Exercise 8.1

1. Find the simple interest on Rs 4000 at 7.5% p.a. for 3 years 3 months. Also, find the amount.

Solution:

Here

Principal (P) = Rs 4000

Rate of interest (R) = 7.5% p.a.

= (15 / 2) % p.a.

Time (T) = 3 years 3 months

=

$$3\frac{3}{12}\text{years}$$

=

$$3\frac{1}{4}\text{years}$$

= 13 / 4 years

Hence,

Simple Interest (I) = (P × R × T) / 100

= Rs {4000 × (15 / 2) × (13 / 4)} / 100

= Rs (4000 × 15 × 13) / (100 × 2 × 4)

On simplification, we get,

= Rs 5 × 15 × 13

= Rs 975

Therefore,

Amount = P + I

= Rs 14000 + Rs 975

= RS 14, 975

2. What sum of money will yield Rs 170.10 as simple interest in 2 years 3 months at 6% per annum?

Solution:

Here

I = Rs 170.10

T = 2 years 3 months

=

$2\dfrac{3}{12}$years

=

$2\dfrac{1}{4}$years

= 9 / 4 years

R = 6%

Hence,

P = (I × 100) / (R × T)

= Rs (170.10 × 100) / {6 × (9 / 4)}

On calculating further, we get,

= Rs (170.10 × 100 × 4) / (6 × 9)

= Rs (17010 × 4) / (6 × 9)

= Rs (17010 × 2) / (3 × 9)

= Rs 34020 / 27

= Rs 1260

3. Find the rate of interest when Rs 800 fetches Rs 130 as a simple interest in 2 years 6 months.

Solution:

Here

P = Rs 800

T = 2 years 6 months

=

$2\dfrac{6}{12}$years

=

$2\dfrac{1}{2}$years

= 5 / 2 years

Hence,

R = (I × 100) / (P × T)

= (130 × 100) / {800 × (5 / 2)} % p.a.

On simplification, we get,

= (130 × 100 × 2) / (800 × 5) % p.a.

= (130 × 2) / 40 %

= 130 / 20 % p.a.

= 13 / 2 %

= 6.5% p.a.

Therefore, the required rate of interest is 6.5% p.a.

4. Find the time when simple interest on Rs 3.3 lakhs at 6.5% per annum is Rs 75075.

Solution:

Here,

P = 3.3 lakhs

= Rs 3.3 × 100000

= Rs 330000

R = 6.5% per annum

I = Rs 75075

Hence,

T = (I × 100) / (P × R)

= (75075 × 100) / (330000 × 6.5) years

= (75075 × 100 × 10) / (330000 × 65) years

On further calculation, we get,

= (75075) / (330 × 65) years

= 1155 / 330 years

We get,

= 7 / 2 years

=

$3\dfrac{1}{2}$years

5. Find the sum of money when

(i) simple interest at $7\dfrac{1}{4}$% p.a. for years is Rs 2356.25

(ii) the final amount is Rs 11300 at 4% p.a. for 3 years 3 months.

Solution:

(i) Here,

I = Rs 2356.25

R =

$7\dfrac{1}{4}$% p.a.

= 29 / 4 % p.a.

T =

$2\dfrac{1}{2}$years

= 5 / 2 years

Hence,

P = (I × 100) / (R × T)

= Rs (2356.25 × 100) / (29 / 4) × (5 / 2)

On further calculation, we get,

= Rs (2356.25 × 100 × 4 × 2) / (29 × 5)

= Rs (235625 × 8) / (29 × 5)

We get,

= Rs (47125 × 8) / 29

= Rs 1625 × 8

= Rs 13000

(ii) Amount (A) = Rs 11300

Rate (R) = 4% p.a.

