Exercise 2(B)

1. Calculate the difference between the simple interest and the compound interest on ₹4,000 in 2 years at 8% per annum compounded yearly.
Solution:

For 1st year
P = ₹4,000; R = 8% and T = 1 year I
= (4,000 x 8 x 1)/100
= ₹320
And,
A = ₹(4,000 + 320)
= ₹4,320

For 2nd year
P = ₹4,320; R = 8% and T = 1 year I
= (4,320 x 8 x 1)/100
= ₹345.60
And,
A = ₹(4,320 + 345.60)
= ₹4,665.60
Hence,
Compound interest = ₹(4,665.60 – 4,000)
= ₹665.60

Now,
Simple interest for 2 years = (4000 x 8 x 2)/100
= ₹640
Hence,
Difference of CI and SI = ₹(665.60 – 640)
= ₹25.60

2. A man lends ₹12,500 at 12% for the first year, at 15% for the second year and at 18% for the third year. If the rates of interest are compounded yearly ; find the difference between the C.I. for the first year and the compound interest for the third year.
Solution:

For 1st year
P = Rs. 12500; R = 12% and R = 1 year
I = (12500 x 12 x 1)/100
= ₹1,500
And,
A = ₹(12,500 + 1,500)
= ₹14,000

For 2nd year
P = ₹14,000; R = 15% and T = 1 year

I = (14000 x 15 x 1)/100
= ₹2,100
And,
A = ₹(1,400 + 2,100)
= ₹16,100

For 3rd year
P = ₹16,100; R = 18% and T = 1 year I
= (16100 x 18 x 1)/100
= ₹2898
And,
A = ₹(16,100 + 2,898)
= ₹18,998

Hence,
The difference between the compound interest of the third year and first year
= ₹2,898 - ₹1,500
= ₹1,398

3. A sum of money is lent at 8% per annum compound interest. If the interest for the second year exceeds that for the first year by ₹96, find the sum of money.
Solution:

Let's assume the money lent to be ₹100
So,
For 1st year
P = ₹100; R = 8% and T = 1 year
Interest for the first year = (100 x 8 x 1)/100
= ₹8
Amount = ₹(100+ 8)
= ₹108

For 2nd year
P = ₹108; R = 8% and T = 1year
Interest for the second year = (108 x 8 x 1)/100
= ₹8.64
Now,
Difference between the interests for the second and first year = ₹(8.64 - 8) = ₹0.64

But given that interest for the second year exceeds the first year by ₹96
Then,
When the difference between the interests is ₹0.64, principal is ₹100
So,
When the difference between the interests is ₹96, principal = ₹(96 x 100/0.64)
= ₹15,000
Therefore, the sum of money lent is ₹15,000

4. A man borrows ₹6,000 at 5% C.I. per annum. If he repays ₹1,200 at the end of each year, find the amount of the loan outstanding at the beginning of the third year.
Solution:

Given, amount borrowed = ₹6,000 at R = 5% C.I. per annum So,
Interest for the 1st year = (5/100 x 6000)
= ₹300
And, the amount at the end of the first year will be
= ₹(6,000 + 300)
= ₹6,300
Given that an amount of ₹1,200 is repaid at the end of each year Now,
The amount left to the paid at the end of 1st year
= ₹(6,300 – 1,200)
= ₹5,100

Then, the interest for the 2nd year is
= (5/100 x 5100)
= ₹255
And, the amount will be = ₹(5100 + 255)
= ₹5,355
Now, the amount left to be paid at the end of 2nd year after reduction of ₹1,200 will be
= ₹(5,355 – 1,200)
= ₹4,155

Hence, the amount of the loan outstanding at the beginning of the third year is ₹4,155

5. A man borrows ₹5,000 at 12 percent compound interest payable every six months. He repays ₹1,800 at the end of every six months. Calculate the third payment he has to make at the end of 18 months in order to clear the entire loan.
Solution:

For 1st six months:
P = ₹5,000; R = 12% and T = ½ year
Interest = (5000 x 12 x 1)/(2 x 100)
= ₹300
And, Amount = ₹(5,000 + 300)
= ₹5,300
Given that the money repaid = ₹1,800
So, balance amount = ₹(5,300 - 1,800)
= ₹3,500

For 2nd six months:
P = ₹3,500; R = 12% and T = ½ year

Interest = (3500 x 12 x 1)/(2 x 100)
= ₹210
And, Amount = ₹(3,500 + 210)
= ₹3,710
Again the money repaid = ₹1,800
So, balance amount = ₹(3,710 - 1,800)
= ₹1,910

For 3rd six months:
P = ₹1,910; R = 12% and T = ½ year
Interest = (1910 x 12 x 1)/(2 x 100)
= ₹114.60
And, Amount = ₹(1,910 + 114.60)
= ₹2,024.60

