balance money for 3rd half year} = \text{Rs. } 18700 - \text{Rs. } 10000 = \text{Rs. } 8700$$

For 3rd half year : P = Rs. 8700; R = 10% and T = 1 year

$$\text{Interest} = \text{Rs. } \frac{8700 \times 10 \times 1}{100} = \text{Rs. } 870$$

$$\text{Amount} = \text{Rs. } 8700 + \text{Rs. } 870 = \text{Rs. } 9570$$

A man should pay Rs. 9570 at the end of 3rd year to clear the account.

Answer 23.

Let the value of ring (P_1) = Rs. 100.

$$\text{Appreciation (C.I.) for the 1st year} = \text{Rs. } \frac{100 \times 10 \times 1}{100} = \text{Rs. } 10$$

$$\therefore \text{Value of the ring at the end of 1st year } (A_1) = \text{Rs. } 100 + \text{Rs. } 10 = \text{Rs. } 110$$

$$\therefore \text{Value of the ring at the beginning of 2nd year } (P_2) = \text{Rs. } 110$$

$$\text{Appreciation (C.I.) for the 2nd year} = \text{Rs. } \frac{110 \times 10 \times 1}{100} = \text{Rs. } 11$$

Sum of the appreciation (C.I.) of 1st year and appreciation (C.I.) of 2nd year

$$= \text{Rs. } (10 + 11)$$

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

Thus, when sum of appreciation is Rs. 21, then value of the ring (P_1) = Rs. 100

And, when sum of appreciation is Rs. 6300, then value of the ring

$$= \text{Rs. } \frac{100 \times 6300}{21}$$

$$= \text{Rs. } 30000$$

So, the value of the ring is Rs. 30000.

Answer 24.

For 1st year : P = Rs. 15500, R = 10% and T = 1 year

$$\text{Interest} = \text{Rs. } \frac{15500 \times 10 \times 1}{100} = \text{Rs. } 1550$$

$$\text{Amount} = \text{Rs. } 15500 + \text{Rs. } 1550 = \text{Rs. } 17050$$

For 2nd year : P = Rs. 17050; R = 15% and T = 1 year

$$\text{Interest} = \text{Rs. } \frac{17050 \times 15 \times 1}{100} = \text{Rs. } 2557.50$$

$$\text{Amount} = \text{Rs. } 17050 + \text{Rs. } 2557.50 = \text{Rs. } 19607.50$$

For 3rd year : P = Rs. 19607.50; R = 20% and T = 1 year

$$\text{Interest} = \text{Rs. } \frac{19607.50 \times 20 \times 1}{100} = \text{Rs. } 3921.50$$

$$\text{Amount} = \text{Rs. } 19607.50 + \text{Rs. } 3921.50 = \text{Rs. } 23529$$

Difference between the C.I. of the 2nd year and the 3rd year

$$= \text{Rs. } (3921.50 - 2557.50)$$

$$= \text{Rs. } 1364$$

Answer 25.

For 1st year : P = Rs. 7500, R = 30% and T = 1 year

$$\text{Interest} = \text{Rs. } \frac{7500 \times 30 \times 1}{100} = \text{Rs. } 2250$$

$$\text{Amount} = \text{Rs. } 7500 + \text{Rs. } 2250 = \text{Rs. } 9750$$

For 2nd year : P = Rs. 9750; R = 30% and T = 1 year

$$\text{Interest} = \text{Rs. } \frac{9750 \times 30 \times 1}{100} = \text{Rs. } 2925$$

$$\text{Amount} = \text{Rs. } 9750 + \text{Rs. } 2925 = \text{Rs. } 12675$$

Thus, total amount to be paid by Samidha = Rs. 12675

But, Samidha gave Rs. 10000 + juicer to Shreya.

$$\Rightarrow \text{Rs. } 10000 + \text{Cost of juicer} = \text{Rs. } 12675$$

$$\Rightarrow \text{Cost of juicer} = \text{Rs. } (12675 - 10000) = \text{Rs. } 2675$$

Ex 3.2

Answer 1.

