



Exercise 11B

Q16.

Answer :

Let P be the sum.

Rate of interest, $R = 6\frac{2}{3}\% = \frac{20}{3}\%$

Time, $n = 2$ years

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

$$= \text{Rs. } P \times \left(1 + \frac{20}{300}\right)^2$$

$$= \text{Rs. } P \times \left(\frac{300+20}{300}\right)^2$$

$$= \text{Rs. } P \times \left(\frac{320}{300}\right)^2$$

$$= \text{Rs. } P \times \left(\frac{16}{15} \times \frac{16}{15}\right)$$

$$= \text{Rs. } \frac{256P}{225}$$

$$\Rightarrow \text{Rs. } 10240 = \text{Rs. } \frac{256P}{225}$$

$$\Rightarrow \text{Rs. } \left(\frac{10240 \times 225}{256}\right) = P$$

$$\therefore P = \text{Rs. } 9000$$

Hence, the *required* sum is Rs. 9000

Q17.

Answer :

Let P be the sum.

Rate of interest, $R = 10\%$

Time, $n = 3$ years

$$\text{Now, } A = P \times \left(1 + \frac{10}{100}\right)^3$$

$$= P \times \left(\frac{110}{100}\right)^3$$

$$\begin{aligned}
&= \text{Rs. } P \times \left(\frac{110}{100} \right)^3 \\
&= \text{Rs. } P \times \left(\frac{110}{100} \right)^3 \\
&= \text{Rs. } P \times \left(\frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} \right) \\
&= \text{Rs. } \frac{1331P}{1000}
\end{aligned}$$

However, amount = Rs. 21296

$$\text{Now, Rs. 21296} = \text{Rs. } \frac{1331P}{1000}$$

$$\Rightarrow \text{Rs. } \left(\frac{21296 \times 1000}{1331} \right) = P$$

$$\therefore P = \text{Rs. } 16000$$

Hence, the *required* sum is Rs. 16000.

Q18.

Answer :

Let $R\%$ p.a. be the required rate.

$$A = 4410$$

$$P = 4000$$

$$n = 2 \text{ years}$$

$$\text{Now, } A = P \left(1 + \frac{R}{100} \right)^n$$

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

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

$$\Rightarrow \frac{441}{400} = \left(1 + \frac{R}{100} \right)^2$$

$$\Rightarrow \left(\frac{21}{20} \right)^2 = \left(1 + \frac{R}{100} \right)^2$$

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

$$\Rightarrow \frac{21-20}{20} = \frac{R}{100}$$

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

$$\Rightarrow R = \left(\frac{1 \times 100}{20} \right) = 5$$

Hence, the required rate is 5% p.a.

Q19.

Answer :

Let the required rate be $R\%$ p.a.

$$A = 77A \text{ A0}$$

$$A = 774.40$$

$$P = 640$$

$$n = 2 \text{ years}$$

$$\text{Now, } A = P \left(1 + \frac{R}{100}\right)^n$$

$$\Rightarrow 774.40 = 640 \left(1 + \frac{R}{100}\right)^2$$

$$\Rightarrow \frac{774.40}{640} = \left(1 + \frac{R}{100}\right)^2$$

$$\Rightarrow 1.21 = \left(1 + \frac{R}{100}\right)^2$$

$$\Rightarrow (1.1)^2 = \left(1 + \frac{R}{100}\right)^2$$

$$\Rightarrow 1.1 - 1 = \frac{R}{100}$$

$$\Rightarrow 0.1 = \frac{R}{100}$$

$$\Rightarrow R = (0.1 \times 100) = 10$$

Hence, the required rate is 10% p.a.

Q20.

Answer :

Let the required time be n years.

