EXERCISE 2.1

1. Find the amount and the compound interest on ₹ 8000 at 5% per annum for 2 years.
Solution:

It is given that
Principal = ₹ 8000
Rate of interest = 5% p.a.

We know that
Interest for the first year = Prt/100
Substituting the values
= (8000 × 5 × 1)/ 100
= ₹ 400

So the amount for the first year or principal for the second year = 8000 + 400 = ₹ 8400
Here
Interest for the second year = (8400 × 5 × 1)/ 100
So we get
= ₹ 420

We know that
Amount after the second year = 8400 + 420
= ₹ 8820
Total compound interest = 8820 + 8000
= ₹ 820

2. A man invests ₹ 46875 at 4% per annum compound interest for 3 years. Calculate:
(i) the amount standing to his credit at the end of the second year.
(ii) the interest for the third year.
(iii) the interest for the first year.
Solution:

It is given that
Principal = ₹ 46875
Rate of interest = 4% p.a.

(i) Interest for the first year = Prt/100
Substituting the values
= (46875 × 4 × 1)/ 100
= ₹ 1875

So the amount after first year or principal for the second year = 46875 + 1875 = ₹ 48750
Here
Interest for the second year = (48750 × 4 × 1)/ 100
So we get
= ₹ 1950

(ii) We know that
Amount at the end of second year = 48750 + 1950

= ₹ 50700

(iii) Interest for the third year = (50700 × 4 × 1)/ 100 = ₹ 2028

3. A man invests ₹ 8000 for three years at the rate of 10% per annum compound interest. Find the interest for the second year. Also find the sum due at the end of third year.
Solution:

It is given that
Principal = ₹ 8000
Rate of interest = 10% p.a.

We know that
Interest for the first year = Prt/100
Substituting the values
= (8000 × 10 × 1)/ 100
= ₹ 800

So the amount after the first year or principal for the second year = 8000 + 800 = ₹ 8800

(i) Interest for the second year = (8800 × 10 × 1)/ 100
= ₹ 880

So the amount after second year or principal for the third year = 8800 + 880 = ₹ 9680
Interest for the third year = (9680 × 10 × 1)/ 100
= ₹ 968

(ii) Amount due at the end of the third year = 9680 + 968
= ₹ 10648

4. Ramesh invests ₹ 12800 for three years at the rate of 10% per annum compound interest
(i) the sum due to Ramesh at the end of the first year.
(ii) the interest he earns for the second year.
(iii) the total amount due to him at the end of three years.
Solution:

It is given that
Principal = ₹ 12800
Rate of interest = 10% p.a.

(i) We know that
Interest for the first year = (12800 × 10 × 1)/ 100
= ₹ 1280

So the sum due at the end of first year = 12800 + 1280
= ₹ 14080

(ii) Principal for second year = ₹ 14080
So the interest for the second year = (14080 × 10 × 1)/ 100
= ₹ 1408

(iii) We know that
Sum due at the end of second year = 14080 + 1408
= ₹ 15488

Here
Principal for third year = ₹ 15488
Interest for the third year = (15488 × 10 × 1)/ 100
= ₹ 1548.80

So the total amount due to him at the end of third year = 15488 + 1548.80
= ₹ 17036.80

5. The simple interest on a sum of money for 2 years at 12% per annum is ₹ 1380. Find:
(i) the sum of money.
(ii) the compound interest on this sum for one year payable half-yearly at the same rate.
Solution:

It is given that
Simple Interest (SI) = ₹ 1380
Rate of interest (R) = 12% p.a.
Period (T) = 2 years

(i) We know that
Sum (P) = (SI × 100)/ (R × T)
Substituting the values
= (1380 × 100)/ (12 × 2)
= ₹ 5750

(ii) Here
Principal (P) = ₹ 5750
Rate of interest (R) = 12% p.a. or 6% half-yearly
Period (n) = 1 year – 2 half years

So we get
Amount (A) = $P (1 + R/100)^n$
Substituting the values
= $5750 (1 + 6/100)^2$
By further calculation
= $5750 \times (53/50)^2$
So we get
= 5750 × 53/50 × 53/50
= ₹ 6460.70

Here
Compound Interest = A – P
Substituting the values
= 6460.70 – 5750
= ₹ 710.70

6. A person invests ₹ 10000 for two years at a certain rate of interest, compounded annually. At the end of

one year this sum amounts to ₹ 11200. Calculate:
(i) the rate of interest per annum.
(ii) the amount at the end of second year.
Solution:

It is given that
Principal (P) = ₹ 10,000
Period (T) = 1 year
Sum amount (A) = ₹ 11,200
Rate of interest = ?

(i) We know that
Interest (I) = 11200 – 10000 = ₹ 1200
So the rate of interest
R = (I × 100)/ (P × T)
Substituting the values
R = (1200 × 100)/ (10000 × 1)
So we get
R = 12% p.a.

Therefore, the rate of interest per annum is 12% p.a.

(ii) We know that
Period (T) = 2 years
Rate of interest (R) = 12% p.a.

Here
$A = P (1 + R/100)^t$
Substituting the values
$A = 10000 (1 + 12/100)^2$
By further calculation
$A = 10000 (28/25)^2$
We can write it as
A = 10000 × 28/25 × 28/25
So we get
A = 16 × 28 × 28
A = ₹ 12544

Therefore, the amount at the end of second year is ₹ 12544.

7. Mr. Lalit invested ₹ 75000 at a certain rate of interest, compounded annually for two years. At the end of first year it amounts to ₹ 5325. Calculate
(i) the rate of interest.
(ii) the amount at the end of second year, to the nearest rupee.
Solution:

It is given that
Investment of Mr. Lalit = ₹ 5000
Period (n) = 2 years

(i) We know that
Amount after one year = ₹ 5325
So the interest for the first year = A – P
Substituting the values
= 5325 – 5000
= ₹ 325

Here
Rate = (SI × 100)/ (P × T)
Substituting the values
= (325 × 100)/ (5000 × 1)
So we get
= 13/2
= 6.5 % p.a.

(ii) We know that
Interest for the second year = (5325 × 13 × 1)/ (100 × 2)
By further calculation
= (213 × 13)/ (4 × 2)
So we get
= 2769/8
= ₹ 346.12

So the amount after second year = 5325 + 346.12
We get
= ₹ 5671.12
= ₹ 5671 (to the nearest rupee)

8. A man invests ₹ 5000 for three years at a certain rate of interest, compounded annually. At the end of one year it amounts to ₹ 5600. Calculate:
(i) the rate of interest per annum
(ii) the interest accrued in the second year.
(iii) the amount at the end of the third year.
Solution:

It is given that
Principal = ₹ 5000
Consider r% p.a. as the rate of interest

(i) We know that
At the end of one year
Interest = Prt/100
Substituting the values
= (5000 × r × 1)/ 100
= 50r

Here
Amount = 5000 + 50r
We can write it as
5000 + 50r = 5600

By further calculation
50r = 5600 – 5000 = 600
So we get
r = 600/50 = 12

Hence, the rate of interest is 12% p.a.

