Chapter 3. Compound Interest

Ex 3.1

Answer 1.

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

Here P = Rs25000, t = $1\frac{1}{2}$ years, r = 10%

Now, Amount after 1 year $= P\left(1+\frac{r}{100}\right) = 25000\left(1+\frac{10}{100}\right)$

$= 25000\left(1+\frac{1}{10}\right) = 25000\left(\frac{11}{10}\right)$

$= 27500$

Thus, principle for the next 6 months = Rs27500

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 = Rs28875 – Rs25000 = Rs3875

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

Here P_1 = Rs32000 and r = $7\frac{1}{2}\% = \frac{15}{2}\%$

So, Amount after 1 year $= P\left(1+\frac{r}{100}\right) = 32000\left(1+\frac{15}{2\times 100}\right)$

$= 32000\left(1+\frac{3}{40}\right) = 32000\left(\frac{43}{40}\right)$

$= 34400$

Thus, P_2 = Rs34400 and r = $\frac{15}{2}\%$

So, Amount after 2 year $= P\left(1+\frac{r}{100}\right) = 34400\left(1+\frac{15}{2\times 100}\right)$

$= 34400\left(1+\frac{3}{40}\right) = 34400\left(\frac{43}{40}\right)$

$= 36980$

Hence, Amount = Rs 36980

Also, CI = A – P = Rs 36980 – Rs 32000 = Rs 4980

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

Here P_1 = Rs10000 and r = 6%

So, Amount after 1 year $= P\left(1+\frac{r}{100}\right) = 10000\left(1+\frac{6}{100}\right)$

$= 10000 \times \frac{106}{100} = 10600$

Thus, P_2 = Rs10600 and r = 6%

Amount after 2 year $= P\left(1+\frac{r}{100}\right) = 10600\left(1+\frac{6}{100}\right)$

$= 10600 \times \frac{106}{100} = 11236$

Thus, principle for the next 6 months = Rs11236

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 = Rs11573.08 – Rs10000 = Rs1573.08

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

Here P = Rs24000, t = $1\frac{1}{2}$ years, r = $7\frac{1}{2}\% = \frac{15}{2}\%$

Now, Amount after 1 year $= P\left(1+\frac{r}{100}\right) = 24000\left(1+\frac{15}{2 \times 100}\right)$

$= 24000\left(1+\frac{3}{40}\right) = 24000\left(\frac{43}{40}\right)$

$= 25800$

Thus, principle for the next 6 months = Rs25800

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 = Rs26767.50 – Rs24000 = Rs2767.50

Answer 2A.

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

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

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

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

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

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

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

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

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

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

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

$\therefore$ Interest = Rs. $\frac{20790 \times 12 \times 1}{100}$ = 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 = Rs20000 and r = 10%

So, Amount after 1 year $= P\left(1+\frac{r}{100}\right) = 20000\left(1+\frac{10}{100}\right)$

$= 20000 \times \frac{110}{100} = 22000$

Thus, P_2 = Rs22000 and r = 10%

Amount after 2 year $= P\left(1+\frac{r}{100}\right) = 22000\left(1+\frac{10}{100}\right)$

$= 22000 \times \frac{110}{100} = 24200$

Thus, P_3 = Rs24200 and r = 10%

Amount after 3 year $= P\left(1+\frac{r}{100}\right) = 24200\left(1+\frac{10}{100}\right)$

$= 24200 \times \frac{110}{100} = 26620$

Hence, Amount = Rs 26620

Also, CI = A − P = Rs 26620 − Rs 20000 = Rs 6620

Answer 4.

For 1st year: P = Rs. 5000, R = 10% and T = 1 year

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

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

For 2nd year: P = Rs. 5500, R = 10% and T = 1 year

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

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

For 3rd year: P = Rs. 6050, R = 10% and T = 1 year

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

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

Answer 5.

For 1st year: P = Rs. 25600, R = 5% and T = 1 year

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

And, amount = Rs. 25600 + Rs. 1280 = Rs. 26880

For 2nd year: P = Rs. 26880, R = 5% and T = 1 year

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

And, amount = Rs. 26880 + Rs. 1344 = Rs. 28224

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

Answer 6.