Rate of interest, $R = 10\%$

Principal amount, $P = \text{Rs. } 1800$

Amount with compound interest, $A = \text{Rs. } 2178$

$$\text{Now, } A = P \times \left(1 + \frac{R}{100}\right)^n$$

$$\begin{aligned}
&= \text{Rs. } 1800 \times \left(1 + \frac{10}{100}\right)^n \\
&= \text{Rs. } 1800 \times \left(\frac{100+10}{100}\right)^n \\
&= \text{Rs. } 1800 \times \left(\frac{110}{100}\right)^n \\
&= \text{Rs. } 1800 \times \left(\frac{11}{10}\right)^n
\end{aligned}$$

However, amount = Rs. 2178

$$\text{Now, Rs. } 2178 = \text{Rs. } 1800 \times \left(\frac{11}{10}\right)^n$$

$$\Rightarrow \frac{2178}{1800} = \left(\frac{11}{10}\right)^n$$

$$\Rightarrow \frac{121}{100} = \left(\frac{11}{10}\right)^n$$

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

$$\Rightarrow n = 2$$

\therefore Time, $n = 2$ years

Q21.

Answer :

Let the required time be n years.

Rate of interest, $R = 8\%$

Principal amount, $P = \text{Rs. } 6250$

Amount with compound interest, $A = \text{Rs. } 7290$

$$\text{Then, } A = P \times \left(1 + \frac{R}{100}\right)^n$$

$$\Rightarrow A = \text{Rs. } 6250 \times \left(1 + \frac{8}{100}\right)^n$$

$$= \text{Rs. } 6250 \times \left(\frac{100+8}{100}\right)^n$$

$$= \text{Rs. } 6250 \times \left(\frac{108}{100}\right)^n$$

$$= \text{Rs. } 6250 \times \left(\frac{27}{25}\right)^n$$

However, amount = Rs. 7290

$$\text{Now, Rs. } 7290 = \text{Rs. } 6250 \times \left(\frac{27}{25}\right)^n$$

$$\Rightarrow \frac{7290}{6250} = \left(\frac{27}{25}\right)^n$$

$$\Rightarrow \frac{729}{625} = \left(\frac{27}{25}\right)^n$$

$$\Rightarrow \left(\frac{27}{25}\right)^2 = \left(\frac{27}{25}\right)^n$$

$$\Rightarrow n = 2$$

\therefore Time, $n = 2$ years

Q22.

Answer :

Population of the town, $P = 125000$

Rate of increase, $R = 2\%$

Time, $n = 3$ years

Then the population of the town after 3 years is *given by*

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

$$= 125000 \times \left(1 + \frac{2}{100}\right)^3$$

$$= 125000 \times \left(\frac{100+2}{100}\right)^3$$

$$= 125000 \times \left(\frac{102}{100}\right)^3$$

$$= 125000 \times \left(\frac{51}{50}\right)^3$$

$$= 125000 \times \left(\frac{51}{50}\right) \times \left(\frac{51}{50}\right) \times \left(\frac{51}{50}\right)$$

$$= (51 \times 51 \times 51)$$

$$= 132651$$

Therefore, the population of the town after three years is 132651.

Q23.

Answer :

Let the population of the town be 50000.

Rate of increase for the first year, $p = 5\%$

Rate of increase for the second year, $q = 4\%$

Rate of increase for the third year, $r = 3\%$

Time = 3 years

$$\text{Now, present population} = \left\{ P \times \left(1 + \frac{p}{100}\right) \times \left(1 + \frac{q}{100}\right) \times \left(1 + \frac{r}{100}\right) \right\}$$

$$= \left\{ 50000 \times \left(1 + \frac{5}{100}\right) \times \left(1 + \frac{4}{100}\right) \times \left(1 + \frac{3}{100}\right) \right\}$$

$$= \left\{ 50000 \times \left(\frac{100+5}{100}\right) \times \left(\frac{100+4}{100}\right) \times \left(\frac{100+3}{100}\right) \right\}$$

$$= \left\{ 50000 \times \left(\frac{105}{100}\right) \times \left(\frac{104}{100}\right) \times \left(\frac{103}{100}\right) \right\}$$

$$= \left\{ 50000 \times \left(\frac{21}{20}\right) \times \left(\frac{26}{25}\right) \times \left(\frac{103}{100}\right) \right\}$$

$$= (21 \times 26 \times 103)$$

$$= 56238$$

Therefore, the present population of the town is 56238.

Q24.

Answer :

Population of the city in 2009, $P = 120000$

Rate of increase, $R = 6\%$

Time, $n = 3$ years

Then the population of the city in the year 2010 is *given by*

***** END *****