Exercise 11B

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

$= 120000 \times \left(1 + \frac{6}{100}\right)^1$

$= 120000 \times \left(\frac{100+6}{100}\right)$

$= 120000 \times \left(\frac{106}{100}\right)$

$= 120000 \times \left(\frac{53}{50}\right)$

$= 2400 \times 53$

$= 127200$

Therefore, the population of the city in 2010 is 127200.

Again, population of the city in 2010, $P = 127200$

Rate of decrease, $R = 5\%$

Then the population of the city in the year 2011 is *given by*

Population $= P \times \left(1 - \frac{R}{100}\right)^n$

$= 127200 \times \left(1 - \frac{5}{100}\right)^1$

$= 127200 \times \left(\frac{100-5}{100}\right)$

$= 127200 \times \left(\frac{95}{100}\right)$

$= 127200 \times \left(\frac{19}{20}\right)$

$= 6360 \times 19$

$= 120840$

Therefore, the population of the city in 2011 is 120840.

Q25.

Answer :

Initial count of bacteria, $P = 500000$

Rate of increase, $R = 2\%$

Time, $n = 2$ hours

Then the count of bacteria at the end of 2 hours is *given by*

Count of bacteria $= P \times \left(1 + \frac{R}{100}\right)^n$

$= 500000 \times \left(1 + \frac{2}{100}\right)^2$

$= 500000 \times \left(\frac{100+2}{100}\right)^2$

$= 500000 \times \left(\frac{102}{100}\right)^2$

$= 500000 \times \left(\frac{51}{50}\right)^2$

$= 500000 \times \left(\frac{51}{50}\right) \times \left(\frac{51}{50}\right)$

$= (200 \times 51 \times 51)$

$= 520200$

Therefore, the count of bacteria at the end of 2 hours is 520200.

Q26.

Answer :

Initial count of bacteria, $P = 20000$
Rate of increase, $R = 10\%$
Time, $n = 3$ hours
Then the count of bacteria at the end of the first hour is given by

$$\text{Count of bacteria} = P \times \left(1 + \frac{10}{100}\right)^n$$

$$= 20000 \times \left(1 + \frac{10}{100}\right)^1$$

$$= 20000 \times \left(\frac{100+10}{100}\right)$$

$$= 20000 \times \left(\frac{110}{100}\right)$$

$$= 20000 \times \left(\frac{11}{10}\right)$$

$$= 2000 \times 11$$

$$= 22000$$

Therefore, the count of bacteria at the end of the first hour is 22000.
The count of bacteria at the end of the second hour is given by

$$\text{Count of bacteria} = P \times \left(1 - \frac{10}{100}\right)^n$$

$$= 22000 \times \left(1 - \frac{10}{100}\right)^1$$

$$= 22000 \times \left(\frac{100-10}{100}\right)$$

$$= 22000 \times \left(\frac{90}{100}\right)$$

$$= 22000 \times \left(\frac{9}{10}\right)$$

$$= 2200 \times 9$$

$$= 19800$$

Therefore, the count of bacteria at the end of the second hour is 19800.
Then the count of bacteria at the end of *the* third hour is *is given by*

$$\text{Count of bacteria} = \mathrm{P} \times \left(1 + \frac{10}{100}\right)^n$$

$$= 19800 \times \left(1 + \frac{10}{100}\right)^1$$

$$= 19800 \times \left(\frac{100+10}{100}\right)$$

$$= 19800 \times \left(\frac{110}{100}\right)$$

$$= 19800 \times \left(\frac{11}{10}\right)$$

$$= 1980 \times 11$$

$$= 21780$$

Therefore, the count of bacteria at the end of *the* first 3 hours is 21780.

Q27.