(ii) We know that
Interest for the second year = (5600 × 12 × 1)/ 100
= ₹ 672
So the amount at the end of second year = 5600 + 672
= ₹ 6272

(iii) We know that
Interest for the third year = (6272 × 12 × 1)/ 100
= ₹ 752.64
So the amount after third year = 6272 + 752.64
= ₹ 7024.64

9. Find the amount and the compound interest on ₹ 2000 at 10% p.a. for 2 years, compounded annually.
Solution:

It is given that
Principal (P) = ₹ 2000
Rate of interest (r) = 10% p.a.
Period (n) = 2 ½ years

We know that
Amount = $P (1 + r/100)^n$
Substituting the values
= $2000 (1 + 10/100)^2 (1 + 10/(2 \times 100))$
By further calculation
= 2000 × 11/10 × 11/10 × 21/20
So we get
= ₹ 2541

Here
Interest = A – P
Substituting the values
= 2541 – 2000
= ₹ 541

10. Find the amount and the compound interest on ₹ 50000 for 1 ½ years at 8% per annum with the interest being compounded semi-annually.
Solution:

It is given that
Principal (P) = ₹ 50000
Rate of interest (r) = 8% p.a. = 4% semi-annually
Period (n) = 1 ½ years = 3 semi-annually

We know that
Amount = $P (1 + r/100)^n$
Substituting the values
= $50000 (1 + 4/100)^3$
By further calculation
= $50000 (26/25)^3$
= 50000 × 26/25 × 26/25 × 26/25
= ₹ 56243.20

Here
Compound Interest = A – P
Substituting the values
= 56243.20 – 50000
= ₹ 6243.20

11. Calculate the amount and the compound interest on ₹ 5000 in 2 years when the rate of interest for successive years is 6% and 8% respectively.
Solution:

It is given that
Principal = ₹ 5000
Period = 2 years
Rate of interest for the first year = 6%
Rate of interest for the second year = 8%

We know that
Amount for two years = $P (1 + r/100)^n$
Substituting the values
= 5000 (1 + 6/100) (1 + 8/100)
By further calculation
= 5000 × 53/50 × 27/25
= ₹ 5724

Here
Interest = A – P
Substituting the values
= 5724 – 5000
= ₹ 724

12. Calculate the amount and the compound interest on ₹ 17000 in 3 years when the rate of interest for successive years is 10%, 10% and 14% respectively.
Solution:

It is given that
Principal = ₹ 17000
Period = 3 years
Rate of interest for 3 successive years = 10%, 10% and 14%

We know that
Amount after 3 years = $P (1 + r/100)^n$

Substituting the values
= 17000 (1 + 10/100) (1 + 10/100) (1 + 14/100)
By further calculation
= 17000 × 11/10 × 11/10 × 57/50
= ₹ 23449.80

Here
Amount of compound interest = A – P
Substituting the values
= 23449.80 – 17000
= ₹ 6449.80

13. A sum of ₹ 9600 is invested for 3 years at 10% per annum at compound interest.
(i) What is the sum due at the end of the first year?
(ii) What is the sum due at the end of the second year?
(iii) Find the compound interest earned in 2 years.
(iv) Find the difference between the answers in (ii) and (i) and find the interest on this sum for one year.
(v) Hence, write down the compound interest for the third year.
Solution:

It is given that
Principal = ₹ 9600
Rate of interest = 10% p.a.
Period = 3 years

We know that
Interest for the first year = Prt/100
Substituting the values
= (9600 × 10 × 1)/ 100
= ₹ 960

(i) Amount after one year = 9600 – 960 = ₹ 10560
So the principal for the second year = ₹ 10560
Here the interest for the second year = (10560 × 10 × 1)/ 100
= ₹ 1056

(ii) Amount after two years = 10560 + 1056 = ₹ 11616

(iii) Compound interest earned in 2 years = 960 + 10560 = ₹ 2016

(iv) Difference between the answers in (ii) and (i) = 11616 – 10560 = ₹ 1056
We know that
Interest on ₹ 1056 for 1 year at the rate of 10% p.a. = (1056 × 10 × 1)/ 100
= ₹ 105.60

(v) Here
Principal for the third year = ₹ 11616
So the interest for the third year = (11616 × 10 × 1)/ 100
= ₹ 1161.60

14. The simple interest on a certain sum of money for 2 years at 10% p.a. is ₹ 1600. Find the amount due and the compound interest on this sum of money at the same rate after 3 years, interest being reckoned annually.
Solution:

It is given that
Period = 2 years
Rate = 10% p.a.

We know that
Sum = (SI × 100)/ (r × n)
Substituting the values
= (1600 × 100)/ (10 × 2)
= ₹ 8000

Here
Amount after 3 years = $P (1 + r/100)^n$
Substituting the values
= $8000 (1 + 10/100)^3$
By further calculation
= 8000 × 11/10 × 11/10 × 11/10
= ₹ 10648

So the compound interest = A – P
Substituting the values
= 10648 – 8000
= ₹ 2648

15. Vikram borrowed ₹ 20000 from a bank at 10% per annum simple interest. He lent it to his friend Venkat at the same rate but compounded annually. Find his gain after 2 years.
Solution:

First case-
Principal = ₹ 20000
Rate = 10% p.a.
Period = 2 ½ = 5/2 years

We know that
Simple interest = Prt/100
Substituting the values
= (20000 × 10 × 5)/ (100 × 2)
= ₹ 5000

Second case-
Principal = ₹ 20000
Rate = 10% p.a.
Period = 2 ½ years at compound interest

We know that
Amount = $P (1 + r/100)^n$

Substituting the values
$= 20000 (1 + 10/100)^2 (1 + 10/ (2 \times 100))^2$
By further calculation
$= 20000 \times 11/10 \times 11/10 \times 21/20$
= ₹ 25410

Here
Compound Interest = A – P
Substituting the values
= 25410 – 20000
= ₹ 5410

So his gain after 2 years = CI – SI
We get
= 5410 – 5000
= ₹ 410

16. A man borrows ₹ 6000 at 5% compound interest. If he repays ₹ 1200 at the end of each year, find the amount outstanding at the beginning of the third year.
Solution:

It is given that
Principal = ₹ 6000
Rate of interest = 5% p.a.

We know that
Interest for the first year = Prt/100
Substituting the values
$= (6000 \times 5 \times 1)/ 100$
= ₹ 300

So the amount after one year = 6000 + 300 = ₹ 6300
Principal for the second year = ₹ 6300
Amount paid = ₹ 1200
So the balance = 6300 – 1200 = ₹ 5100

Here
Interest for the second year = $(5100 \times 5 \times 1)/ 100$ = ₹ 255
Amount for the second year = 5100 + 255 = ₹ 5355
Amount paid = ₹ 1200
So the balance = 5355 – 1200 = ₹ 4155

17. Mr. Dubey borrows ₹ 100000 from State Bank of India at 11% per annum compound interest. He repays ₹ 41000 at the end of first year and ₹ 47700 at the end of second year. Find the amount outstanding at the beginning of the third year.
Solution:

It is given that
Borrowed money (P) = ₹ 100000
Rate = 11% p.a.