Time (T) = 3 years 3 months

=

$3\dfrac{3}{12}$years

=

$3\dfrac{1}{4}$years

= 13 / 4 years

Let the principal be Rs x

Hence,

S.I. = (P × R × T) / 100

= Rs (x × 4 × 13) / (100 × 4)

We get,

= Rs 13x / 100

Then,

Amount = Principal + Simple Interest

= Rs x + Rs 13x / 100

= Rs (x + 13x) / 100

We get,

= Rs (100x + 13x) / 100

= Rs (113x / 100)

But, the amount given is Rs 11300

Hence,

113x / 100 = 11300

x = 11300 × 100 / 113

x = 100 × 100

We get,

x = 10000

Therefore, principal (P) = Rs 10000

6. How long will it take a certain sum of money to triple itself at $13\dfrac{1}{3}$ % per annum simple interest?

Solution:

Let the sum of money be x

Amount = 3 × Rs x

= Rs 3x

Interest = Amount – Principal

= Rs 3x – Rs x

= Rs 2x

Rate = $13\dfrac{1}{3}$% p.a.

= 40 / 3 % p.a.

Time (T) = (I × 100) / (P × R)

= (2x × 100) / x × (40 / 3) years

On further calculation, we get,

= (2 × 100 × 3) / 40 years

= (100 × 3) / 20 years

We get,

= 5 × 3 years

= 15 years

7. At a certain rate of simple interest Rs 4050 amounts to Rs 4576.50 in 2 years. At the same rate of simple interest, how much would Rs 1 lakh amount to in 3 years?

Solution:

Here,

P = Rs 40000

A = Rs 4576.50

T = 2 years

Interest = Amount – Principal

= Rs 4576.50 – Rs 4050

= Rs 526.50

Let the rate of simple interest = R% per annum

Then,

R = (I × 100) / (P × T)

= (526.50 × 100) / (4050 × 2) % p.a.

On further calculation, we get,

= (526.50 × 10) / (405 × 2) % p.a.

= 5265 / 810 % p.a.

We get,

= 6.5% p.a.

Now,

P = Rs 1 lakh

= Rs 100000

R = 6.5% p.a.

T = 3 years

I = (P × R × T) / 100

= Rs (100000 × 6.5 × 3) / 100

We get,

= RS 1000 × 6.5 × 3

= Rs 19500

Amount = Principal + Interest

= Rs 100000 + Rs 19500

= Rs 119500

8. What sum of money invested at 7.5% p.a. simple interest for 2 years produces twice as much interest as Rs 9600 in 3 years 6 months at 10% p.a. simple interest?

Solution:

First Case:

Principal (P_1) = Rs 9600

Rate (R_1) = 10%

Period = (T) = 3 years 6 months

=

$3\dfrac{1}{2}$years = 7 / 2 years

Simple interest = (P × R × T) / 100

= (9600 × 10 × 7) / (100 × 2)

We get,

= Rs 3360

Second case:

Simple interest = Rs 3360 × 2

= Rs 6720

Rate (R) = 7.5% p.a. and

Period (T) = 2 years

Therefore,

Principal = (S.I × 100) / (R × T)

= (6720 × 100) / (7.5 × 2)

= Rs (6720 × 100 × 10) / (75 × 2)

= 6720000 / 150

We get,

= Rs 44800

Exercise 8.2

1. Calculate the compound interest on Rs 6000 at 10% per annum for two years.

Solution:

Given

Rate of interest = 10% per annum

Principal for the first year = Rs 6000

Interest for the first year = Rs (6000 × 10 × 1) / 100

= Rs 600

Amount at the end of first year = Rs 6000 + Rs 600

= Rs 6600

Principal for the second year = Rs 6600

Interest for the second year = Rs (6600 × 10 × 1) / 100

= Rs 660

Amount for the second year = Rs 6600 + Rs 660

= Rs 7260

Therefore, compound interest for 2 years = final amount – (original) Principal

= Rs 7260 – Rs 6000

We get,

= Rs 1260

2. Salma borrowed from Mahila Samiti a sum of Rs 1875 to purchase a sewing machine. If the rate of interest is 4% per annum, what is the compound interest that she has to pay after 2 years?