(i) Rs 8000 for 3 years at 10% per annum compounded annually.

Here $P = \text{Rs } 8000$, $t = 3$ years, $r = 10\%$

$$\begin{aligned}\text{Now, Amount} &= P\left(1 + \frac{r}{100}\right)^t = 8000\left(1 + \frac{10}{100}\right)^3 \\ &= 8000\left(\frac{11}{10}\right)^3 \\ &= 8000 \times \frac{1331}{1000} = 10648\end{aligned}$$

Hence, Amount = Rs 10648

Also, $CI = A - P = \text{Rs } 10648 - \text{Rs } 8000 = \text{Rs } 2648$

(ii) Rs 15000 for 2 years at 8% per annum compounded semi-annually.

Here $P = \text{Rs } 15000$, $t = 2$ years, $r = 8\%$

Since interest is compounded semi-annually, so

$$\begin{aligned}\text{Amount} &= P\left(1 + \frac{r}{200}\right)^{2t} = 15000\left(1 + \frac{8}{200}\right)^4 \\ &= 15000\left(\frac{26}{25}\right)^4 \\ &= 15000 \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25} = 17547.88\end{aligned}$$

Hence, Amount = Rs 17547.88

Also, $CI = A - P = \text{Rs } 17547.88 - \text{Rs } 15000 = \text{Rs } 2547.88$

(iii) Rs 12000 for $1\frac{1}{2}$ years at 5% per annum compounded annually.

Here $P = \text{Rs } 12000$, $t = 1\frac{1}{2}$ years, $r = 5\%$

$$\begin{aligned}\text{Now, Amount after 1 year} &= P\left(1 + \frac{r}{100}\right)^t = 12000\left(1 + \frac{5}{100}\right) \\ &= 12000\left(\frac{105}{100}\right) \\ &= 12600\end{aligned}$$

Now interest for the next half year = $\frac{12600 \times 5}{100 \times 2} = 315$

Hence, Amount = Rs 12600 + Rs 315 = Rs 12915

Also, $CI = A - P = \text{Rs } 12915 - \text{Rs } 12000 = \text{Rs } 915$

(iv) Rs 25000 for 2 years at 6% per annum compounded semi-annually.

Here $P = \text{Rs}25000$, $t = 2$ years, $r = 6\%$

Since interest is compounded semi-annually, so

$$\begin{aligned}\text{Amount} &= P\left(1 + \frac{r}{200}\right)^{2t} = 25000\left(1 + \frac{6}{200}\right)^4 \\ &= 25000\left(\frac{103}{100}\right)^4 \\ &= 28137.72\end{aligned}$$

Hence, Amount = Rs 28137.72

Also, $CI = A - P = \text{Rs } 28137.72 - \text{Rs } 25000 = \text{Rs } 3137.72$

(v) Rs16000 for 3 years at 10%, 8% and 6% for successive years.

Here $P = \text{Rs } 16000$, $t = 3$ years, $r = 10\%$, 8% , 6% successively.

$$\begin{aligned}\text{Now, Amount} &= P\left(1 + \frac{r_1}{100}\right)\left(1 + \frac{r_2}{100}\right)\left(1 + \frac{r_3}{100}\right) \\ &= 16000\left(1 + \frac{10}{100}\right)\left(1 + \frac{8}{100}\right)\left(1 + \frac{6}{100}\right) \\ &= 16000\left(\frac{11}{10}\right)\left(\frac{108}{100}\right)\left(\frac{106}{100}\right) \\ &= 20148.48\end{aligned}$$

Hence, Amount = Rs 20148.48

Also, $CI = A - P = \text{Rs } 20148.48 - \text{Rs } 16000 = \text{Rs } 4148.48$

Answer 2.