Time = 1 year
We know that
Amount after first year = Prt/100
Substituting the values
= (100000 × 11 × 1)/ 100
By further calculation
= 100000 + 11000
= ₹ 111000

Amount paid at the end of first year = ₹ 41000
So the principal for second year = 111000 – 41000
= ₹ 70000

We know that
Amount after second year = P + (70000 × 11)/ 100
By further calculation
= 70000 + 700
= ₹ 77700
So the amount paid at the end of second year = ₹ 47700
Here the amount outstanding at the beginning year = 77700 – 47700
= ₹ 30000

18. Jaya borrowed ₹ 50000 for 2 years. The rates of interest for two successive years are 12% and 15% respectively. She repays ₹ 33000 at the end of first year. Find the amount she must pay at the end of second year to clear her debt.
Solution:

It is given that
Amount borrowed by Jaya = ₹ 50000
Period (n) = 2 years
Rate of interest for two successive years are 12% and 15% respectively

We know that
Interest for the first year = Prt/100
Substituting the values
= (50000 × 12 × 1)/ 100
= ₹ 6000
So the amount after first year = 50000 + 6000 = ₹ 56000
Amount repaid = ₹ 33000

Here
Balance amount for the second year = 56000 – 33000 = ₹ 23000
Rate = 15%
So the interest for the second year = (230000 × 15 × 1)/ 100
= ₹ 3450
Amount paid after second year = 23000 + 3450 = ₹ 26450

EXERCISE 2.2

1. Find the amount and the compound interest on ₹ 5000 for 2 years at 6% per annum, interest payable yearly.
Solution:

It is given that
Principal (P) = ₹ 5000
Rate of interest (r) = 6% p.a.
Period (n) = 2 years

We know that
Amount = $P (1 + r/100)^n$
Substituting the values
= $5000 (1 + 6/100)^2$
By further calculation
= 5000 × 53/50 × 53/50
= ₹ 5618

Here
CI = A – P
Substituting the values
= 5618 – 5000
= ₹ 618

2. Find the amount and the compound interest on ₹ 8000 for 4 years at 10% per annum interest reckoned yearly.
Solution:

It is given that
Principal (P) = ₹ 8000
Rate of interest (r) = 10% p.a.
Period (n) = 4 years

We know that
Amount = $P (1 + r/100)^n$
Substituting the values
= $8000 (1 + 10/100)^4$
By further calculation
= 8000 × 11/10 × 11/10 × 11/10 × 11/10
= ₹ 11712.80

Here
CI = A – P
Substituting the values
= 11712.80 – 8000
= ₹ 3712.80

3. If the interest is compounded half yearly, calculate the amount when the principal is ₹ 7400, the rate of interest is 5% and the duration is one year.

Solution:

It is given that
Principal (P) = ₹ 7400
Rate of interest (r) = 5%
Period (n) = 1 year

We know that
$A = P (1 + r/(2 \times 100))^{2\times n}$
Substituting the values
$= 7400 (1 + 5/200)^2$
By further calculation
$= 7400 \times 205/200 \times 205/200$
= ₹ 7774.63

4. Find the amount and the compound interest on ₹ 5000 at 10% p.a. for 1 year. Find the compound interest reckoned semi-annually.
Solution:

It is given that
Principal (P) = ₹ 5000
Rate of interest = 10% p.a. or 5% half-yearly
Period (n) = 1 ½ years or 3 half-years

We know that
$A = P (1 + r/100)^n$
Substituting the values
$= 5000 (1 + 5/100)^3$
By further calculation
$= 5000 \times 21/20 \times 21/20 \times 21/20$
= ₹ 5788.12

Here
CI = A – P
Substituting the values
= 5788.12 – 5000
= ₹ 788.12

5. Find the amount and the compound interest on ₹ 100000 compounded quarterly for 9 months at the rate of 4% p.a.
Solution:

It is given that
Principal (P) = ₹ 100000
Rate of interest = 4% p.a. or 1% quarterly
Period (n) = 9 months or 3 quarters

We know that
$A = P (1 + r/100)^n$
Substituting the values

$= 100000 (1 + 1/100)^3$
By further calculation
$= 100000 \times 101/100 \times 101/100 \times 101/100$
= ₹ 103030.10

Here
CI = A – P
Substituting the values
= 103030.10 – 100000
= ₹ 3030.10

6. Find the difference between CI and SI on sum of ₹ 4800 for 2 years at 5% per annum payable yearly.
Solution:

It is given that
Principal (P) = ₹ 4800
Rate of interest (r) = 5% p.a.
Period (n) = 2 years

We know that
SI = Prt/100
Substituting the values
= (4800 × 5 × 2)/ 100
= ₹ 480

If compounded yearly
$A = P (1 + r/100)^n$
Substituting the values
$= 4800 (1 + 5/100)^2$
By further calculation
$= 4800 \times 21/20 \times 21/20$
= ₹ 5292

Here
CI = A – P
Substituting the values
= 5292 – 4800
= ₹ 492

So the difference between CI and SI = 492 – 480 = ₹ 12

7. Find the difference between the simple interest and compound interest on 2 years at 4% per annum, compound interest being reckoned semi-annually.
Solution:

It is given that
Principal (P) = ₹ 2500
Rate of interest (r) = 4% p.a. or 2% half-yearly
Period (n) = 2 years or 4 half-years

We know that
SI = Prt/100
Substituting the values
= (2500 × 4 × 2)/100
= ₹ 200

If compounded semi-annually
$A = P (1 + r/100)^n$
Substituting the values
$= 2500 (1 + 2/100)^4$
By further calculation
= 2500 × 51/50 × 51/50 × 51/50 × 51/50
= ₹ 2706.08

We know that
CI = A – P
Substituting the values
= 2706.08 – 2500
= ₹ 206.08

So the difference between CI and SI = 206.08 – 200 = ₹ 6.08

8. Find the amount and the compound interest on ₹ 2000 in 2 years if the rate is 4% the first year and 3% for the second year.
Solution:

It is given that
Principal (P) = ₹ 2000
Rate of interest = 4% on the first year and 3% for the second year
Period (n) = 2 years

We know that
$Amount = P (1 + r/100)^n$
Substituting the values
= 2000 (1 + 4/100) (1 + 3/100)
By further calculation
= 2000 × 26/25 × 103/100
= ₹ 2142.40

Here
CI = A – P
Substituting the values
= 2142.40 – 2000
= ₹ 142.40

9. Find the compound interest on ₹ 3125 for 3 years if the rates of interest for the second and third year are respectively 4%, 5% and 6% per annum.
Solution:

It is given that

Principal (P) = ₹ 3125
Rate of interest for continuous = 4%, 5% and 6%
Period (n) = 3 years

We know that
Amount = $P (1 + r/100)^n$
Substituting the values
= $3125 (1 + 4/100) (1 + 5/100) (1 + 6/100)$
By further calculation
= $3125 \times 26/25 \times 21/50 \times 53/50$
= ₹ 3617.25

Here
CI = A – P
Substituting the values
= 3617.25 – 3125
= ₹ 492.25

10. What sum of money will amount to ₹ 9261 in 3 years at 5% per annum compound interest?
Solution:

It is given that
Amount (A) = ₹ 9261
Rate of interest (r) = 5% per annum
Period (n) = 3 years

We know that
$A = P (1 + r/100)^n$
Substituting the values
$9261 = P (1 + 5/100)^3$
By further calculation
$9261 = P (21/20)^3$
So we get
$P = (9261 \times 20 \times 20 \times 20)/ (21 \times 21 \times 21)$
P = ₹ 8000

Therefore, the sum of money is ₹ 8000.