Solution:

Principal for the first year = Rs 1875

Rate of interest = 4% p.a.

Interest for the first year = Rs (1875 × 4 × 1) / 100

= 75

Amount at the end of first year = Rs 1875 + Rs 75

= Rs 1950

Principal for the second year = Rs 1950

Interest for the second year = Rs (1950 × 4 × 1) / 100

= 78

Amount at the end of second year = Rs 1950 + Rs 78

= Rs 2028

Hence,

Compound interest paid by Salma = Final amount – (original) Principal

= Rs 2028 – Rs 1875

= Rs 153

3. Jacob invests Rs 12000 for 3 years at 10% per annum. Calculate the amount and the compound interest that Jacob will get after 3 years.

Solution:

Principal for the first year = Rs 12000

Rate of interest = 10% p.a.

Interest for the first year = Rs (12000 × 10 × 1) / 100

= Rs 1200

Amount at the end of first year = Rs 12000 + Rs 1200

= 13200

Principal for the second year = Rs 13200

Interest for the second year = Rs (13200 × 10 × 1) / 100

= Rs 1320

Amount at the end of second year = Rs 13200 + Rs 1320

= Rs 14520

Principal for the third year = Rs 14520

Interest for the third year = Rs (14520 × 10 × 1) / 100

= Rs 1452

Amount at the end of third year = Rs 14520 + Rs 1452

= Rs 15972

Hence,

Compound interest for 3 year = Final amount – (original) Principal

= Rs 15972 – Rs 12000

= Rs 3972

4. A man invests Rs 46875 at 4% per annum compound interest for 3 years.

Calculate:

(i) the interest for the first year

(ii) the amount standing to his credit at the end of second year

(iii) the interest for the third year

Solution:

(i) Principal for the first year = Rs 46875

Rate of interest = 4% per annum

Therefore,

Interest for the first year = Rs (46875 × 4 × 1) / 100

We get,

= Rs 46875 / 25

= Rs 1875

Hence, interest for the first year is Rs 1875

(ii) Amount at the end of first year

= Rs 46875 + Rs 1875

We get,

= Rs 48750

Principal for the second year = Rs 48750

Interest for the second year = Rs (48750 × 4 × 1) / 100

= Rs 48750 / 25

We get,

= Rs 1950

Amount at the end of second year = Rs 48750 + Rs 1950

We get,

= Rs 50700

Hence, the amount at the end of second year is Rs 50700

(iii) Principal for the third year = Rs 50700

Interest for the third year = Rs (50700 × 4 × 1) / 100

We get,

= Rs 507 × 4

= Rs 2028

Hence, the interest for the third year is Rs 2028

5. Calculate the compound interest for the second year on Rs 6000 invested for 3 years at 10% p.a. Also find the sum due at the end of third year.

Solution:

Principal for the first year = Rs 6000

Rate of interest = 10% p.a.

Interest for the first year = Rs (6000 × 10 × 1) / 100

= Rs 600

Amount at the end of first year = Rs 6000 + Rs 600

= Rs 6600

Principal for the second year = Rs 6600

Interest for the second year = Rs (6600 × 10 × 1) / 100

We get,

= Rs 660

Amount at the end of second year = Rs 6600 + Rs 660

= Rs 7260

Compound interest for the second year = Final amount – (original) Principal

= Rs 7260 – Rs 6000

= Rs 1260

Principal for the third year = Rs 7260

Interest for the third year = Rs (7260 × 10 × 1) / 100

We get,

= Rs 726

Amount at the end of third year = Rs 7260 + Rs 726

= Rs 7986

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

Solution:

Principal for the first year = Rs 5000

Rate of interest = 6% p.a.

Interest for the first year = Rs (5000 × 6 × 1) / 100

= Rs 50 × 6

= Rs 300

Amount at the end of first year = Rs 5000 + Rs 300

= Rs 5300

Principal for the second year = Rs 5300

Rate of interest = 8% p.a.

