EXERCISE 14.4   PAGE NO: 14.27

1. The present population of a town is 28000. If it increases at the rate of 5% per annum, what will be its population after 2 years?
Solution:
Given details are,
Present population of town is = 28000
Rate of increase in population is = 5% per annum
Number of years = 2
By using the formula,
$A = P (1 + R/100)^n$
Population of town after 2 years = $28000 (1 + 5/100)^2$
$= 28000 (1.05)^2$
$= 30870$
∴ Population of town after 2 years will be 30870

2. The population of a city is 125000. If the annual birth rate and death rate are 5.5% and 3.5% respectively, calculate the population of city after 3 years.
Solution:
Given details are,
Population of city (P) = 125000
Annual birth rate R_1= 5.5 %
Annual death rate R_2 = 3.5 %
Annual increasing rate R = $(R_1 – R_2)$ = 5.5 – 3.5 = 2 %
Number of years = 3
By using the formula,
$A = P (1 + R/100)^n$
So, population after two years is = $125000 (1 + 2/100)^3$
$= 125000 (1.02)^3$
$= 132651$
∴ Population after 3 years will be 132651

3. The present population of a town is 25000. It grows at 4%, 5% and 8% during first year, second year and third year respectively. Find its population after 3 years.
Solution:
Given details are,
Present population is = 25000
First year growth R_1 = 4%
Second year growth R_2 = 5%

Third year growth $R_3 = 8\%$
Number of years = 3
By using the formula,
$A = P (1 + R/100)^n$
So, population after three years = $P (1 + R_1/100) (1 + R_2/100) (1 + R_3/100)$
$= 25000(1 + 4/100) (1 + 5/100) (1 + 8/100)$
$= 25000 (1.04) (1.05) (1.08)$
$= 29484$
∴ Population after 3 years will be 29484

4. Three years ago, the population of a town was 50000. If the annual increase during three successive years be at the rate of 4%, 5% and 3% respectively, find the present population.
Solution:
Given details are,
Three years ago population of town was = 50000
Annual increasing in 3 years = 4%,5%, 3% respectively
So, let present population be = x
By using the formula,
$A = P (1 + R/100)^n$
$x = 50000 (1 + 4/100) (1 + 5/100) (1 + 3/100)$
$= 50000 (1.04) (1.05) (1.03)$
$= 56238$
∴ Present population of the town is 56238

5. There is a continuous growth in population of a village at the rate of 5% per annum. If its present population is 9261, what it was 3 years ago?
Solution:
Given details are,
Present population of town is = 9261
Continuous growth of population is = 5%
So, let population three years ago be = x
By using the formula,
$A = P (1 + R/100)^n$
$9261 = x (1 + 5/100) (1 + 5/100) (1 + 5/100)$
$9261 = x (1.05) (1.05) (1.05)$
$= 8000$
∴ Present population of the town is 8000

6. In a factory the production of scooters rose to 46305 from 40000 in 3 years. Find the annual rate of growth of the production of scooters.

Solution:

Given details are,

Initial production of scooters is = 40000

Final production of scooters is = 46305

Time = 3 years

Let annual growth rate be = R%

By using the formula,

$A = P (1 + R/100)^n$

46305 = 40000 (1 + R/100) (1 + R/100) (1 + R/100)

$46305 = 40000 (1 + R/100)^3$

$(1 + R/100)^3 = 46305/40000$

$\qquad\qquad = 9261/8000$

$\qquad\qquad = (21/20)^3$

1 + R/100 = 21/20

R/100 = 21/20 – 1

R/100 = (21-20)/20

$\qquad = 1/20$

R = 100/20

$\quad = 5$

∴ Annual rate of growth of the production of scooters is 5%

7. The annual rate of growth in population of a certain city is 8%. If its present population is 196830, what it was 3 years ago?

Solution:

Given details are,

Annual growth rate of population of city is = 8%

Present population of city is = 196830

Let population of city 3 years ago be = x

By using the formula,

$A = P (1 + R/100)$

196830 = x (1 + 8/100) (1 + 8/100) (1 + 8/100)

196830 = x (27/25) (27/25) (27/25)

196830 = x (1.08) (1.08) (1.08)

196830 = 1.259712x

x = 196830/1.259712

$\quad = 156250$

∴ Population 3 years ago was 156250

8. The population of a town increases at the rate of 50 per thousand. Its population after 2 years will be 22050. Find its present population.
Solution:
Given details are,
Growth rate of population of town is = 50/1000×100 = 5%
Population after 2 years is = 22050
So, let present population of town be = x
By using the formula,
A = P (1 + R/100)
22050 = x (1 + 5/100) (1 + 5/100)
22050 = x (105/100) (105/100)
22050 = x (1.05) (1.05)
22050 = 1.1025x
x = 22050/1.1025
   = 20000
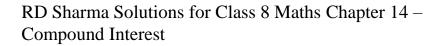∴ Present population of the town is 20000