11. What sum invested at 4% per annum compounded semi-annually amounts ₹ 7803 at the end of one year?
Solution:

It is given that
Amount (A) = ₹ 7803
Rate of interest (r) = 4% p.a. or 2% semi-annually
Period (n) = 1 year or 2 half years

We know that
$A = P (1 + r/100)^n$
Substituting the values

$= 7803 + (1 + 2/100)^2$
By further calculation
$= 7803 + (51/20)^2$
$= 7803 \times 50/51 \times 50/51$
= ₹ 7500

Hence, the principal is ₹ 7500.

12. What sum invested for 1.5 year amount to ₹ 132651 in 1 ½ years compounded half yearly at the rate of 4% p.a.?
Solution:

It is given that
Amount (A) = ₹ 132651
Rate of interest (r) = 4% p.a. or 2% half yearly
Period (n) = 1 ½ years or 3 half years

We know that
$A = P (1 + r/100)^n$
It can be written as
$P = A \div (1 + r/100)^n$
Substituting the values
$= 132651 \div (1 + 2/100)^3$
By further calculation
$= 132651 \div (51/50)^3$
So we get
$= 132651 \times (50/51)^3$
$= 132651 \times 50/51 \times 50/51 \times 50/51$
= ₹ 125000

Hence, the principal amount is ₹ 125000.

13. On what sum will the compound interest for 2 years at 4% per annum be ₹ 5712?
Solution:

It is given that
CI = ₹ 5712
Rate of interest (r) = 4% p.a.
Period (n) = 2 years

We know that
$A = P (1 + r/100)^n$
It can be written as
$CI = A – P = P (1 + r/100)^n – P$
$= P [(1 + r/100)^n – 1]$
Substituting the values
$5712 = P [(1 + 4/100)^2 – 1]$
$= P [(26/25)^2 – 1]$
By further calculation
$= P [676/625 – 1]$

Taking LCM
= P [(676 – 625)/ 625]
= P × 51/625
Here
P = 5712 × 625/51
= 112 × 625
= ₹ 70000

Hence, the principal amount is ₹ 70000.

14. A man invests ₹ 1200 for two years at compound interest. After one year the money amounts to ₹ 1275. Find the interest for the second year correct to the nearest rupee.
Solution:

It is given that
Principal = ₹ 1200
After one year, the amount = ₹ 1275
So the interest for one year = 1275 – 1200 = ₹ 75

We know that
Rate of interest = (SI × 100)/ (P × t)
Substituting the values
= (75 × 100)/ (1200 × 1)
By further calculation
= 75/12
= 25/4
= 6 ¼ % p.a.

Here
Interest for the second year on ₹ 1275 at the rate of 25/4% = Prt/100
Substituting the values
= (1275 × 25 × 1)/ (100 × 4)
By further calculation
= 1275/16
= ₹ 79.70
= ₹ 80

15. At what rate percent per annum compound interest will ₹ 2304 amount to ₹ 2500 in 2 years?
Solution:

It is given that
Amount = ₹ 2500
Principal = ₹ 2304
Period (n) = 2 years
Consider r% p.a. as the rate of interest

We know that
$A = P (1 + r/100)^n$
It can be written as
$(1 + r/100)^n = A/P$

Substituting the values
$(1 + r/100)^2 = 2500/2304$
By further calculation
$(1 + r/100)^2 = 625/576 = (25/24)^2$
So we get
$1 + r/100 = 25/24$
$r/100 = 25/24 – 1$
Taking LCM
$r = 100/24 = 25/6 = 4\ 1/6$

Hence, the rate of interest is 4 1/6% p.a.

16. A sum compounded annually becomes 25/16 time of itself in two years. Determine the rate of interest.
Solution:

Consider sum (P) = x
Amount (A) = 25/16x
Period (n) = 2 years

We know that
$A/P = (1 + r/100)^n$
Substituting the values
$25x/16x = (1 + r/100)^2$
By further calculation
$(1 + r/100)^2 = (5/4)^2$
So we get
$1 + r/100 = 5/4$
$r/100 = 5/4 – 1/1 = 1/4$
By cross multiplication
$r = 100 \times ¼ = 25$

Hence, the rate of interest is 25% p.a.

17. At what rate percent will ₹ 2000 amount to ₹ 2315.25 in 3 years at compound interest?
Solution:

It is given that
Principal (P) = ₹ 2000
Amount (A) = ₹ 2315.25
Period (n) = 3 years
Consider r% p.a. as the rate of interest

We know that
$A/P = (1 + r/100)^n$
Substituting the values
$2315.25/2000 = (1 + r/100)^3$
By further calculation
$(1 + r/100)^3 = 231525/(100 \times 2000) = 9261/8000 = (21/20)^3$
So we get
$1 + r/100 = 21/20$

It can be written as
r/100 = 21/20 – 1 = 1/20
r = 100/20 = 5

Hence, the rate of interest is 5% p.a.

18. If ₹ 40000 amounts to ₹ 48620.25 in 2 years, compound interest payable half-yearly, find the rate of interest per annum.
Solution:

It is given that
Principal (P) = ₹ 40000
Amount (A) = ₹ 48620.25
Period (n) = 2 years = 4 half years
Consider rate of interest = r% p.a. = r/2% half yearly

We know that
$A/P = (1 + r/100)^n$
Substituting the values
$48620.25/40000 = (1 + r/200)^4$
By further calculation
$(1 + r/200)^4 = 4862025/ (100 \times 40000) = 194481/160000$
So we get
$(1 + r/200)^4 = (21/20)^4$
It can be written as
1 + r/200 = 21/20
r/200 = 21/20 – 1 = 1/20
By cross multiplication
r = 200 × 1/20 = 10

Hence the rate of interest per annum is 10%.

19. Determine the rate of interest for a sum that becomes compounded semi-annually. A sum compounded annually becomes 216/125 times of itself in 1 ½ years.
Solution:

Consider principal (P) = x
Amount (A) = 216/125 x
Period (n) = 1 ½ years = 3 half years
Take rate percent per year = 2r% and r% half yearly

We know that
$A/P = (1 + r/100)^n$
Substituting the values
$216x/125x = (1 + r/100)^3$
By further calculation
$(1 + r/100)^3 = 216/125 = (6/5)^3$
So we get
1 + r/100 = 6/5
r/100 = 6/5 – 1 = 1/5

By cross multiplication
r = 100 × 1/5 = 20%
So the rate percent per year = 2 × 20 = 40%

20. At what rate percent p.a. compound interest would ₹ 80000 amounts to ₹ 88200 in two years, interest being compounded yearly. Also find the amount after 3 years at the above rate of compound interest.
Solution:

It is given that
Principal (P) = ₹ 80000
Amount (A) = ₹ 88200
Period (n) = 2 years
Consider r% per annum as the rate of interest percent

We know that
$A/P = (1 + r/100)^n$
Substituting the values
$88200/80000 = (1 + r/100)^2$
By further calculation
$(1 + r/100)^2 = 441/400 = (21/20)^2$
So we get
$1 + r/100 = 21/20$
$r/100 = 21/20 – 1 = 1/20$
By cross multiplication
$r = 1/20 × 100 = 5$

Hence, the rate of interest is 5% per annum.