Interest for the second year = Rs (5300 × 8 × 1) / 100

= Rs 53 × 8

We get,

= Rs 424

Amount for the second year = Rs 5300 + Rs 424

= Rs 5724

Compound interest for two years = Final amount – (original) Principal

= Rs 5724 – Rs 5000

We get,

= Rs 724

7. Calculate the difference between the compound interest and the simple interest on Rs 20000 in 2 years at 8% per annum.

Solution:

Principal (P) = Rs 20000

Rate (R) = 8% p.a.

Period (T) = 2 years

Hence,

Simple interest (S.I.) = PRT / 100

= Rs (20000 × 8 × 2) / 100

We get,

= Rs 3200

Now,

Amount on compound interest

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

$= RS\ 20000 \{1 + (8 / 100)\}^2$

On further calculation,

We get,

= Rs 20000 × (27 / 25) × (27 / 25)

= Rs 32 × 729

= Rs 23328

Therefore,

Compound interest = Final amount – (original) Principal

= Rs 23328 – Rs 20000

We get,

= Rs 3328

Hence,

Difference in compound interest – simple interest

= Rs 3328 – Rs 3200

= Rs 128

Exercise 8.3

1. Calculate the amount and compound interest on

(i) Rs 15000 for 2 years at 10% per annum compounded annually.

(ii) Rs 156250 for $1\frac{1}{2}$ **years at 8% per annum compounded half-yearly.**

(iii) Rs 100000 for 9 months at 4% per annum compounded quarterly.

Solution:

(i) Given

Principal (P) = Rs 15000

Rate (R) = 10% p.a.

Period (n) = 2 years

Hence,

Amount (A) = P $\{1 + (R / 100)\}^n$

= Rs 15000 $\{1 + (10 / 100)\}^2$

On further calculation, we get,

= Rs 15000 × (11 / 10) × (11 / 10)

We get,

= Rs 18150

Therefore,

Compound interest = Amount – Principal

= Rs 18150 – 15000

We get,

= Rs 3150

(ii) Principal (P) = Rs 156250

Rate (R) = 8% p.a. or 4% half-yearly

Period (n) =

$1\frac{1}{2}$ years

= 3 half-year

Therefore,

Amount (A) = P $\{1 + (R / 100)\}^n$

= Rs 156250 $\{1 + (4 / 100)\}^3$

On further calculation, we get,

= Rs 156250 × $(26 / 25)^3$

= Rs 156250 × (26 / 25) × (26 / 25) × (26 / 25)

We get,

= Rs 175760

Hence,

Compound interest = Amount – Principal

= Rs 175760 – Rs 156250

= Rs 19510

2. Find the difference between the simple interest and compound interest on Rs 4800 for 2 years at 5% per annum, compound interest being reckoned annually.

Solution:

Given

Principal (P) = Rs 4800

Rate (R) = 5% p.a.

Period (n) = 2 years

Therefore,

S.I. = PRT / 100

= (4800 × 5 × 2) / 100

We get,

= Rs 480

And when interest is compounded annually

Amount (A) = P $\{1 + (R / 100)\}^n$

= Rs 4800 $\{1 + (5 / 100)\}^2$

= Rs 4800 × (21 / 20) × (21 / 20)

We get,

= Rs 5292

Hence,

Compound interest = Amount – Principal

= Rs 5292 – Rs 4800

= Rs 492

Now,

Difference in compound interest and simple interest = Rs 492 – Rs 480

= Rs 12

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

Solution:

Given

Principal (P) = Rs 3125

Rate of interest for continuous 3 years = 4%, 5%, 6%

Period (n) = 3 years

Therefore,

Amount = $P \{1 + (r/100)\}^n$

= 3125 {1 + (4 / 100)} {1 + (5 / 100)} {1 + (6 / 100)}

On further calculation, we get,

= 3125 × (26 / 25) × (21 / 20) × (53 / 50)

We get,

= Rs 14469 / 4

= Rs 3617.25

Hence,

Compound interest = Amount – Principal

= Rs 3617. 25 – Rs 3125

= Rs 492. 25

4. Kamla borrowed Rs 26400 from a Bank to buy a scooter at a rate of 15% p.a. compounded yearly. What amount will she pay at the end of 2 years and 4 months to clear the loan?