Here $P = \text{Rs}15000$, $t = 2\frac{1}{2}$ years, $r = 10\%$

$$\begin{aligned}\text{Now, Amount after 2 year} &= P\left(1 + \frac{r}{100}\right)^t = 15000\left(1 + \frac{10}{100}\right)^2 \\ &= 15000\left(\frac{11}{10}\right)^2 \\ &= 18150\end{aligned}$$

Now interest for the next half year = $\frac{18150 \times 10}{100 \times 2} = 907.5$

Hence, Amount = Rs 18150 + Rs 907.50 = Rs19057.50

Also, $CI = A - P = \text{Rs } 19057.50 - \text{Rs } 15000 = \text{Rs } 4057.50$

Answer 3.

Here $P = \text{Rs } 36000$, $t = 2$ years, $r = 15\%$

$$\begin{aligned}\text{Now, Amount} &= P \left(1 + \frac{r}{100}\right)^t = 36000 \left(1 + \frac{15}{100}\right)^2 \\ &= 36000 \left(\frac{115}{100}\right)^2 \\ &= 47610\end{aligned}$$

Hence, Amount = Rs 47610

Answer 4.

Here $P = \text{Rs } 50000$, $t = 1\frac{1}{2}$ years, $r = 8\%$

Since interest is compounded half-yearly, so

$$\begin{aligned}\text{Now, Amount} &= P \left(1 + \frac{r}{200}\right)^{2t} = 50000 \left(1 + \frac{8}{200}\right)^3 \\ &= 50000 \left(\frac{104}{100}\right)^3 \\ &= 56243.20\end{aligned}$$

Hence, Amount = Rs 56243.20

Also, $CI = A - P = \text{Rs } 56243.20 - \text{Rs } 50000 = \text{Rs } 6243.20$

Answer 5.

Here $P = \text{Rs } 25000$, $t = 2$ years, $r = 4\%$, 5% successively.

$$\begin{aligned}\text{Now, Amount} &= P \left(1 + \frac{r_1}{100}\right) \left(1 + \frac{r_2}{100}\right) \\ &= 25000 \left(1 + \frac{4}{100}\right) \left(1 + \frac{5}{100}\right) \\ &= 25000 \left(\frac{104}{100}\right) \left(\frac{105}{100}\right) \\ &= 27300\end{aligned}$$

Hence, Amount = Rs 27300

Answer 6.

Here $P = \text{Rs}31250$, $t = 3$ years, $r = 8\%, 10\%, 12\%$ successively.

$$\begin{aligned} \text{Now, Amount} &= P \left(1 + \frac{r_1}{100}\right) \left(1 + \frac{r_2}{100}\right) \left(1 + \frac{r_3}{100}\right) \\ &= 31250 \left(1 + \frac{8}{100}\right) \left(1 + \frac{10}{100}\right) \left(1 + \frac{12}{100}\right) \\ &= 31250 \left(\frac{108}{100}\right) \left(\frac{110}{100}\right) \left(\frac{112}{100}\right) \\ &= 41580 \end{aligned}$$

Hence, Amount = Rs 41580

Answer 7.

Here $P = \text{Rs} 28000$, $A = 30870$, $t = 2$ years

$$\text{Now, } P \left(1 + \frac{r}{100}\right)^t = A \Rightarrow 28000 \left(1 + \frac{r}{100}\right)^2 = 30870$$

$$\Rightarrow \left(1 + \frac{r}{100}\right)^2 = \frac{30870}{28000} = \frac{441}{400} = \left(\frac{21}{20}\right)^2$$

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

Hence rate of interest is 5%.

Answer 8.

Here $P = \text{Rs} 15625$, $A = 17576$, $r = 4\%$

$$\text{Now, } P \left(1 + \frac{r}{100}\right)^t = A \Rightarrow 15625 \left(1 + \frac{4}{100}\right)^t = 17576$$

$$\Rightarrow \left(\frac{26}{25}\right)^t = \frac{17576}{15625} = \left(\frac{26}{25}\right)^3$$

By comparing powers, $t = 3$

Hence time is 3 years.