21. A certain sum amounts to ₹ 5292 in 2 years and to ₹ 5556.60 in 3 years at compound interest. Find the rate and the sum.
Solution:

It is given that
Amount after 2 years = ₹ 5292
Amount after 3 years = ₹ 5556.60
So the difference = 5556.60 – 5292 = ₹ 264.60
Here ₹ 264.60 is the interest on ₹ 5292 for one year

We know that
Rate % = (SI × 100)/ (P × t)
Substituting the values
= (264.60 × 100)/ (5292 × 1)
Multiply and divide by 100
= (26460 × 100)/ (100 × 5292)
= 5%

Here
$A = P (1 + r/100)^n$
Substituting the values
$5292 = P (1 + 5/100)^2$

By further calculation
$P = 5292 \div (1 + 5/100)^2$
So we get
$P = 5292 \div (21/20)^2$
$P = 5292 \times 21/20 \times 21/20$
P = ₹ 4800

Hence, the rate is 5% and the sum is ₹ 4800.

22. A certain sum amounts to ₹ 798.60 after 3 years and ₹ 878.46 after 4 years. Find the interest rate and the sum.
Solution:

It is given that
Amount after 3 years = ₹ 798.60
Amount after 4 years = ₹ 878.46
So the difference = 878.46 – 798.60 = ₹ 79.86
Here ₹ 79.86 is the interest on ₹ 798.60 for 1 year.

We know that
Rate = (SI × 100)/ (P × t)
Substituting the values
= (79.86 × 100)/ (798.60 × 1)
Multiply and divide by 100
= (7986 × 100 × 100)/ (79860 × 100 × 1)
= 10%

Here
$A = P (1 + r/100)^n$
It can be written as
$P = A \div (1 + r/100)^n$
Substituting the values
$P = 798.60 \div (1 + 10/100)^3$
By further calculation
$P = 79860/100 \times 10/11 \times 10/11 \times 10/11$
P = ₹ 600

23. In what time will ₹ 15625 amount to ₹ 17576 at 4% per annum compound interest?
Solution:

It is given that
Amount (A) = ₹ 17576
Principal (P) = ₹ 15625
Rate = 4% p.a.
Consider n years as the period

We know that
$A/P = (1 + r/100)^n$
Substituting the values
$17576/15625 = (1 + 4/100)^n$

By further calculation
$(26/25)^3 = (26/25)^n$
So we get
n = 3

24. (i) In what time will ₹ 1500 yield ₹ 496.50 as compound interest at 10% per annum compounded annually?
(ii) Find the time (in years) in which ₹ 12500 will produce 3246.40 as compound interest at 8% per annum, interest compounded annually.
Solution:

(i) It is given that
Principal (P) = ₹ 1500
CI = ₹ 496.50
So the amount (A) = P + SI
Substituting the values
= 1500 + 496.50
= ₹ 1996.50
Rate (r) = 10% p.a.

We know that
$A = P (1 + r/100)^n$
It can be written as
$A/P = (1 + r/100)^n$
Substituting the values
$1996.50/1500 = (1 + 10/100)^n$
By further calculation
$199650/(1500 \times 100) = (11 /10)^n$
So we get
$1331/1000 = (11/10)^n$
$(11/10)^3 = (11/10)^n$
Here Time n = 3 years

(ii) It is given that
Principal (P) = ₹ 12500
CI = ₹ 3246.40
So the amount (A) = P + CI
Substituting the values
= 12500 + 3246.40
= ₹ 15746.40
Rate (r) = 8% p.a.

We know that
$A = P (1 + r/100)^n$
It can be written as
$A/P = (1 + r/100)^n$
Substituting the values
$15746.40/12500 = (1 + 8/100)^n$
Multiply and divide by 100
$1574640/ (12500 \times 100) = (27/25)^n$

By further calculation
$78732/ (12500 \times 5) = (27/ 25)^n$
$19683/ (3125 \times 5) = (27/25)^n$
So we get
$19683/15625 = (27/25)^n$
$(27/25)^3 = (27/25)^n$
Here Period = 3 years

25. If ₹ 16000 invested at 10% p.a. compounded semi-annually, amounts to ₹ 18522, find the time period of investment.
Solution:

It is given that
Principal (P) = ₹ 16000
Amount (A) = ₹ 18522
Rate = 10% p.a. or 5% semi-annually
Consider period = n half years

We know that
$A/P = (1 + r/100)^n$
Substituting the values
$18522/16000 = (1 + 5/100)^n$
By further calculation
$9261/8000 = (21/20)^n$
So we get
$(21/20)^3 = (21/20)^n$
n = 3 half years

Here
Time = 3/2 = 1 ½ years

26. What sum will amount to ₹ 2782.50 in 2 years at compound interest, if the rates are 5% and 6% for the successive years?
Solution:

It is given that
Amount (A) = ₹ 2782.50
Rate of interest for two successive years = 5% and 6%

We know that
$A = P (1 + r/100)^n$
Substituting the values
$2782.50 = P (1 + 5/100) (1 + 6/100)$
By further calculation
$2782.50 = P \times 21/20 \times 53/50$
So we get
$P = 2782.50 \times 20/21 \times 50/53$
Multiply and divide by 100
$P = 278250/100 \times 20/21 \times 50/53$
P = ₹ 2500

Hence, the principal is ₹ 2500.

27. A sum of money is invested at compound interest payable annually. The interest in two successive years is ₹ 225 and ₹ 240. Find:
(i) the rate of interest
(ii) the original sum
(iii) the interest earned in the third year.
Solution:

It is given that
Interest for the first year = ₹ 225
Interest for the second year = ₹ 240
So the difference = 240 – 225 = ₹ 15
Here ₹ 15 is the interest on ₹ 225 for 1 year

(i) Rate = (SI × 100)/ (P × t)
Substituting the values
= (15 × 100)/ (225 × 1)
So we get
= 20/3
= 6 2/3% p.a.

(ii) We know that
Sum = (SI × 100)/ (R × t)
Substituting the values
= (225 × 100)/ (20/3 × 1)
It can be written as
= (225 × 100 × 3)/ (20 × 1)
So we get
= 225 × 15
= ₹ 3375

(iii) Here
Amount after second year = 225 + 240 + 3375 = ₹ 3840
So the interest for the third year = Prt/100
Substituting the values
= (3840 × 20 × 1)/ (100 × 3)
= ₹ 256

28. On what sum of money will the difference between the compound interest and interest for 2 years be equal to ₹ 25 if the rate of interest charged for both is 5% p.a.
Solution:

It is given that
Sum (P) = ₹ 100
Rate (R) = 5% p.a.
Period (n) = 2 years

We know that
SI = PRT/100

Substituting the values
= (100 × 5 × 2)/ 100
= ₹ 10

So the amount when interest is compounded annually = $P (1 + R/100)^n$
Substituting the values
= $100 (1 + 5/100)^2$
By further calculation
= $100 × (21/20)^2$
= 100 × 21/20 × 21/20
So we get
= ₹ 441/4

Here
CI = A – P
Substituting the values
= 441/4 – 100
= ₹ 41/4

So the difference between CI and SI = 41/4 – 10 = ₹ ¼
If the difference is ₹ ¼ then sum = ₹ 100
If the difference is ₹ 25 then sum = (100 × 4)/ 1 × 25 = ₹ 10000

29. The difference between the compound interest for a year payable half-yearly simple interest on a certain sum of money lent out at 10% for a year is sum of money lent out.
Solution:

It is given that
Sum = ₹ 100
Rate = 10% p.a. or 5% half yearly
Period = 1 years or 2 half years

We know that
$A = P (1 + R/100)^n$
Substituting the values
= $100 (1 + 5/100)^2$
By further calculation
= 100 × 21/20 × 21/20
= ₹ 441/4