Solution:

Given

Money borrowed (P) = Rs 26400

Rate (R) = 15% p.a.

Period (n) = 2 years 4 months

=

$$2\frac{4}{12}$$

=

$$2\frac{1}{3} \text{years}$$

Therefore,

Amount = $P \{1 + (R/100)\}^n$

= Rs 26400 $\{1 + (5/100)^2\} \times [1 + \{15/(3 \times 100)\}]^1$

On further calculation, we get,

= Rs 26400 × (23 / 20) × (23 / 20) × (21 / 20)

We get,

= Rs 366597 / 10

= Rs 36659.70

5. Anil borrowed Rs 18000 from Rakesh at 8% per annum simple interest for 2 years. If Anil had borrowed this sum at 8% per annum compound interest, what extra amount would he has to pay?

Solution:

Given

Money borrowed (P) = Rs 18000

Rate (R) = 8% p.a.

Time (n) = 2 years

Simple Interest = PRT / 100

= Rs (18000 × 8 × 2) / 100

= Rs 2880

In case of compound interest

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

= Rs 18000 {1 + (8 / 100)}^{2}

= Rs 18000 × (27 / 25)^2

= Rs 18000 × (27 / 25) × (27 / 25)

We get,

= Rs 104976 / 5

= Rs 20995.20

Hence,

Compound interest = Amount – Principal

= Rs 20995.20 – Rs 18000

= Rs 2995.20

Now,

Difference between compound interest and simple interest

= Rs 2995.20 – Rs 2880

= Rs 115.20

6. Mukesh borrowed 75000 from a bank. If the rate of interest is 12% per annum, find the amount he would be paying after $1\dfrac{1}{2}$ years if the interest is

(i) compounded annually

(ii) compounded half-yearly

Solution:

Given

Money borrowed (P) = Rs 75000

Rate (R) = 12% p.a. or 6% half- yearly

Period (n) =

$1\dfrac{1}{2}$years or 3 half-years

(i) When the interest compounded yearly

Amount (A) = P $\{1 + (R / 100)\}^n$

= Rs 75000 {1 + (12 / 100)} {1 + (6 / 100)}

= Rs 75000 × (28 / 25) × (53 / 50)

On simplification, we get,

= Rs 89040

(ii) When the interest compounded half-yearly

Then,

Amount = Rs 75000 $\{1 + (6 / 100)\}^3$

= Rs 75000 × $(53 / 50)^3$

= Rs 75000 × (53 / 50) × (53 / 50) × (53 / 50)

We get,

= Rs 446631 / 5

= Rs 89326.20

7. Aryaman invested Rs 10000 in a company, he would be paid interest at 7% per annum compounded annually. Find

(i) the amount received by him at the end of 2 years

(ii) the interest for the 3rd year

Solution:

(i) Given

Investment to a company (P) = Rs 10000

Rate of interest (R) = 7% p.a.

Period (n) = 2 years

Hence,

Amount (A) = P $\{1 + (R / 100)\}^n$

= Rs 10000 $\{1 + (7 / 100)\}^2$

= Rs 10000 × (107 / 100) × (107 / 100)

On simplification, we get,

= Rs 11449

(ii) Amount after 3rd year = Rs 11449 × (107 / 100)

We get,

= Rs 12250.43

Therefore,

Interest on the 3rd year = Rs 12250.43 – 11449

= Rs 801.43

8. What sum of money will amount to Rs 9261 in 3 years at 5% per annum compound interest?

Solution:

Given

Amount (A) = Rs 9261

Rate of interest = 5% p.a.

Time (T) = 3 years

Principal (P) =?