Hence, the 3rd payment to be made to clear the entire loan is ₹2,024.60

6. On a certain sum of money, the difference between the compound interest for a year, payable half-yearly, and the simple interest for a year is ₹180. Find the sum lent out, if the rate of interest in both the cases is 10% per annum.
Solution:

Let assume a principal of ₹100
And, for R = 10% and T = 1 year
S.I. = (100 x 10 x 1)/100
= ₹10

Compound interest payable half yearly
R = 5% half-yearly, T = ½ year = 1 half-year
Now, for first ½ year
I = (100 x 5 x 1)/100
= ₹5
And,
A = ₹(100 + 5)
= ₹105

For second ½ year
P = ₹105 and R = 5%
I = (105 x 5 x 1)/100
= ₹5.25

Total compound interest = ₹(5 + 5.25)
= ₹10.25
Difference of C.I. and S.I. = ₹(10.25 – 10)
= ₹0.25
So, when difference in interest is ₹10.25, the sum is ₹100

So, if the difference is ₹1, the sum is (100/0.25) = 400 And,
If the difference is ₹180, the sum will be ₹(400 x 180) = ₹72,000
Hence, the sum lent out is ₹72,000

7. A manufacturer estimates that his machine depreciates by 15% of its value at the beginning of the year. Find the original value (cost) of the machine, if it depreciates by ₹5,355 during the second year.
Solution:

Let's assume the original cost of the machine to be ₹100
Given that the machine depreciates by 15% during the first year
So, 15% of ₹100 = ₹15
Now,
The value of the machine at the beginning of the 2nd year will be
= ₹(100 – 15)
= ₹85
Again, the depreciation during the 2nd year = 15% of ₹85 = ₹12.75
Now,
When the depreciation during the 2nd year is ₹12.75, the original cost is ₹100
So,
When the depreciation during the 2nd year is ₹5,355, the original cost will be
= (100 x 5355)/12.75
= ₹42,000

Therefore, the original cost of the machine is ₹42,000

8. A man invest ₹5,600 at 14% per annum compound interest for 2 years. Calculate:
(i) The interest for the first year.
(ii) The amount at the end of the first year.
(iii) The interest for the second year, correct to the nearest rupee.
Solution:

(i) For the 1st year
P = ₹5,600; R = 14% and T = 1 year I
= (5600 x 14 x 1)/100
= ₹784
And,
(ii) Amount at the end of the first year is
= ₹(5600 + 784)
= ₹6,384

(iii) Now, for the 2nd year
P = ₹6,384; R = 14% and R = 1 year I
= (6384 x 14 x 1)/100

= ₹893.76 ~ ₹894 (nearly)
Hence, the interest for the second year is ₹894

9. A man saves ₹3,000 every year and invests it at the end of the year at 10% compound interest. Calculate the total amount of his savings at the end of the third year.
Solution:

Savings at the end of every year = ₹3,000 So,
for 2nd year
P = ₹3,000; R = 10% and T = 1 year I
= (3000 x 10 x 1)/100
= ₹300
And,
A = ₹(3000 + 300)
= ₹3,300
Now,
For 3rd year, savings = ₹3,000
So, P = ₹(3,000 + 3,300) = ₹6,300
R = 10% and T = 1 year
I = (6300 x 10 x 1)/100
= ₹630
And,
A = ₹(6,300 + 630) = ₹6,930
Amount at the end of 3rd year
= ₹(6,930 + 3,000)
= ₹9,930

Hence, the total amount of his savings at the end of the third year is ₹9,930

10. A man borrows ₹10,000 at 5% per annum compound interest. He repays 35% of the sum borrowed at the end of the first year and 42% of the sum borrowed at the end of the second year. How much must he pay at the end of the third year in order to clear the debt?
Solution:

Given,
The amount borrowed is ₹10,000 at R = 5%
Interest for the 1st year
I = (10000 x 5)/100
= ₹500
And, the amount at the end of 1st year = ₹(10,000 + 500)
= ₹10,500

It's said that the man pays 35% of ₹10,500 at the end of the first year
= (35 x 10500)/100
= ₹3,675

So, the amount left to be paid will be
= ₹(10,500 – 3,675)
= ₹6,825

Now,
The interest for the 2nd year is
I = (6,825 x 5)/100
= ₹341.5
So, the amount at the end of the 2nd year will be
= ₹(6,825 + 341.25)
= ₹7,166.25

Given that the man pays 42% of ₹7,166.25 at the end of 2nd year
= (42 x 7166.25)/100
= ₹3,009.825
So, the amount left to be paid = ₹(7,166.25 – 3,009.825)
= ₹4,156.425

Now, the interest for the third year
= (4156.425 x 5)/100
= ₹207.82125
So, the amount at the end of the third year will be
= (4,156.425 + 207.82125)
= ₹4,364.24625

Hence, the man must pay an amount of ₹4,364.24625 at the end of 3rd year in order to clear the debt.