Here
CI = A – P
Substituting the values
= 441/4 – 100
= ₹ 41/4

SI = PRT/100
Substituting the values
= (100 × 10 × 1)/ 100
= ₹ 10

So the difference between CI and SI = 41/4 – 10 = ₹ ¼
Here if the difference is ₹ ¼ then sum = ₹ 100
If the difference is ₹ 15 then sum = (100 × 4 × 15)/ 1 = ₹ 6000

30. The amount at compound interest which is calculated yearly on a certain sum of ₹ 1250 after one year and ₹ 1375 after two years.
Solution:

It is given that
Amount after one year = ₹ 1250
Amount after two years = ₹ 1375
Here the difference = 1375 – 1250 = ₹ 125
So ₹ 125 is the interest on ₹ 1250 for 1 year

We know that
Rate of interest = (SI × 100)/ (P × t)
Substituting the values
= (125 × 100)/ (1250 × 1)
= 10%

31. The simple interest on a certain sum for 3 years is ₹ 225 and the compound interest ₹ 1250 in one year and ₹ 1375 in two years. Calculate the rate of interest on the same sum at the same rate for 2 years is ₹ 153. Find the rate of interest and principal.
Solution:

It is given that
SI for 3 years = ₹ 225
SI for 2 years = (225 × 2)/ 3 = ₹ 150
CI for 2 years = ₹ 153
So the difference = 153 – 150 = ₹ 3

Here ₹ 3 is interest on one year i.e. ₹ 75 for one year
We know that
Rate = (SI × 100)/ (P × t)
Substituting the values
= (3 × 100)/ (75 × 1)
= 4%

SI for 3 years = ₹ 225
Rate = 4% p.a.
So principal = (SI × 100)/ (R × t)
Substituting the values
= (225 × 100)/ (4 × 3)
= ₹ 1875

32. Find the difference between compound interest on ₹ 8000 for compounded annually and semi-annually.
Solution:

It is given that
Principal (P) = ₹ 8000

Rate = 10% p.a. or 5% half-yearly
Period = 1 ½ years or 3 half years

Case 1 – When compounded annually
$A = P (1 + r/100)^n$
Substituting the values
$= 8000 (1 + 10/100) (1 + 5/100)$
By further calculation
$= 8000 \times 11/10 \times 21/20$
= ₹ 9240

We know that
CI = A – P
Substituting the values
= 9240 – 8000
= ₹ 1240

Case 2 – When compounded half-yearly
$A = P (1 + r/100)^n$
Substituting the values
$= 8000 (1 + 5/100)^3$
By further calculation
$= 8000 \times 21/20 \times 21/20 \times 21/20$
= ₹ 9261

We know that
CI = A – P
Substituting the values
= 9261 – 8000
= ₹ 1261

Here the difference between two CI = 1261 – 1240 = ₹ 21

33. A sum of money is lent out at compound interest for two years at 20% p.a., CI reckoned yearly. If the same sum of money is lent out at compound interest at same rate percent per annum, CI being reckoned half-yearly, it would have fetched ₹ 482 more by way of interest. Calculate the sum of money lent out.
Solution:

It is given hat
Sum = ₹ 100
Rate = 20% p.a. or 10% half-yearly
Period = 2 years or 4 half-years

Case 1 – When the interest is reckoned yearly
$A = P (1 + r/100)^n$
Substituting the values
$= 100 (1 + 20/100)^2$
By further calculation
$= 100 \times 6/5 \times 6/5$
= ₹ 144

We know that
CI = A – P
Substituting the values
= 144 – 100
= ₹ 44

Case 2 – When the interest is reckoned half-yearly
$A = P (1 + r/100)^n$
Substituting the values
$= 100 (1 + 10/100)^4$
By further calculation
= 100 × 11/10 × 11/10 × 11/10 × 11/10
= ₹ 146.41

We know that
CI = A – P
Substituting the values
= 146.41 – 100
= ₹ 46.41

So the difference between two CI = 46.41 – 44 = ₹ 2.41
If the difference is ₹ 2.41 then sum = ₹ 100
If the difference is ₹ 482 then sum = (100 × 482)/ 2.41
Multiplying and dividing by 100
= (100 × 482 × 100)/ 241
= ₹ 20000

34. A sum of money amounts to ₹ 13230 in one year and to ₹ 13891.50 in 1.5 years at compound interest, compounded semi-annually. Find the sum and the rate of interest p.a.
Solution:

It is given that
Amount after one year = ₹ 13230
Amount after 1 ½ years = ₹ 13891.50
So the difference = 13891.50 – 13230 = ₹ 661.50
Here ₹ 661.50 is the interest on ₹ 13230 for ½ years

We know that
Rate = (661.50 × 100 × 2)/ (13230 × 1)
Multiplying and dividing by 100
= (66150 × 100 × 2)/ (13230 × 1 × 100)
= 10% p.a.

Here
$A = P (1 + r/100)^n$
Substituting the values
$13891.50 = P (1 + 5/100)^3$
By further calculation
13891.50 = P × 21/20 × 21/20 × 21/20
So we get

P = 13891.50 × 20/21 × 20/21 × 20/21
P = ₹ 12000

EXERCISE 2.3

1. The present population of a town is 200000. Its population increases by 10% in the first year and 15% in the second year. Find the population of the town at the end of 2 years.
Solution:

We know that
Population after 2 years = Present population × $(1 + r/100)^n$
Here the present population = 200000

Population after first year = 200000 × $(1 + 10/100)^1$
By further calculation
= 200000 × 11/10
= 220000

Population after two years = 220000 × $(1 + 15/100)^1$
By further calculation
= 220000 × 23/20
= 253000

2. The present population of a town is 15625. If the population increases at the rate of 4% every year, what will be the increase in the population in next 3 years?
Solution:

It is given that
Present population (P) = 15625
Rate of increase (r) = 4% p.a.
Period (n) = 3 years

We know that
Population after 3 years = P $(1 + r/100)^n$
Substituting the values
= 15625 $(1 + 4/100)^3$
By further calculation
= 15625 × 26/25 × 26/25 × 26/25
= 17576

So the increase = 17576 – 15625 = 1951

3. The population of a city increase each year by 4% of what it had been at the beginning of two years of each year. If its present population is 6760000, find:
(i) its population 2 years hence
(ii) its population 2 years ago.
Solution:

It is given that
Present population = 6760000
Increase percent = 4% p.a.