$A = P \{1 + (r / 100)\}^t$

$9261 = P \{1 + (5 / 100)\}^3$

We get,

$9261 = P (21 / 20)^3$

P = (9261 × 20 × 20 × 20) / (21 × 21 × 21)

On simplification, we get,

= Rs 8000

Therefore, the sum of money = Rs 8000

9. What sum invested for $1\dfrac{1}{2}$ years compounded half-yearly at the rate of 8% p.a. will amount to Rs 140608?

Solution:

Given

Amount (A) = Rs 140608

Rate (R) = 8% p.a. = 4% half-yearly

Period (n) =
$1\dfrac{1}{2}$ years = 3 half-year

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

$140608 = P \{1 + (4 / 100)\}^3$

$140608 = P (26 / 25)^3$

Therefore,

$P = 140608 \times (25 / 26) \times (25 / 26) \times (25 / 26)$

On further calculation, we get,

P = Rs 125000

Hence,

Principal = Rs 125000

10. At what rate percent will Rs 2000 amount to Rs 2315.25 in 3 years at compound interest?

Solution:

Given

Principal (P) = Rs 2000

Amount (A) = Rs 2315.25

Period (n) = 3 years

Let the rate of interest be r% p.a.

WKT

$A / P = \{1 + (r / 100)\}^n$

$2315.25 / 2000 = \{1 + (r / 100)\}^3$

$\{1 + (r / 100)\}^3 = (231525) / (100 \times 2000)$

On calculating, we get,

$\{1 + (r / 100)\}^3 = 9261 / 8000$

$\{1 + (r / 100)\}^3 = (21 / 20)^3$

We get,

$1 + (r / 100) = 21 / 20$

$r / 100 = (21 / 20) - 1$

$r / 100 = 1 / 20$

We get,

$r = 100 / 20$

$r = 5$

Therefore, rate of interest = 5% p.a.

11. If Rs 40000 amounts to Rs 46305 in $1\dfrac{1}{2}$ years, compound interest payable half-yearly, find the rate of interest per annum.

Solution:

Given

Principal (P) = Rs 40000

Amount (A) = Rs 46305

Period (n) =

$1\dfrac{1}{2}$ years = 3/2 years

So half yearly, 2n = 2 × (3/2) = 3 years.

Let the rate of interest be r% p.a.

WKT

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

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

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

On further calculation, we get,

$(1 + r / 100)^3 = 9261 / 8000$

$(1 + r / 100)^3 = (21 / 20)^3$

We get,

$(1 + r / 100) = (21 / 20)$

$r / 100 = (21 / 20) - 1$

$r / 100 = 1 / 20$

$r = 100 / 20$

We get,

r = 5

Therefore, rate of interest = 5% for half year.

So, 2 × 5 = 10% per annum.

12. In what time will Rs 15625 amount to Rs 17576 at 4% per annum compound interest?

Solution:

Given

Amount (A) = Rs 17576

Principal (P) = Rs 15625

Rate (R) = 4% p.a.

Let period be n years

WKT

A / P = {1 + (r / 100)}^{n}

17576 / 15625 = {1 + (4 / 100)}^{n}

We get,

$(26 / 25)^3 = (26 / 25)^n$

n = 3

Therefore, time = 3 years

13. Rs 16000 invested at 10% p.a. compounded semi-annually, amounts to Rs 18522. Find the time period of investment.

Solution:

Given

Principal (P) = Rs 16000

Amount (A) = Rs 18522

Rate (R) = 10% p.a. or 5% semi-annually

Let period be n half-years

WKT

A / P = {1 + (r / 100)}^{n}

18522 / 16000 = {1 + (5 / 100)}^{n}

On further calculation, we get,

$9261 / 8000 = (21 / 20)^n$

$(21 / 20)^3 = (21 / 20)^n$

So,

n = 3 half years

Therefore,

Time = 3 / 2 = $1\dfrac{1}{2}$years