Exercise 2(D)

1. What sum will amount of ₹6,593.40 in 2 years at C.I., if the rates are 10 per cent and 11 per cent for the two successive years?
Solution:

Let's assume the principal (P) to be ₹100
For 1st year, we have
P = ₹100; R = 10% and T = 1 year
So,
I = (100 x 10 x 1)/100\
= ₹10
And,
A = ₹(100 + 10) = ₹110
For 2nd year, we have
P = ₹110;R = 11% and T = 1 year So,
I = (110 x 11 x 1)/100
= ₹12.10
And,
A = ₹(110 + 12.10)
= ₹122.10

Now,
If the amount is ₹122.10 for a sum of ₹100
Then,
If amount is ₹1, sum will be ₹(100/122.10)
And,
If amount is ₹6,593.40, sum will be ₹(100/122.10) x 6,593.40 = ₹5,400 Therefore,

the sum is ₹5,400

2. The value of a machine depreciated by 10% per year during the first two years and 15% per year during the third year. Express the total depreciation of the machine, as per cent, during the three years.
Solution:

Let's assume the value of machine in the beginning to be ₹100
For 1st year,
Depreciation = 10% of ₹100
= ₹100
So, the value of machine for second year will become ₹(100 – 10) = ₹90

For 2nd year,
Depreciation = 10% of ₹90 = ₹9
So, the value of machine for third year will become ₹(90 – 9) = ₹81

For 3rd year,
Depreciation = 15% of ₹81 = ₹12.15
So, the value of machine at the end of third year = ₹(81 - 12.15) = ₹68.85
Thus,
Net depreciation = ₹(100 - 68.85) = ₹31.15 Or
31.15%

3. Rachna borrows ₹12,000 at 10 percent per annum interest compounded half-yearly. She repays ₹4,000 at the end of every six months. Calculate the third payment she has to make at end of 18 months in order to clear the entire loan.
Solution:

For 1st half-year
P = ₹12,000; R = 10% and T = ½ year
Interest = ₹(12,000 x 10 x 1)/(100 x 2)
= ₹600
And,
Amount = ₹12,000 + ₹600
= ₹12,600
Money paid at the end of 1st half year = ₹4,000
So, the balance money for 2nd half-year = ₹12,600 - ₹4,000
= ₹8,600

For 2nd half-year
P = ₹8,600; R = 10% and T = ½ year
Interest = ₹(8,600 x 10 x 1)/(100 x 2)
= ₹430
And,
Amount = ₹8,600 + ₹430
= ₹9,030
Money paid at the end of 2nd half-year = ₹4,000
So, the balance money for 3rd half-year = ₹9,030 - ₹4,000
= ₹5,030

For 3rd half-year
P = ₹5,030; R = 10% and T = ½ year
Interest = ₹(5,030 x 10 x 1)/(100 x 2)
= ₹251.50
And,
Amount = ₹(5,030 + 251.50)
= ₹5,281.50

Hence, Rachna has to pay an amount of ₹5,281.50 as third payment in order to clear the entire loan

4. On a certain sum of money, invested at the rate of 10 percent per annum

compounded annually, the interest for the first year plus the interest for the third year is ₹2,652. Find the sum.
Solution:

Let's assume the principal as ₹100
For 1st year
P = ₹100; R = 10% and T = 1year
Interest = ₹(100 x 10 x 1)/100
= ₹10
And,
Amount = ₹(100 + 10)
= ₹110
For 2nd year
P = ₹110; R = 10% and T = 1year
Interest = ₹(110 x 10 x 1)/100
= ₹11
And,
Amount = ₹(110 + 11)
= ₹121
For 3rd year
P = ₹121; R = 10% and T = 1year
Interest = ₹(121 x 10 x 1)/100
= ₹12.10
Sum of C.I. for 1st year and 3rd year = ₹(10 + 12.10)
= ₹22.10
Now,
When sum is ₹22.10, principal is ₹100 So,
When sum is ₹2,652, principal will be (100 x 2652)/22.10 = ₹12,000 Hence,

the sum is ₹12,000

5. During every financial year, the value of a machine depreciates by 12%. Find the original cost of a machine which depreciates by ₹2,640 during the second financial year of its purchase.
Solution:

Let's assume the original value of the machine to be ₹100 For
1st year
P = ₹100; R = 12% and T = 1 year Depreciation
in 1st year = ₹(100 x 12 x 1)/100
= ₹12
Value at the end of 1st year = ₹(100 – 12)
= ₹88
For 2nd year
P = ₹88; R = 12% and T = 1year

Depreciation in 2nd year = ₹(88 x 12 x 1)/100
= ₹10.56
Now,
When depreciation in 2nd year is ₹10.56, original cost is ₹100 So,
When depreciation in 2nd year is ₹2,640, original cost will be (100 x 2,640)/10.56
= ₹25,000

Hence, the original cost of the machine is ₹25,000

6. Find the sum on which the difference between the simple interest and compound interest at the rate of 8% per annum compounded annually would be ₹64 in 2years.
Solution:

Let's assume ₹x to be the sum. So,
the S.I. is
= (x × 8 × 2)/100
= 0.16x

Now,
Compound interest
For 1st year:
P = ₹x, R = 8% and T = 1
Interest = (x × 8 × 1)/100
= 0.08x
And, amount = ₹(x + 0.08x)
= ₹1.08x

For 2nd year:
P = ₹1.08x, R = 8% and T = 1
Interest = (1.08x × 8 × 1)/100
= 0.0864x
And, amount = ₹(1.08x + 0.0864x)
= ₹1.1664x
So,
C.I. = Amount - P
= ₹(1.1664x – x)
= ₹0.1664x

Given that,
The difference between the simple interest and compound interest at the rate of 8% per annum compounded annually should be ₹64 in 2 years.
₹0.1664*x* - ₹0.16*x* = ₹64
₹0.0064*x* = ₹64 x
= ₹10000

Therefore, the sum is ₹10,000.

7. A sum of ₹13,500 is invested at 16% per annum compound interest for 5 years.
Calculate:
(i) the interest for the first year.
(ii) the amount at the end of first year.
(iii) the interest for the second year, correct to the nearest rupee.
Solution:

For 1st year
P = ₹13,500; R = 16% and T = 1year
Interest = ₹(13,500 x 16 x 1)/100
= ₹2,160
(i) The interest for the first year is ₹2,160
And,
Amount = ₹13,500 + ₹2,160
= ₹15,660
(ii) The amount at the end of first year is ₹15,660
For 2nd year
P = ₹15,660; R =16% and T = 1year
Interest = ₹(15,660 x 16 x 1)/100
= ₹2,505.60
= ₹2,506 (corrected to the nearest rupee)
(iii) Hence, the interest for the second year is ₹2,506

8. Saurabh invests ₹48,000 for 7 years at 10% per annum compound interest.
Calculate:
(i) the interest for the first year.
(ii) the amount at the end of second year.
(iii) the interest for the third year.
Solution:

For 1st year
P = ₹48,000; R = 10% and T = 1 year
Interest = ₹(48,000 x 10 x 1)/100
= ₹4,800
(i) Hence, the interest for the first year is ₹4,800
And,
Amount = ₹48,000 + ₹4,800
= ₹52,800
For 2nd year
P = ₹52,800; R = 10% and T = 1year
Interest = ₹(52,800 x 10 x 1)/100
= ₹5,280
And,
Amount = ₹52,800 + ₹5,280 = ₹58,080

(ii) Hence, the amount at the end of second year is ₹58,080
For 3rd year
P = ₹58,080; R = 10% and T = 1year
Interest = ₹(58,080 x 10 x 1)/100
= ₹5,808
(iii) Hence, the interest for the third year is ₹5,808

9. Ashok borrowed ₹12,000 at some rate on compound interest. After a year, he paid back ₹4,000. If the compound interest for the second year is ₹920, find:
i. The rate of interest charged
ii. The amount of debt at the end of the second year
Solution:

(i) Let's assume x% to be the rate of interest charged
Then C.I, calculated
For 1st year
P = ₹12,000, R = x% and T = 1 year
Interest = (12,000 × x × 1)/100
= 120x
And, amount = ₹(12,000 + 120x)

For 2nd year
After a year, given that Ashok paid back ₹4,000.
P = (₹12,000 + ₹120x) - ₹4,000 = ₹(8,000 + 120x)
Interest = [(8,000 + 120x) × x × 1]/100
= ₹$(80x + 1.20x^2)$
But given,
The compound interest for the second year is ₹920
₹$(80x + 1.20x^2)$ = ₹920
$1.20x^2 + 80x - 920 = 0$
$3x^2 + 200x - 2300 = 0$
$3x^2 + 230x - 30x - 2300 = 0$
$x(3x + 230) -10(3x + 230) = 0$
$(3x + 230)(x - 10) = 0$
$x = -230/3$ or $x = 10$
Since, the rate of interest cannot be negative
So, x = 10
Therefore, the rate of interest charged is 10%.

(ii) For 1st year:
Interest = ₹120x = ₹1200 For
2nd year:
Interest = ₹$(80x + 1.20x^2)$ = ₹920

The amount of debt at the end of the second year is equal to the sum of the principal of the second year and interest for the two years.
Thus,
Total debt = ₹(8,000 + 1,200 + 920) = ₹10,120

10. On a certain sum of money, lent out at C.I., interests for first, second and third years are ₹1,500, ₹1,725 and ₹2,070 respectively. Find the rate of interest for the
(i) second year (ii) third year.
Solution:

Given,
sThe interest obtained in the first year is ₹1,500
The interest obtained in the second year is ₹1,750
Now,
(i) Difference between the interests of second year and first year is
= ₹1,725 - ₹1,500
= ₹225
So,
The rate of interest for the second year is calculated as
= (225/1,500) x 100
= 15%

Now,
(ii) Difference between the interests of third year and second year is
= ₹2,070 - ₹1,725
= ₹345
So,
The rate of interest for the second year is calculated as
= (345/1,725) x 100
= 20%

Therefore, the rates of interest for the second and third year are 15% and 20% respectively.