Here P_1 = Rs7500 and rate of interest for half year (r) = 4%

So, Amount after $\frac{1}{2}$ year $= P\left(1+\frac{r}{100}\right) = 7500\left(1+\frac{4}{100}\right)$

$= 7500 \times \frac{104}{100} = 7800$

Thus, P_2 = Rs7800 and r = 4%

Amount after 1 year $= P\left(1+\frac{r}{100}\right) = 7800\left(1+\frac{4}{100}\right)$

$= 7800 \times \frac{104}{100} = 8112$

Thus, P_3 = Rs8112 and r = 4%

Amount after $1\frac{1}{2}$ year $= P\left(1+\frac{r}{100}\right) = 8112\left(1+\frac{4}{100}\right)$

$= 8112 \times \frac{104}{100} = 8436.48$

Hence, Amount = Rs 8436.48

Also, CI = A – P = Rs 8436.48 – Rs 7500 = Rs 936.48

Answer 7.

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

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

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

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

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

$$\text{Amount after 2 year} = P\left(1+\frac{r}{100}\right) = 27600\left(1+\frac{15}{100}\right)$$

$$= 27600 \times \frac{115}{100} = 31740$$

Answer 8.

Here P_1 = Rs14000 and r = 5%

$$\text{So, Amount after 1 year} = P\left(1+\frac{r}{100}\right) = 14000\left(1+\frac{5}{100}\right)$$

$$= 14000 \times \frac{105}{100} = 14700$$

Thus, P_2 = Rs14700 and r = 8%

$$\text{Amount after 2 year} = P\left(1+\frac{r}{100}\right) = 14700\left(1+\frac{8}{100}\right)$$

$$= 14700 \times \frac{108}{100} = 15876$$

Hence, Amount = Rs 15876

Answer 9.

Here P_1 = Rs17500 and r = 4%

So, Amount after 1 year $= P\left(1+\frac{r}{100}\right) = 17500\left(1+\frac{4}{100}\right)$

$= 17500 \times \frac{104}{100} = 18200$

Thus, P_2 = Rs18200 and r = 5%

Amount after 2 year $= P\left(1+\frac{r}{100}\right) = 18200\left(1+\frac{5}{100}\right)$

$= 18200 \times \frac{105}{100} = 19110$

Thus, P_3 = Rs19110 and r = 6%

Amount after 3 year $= P\left(1+\frac{r}{100}\right) = 19110\left(1+\frac{6}{100}\right)$

$= 19110 \times \frac{106}{100} = 20256.60$

Hence, Amount = Rs 20256.60

Also, CI = A – P = Rs 20256.60 – Rs 17500 = Rs2756.60

Answer 10.

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

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

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

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

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

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

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

Interest = Rs. $\frac{4579.60 \times 14 \times 1}{100 \times 2}$ = 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 = Rs42000 and rate of interest for half year = 4%, t = 4 half years

So, Amount after $\frac{1}{2}$ year $= P\left(1+\frac{r}{100}\right) = 42000\left(1+\frac{4}{100}\right)$

$$= 42000 \times \frac{104}{100} = 43680$$

Thus, P_2 = Rs43680

Amount after 1 year $= P\left(1+\frac{r}{100}\right) = 43680\left(1+\frac{4}{100}\right)$

$$= 43680 \times \frac{104}{100} = 45427.20$$

Thus, P_3 = Rs45427.20

Amount after $1\frac{1}{2}$ year $= P\left(1+\frac{r}{100}\right) = 45427.20\left(1+\frac{4}{100}\right)$

$$= 45427.20 \times \frac{104}{100} = 47244.29$$

Thus, P_4 = Rs47244.29

Amount after 2 year $= P\left(1+\frac{r}{100}\right) = 47244.29\left(1+\frac{4}{100}\right)$

$$= 47244.29 \times \frac{104}{100} = 49134.06$$

Hence, Amount = Rs 49134.06

Also, CI = A – P = Rs 49134.06 – Rs 42000 = Rs 7134.06

Answer 12.

Case I:

Here P = Rs15000 and r = 10.5%

So, Amount after 1 year $= P\left(1+\frac{r}{100}\right) = 15000\left(1+\frac{10.5}{100}\right)$

$$= 15000 \times \frac{110.5}{100} = 16575$$

Case II:

Here P_1 = Rs15000 and rate of interest for half year (r) = 5%

So, Amount after $\frac{1}{2}$ year $= P\left(1+\frac{r}{100}\right) = 15000\left(1+\frac{5}{100}\right)$

$$= 15000 \times \frac{105}{100} = 15750$$

Thus, P_2 = Rs15750 and r = 5%

Amount after 1 year $= P\left(1+\frac{r}{100}\right) = 15750\left(1+\frac{5}{100}\right)$

$$= 15750 \times \frac{105}{100} = 16537.50$$

Hence the first man gains by Rs16575 – Rs16537.50 = Rs37.50

Answer 13.

