Chapter 2

Compound Interest

Exercise 2.1

Question 1.

Find the amount and the compound interest on 8000 at 5% per annum for 2 year.

Solution:

It is given that

Principal = 8000

Rate of interest = 5% p.a

We know that

Interest for the first year = $\frac{prt}{100}$

Substituting the values

$= \frac{(8000 \times 5 \times 1)}{100}$

= 400

So the amount for the first year or principal for the second year = 8000 + 400 = 8400

Here

Interest for the second year = $\frac{(8000 \times 5 \times 1)}{100}$

So we get

= 420

We know that

Amount after the second year = 8400 + 420

= 8820

Total compound interest = 8820 – 8000

= 820

Question 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 = $\frac{prt}{100}$

Substituting the values

$= \frac{(46875 \times 4 \times 1)}{100}$

= 1875

So the amount after first year or principal for the second year = 46875 + 1875 = 48750

Here

Interest for the second year = $\frac{(48750 \times 4 \times 1)}{100}$

So we get

= 1950

(ii) we know that

Amount at the end of second year = 48750 + 1950

= 50700

(iii) Interest for the third year = $\frac{50700 \times 4 \times 1}{100}$ = 2028

Question 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 = $\frac{prt}{100}$

Substituting the values

$= \frac{(8000 \times 10 \times 1)}{100}$

= 800

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

(i) Interest for the second year = $\frac{(8000 \times 10 \times 1)}{100}$

= 880

So the amount after second year or principal for the third year = 8800 + 880 = 9680

Interest for the third year = $\frac{(9680 \times 10 \times 1)}{100}$

= 968

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

= 10648

Question 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 = $\frac{12800 \times 10 \times 1}{100}$

= 1408

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 = $\frac{14080 \times 10 \times 1}{100}$

= 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 = $\frac{15488 \times 10 \times 1}{100}$

= 1548.80

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

Question 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 of 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) = 2year

(i) we know that

Sum (p) = $\frac{(\text{SI} \times 100)}{(\text{R} \times \text{T})}$

Substituting the values

= $\frac{(1380 \times 100)}{(12 \times 2)}$

= 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) = $\text{P}\left(1 + \frac{R}{100}\right)^{n}$

Substituting the values

$= 5750 \left(1 + \frac{6}{100}\right)^2$

$5750 \times \left(\frac{53}{50}\right)^2$

So we get

$= 5750 \times \frac{53}{50} \times \frac{53}{50}$

$= 6460.70$

Here

Compound interest = A – p

Substituting the values

= 6460.70 – 5750

= 710.70

Question 6.

A person invests 10000 for two years at a certain rate of interest, compounded annually. At the end of one year this sum amount 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) = 1year

Sum amount (A) = 11,200

Rate of interest = ?

(i) We know that

Interest (I) = 11200 – 10000 = 1200

So the rate of interest

$$R = \frac{(I \times 100)}{(P \times T)}$$

Substituting the values

$$R = \frac{(1200 \times 100)}{(10000 \times 1)}$$

So we get

R = 12%

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

(ii) we know that

Period (T) = 2year

Rate of interest (R) = 12% p.a

Here

$$A = P\left(1 + \frac{R}{100}\right)^{t}$$

Substituting the values

$$A = 10000\left(1 + \frac{12}{100}\right)^{2}$$

By further calculation

$$A = 10000\left(\frac{28}{25}\right)^{2}$$

We can write it as

$A = 10000 \times \frac{28}{25} \times \frac{28}{25}$

So we get

$A = 16 \times 28 \times 28$

$A = 12544$

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

Question 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) = 2year

(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 = $\frac{(SI \times 100)}{(P \times T)}$

Substituting the values

= $\frac{(325 \times 100)}{(5000 \times 1)}$

So we get

= $\frac{13}{2}$

= 6.5% p.a

We know that

Interest for the second year = $\frac{(5325 \times 13 \times 1)}{(100 \times 2)}$

By further calculation

= $\frac{(213 \times 13)}{(4 \times 2)}$

So we get

= $\frac{2769}{8}$

= 346.12

So the amount after second year = 5325 + 346.12

We get

= 5671.12

= 5671 (to the nearest rupee)

Question 8.

A man invests 5000 for the three years at a certain rate of interest,

Compounded annually. At the end of one year it amounts to 5600.