Answer :

Initial value of the machine, $P =$ Rs 625000
Rate of depreciation, $R = 8\%$
Time, $n = 2$ years
Then the value of the machine after two years is given by

$$\text{Value} = P \times \left(1 - \frac{R}{100}\right)^n$$

$$= \text{Rs } 625000 \times \left(1 - \frac{8}{100}\right)^2$$

$$= \text{Rs } 625000 \times \left(\frac{100-8}{100}\right)^2$$

$$= \text{Rs } 625000 \times \left(\frac{92}{100}\right)^2$$

$$= \text{Rs } 625000 \times \left(\frac{23}{25}\right)^2$$

$$= \text{Rs } 625000 \times \left(\frac{23}{25}\right) \times \left(\frac{23}{25}\right)$$

$$= \text{Rs } (1000 \times 23 \times 23)$$

$$= \text{Rs } 529000$$

Therefore, the value of the machine after two years will be Rs. 529000.

Q28.

Answer :

Initial value of the scooter, $P =$ Rs 56000
Rate of depreciation, $R = 10\%$
Time, $n = 3$ years
Then the value of the scooter after three years is given by

$$\text{Value} = P \times \left(1 - \frac{R}{100}\right)^n$$

$$= \text{Rs. } 56000 \times \left(1 - \frac{10}{100}\right)^3$$

$$= \text{Rs. } 56000 \times \left(\frac{100-10}{100}\right)^3$$

$$= \text{Rs. } 56000 \times \left(\frac{90}{100}\right)^3$$

$$= \text{Rs. } 56000 \times \left(\frac{9}{10}\right)^3$$

$$= \text{Rs. } 56000 \times \left(\frac{9}{10}\right) \times \left(\frac{9}{10}\right) \times \left(\frac{9}{10}\right)$$

$$= \text{Rs. } (56 \times 9 \times 9 \times 9)$$

$$= \text{Rs. } 40824$$

Therefore, the value of the scooter after three years will be Rs. 40824.

Q29.

Answer :

Initial value of the car, $P =$ Rs 348000
Rate of depreciation for the first year, $p = 10\%$
Rate of depreciation for the second year, $q = 20\%$
Time, $n = 2$ years.
Then the value of the car after two years is given by

$$\text{Value} = \left\{P \times \left(1 - \frac{p}{100}\right) \times \left(1 - \frac{q}{100}\right)\right\}$$

$$= \text{Rs. } \left\{348000 \times \left(1 - \frac{10}{100}\right) \times \left(1 - \frac{20}{100}\right)\right\}$$

$$= \text{Rs. } \left\{348000 \times \left(\frac{100-10}{100}\right) \times \left(\frac{100-20}{100}\right)\right\}$$

$$= \text{Rs. } \left\{348000 \times \left(\frac{90}{100}\right) \times \left(\frac{80}{100}\right)\right\}$$

$$= \text{Rs. } \left\{348000 \times \left(\frac{9}{10}\right) \times \left(\frac{8}{10}\right)\right\}$$

$$= \text{Rs. } (3480 \times 9 \times 8)$$

$$= \text{Rs. } 250560$$

$\therefore$ The value of the car after two years is Rs 250560.

Q30.

Answer :

Let the initial value of the machine, P be Rs x.
Rate of depreciation, $R = 10\%$
Time, $n = 3$ years
The present value of the machine is Rs 291600.
Then the initial value of the machine is given by

$$\text{Value} = P \times \left(1 - \frac{R}{100}\right)^n$$

$$= \text{Rs. } x \times \left(1 - \frac{10}{100}\right)^3$$

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

$$= \text{Rs. } x \times \left(\frac{90}{100}\right)^3$$

$$= \text{Rs. } x \times \left(\frac{9}{10}\right)^3$$

$\therefore$ Present value of the machine = Rs 291600

$$\text{Now, Rs } 291600 = \text{Rs } x \times \left(\frac{9}{10}\right) \times \left(\frac{9}{10}\right) \times \left(\frac{9}{10}\right)$$

$$\Rightarrow x = \text{Rs } \frac{291600 \times 10 \times 10 \times 10}{9 \times 9 \times 9}$$

$$\Rightarrow x = \text{Rs } \frac{291600000}{729}$$

$$\Rightarrow x = \text{Rs } 400000$$

$\therefore$ The initial value of the machine is Rs 400000.

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