Case I:

Here P_1 = Rs20000 and r = 12%

So, Amount after 1 year $= P\left(1+\frac{r}{100}\right) = 20000\left(1+\frac{12}{100}\right)$

$= 20000 \times \frac{112}{100} = 22400$

Thus, P_2 = Rs22400 and r = 12%

Amount after 2 year $= P\left(1+\frac{r}{100}\right) = 22400\left(1+\frac{12}{100}\right)$

$= 22400 \times \frac{112}{100} = 25088$

Thus, P_3 = Rs25088 and r = 12%

Amount after 3 year $= P\left(1+\frac{r}{100}\right) = 25088\left(1+\frac{12}{100}\right)$

$= 25088 \times \frac{112}{100} = 28098.56$

Hence, Amount = Rs 28098.56

Also, CI = A – P = Rs 28098.56 – Rs 20000 = Rs 8098.56

Case II:

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.

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 = Rs 18750, r = 4%, t = 2 year

Here P_1 = Rs 18750 and r = 4%

So, Amount after 1 year $= P\left(1+\frac{r}{100}\right) = 18750\left(1+\frac{4}{100}\right)$

$= 18750 \times \frac{104}{100} = 19500$

Thus, P_2 = Rs19500 and r = 4%

Amount after 2 year $= P\left(1+\frac{r}{100}\right) = 19500\left(1+\frac{4}{100}\right)$

$= 19500 \times \frac{104}{100} = 20280$

Hence, Amount = Rs 20280

Also, CI = A – P = Rs 20280 – Rs 18750 = Rs 1530

Answer 15.

Case I:

Here P_1 = Rs 5000 and r = 6%

So, Amount after 1 year $= P\left(1+\frac{r}{100}\right) = 5000\left(1+\frac{6}{100}\right)$

$= 5000\times\frac{106}{100} = 5300$

Amount after 2 year $= P\left(1+\frac{r}{100}\right) = 5300\left(1+\frac{6}{100}\right)$

$= 5300\times\frac{106}{100} = 5618$

Thus, P_3 = Rs 5618 and r = 6%

Amount after 3 year $= P\left(1+\frac{r}{100}\right) = 5618\left(1+\frac{6}{100}\right)$

$= 5618\times\frac{106}{100} = 5955.08$

Hence, Amount = Rs 5955.08

Also, CI = A – P = Rs 5955.08 – Rs 5000 = Rs 955.08

Case II:

Simple interest $= \frac{5000\times6\times3}{100} = 900$

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

Answer 16.

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

$\Rightarrow 450 = \frac{P\times4\times2}{100} \Rightarrow P = \frac{45000}{8} = 5625$

Now for CI, P = Rs 5625, r = 4, t = 1 year

Here P_1 = Rs5625 and rate of interest for half-yearly = 2%

So, Amount after $\frac{1}{2}$ year $= P\left(1+\frac{r}{100}\right) = 5625\left(1+\frac{2}{100}\right)$

$= 5625\times\frac{102}{100} = 5737.50$

Thus, P_2 = Rs 5737.50 and r = 2%

Amount after 1 year $= P\left(1+\frac{r}{100}\right) = 5737.50\left(1+\frac{2}{100}\right)$

$= 5737.50\times\frac{102}{100} = 5852.25$

Hence, Amount = Rs 5852.25

Also, CI = A – P = Rs 5852.25 – Rs 5625 = Rs 227.25

Answer 17.

Case I:

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

Amount = Rs 62500 + Rs 10000 = Rs 72500

Case II:

Here P_1 = Rs 62500 and r = 8%

$$\text{So, Amount after 1 year} = P\left(1 + \frac{r}{100}\right) = 62500\left(1 + \frac{8}{100}\right)$$

$$= 62500 \times \frac{108}{100} = 67500$$

Thus, P_2 = Rs 67500 and r = 8%

$$\text{Amount after 2 year} = P\left(1 + \frac{r}{100}\right) = 67500\left(1 + \frac{8}{100}\right)$$

$$= 67500 \times \frac{108}{100} = 72900$$

Hence, Amount = Rs 72900

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

Answer 18.

For 1st year: P = Rs. 100, R = 10% and T = 1 year

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

Amount = Rs. 100 + Rs. 10 = Rs. 110

For 2nd year: P = Rs. 110, R = 15% and T = 1 year

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

Amount = Rs. 110 + Rs. 16.50 = 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:

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

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

To calculate the C.I. earned by Sunil:

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

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

And, amount $= Rs.50000 + Rs.5000 = Rs.55000$

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

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

And, amount $= Rs.55000 + Rs.2750 = Rs.57750$

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

$\Rightarrow$ Sunil's gain in $1\frac{1}{2}$ years = C.I. earned − S.I. paid

$= Rs.\ 7750 - Rs.\ 7500$

$= Rs.250$

Answer 20.