Calcutale:

(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 = $\frac{prt}{100}$

Substituting the values

= $\frac{(5000 \times r \times 1)}{100}$

= 50r

Here

Amount = 5000 + 50r

We can write it as

5000 + 50r = 5600

By further calculation

50r = 5600 – 5000 = 600

So we get

R = $\frac{600}{50} = 12$

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

(ii) We know that

Interest for the second year = $\frac{(5600 \times 12 \times 1)}{100}$

= 672

So the amount at the end of second year = 5600 + 672

= 6272

(iii) we know that

Interest for the third year = $\frac{(6272 \times 12 \times 1)}{100}$

= 752.64

So the amount after third year = 6272 + 752.64

= 7024.64

Question 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) = $2\frac{1}{2}$ years

We know that

Amount = p $\left(1+\frac{r}{100}\right)^{n}$

Substituting the values

= 2000 $\left(1+\frac{10}{100}\right)^{2}\left(\frac{1+10}{2\times100}\right)$

By further calculation

= $2000\times\frac{11}{10}\times\frac{11}{10}\times\frac{21}{20}$

So we get

= 2541

Here

Interest = A – P

Substituting the values

= 2541 – 2000

= 541

Question 10.

Find the amount and the compound interest on 50000 for $1\frac{1}{2}$

Year 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) = $1\frac{1}{2}$ years, = 3 semi – annually

We know that

Amount = p (1 + $\frac{r}{100}$)^n

Substituting the values

= 50000 $\left(1 + \frac{4}{100}\right)^3$

By further calculation

= 50000 $\left(\frac{26}{25}\right)^3$

= 50000 $\times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25}$

= 56243.20

Here

Compound interest = A – P

Substituting the values

= 56243.20 – 50000

= 6243.20

Question 11.

Calculate the amount and the compound interest on5000 in 2 year when the rate of interest for successive is 6% and 8% respectively.

Solution:

It is given that

Principal = 5000

Period = 2year

Rate of interest for the first year = 6%

Rate of interest for the second year = 8%

We know that

Amount for two years = $P\left(1+\frac{r}{100}\right)^{n}$

Substituting the values

$= 5000\left(1+\frac{6}{100}\right)\left(1+\frac{8}{100}\right)$

By further calculation

$= 5000 \times \frac{53}{50} \times \frac{27}{25}$

$= 5724$

Here

Interest = A – P

Substituting the values

= 5724 – 5000

= 724

Question 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 = 3years

Rate of interest for 3 successive years = 10% , 10% and 14%

We know that

Amount after 3 years = $\left(1+\frac{r}{100}\right)^{n}$

Substituting the values

= $17000\left(1+\frac{10}{100}\right)\left(1+\frac{10}{100}\right)\left(1+\frac{14}{100}\right)$

By further calculation

= $17000\times\frac{11}{10}\times\frac{11}{10}\times\frac{57}{50}$

= 23449.80

Here

Amount of compound interest = A – P

Substituting the values

= 23449.80 – 17000

= 6449.80

Question 13.

A sum of 9600 is invested for 3 year 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 = 3year

We know that

Interest for the first year = $\frac{prt}{100}$

Substituting the values

= $\frac{(9600 \times 10 \times 1)}{100}$

= 960

(i) Amount after one year = 9600 – 960 = 10560

So the principal for the second year = 10560

So the principal for the second year = 10560

Here the interest for the second year = $\frac{(10560 \times 10 \times 1)}{100}$

= 1056

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

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

(iv) Difference between the answer in (ii) and (i) = 11616 – 10560 = 1056

We know that

Interest on 1056 for 1 year at the rate of 10% p.a = $\left(\frac{1056 \times 10 \times 1}{100}\right)$

= 105.60

(v) here

Principal for the third year = 11616

So the interest for the third year = $\frac{(11616 \times 10 \times 1)}{100}$

= 1161.60

Question 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 = $\frac{(\text{SI} \times 100)}{(\text{r} \times \text{n})}$

Substituting the values

= $\frac{(1600 \times 100)}{(10 \times 2)}$

= 8000

Here

Amount after 3 years = P $\left(1 + \frac{r}{100}\right)^n$

Substituting the values

= 8000 $\left(1 + \frac{10}{100}\right)^3$

By further calculation

= 8000$\times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}$

= 10648

So the compound interest = A – P

Substituting the values

= 10648 – 8000

= 2648

Question 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-

Principl = 20000

Rate = 10% p.a

Period = $2\frac{1}{2} = \frac{5}{2}\ years$

We know that

Simple interest = $\frac{prt}{100}$

Substituting the values

= $\frac{(20000 \times 10 \times 5)}{(100 \times 2)}$

= 5000

Second case –

Principal = 20000

Rate = 10% p.a

Period = $2\frac{1}{2}$ years at compound interest

We know that

Amount = $P\left(1+\frac{r}{100}\right)^{n}$

Substituting the values

$= 20000\left(1+\frac{10}{100}\right)^{2}\left(\frac{1+10}{2\times100}\right)^{2}$