Answer 9.

Here $P = \text{Rs} 2000$, $A = \text{Rs} 2662$, $r = 10\%$

$$\text{Now, } P \left(1 + \frac{r}{100}\right)^t = A \Rightarrow 2000 \left(1 + \frac{10}{100}\right)^t = 2662$$

$$\Rightarrow \left(\frac{11}{10}\right)^t = \frac{2662}{2000} = \frac{1331}{1000} = \left(\frac{11}{10}\right)^3$$

By comparing powers, $t = 3$

Hence time is 3 years.

Answer 10.

$$\text{Since, Simple interest} = \frac{P \times r \times t}{100}$$

$$\Rightarrow 600 = \frac{P \times 4 \times 3}{100} \Rightarrow P = \frac{60000}{12} = 5000$$

Now for CI, $P = \text{Rs } 5000$, $r = 4\%$, $t = 3$ year

$$\text{Amount} = P \left(1 + \frac{r}{100}\right)^t = 5000 \left(1 + \frac{4}{100}\right)^3$$

$$= 5000 \times \left(\frac{26}{25}\right)^3 = 5624.32$$

Hence, Amount = Rs 5624.32

Also, $\text{CI} = A - P = \text{Rs } 5624.32 - \text{Rs } 5000 = \text{Rs } 624.32$

Answer 11.

Let sum be Rs P and $r\%$ be the rate of interest.

We have $t = 2$ years, $\text{CI} = \text{Rs } 40.80$ and $\text{SI} = \text{Rs } 40$

$$\text{Since, Simple interest} = \frac{P \times r \times t}{100}$$

$$\Rightarrow 40 = \frac{P \times r \times 2}{100} \Rightarrow Pr = \frac{4000}{2} = 2000$$

Now,

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

$$\Rightarrow 40.80 = P \left[\left(1 + \frac{r}{100}\right)^2 - 1 \right]$$

$$\Rightarrow 40.80 = P \left(1 + \frac{r^2}{10000} + \frac{2r}{100} - 1 \right)$$

$$\Rightarrow 40.80 = P \left(1 + \frac{r^2}{10000} + \frac{2r}{100} - 1 \right)$$

$$\Rightarrow 40.80 = P \left(\frac{r^2}{10000} + \frac{2r}{100} \right)$$

$$\Rightarrow 40.80 = Pr \left(\frac{r}{10000} + \frac{2}{100} \right)$$

$$\Rightarrow 40.80 = 2000 \left(\frac{r + 200}{10000} \right)$$

$$\Rightarrow 40.80 = \frac{r + 200}{5}$$

$$\Rightarrow r = 40.80 \times 5 - 200 = 204 - 200 = 4$$

Hence, $r = 4\%$.

$$\text{Now, } Pr = 2000 \Rightarrow P = \frac{2000}{r} = \frac{2000}{4} = 500.$$

Thus, sum is Rs 500 and rate of interest is 4%.

Answer 12.

Since, C.I. = A - P

$$\text{C.I.} = P \left(1 + \frac{8}{100} \right)^2 - P = P \left(\frac{108}{100} \right)^2 - P = \frac{11664P}{10000} - P = \frac{11664P - 10000P}{10000} = \frac{1664P}{10000}$$

$$\text{S.I.} = \frac{P \times 8 \times 2}{100} = \frac{16P}{100}$$

Now, C.I. - S.I. = Rs. 448

$$\Rightarrow \frac{1664P}{10000} - \frac{16P}{100} = \text{Rs. } 448$$

$$\Rightarrow \frac{1664P - 1600P}{10000} = \text{Rs. } 448$$

$$\Rightarrow 64P = \text{Rs. } 4480000$$

$$\Rightarrow P = \text{Rs. } 70000$$

Hence, the sum is Rs. 70000.

Answer 13.