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

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

Value of machine for second year = Rs. 100 − Rs. 5 = Rs. 95

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

Value of machine for third year = Rs. 95 − Rs. 4.75 = Rs. 90.25

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

Value of machine at the end of third year = Rs. 90.25 − Rs. 9.025 = Rs. 81.225

Net depreciation = Rs. 100 − Rs. 81.225 = Rs. 18.775 or 18.775%

Answer 21.

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

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

Amount = Rs. 6500 + Rs. 325 = Rs. 6825

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

Balance money for 2nd half year = Rs. 6825 – Rs. 2000 = Rs. 4825

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

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

Amount = Rs. 4825 + Rs. 241.25 = Rs. 5066.25

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

Balance money for 3rd half year = Rs. 5066.25 – Rs. 2000 = Rs. 3066.25

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

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

Amount = Rs. 3066.25 + Rs. 153.3125 = Rs. 3219.5625

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

Amount outstanding at the end of 3rd payment

= Rs. 3219.5625 – Rs. 2000

= Rs. 1219.5625

= Rs. 1220 (nearest rupee)

Answer 22.

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

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

Amount = Rs. 20000 + Rs. 2000 = Rs. 22000

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

Balance money for 2nd half year = Rs. 22000 – Rs. 5000 = Rs. 17000

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

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

Amount = Rs. 17000 + Rs. 1700 = Rs. 18700

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

Balance money for 3rd half year = Rs. 18700 – Rs. 10000 = Rs. 8700

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

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

Amount = Rs. 8700 + Rs. 870 = 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.

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

∴ Value of the ring at the end of 1st year (A_1) = Rs. 100 + Rs. 10 = Rs. 110

∴ Value of the ring at the beginning of 2nd year (P_2) = Rs. 110

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

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

= Rs. (10 + 11)

= 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

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

= 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

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

Amount = Rs. 15500 + Rs. 1550 = Rs. 17050

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

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

Amount = Rs. 17050 + Rs. 2557.50 = Rs. 19607.50

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

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

Amount = Rs. 19607.50 + Rs. 3921.50 = Rs. 23529

Difference between the C.I. of the 2nd year and the 3rd year
= Rs. (3921.50 – 2557.50)
= Rs. 1364

Answer 25.

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

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

Amount = Rs. 7500 + Rs. 2250 = Rs. 9750

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

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

Amount = Rs. 9750 + Rs. 2925 = Rs. 12675

Thus, total amount to be paid by Samidha = Rs. 12675
But, Samidha gave Rs. 10000 + juicer to Shreya.
⇒ Rs. 10000 + Cost of juicer = Rs. 12675
⇒ Cost of juicer = Rs. (12675 – 10000) = Rs. 2675

Ex 3.2

Answer 1.

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

Here P = Rs 8000, t = 3 years, r = 10%

$$\text{Now, Amount} = P\left(1+\frac{r}{100}\right)^t = 8000\left(1+\frac{10}{100}\right)^3$$

$$= 8000\left(\frac{11}{10}\right)^3$$

$$= 8000 \times \frac{1331}{1000} = 10648$$

Hence, Amount = Rs 10648

Also, CI = A – P = Rs 10648 – Rs 8000 = Rs 2648

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

Here P = Rs 15000, t = 2 years, r = 8%

Since interest is compounded semi-annually, so

$$\text{Amount} = P\left(1+\frac{r}{200}\right)^{2t} = 15000\left(1+\frac{8}{200}\right)^4$$

$$= 15000\left(\frac{26}{25}\right)^4$$

$$= 15000 \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25} = 17547.88$$

Hence, Amount = Rs 17547.88

Also, CI = A – P = Rs 17547.88 – Rs 15000 = Rs 2547.88

(iii) Rs12000 for $1\frac{1}{2}$ years at 5% per annum compounded annually.