9. The count of bacteria in a culture grows by 10% in the first hour, decreases by 8% in the second hour and again increases by 12% in the third hour. If the count of bacteria in the sample is 13125000, what will be the count of bacteria after 3 hours?
Solution:
Given details are,
Count of bacteria in sample is = 13125000
The increase and decrease of growth rates are = 10%, -8%, 12%
So, let the count of bacteria after 3 hours be = x
By using the formula,
A = P (1 + R/100)
x = 13125000 (1 + 10/100) (1 – 8/100) (1 + 12/100)
x = 13125000 (110/100) (92/100) (112/100)
x = 13125000 (1.1) (0.92) (1.12)
   = 14876400
∴ Count of bacteria after three hours will be 14876400

10. The population of a certain city was 72000 on the last day of the year 1998. During next year it increased by 7% but due to an epidemic it decreased by 10% in the following year. What was its population at the end of the year 2000?
Solution:
Given details are,
Population of city on last day of year 1998 = 72000

Increasing rate (R) in 1999 = 7%
Decreasing rate (R) in 2000 = 10 %
By using the formula,
A = P (1 + R/100)
x = 72000 (1 + 7/100) (1 – 10/100)
  = 72000 (107/100) (90/100)
  = 72000 (1.07) (0.9)
  = 69336
∴ Population at the end of the year 2000 will be 69336

11. 6400 workers were employed to construct a river bridge in four years. At the end of the first year, 25% workers were retrenched. At the end of the second year, 25% of those working at that time were retrenched. However, to complete the project in time, the number of workers was increased by 25% at the end of the third year. How many workers were working during the fourth year?
Solution:
Given details are,
Initial number of workers are = 6400
At the end of first year = 25% retrenched
At the end of second year = 25% retrenched
At the end of third year = 25% increased
By using the formula,
A = P (1 + R/100)
x = 6400 (1 – 25/100) (1 – 25/100) (1 + 25/100)
  = 6400 (75/100) (75/100) (125/100)
  = 6400 (0.75) (0.75) (1.25)
  = 4500
∴ Number of workers working during the fourth year is 4500

12. Aman started a factory with an initial investment of Rs 100000. In the first year, he incurred a loss of 5%. However, during the second year, he earned a profit of 10% which in the third year rose to 12%. Calculate his net profit for the entire period of three years.
Solution:
Given details are,
Initial investment by Aman = Rs.100000
In first year = incurred a loss of 5%
In second year = earned a profit of 10%
In third year = earned a profit of 12 %

By using the formula,

A = P (1 + R/100)

x = 100000 (1 – 5/100) (1 + 10/100) (1 + 12/100)

= 100000 (95/100) (110/100) (112/100)

= 100000 (0.95) (1.1) (1.12)

= 117040

∴ Aman's net profit for entire three years is 117040 – 100000 = Rs 17040

13. The population of a town increases at the rate of 40 per thousand annually. If the present population be 175760, what was the population three years ago.

Solution:

Given,

Annul increase rate of population of town = 40/1000× 100 = 4%

Present population of town = 175760

So, let the population of town 3 years ago be = x

By using the formula,

A = P (1 + R/100)

175760 = x (1 + 4/100) (1 + 4/100) (1 + 4/100)

175760 = x (104/100) (104/100) (104/100)

175760 = x (1.04) (1.04) (1.04)

175760 = 1.124864x

x = 175760/1.124864

= 156250

∴ Population 3 years ago was 156250

14. The population of a mixi company in 1996 was 8000 mixies. Due to increase in demand it increases its production by 15% in the next two years and after two years its demand decreases by 5%. What will its production after 3 years?

Solution:

Given,

Population of mixi company in 1996 was = 8000 mixies

Production growth rate in next 2 years is = 15 %

Decrease rate in 3rd year is = 5%

By using the formula,

A = P (1 + R/100)

x = 8000 (1 + 15/100) (1 + 15/100) (1 – 5/100)

= 8000 (115/100) (115/100) (95/100)

= 8000 (1.15) (1.15) (0.95)

= 10051

∴ Production after three years will be 10051 mixies

15. The population of a city increases each year by 4% of what it had been at the beginning of each year. If the population in 1999 had been 6760000, find the population of the city in (1) 2001 (ii) 1997.
Solution:
Given details are,
Annual increase rate of population of city is = 4%
Population in 1999 was = 6760000

(i) Population of the city in 2001 (2 years after)
By using the formula,
A = P (1 + R/100)
x = 6760000 (1 + 4/100) (1 + 4/100)
  = 6760000 (104/100) (104/100)
  = 6760000 (1.04) (1.04)
  = 7311616
∴ Population in the year 2001 is 7311616

(ii) Population of city in 1997 (2 years ago)
By using the formula,
A = P (1 + R/100)
x = 6760000 (1 - 4/100) (1 - 4/100)
  = 6760000 (96/100) (96/100)
  = 6760000 (0.96) (0.96)
  = 6230016
∴ Population in the year 1997 was 6230016

16. Jitendra set up a factory by investing Rs. 2500000. During the first two successive years his profits were 5% and 10% respectively. If each year the profit was on previous year's capital, compute his total profit.
Solution:
Given details are,
Initial investment by Jitendra was = Rs 2500000
Profit in first 2 successive years were = 5% and 10%
Final investment after two successive profits = 2500000 (1+ 5/100) (1 + 10/100)
                                             = 2500000 (105/100) (110/100)
                                             = 2500000 (1.05) (1.1)
                                             = 2887500

∴ Jitendra total profit is = 2887500 – 2500000 = Rs 387500