(i) We know that

Population 2 years hence = $P (1 + r/100)^2$
Substituting the values
= $6760000 (1 + 4/100)^2$
By further calculation
= $6760000 \times 26/25 \times 26/25$
= 7311616

(ii) We know that A = 6760000
Population 2 years ago $P = A + (1 + r/100)^2$
Substituting the values
= $6760000 + (1 + 4/100)^2$
By further calculation
= $6760000 + (26/25)^2$
= $6760000 \times 25/26 \times 25/26$
= 6250000

4. The cost of a refrigerator is ₹ 9000. Its value depreciates at the rate of 5% ever year. Find the total depreciation in its value at the end of 2 years.
Solution:

It is given that
Present value (P) = ₹ 9000
Rate of depreciation (r) = 5% p.a.
Period (n) = 2 years

We know that
Value after 2 years = $P (1 – r/100)^n$
Substituting the values
= $9000 (1 – 5/100)^2$
By further calculation
= $9000 \times 19/20 \times 19/20$
= ₹ 8122.50

So the total depreciation = 9000 – 8122.50 = ₹ 877.50

5. Dinesh purchased a scooter for ₹ 24000. The value of the scooter is depreciating at the rate of 5% per annum. Calculate its value after 3 years.
Solution:

It is given that
Present value of scooter (P) = ₹ 24000
Rate of depreciation (r) = 5%
Period (n) = 3 years

We know that
Value after 3 years = $P (1 – r/100)^n$
Substituting the values
= $24000 (1 – 5/100)^3$
By further calculation
= $24000 \times 19/20 \times 19/20 \times 19/20$

= ₹ 20577

6. A farmer increases his output of wheat in his farm every year by 8%. This year produced 2187 quintals of wheat. What was the yearly produce of wheat two years ago?
Solution:

It is given that
Present production of wheat = 2187 quintals
Increase in production = 8% p.a.

We know that
Production of wheat 2 years ago = $A \div (1 + r/100)^n$
Substituting the values
= $2187 \div (1 + 8/100)^2$
By further calculation
= $2187 \div (27/25)^2$
So we get
= $2187 \times 25/27 \times 25/27$
= 1875 quintals

7. The value of a property decreases every year at the rate of 5%. If its present value is ₹ 411540, what was its value three years ago?
Solution:

It is given that
Present value of property = ₹ 411540
Rate of decrease = 5% p.a.

We know that
Value of property 3 years ago = $A \div (1 – r/100)^n$
Substituting the values
= $411540 \div (1 – 5/100)^3$
By further calculation
= $411540 \div (19/20)^3$
So we get
= $411540 \times 20/19 \times 20/19 \times 20/19$
= ₹ 480000

8. Ahmed purchased an old scooter for ₹ 16000. If the cost of the scooter after 2 years depreciates to ₹ 14440, find the rate of depreciation.
Solution:

It is given that
Present value = ₹ 16000
Value after 2 years = ₹ 14440
Consider r% p.a. as the rate of depreciation

We know that
$A/P = (1 – r/100)^n$
Substituting the values

$14440/16000 = (1 – r/100)^2$
By further calculation
$361/400 = (1 – r/100)^2$
$(19/20)^2 = (1 – r/100)^2$
We can write it as
$1 – r/100 = 19/20$
So we get
$r/100 = 1 – 19/20 = 1/20$
By cross multiplication
$r = 1/20 \times 100 = 5\%$

Hence, the rate of depreciation is 5%.

9. A factory increased its production of cars from 80000 in the year 2011-2012 to 92610 in 2014-15. Find the annual rate of growth of production of cars.
Solution:

It is given that
Production of cars in 2011-2012 = 80000
Production of cars in 2014-2015 = 92610
Period (n) = 3 years
Consider r% as the rate of increase

We know that
$A/P = (1 + r/100)^n$
Substituting the values
$92610/80000 = (1 + r/100)^3$
By further calculation
$(21/20)^3 = (1 + r/100)^3$
We can write it as
$1 + r/100 = 21/20$
$r/100 = 21/20 – 1 = 1/20$
By cross multiplication
$r = 1/20 \times 100 = 5$

Hence, the annual rate of growth of production of cars is 5% p.a.

10. The value of a machine worth ₹ 500000 is depreciating at the rate of 10% every year. In how many years will its value be reduced to ₹ 364500?
Solution:

It is given that
Present value = ₹ 500000
Reduced value = ₹ 364500
Rate of depreciation = 10% p.a.
Consider n years as the period

We know that
$A/P = (1 – r/100)^n$
Substituting the values

$364500/500000 = (1 – 10/100)^n$
By further calculation
$(9/10)^n = 729/1000 = (9/10)^3$
So we get
n = 3

Therefore, the period in which its value be reduced to ₹ 364500 is 3 years.

11. Afzal purchased an old motorbike for ₹ 16000. If the value of the motorbike after 2 years is ₹ 14440, find the rate of depreciation.
Solution:

It is given that
CP of an old motorbike = ₹ 16000
Price after 2 years = ₹ 14440
Consider r% as the rate of depreciation

We know that
$A/P = (1 – r/100)^n$
Substituting the values
$14440/16000 = (1 – r/100)^2$
By further calculation
$361/400 = (1 – r/100)^2$
$(19/20)^2 = (1 – r/100)^2$
So we get
$19/20 = 1 – r/100$
$r/100 = 1 – 19/20 = (20 – 19)/ 20 = 1/20$
By cross multiplication
r = 100/20 = 5

Hence, the rate of depreciation is 5%.

12. Mahindra set up a factory by investing ₹ 2500000. During the first two years, his profits were 5% and 10% respectively. If each year the profit was on previous year's capital, calculate his total profit.
Solution:

It is given that
Investment = ₹ 2500000
Rates of profit during first two years = 5% and 10%

We know that
Capital after two years (A) = $P (1 + r/100)^n$
Substituting the values
= 2500000 (1 + 5/100) (1 + 10/100)
By further calculation
= 2500000 × 21/20 × 11/10
= ₹ 2887500

So the net profit = A – P
Substituting the values

= 2887500 – 2500000
= ₹ 387500

13. The value of a property is increasing at the rate of 25% every year. By what percent will the value of the property increase after 3 years?
Solution:

It is given that
Original price of the property (P) = ₹ 100
Rate of increase (r) = 25% p.a.
Period (n) = 3 years

We know that
Increased value after 3 years = $P (1 + r/100)^n$
Substituting the values
= $100 (1 + 25/100)^3$
By further calculation
= 100 × 5/4 × 5/4 × 5/4
= ₹ 3125/16

Here
Increased value = 3125/16 – 100
Taking LCM
= (3125 – 1600)/ 16
= 1525/16

So the percent increase after 3 years = 1525/16 = 95 5/16%

CHAPTER TEST

1. ₹ 10000 was lent for one year at 10% per annum. By how much more will the interest be, if the sum was lent at 10% per annum, interest being compounded half yearly?
Solution:

It is given that
Principal = ₹ 10000
Rate of interest (r) = 10% p.a.
Period = 1 year

We know that
$A = P (1 + r/100)^n$
Substituting the values
$= 10000 (1 + 10/100)^1$
By further calculation
$= 10000 \times 11/10$
= ₹ 11000

Here
Interest = A – P
Substituting the values
= 11000 – 10000
= ₹ 1000

In case 2,
Rate (r) = 10% p.a. or 5% half-yearly
Period (n) = 1 year or 2 half-years

We know that
$A = P (1 + r/100)^n$
Substituting the values
$= 10000 (1 + 5/100)^2$
By further calculation
$= 10000 \times 21/20 \times 21/20$
= ₹ 11025

Here
Interest = A – P
Substituting the values
= 11025 – 10000
= ₹ 1025

So the difference between the two interests = 1025 – 1000 = ₹ 25

2. A man invests ₹ 3072 for two years at compound interest. After one year the money amounts to ₹ 3264. Find the rate of interest and the amount due at the end of second year.
Solution:

It is given that

Principal (P) = ₹ 3072
Amount (A) = ₹ 3264
Period (n) = 1 year

We know that
$A/P = (1 + r/100)^n$
Substituting the values
$3264/3072 = (1 + r/100)^1$
By further calculation
$1 + r/100 = 17/16$
$r/100 = 17/16 – 1 = 1/16$
By cross multiplication
$r = 100 \times 1/16 = 25/4 = 6\ ¼$

Hence, the rate of interest is 6 ¼%.