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

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

$$= 12000\left(\frac{105}{100}\right)$$

$$= 12600$$

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

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

Also, CI = A-P = Rs 12915 – Rs 12000 = Rs 915

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

Here P = Rs25000, t = 2 years, r = 6%

Since interest is compounded semi-annually, so

$$\text{Amount} = P\left(1+\frac{r}{200}\right)^{2t} = 25000\left(1+\frac{6}{200}\right)^{4}$$

$$= 25000\left(\frac{103}{100}\right)^{4}$$

$$= 28137.72$$

Hence, Amount = Rs 28137.72

Also, CI = A – P = Rs 28137.72 – Rs 25000 = Rs 3137.72

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

Here P = Rs 16000, t = 3 years, r = 10%, 8%, 6% successively.

$$\text{Now, Amount} = P\left(1+\frac{r_1}{100}\right)\left(1+\frac{r_2}{100}\right)\left(1+\frac{r_3}{100}\right)$$

$$= 16000\left(1+\frac{10}{100}\right)\left(1+\frac{8}{100}\right)\left(1+\frac{6}{100}\right)$$

$$= 16000\left(\frac{11}{10}\right)\left(\frac{108}{100}\right)\left(\frac{106}{100}\right)$$

$$= 20148.48$$

Hence, Amount = Rs 20148.48

Also, CI = A – P = Rs 20148.48 – Rs 16000 = Rs 4148.48

Answer 2.

Here P = Rs15000, t = $2\frac{1}{2}$ years, r = 10%

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

$$= 15000\left(\frac{11}{10}\right)^{2}$$

$$= 18150$$

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

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

Also, CI = A – P = Rs 19057.50 – Rs 15000 = Rs 4057.50

Answer 3.

Here P = Rs 36000, t = 2 years, r = 15%

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

$$= 36000\left(\frac{115}{100}\right)^2$$

$$= 47610$$

Hence, Amount = Rs 47610

Answer 4.

Here P = Rs50000, t = $1\frac{1}{2}$ years, r = 8%

Since interest is compounded half-yearly, so

$$\text{Now, Amount} = P\left(1+\frac{r}{200}\right)^{2t} = 50000\left(1+\frac{8}{200}\right)^3$$

$$= 50000\left(\frac{104}{100}\right)^3$$

$$= 56243.20$$

Hence, Amount = Rs 56243.20

Also, CI = A – P = Rs 56243.20 – Rs 50000 = Rs 6243.20

Answer 5.

Here P = Rs25000, t = 2 years, r = 4%, 5% successively.

$$\text{Now, Amount} = P\left(1+\frac{r_1}{100}\right)\left(1+\frac{r_2}{100}\right)$$

$$= 25000\left(1+\frac{4}{100}\right)\left(1+\frac{5}{100}\right)$$

$$= 25000\left(\frac{104}{100}\right)\left(\frac{105}{100}\right)$$

$$= 27300$$

Hence, Amount = Rs 27300

Answer 6.

Here P = Rs31250, t = 3 years, r = 8%, 10%, 12% successively.

$$\text{Now, Amount} = P\left(1+\frac{r_1}{100}\right)\left(1+\frac{r_2}{100}\right)\left(1+\frac{r_3}{100}\right)$$

$$= 31250\left(1+\frac{8}{100}\right)\left(1+\frac{10}{100}\right)\left(1+\frac{12}{100}\right)$$

$$= 31250\left(\frac{108}{100}\right)\left(\frac{110}{100}\right)\left(\frac{112}{100}\right)$$

$$= 41580$$

Hence, Amount = Rs 41580

Answer 7.

Here P = 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 = 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 = Rs 2000, A = 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.

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 = 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, CI = A – P = Rs 5624.32 – Rs 5000 = Rs 624.32

Answer 11.

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

We have t = 2 years, CI = Rs 40.80 and SI = Rs 40

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,

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

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

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

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

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

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

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

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

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

Hence, r = 4%.

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

Thus, sum is Rs500 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 $r_2 = 7\%$

$$A = P\left(1+\frac{r_1}{100}\right)\left(1+\frac{r_2}{100}\right)$$

$$\Rightarrow 15729 = P\left(1+\frac{5}{100}\right)\left(1+\frac{7}{100}\right)$$

$$\Rightarrow 15729 = P\left(\frac{105}{100}\right)\left(\frac{107}{100}\right)$$

$$\Rightarrow P = \frac{15729 \times 100 \times 100}{105 \times 107}$$

$$\Rightarrow P = \text{Rs. } 14000$$

Answer 15.

Given : A = Rs. 13891.50, P = Rs. 12000, n = 3 years

$$13891.50 = 12000\left(1+\frac{r}{100}\right)^3$$

$$\Rightarrow \frac{13891.50}{12000} = \left(1+\frac{r}{100}\right)^3$$

$$\Rightarrow \frac{1389150}{12000 \times 100} = \left(1+\frac{r}{100}\right)^3$$

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

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

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

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

$$\Rightarrow r = 5\%$$

Answer 16.

Let the share of A be Rs. x.
Then, the share of B = Rs. (16820 – x)

For A: P = 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 = 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