Exercise 11B

Q16.

Answer :

Let P be the sum.

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

Time, $n = 2$ years

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

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

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

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

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

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

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

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

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

Hence, the *required* sum is Rs. 9000

Q17.

Answer :

Let P be the sum.

Rate of interest, $R = 10\%$

Time, $n = 3$ years

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

$$= \text{Rs. } P \times \left(\frac{100+10}{100}\right)^3$$

$= \text{Rs. } P \times \left(\frac{\quad}{100}\right)$

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

$= \text{Rs. } P \times \left(\frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}\right)$

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

However, amount $= \text{Rs. } 21296$

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

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

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

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

Q18.

Answer :

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

$A = 4410$

$P = 4000$

$n = 2$ years

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

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

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

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

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

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

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

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

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

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

Q19.

Answer :

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

$A = 774.40$

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$P = 640$

$n = 2$ years

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

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

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

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

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

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

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

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

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

Q20.

Answer :

Let the required time be n years.

Rate of interest, $R = 10\%$

Principal amount, $P =$ Rs. 1800

Amount with compound interest, $A =$ Rs. 2178

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

$= \text{Rs. } 1800 \times \left(1 + \frac{10}{100}\right)^n$

$= \text{Rs. } 1800 \times \left(\frac{100+10}{100}\right)^n$

$= \text{Rs. } 1800 \times \left(\frac{110}{100}\right)^n$

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

However, amount $= \text{Rs. } 2178$

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

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

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

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

$\Rightarrow n = 2$

$\therefore$ 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, $A = \text{Rs. } 7290$

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

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

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

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

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

However, amount $= \text{Rs. } 7290$

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

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

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

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

$\Rightarrow n = 2$

$\therefore$ 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 **********