Here
Amount after 2 years $= 3072\ (1 + 25/\ (4 \times 100))^2$
By further calculation
$= 3072\ (1 + 1/16)^2$
So we get
$= 3072 \times 17/16 \times 17/16$
= ₹ 3468

Hence, the amount due at the end of 2 years is ₹ 3468.

3. What sum will amount to ₹ 28090 in two years at 6% per annum compound interest? Also find the compound interest.
Solution:

It is given that
Amount (A) = ₹ 28090
Rate (r) = 6% p.a.
Period (n) = 2 years

We know that
$P = A \div (1 + r/100)^n$
Substituting the values
$= 28090 \div (1 + 6/100)^2$
By further calculation
$= 28090 \div (53/50)^2$
So we get
$= 28090 \times 50/53 \times 50/53$
= ₹ 25000

Here
Amount of CI = A – P
Substituting the values
= 28090 – 25000
= ₹ 3090

4. The compound interest on a sum of money for 2 years is ₹ 1331.20 and the simple interest on the same sum for the same period at the same rate is ₹ 1280. Find the sum and the rate of interest per annum.
Solution:

It is given that
CI for 2 years = ₹ 1331.20
SI for 2 years = ₹ 1280
So the difference = 1331.20 – 1280 = ₹ 51.20

Here ₹ 51.20 is the simple interest on 1280/2 = ₹ 640 for one year
We know that
Rate = (SI × 100)/ (P × t)
Substituting the values
= (51.20 × 100)/ (640 × 1)
Multiplying and dividing by 100
= (5120 × 100)/ (100 × 640)
= 8% p.a.

So the SI for two years at the rate of 8% pa
Sum = (SI × 100)/ (r × t)
Substituting the values
= (1280 × 100)/ (8 × 2)
= ₹ 8000

5. On what sum will the difference between the simple and compound interest for 3 years if the rate of interest is 10% p.a.
Solution:

Consider sum (P) = ₹ 100
Rate (r) = 10% p.a.
Period (n) = 3 years

We know that
$A = P (1 + r/100)^n$
Substituting the values
$= 100 (1 + 10/100)^3$
By further calculation
= 100 × 11/10 × 11/10 × 11/10
= ₹ 133.10

Here
CI = A – P
Substituting the values
= 133.10 – 100
= ₹ 33.10

So the simple interest = PRT/100
Substituting the values
= (100 × 10 × 3)/ 100
= ₹ 30

Difference = 33.10 – 30 = ₹ 3.10

Here if the difference is ₹ 3.10 then sum = ₹ 100
If the difference is ₹ 232.50 then sum = (100 × 232.50)/ 3.10
Multiplying and dividing by 100
= (100 × 23250)/ 310
= ₹ 7500

6. The simple interest on a certain sum for 3 years is ₹ 1080 and the compound interest on the same sum at the same rate for 2 years is ₹ 741.60. Find:
(i) the rate of interest
(ii) the principal.
Solution:

It is given that
SI for 3 years = ₹ 1080
SI for 2 years = (1080 × 2)/ 3 = ₹ 720
CI for 2 years = ₹ 741.60
So the difference = 741.60 – 720 = ₹ 21.60
Here ₹ 21.60 is the SI on 720/2 = ₹ 360 for one year

(i) We know that
Rate = (SI × 100)/ (P × t)
Substituting the values
= (21.60 × 100)/ (360 × 1)
Multiply and divide by 100
= (2160 × 100)/ (100 × 360 × 1)
= 6%

(ii) ₹ 1080 is SI for 3 years at the rate of 6% p.a.
So the principal = (SI × 100)/ (r × t)
Substituting the values
= (1080 × 100)/ (6 × 3)
= ₹ 6000

7. In what time will ₹ 2400 amount to ₹ 2646 at 10% p.a. compounded semi-annually.
Solution:

It is given that
Amount (A) = ₹ 2646
Principal (P) = ₹ 2400
Rate (r) = 10% p.a. or 5% semi-annually
Consider Period = n half-years

We know that
$A/P = (1 + r/100)^n$
Substituting the values
$2646/2400 = (1 + 5/100)^n$
By further calculation
$(21/20)^n = 441/400 = (21/20)^2$

n = 2

Therefore, the time period is 2 half years or 1 year.

8. Sudarshan invested ₹ 60000 in a finance company and received ₹ 79860 after 1.5 years. Find the rate of interest per annum compounded half-yearly.
Solution:

It is given that
Principal (P) = ₹ 60000
Amount (A) = ₹ 79860
Period (n) = 1 ½ years = 3 half-years

We know that
$A/P = (1 + r/100)^n$
Substituting the values
$79860/60000 = (1 + r/100)^3$
By further calculation
$(1 + r/100)^3 = 1331/1000 = (11/10)^3$
We get
$1 + r/100 = 11/10$
$r/100 = 11/10 – 1 = 1/10$
By cross multiplication
$r = 1/10 \times 100 = 10\%$ half-yearly
$r = 10 \times 2 = 20\%$ p.a.

Therefore, the rate of interest per annum compounded half-yearly is 20%.

9. The population of a city is 320000. If the annual birth rate is 9.2% and the annual death rate is 1.7%, find the population after 3 years.
Solution:

It is given that
Birth rate = 9.2%
Death rate = 1.7%
So the net growth rate = 9.2 – 1.7 = 7.5%
Present population (P) = 320000
Period (n) = 3 years

We know that
Population after 3 years $(A) = P (1 + r/100)^n$
Substituting the values
$= 320000 (1 + 7.5/100)^3$
By further calculation
$= 320000 (1 + 3/40)^3$
$= 320000 \times (43/40)^3$
So we get
$= 320000 \times 43/40 \times 43/40 \times 43/40$
$= 397535$

10. The cost of a car, purchased 2 years ago, depreciates at the rate of 20% every year. If the present value of the car is ₹ 315600 find:
(i) value of car 2 years ago
(ii) value of car after 3 years
Solution:

It is given that
Present value of car = ₹ 315600
Rate of depreciation (r) = 20%

(i) We know that
Value of car 2 years ago = $A \div (1 - r/100)^n$
Substituting the values
$= 315600 \div (1 - 20/100)^2$
By further calculation
$= 315600 \times 5/4 \times 5/4$
= ₹ 493125

(ii) We know that
Value of car after 3 years = $315600 \times (1 - 20/100)^3$
By further calculation
$= 315600 \times 4/5 \times 4/5 \times 4/5$
= ₹ 161587.20

11. Amar Singh started a business with an initial investment of ₹ 400000. In the first year the loss was 4%, second year profit was 5% and 10% for the third year. Find the total amount after 3 years.
Solution:

It is given that
Investment (P) = ₹ 400000
Loss in the first year = 4%
Profit in the second year = 5%
Profit in the third year = 10%

We know that
Total amount after 3 years = $P (1 + r/100)^n$
Substituting the values
$= 400000 (1 - 4/100) (1 + 5/100) (1 + 10/100)$
By further calculation
$= 400000 \times 24/25 \times 21/20 \times 11/10$
= ₹ 443520

So the net profit after 3 years = 443520 – 400000 = ₹ 43520