Exercise 3(D)

1. The cost of a machine is supposed to depreciate each year at 12% of its value at the beginning of the year. If the machine is valued at ₹44,000 at the beginning of 2008, find its value:
(i) at the end of 2009.
(ii) at the beginning of 2007.
Solution:

Given:
Cost of machine in 2008 (P) = ₹44,000 and its depreciation rate = 12%
Then,
(i) The cost of machine at the end of 2009 will be
$= P(1 – r/100)^n$
$= 44000 (1 – 12/100)^2$
$= 44000 (88/100)^2$
= 34073.60
Hence, the cost of the machine at the end of 2009 is ₹34,073.60

(ii) The c… the beginning of 2007(P)
A = P(…
4400…
440…
P = …
= …
Hen… at the beginning of 2007 is ₹50,000

2. The … decreases for two years at the rate of 10% per year and then in the third y… …s by 10%. Find the original value of the article, if its value at the end of 3 years is ₹40,095.
Solution:

Let's assume x to be the value of the article
Given, the value of an article decreases for two years at the rate of 10% per year.
So,
The value of the article at the end of the 1st year will be
x - 10% of x = x – 0.10x = 0.90x
And,
The value of the article at the end of the 2nd year will be
0.90x - 10% of (0.90x) = 0.90x – 0.90x = 0.81x
Now,
The value of the article increases in the 3rd year by 10%.
So, the value of the article at the end of 3rd year will be
0.81x + 10% of (0.81x) = 0.81x + 0.081 = 0.891x

Given that, the value of the article at the end of 3 years is ₹40,095
Then,

0.891x = 40095
x = 40095/0.891
= 45000

Therefore,
The original value of the article is ₹45,000.

3, According to a census taken towards the end of the year 2009, the population of a rural town was found to be 64,000. The census authority also found that the population of this particular town had a growth of 5% per annum. In how many years after 2009 did the population of this town reach 74,088?
Solution:

Given: Population in 2009 (P) = 64,000
Let's assume that after 'n' years its population to be 74,088 (A)
Also, given
Growth rate = 5% per annum
We know that,
A = P(1 + r/1
74088 =
74088
9261
(21/
On
n =

There 2009 for the population of the town to reach 74,088

4. The popu town decreased by 12% during 1998 and then increased by 8% during 1999. Find the population of the town, at the beginning of 1998, if at the end of 1999 its population was 2,85,120.
Solution:

Let's assume the population in the beginning of 1998 be P
Given, the population at the end of 1999 = 2,85,120 (A)
According to the question,
r_1 = -12% and r_2 = +8%
Then,
A = P(1 – r_1/100) (1 + r_2/100)
285120 = P(1 – 12/100) (1 + 8/100)
285120 = P(22/25) (27/25)
P = (285120 x 25 x 25)/(22 x 27)
= 300000

Therefore, the population of the town at the beginning of 1998 was 3,00,000

5. A sum of money, invested at compound interest, amounts to ₹16,500 in 1 year and to ₹19,965 in 3 years. Find the rate per cent and the original sum of money invested.
Solution:

Let's assume the sum of money to be P and the rate of interest = r%
Given, the amount after 1year = ₹16,500
And, the amount after 3years = ₹19,965
For 1year
$A = P(1 + r/100)^n$
$16500 = P(1 + r/100)^1$ … (1)

For 3years
$A = P(1 + r/100)^n$
$19965 = P(1 + r/100)^3$ … (2)

On dividing equations (2) by (1), we have

$$\frac{19,965}{16,500} = \frac{P\left(1+\frac{r}{100}\right)^3}{}$$

121/
(11/
On
11/
11/1
110 =
r = 10%
Putting the va… in equation (1), we get
16500 = P(1 + 10/100)
P = (16500 x 10)/11
= 15000

Therefore, the rate of interest and original sum of invested are 10% and ₹15,000

6. The difference between C.I. and S.I. on ₹7,500 for two years is ₹12 at the same rate of interest per annum. Find the rate of interest.
Solution:

Given: P = ₹7,500 and time (n) = 2 years
Let's assume the rate of interest as y%
Now,
S.I. = P x R x T/100
= (7500 x y x 2)/100
= 150y
And,

C.I. = $P(1 + r/100)^n – P$
$= 7500(1 + y/100)^2 – 7500$

It's given that, C.I. - S.I. = ₹12 $7500(1 + y/100)^2 – 7500 - 150y = 12$
$7500(1 + y^2/10000 + 2y/100) – 7500 - 150y = 12$
$7500 + 75y^2/100 + 150y – 7500 - 150y = 12$
$75y^2/100 = 12$
$3y^2/4 = 12$
$y^2 = (12 \times 4)/3 = 16$
$y = 4\%$

Hence, the rate of interest is 4%

7. A sum of money lent out at C.I. at a certain rate per annum becomes three times of itself in 10 years. Find in how many years will the money become twenty-seven times of itself at the same rate of interest p.a.
Solution:

Let's as be ₹y and rate = r%
From to 1st condition
Amo
We
A =
3y =
3 = (

Accordi
Let's consid years amount will be ₹27y A
$= P(1 + r/100)^n$
$27y = y(1 + r/100)^n$
$3^3 = (1 + r/100)^n$
Using (1), we have
$[(1 + r/100)^{10}]^3 = (1 + r/100)^n$
$(1 + r/100)^{30} = (1 + r/100)^n$
On comparing,
n = 30

Hence, it will 30 years for the money to become 27 times of itself.

8. Mr. Sharma borrowed a certain sum of money at 10% per annum compounded annually. If by paying ₹19,360 at the end of the second year and ₹31,944 at the end of the third year he clears the debt; find the sum borrowed by him.
Solution:

Let's assume the sum which Sharma borrowed as P

Given that the rate of interest is 10% and compounded annually
Now, according to the question
At the end of the two years the amount will
$A_1 = P(1 + r/100)^n$
$= P(1 + 10/100)^2$
$= P(11/10)^2$
And,
Mr. Sharma paid ₹19,360 at the end of the second year.
So, for the third year the principal will be (A_1 - ₹19,360)
Also given, he cleared the debt by paying ₹31,944 at the end of the third year.
Now,
$A_2 = P(1 + r/100)^n$
$31944 = P[(1 + 10/100)^2 – 19360] (1 + 10/100)^1$
$29040 = P[(11/10)^2 – 19360]$
$P(11/10)^2 = 48400$
$P = 48400 \times (10/11)^2$
$= 40000$

Therefore, M borrowed ₹40,000.

9. Th ompound interest for a year payable half-yearly and simple inter money lent out at 10% for a year is ₹15. Find the sum of mo
Sol

Let's to be ₹y
Calcu
S.I. = (P
= (y x 1
= y/10
And,
Calculating C.I.(compounded half-yearly)
$C.I. = P \{[1 + r/(2 \times 100)]^{nx2} – 1\}$
$= y \{[1 + 10/(2 \times 100)]^{1x2} – 1\}$
$= y[(21/20)^2 - 1]$
$= (41/400)y$

It's given that C.I. – S.I. = ₹15
So,
$(41/400)y – y/10 = 15$
$y/400 = 15$
$y = 6000$

Therefore, the sum of money lent out is ₹6,000

10. The ages of Pramod and Rohit are 16 years and 18 years respectively. In what ratio must they invest money at 5% p.a. compounded yearly so that both get the same sum on attaining the age of 25 years?
Solution:

Let's assume that ₹x and ₹y to be the money invested by Pramod and Rohit respectively such that they will get the same sum on attaining the age of 25 years.
Now,
Pramod will attain the age of 25 years after (25 – 16) = 9 years
Rohit will attain the age of 25 years after (25 -18) = 7 years
So, we have
$x (1 + 5/100)^9 = y(1 + 5/100)^7$
$x/y = 1/(1 + 5/100)^2$
$x/y = 400/441$

Therefore,
Pramod and Rohit should invest in the ratio 400:441 respectively such that they will get the same sum on attaining the age of 25.