By further calculation

$= 20000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{21}{20}$

= 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

Question 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 = 60000

Rate of interest = 5%

We know that

Interest for the first year = $\frac{prt}{100}$

Substituting the values

$= \frac{(6000 \times 5 \times 1)}{100}$

= 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 = $\frac{(5100 \times 5 \times 1)}{100}$ = 255

Amount for the second year = 5100 + 225 = 5355

Amount paid = 1200

So the balance = 5355 – 1200 = 4155

Question 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 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 = 1year

We know that

Amount after first year = $\frac{prt}{100}$

Substituting the values

= $\left(\frac{100000 \times 11 \times 1}{100}\right)$

By further calculation

= 100000 + 11000

= 111000

Amount paid at the end of first year = 41000

= 70000

We know that

Amount after second year = p + $\frac{(70000 \times 11)}{100}$

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

Question 18.

Jaya borrowed 50000 for 2 years. The rates of interest for two successive year 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) = 2year

Rate of interest for two successive years are 12% and 15% respectively we know that

Interest for the first year = $\frac{prt}{100}$

Substituting the values

= $\frac{(50000 \times 12 \times 1)}{100}$

= 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 = $\frac{(230000 \times 15 \times 1)}{100}$

= 3450

Amount paid after second year = 23000 + 3450 = 26450

Exercise 2.2

Question 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) = 2year

We know that

Amount = $P\left(1+\frac{r}{100}\right)^{n}$

Substituting the values

$= 5000\left(1+\frac{6}{100}\right)^{2}$

By further calculation

$= 5000 \times \frac{53}{50} \times \frac{53}{50}$

$= 5618$

Here

CI = A –P

Substituting the values

= 5618 – 5000

= 618

Question 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) = 4years

We know that

Amount = $P\left(1+\frac{r}{100}\right)^{n}$

Substituting the values

= $8000\left(1+\frac{10}{100}\right)^{4}$

By further calculation

= $8000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}$

= 11712.80

Here

CI = A – P

Substituting the values

= 11712.80 – 8000

= 3712.80

Question 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) = 1year

We know that

$A = P\left(1 + \frac{r}{2\times100}\right)^{2\times n}$

Substituting the values

$= 7400\left(1 + \frac{5}{200}\right)^{2}$

By further calculation

$7400 \times \frac{205}{200} \times \frac{205}{200}$

= 7774.63

Question 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) = $1\frac{1}{2}$ years or 3 half – years

We know that

$$A = P\left(1 + \frac{r}{100}\right)^{n}$$

Substituting the values

$$= 5000\left(1 + \frac{5}{100}\right)^{3}$$

By further calculation

$$= 5000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}$$

$$= 5788.12$$

Here

CI = A – P

Substituting the values

= 5788.12 – 5000

= 788.12

Question 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) = 9months or 3 quarters
We know that

$= 100000\left(1 + \frac{1}{100}\right)^3$

By further calculation

$= 100000 \times \frac{101}{100} \times \frac{101}{100} \times \frac{101}{100}$

$= 103030.10$
Here
CI = A – P

Substituting the values

$= 103030.10 – 100000$
$= 3030.10$

Question 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) = 2year

We know that

SI = $\frac{prt}{100}$

Substituting the values

= $\frac{(4800 \times 5 \times 2)}{100}$

= 480

If compounded yearly

A = P $\left(1 + \frac{r}{100}\right)^n$

Substituting the values

= 4800 $\left(1 + \frac{5}{100}\right)^2$

By further calculation

= 4800 $\times \frac{21}{20} \times \frac{21}{20}$

= 5292

Here

CI = A – P

Substituting the values

= 5292 – 4800

= 492

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

Question 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 = $\frac{prt}{100}$

Substituting the values

= $\frac{(2500 \times 4 \times 2)}{100}$

= 200

If compounded semi – annually

A = P $\left(1 + \frac{r}{100}\right)^n$

Substituting the values

= 2500 $\left(1 + \frac{2}{100}\right)^4$

By further calculation

= 2500 $\times \frac{51}{50} \times \frac{51}{50} \times \frac{51}{50} \times \frac{51}{50}$

= 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

Question 8.