Let the rate of interest per year be $r\%$.

$$\text{S.I. in 2 years} = \text{Rs. } \frac{50000 \times r \times 2}{100} = \text{Rs. } 1000r$$

$$\text{And, C.I. in 2 years} = A - P = \text{Rs. } 50000 \left(1 + \frac{r}{100} \right)^2 - \text{Rs. } 50000$$

Given, C.I. - S.I. = Rs. 125

$$\Rightarrow 50000 \left(1 + \frac{r}{100} \right)^2 - 50000 - 1000r = 125$$

$$\Rightarrow 50000 \left(1 + \frac{r^2}{10000} + \frac{2r}{100} \right) - 50000 - 1000r = 125$$

$$\Rightarrow 50000 + 5r^2 + 1000r - 50000 - 1000r = 125$$

$$\Rightarrow 5r^2 = 125$$

$$\Rightarrow r^2 = 25$$

$$\Rightarrow r = \pm 5$$

But the rate of interest cannot be negative.

\therefore Rate of interest is 5%.

Answer 14.

Given: Amount = Rs. 15729, $n = 2$ years, $r_1 = 5$ and $r_2 = 7\%$

$$\begin{aligned}A &= P \left(1 + \frac{r_1}{100}\right) \left(1 + \frac{r_2}{100}\right) \\ \Rightarrow 15729 &= P \left(1 + \frac{5}{100}\right) \left(1 + \frac{7}{100}\right) \\ \Rightarrow 15729 &= P \left(\frac{105}{100}\right) \left(\frac{107}{100}\right) \\ \Rightarrow P &= \frac{15729 \times 100 \times 100}{105 \times 107} \\ \Rightarrow P &= \text{Rs. } 14000\end{aligned}$$

Answer 15.

Given: $A = \text{Rs. } 13891.50$, $P = \text{Rs. } 12000$, $n = 3$ years

$$\begin{aligned}13891.50 &= 12000 \left(1 + \frac{r}{100}\right)^3 \\ \Rightarrow \frac{13891.50}{12000} &= \left(1 + \frac{r}{100}\right)^3 \\ \Rightarrow \frac{1389150}{12000 \times 100} &= \left(1 + \frac{r}{100}\right)^3 \\ \Rightarrow \frac{9261}{8000} &= \left(1 + \frac{r}{100}\right)^3 \\ \Rightarrow \frac{21}{20} &= 1 + \frac{r}{100} \\ \Rightarrow \frac{21}{20} - 1 &= \frac{r}{100} \\ \Rightarrow \frac{1}{20} &= \frac{r}{100} \\ \Rightarrow r &= 5\%\end{aligned}$$

Answer 16.

Let the share of A be Rs. x .

Then, the share of B = Rs. $(16820 - x)$

For A: $P = \text{Rs. } x$, $r = 5\%$ and $n = (40 - 27)$ years = 13 years

$$\therefore A = P \left(1 + \frac{r}{100}\right)^n = \text{Rs. } x \left(1 + \frac{5}{100}\right)^{13} = \text{Rs. } x \left(\frac{21}{20}\right)^{13}$$

For B: $P = \text{Rs. } (16820 - x)$, $r = 5\%$ and $n = (40 - 25)$ years = 15 years

$$\therefore A = P \left(1 + \frac{r}{100}\right)^n = \text{Rs. } (16820 - x) \left(1 + \frac{5}{100}\right)^{15} = \text{Rs. } (16820 - x) \left(\frac{21}{20}\right)^{15}$$

Given; both receive equal sums on reaching the age of 40 years.

$$\therefore x \left(\frac{21}{20}\right)^{13} = (16820 - x) \left(\frac{21}{20}\right)^{15}$$

$$\Rightarrow x = (16820 - x) \times \left(\frac{21}{20}\right)^2$$

$$\Rightarrow x = \text{Rs. } 8820$$

$$\Rightarrow 16820 - x = 16820 - 8820 = 8000$$

\therefore Share of A = Rs. 8820 and Share of B = Rs. 8000