Find the amount and the compound interest on 2000 in2 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) = 2year
We know that

$$\text{Amount} = P\left(1+\frac{r}{100}\right)^{n}$$

Substituting the values

$$= 2000\left(1+\frac{4}{100}\right)\left(1+\frac{3}{100}\right)$$

By further calculation

$$= 2000 \times \frac{26}{25} \times \frac{103}{100}$$

= 2142.40
Here

CI = A – P

Substituting the values
= 2142.40-2000
= 142.40

Question 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) = 3years

We know that

Amount = p $\left(1+\frac{r}{100}\right)^{n}$

Substituting the values

= 3125 $\left(1+\frac{4}{100}\right)\left(1+\frac{5}{100}\right)\left(1+\frac{6}{100}\right)$

By further calculation

= 3125 $\times \frac{26}{25} \times \frac{21}{50} \times \frac{53}{50}$

= 3617.25
Here

CI = A – P

Substituting the values
= 3617.25 – 3125
= 492 . 25

Question 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
$A = P\left(1 + \frac{r}{100}\right)^n$

Substituting the values
$9261 = P\left(\frac{21}{20}\right)^3$
So we get
$P = 9261 \times \frac{20}{21} \times \frac{20}{21} \times \frac{20}{21}$

P = 8000

Therefore, the sum of money is 8000.

Question 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) = 1year or 2 half years
We know that

$$A = P\left(1 + \frac{r}{100}\right)^n$$

Substituting the values

$$= 7803 + \left(1 + \frac{2}{100}\right)^2$$

By further calculation

$$= 7803 + \left(\frac{51}{20}\right)^2$$

$$= 7803 \times \frac{51}{20} \times \frac{51}{20}$$

$$= 7500$$

Hence, the principal is 7500

Question 12.

What sum invested for 1.5 year amount to 132651 in $1\frac{1}{2}$ 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) = $1\frac{1}{2}$ years or 3 half years.

We know that

$A = P\left(1 + \frac{r}{100}\right)^n$

It can be written as

$P = A \div \left(1 + \frac{r}{100}\right)^n$

Substituting the values

$P = 132651 \div \left(1 + \frac{2}{100}\right)^3$

by further calculation

$= 132651 \div \left(\frac{51}{50}\right)^3$

So we get

$132651 \times \frac{51}{50} \times \frac{51}{50} \times \frac{51}{50}$

$= 125000$

Hence, the principal amount is 125000.

Question 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) = 2year

We know that

$A = P\left(1 + \frac{r}{100}\right)^n$

It can be written as

$CI = A - P = P\left(1 + \frac{r}{100}\right)^n - P$

$= P\left[\left(1 + \frac{r}{100}\right)^n - 1\right]$

Substituting the values

$5712 = p\left[\left(1 + \frac{4}{100}\right)\right]^2 - 1$

Substituting the values

$5712 = P\left[\left(1 + \frac{4}{100}\right)\right]^2 - 1$

$= P\left[\left(\frac{26}{25}\right)^2 - 1\right]$

By further calculation

$= P\left[\frac{676}{625} - 1\right]$

Taking LCM

$= P\left[\left(\frac{676-625}{625}\right)\right]$

$= P \times \frac{51}{625}$

Here

$P = 5712 \times \frac{625}{51}$

$= 112 \times 625$

$= 70000$

Hence , the principal amount is 70000 .

Question 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 = $\frac{SI \times 100}{p \times t}$

Substituting the values

$= \left(\frac{75 \times 100}{1200 \times 1}\right)$

By further calculation

$= \frac{75}{12}$

$= \frac{25}{4}$

$= 6\frac{1}{4}\% \; p.a$

Here

Interest for the second year on 1275 at the rate of $\frac{25}{4}\%$ $= \frac{prt}{100}$

Substituting the values

$= \left(\frac{1275 \times 25 \times 1}{100 \times 4}\right)$

By further calculation

$= \frac{1275}{16}$

$= 79.70$

$= 80$

Question 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

$A = P\left(1 + \frac{r}{100}\right)^n$

It can be written as

$\left(1 + \frac{r}{100}\right)^n = \frac{A}{P}$

Substituting the values

$$\left(1+\frac{r}{100}\right)^2 = \frac{2500}{2304}$$

By further calculation

$$\left(1+\frac{r}{100}\right)^2 = \frac{625}{576} = \left(\frac{25}{24}\right)^2$$

So we get

$$\left(1+\frac{r}{100}\right) = \frac{25}{24}$$

$$\frac{r}{100} = \frac{25}{24} - 1$$

Taking LCM

$$r = \frac{100}{24} = \frac{25}{6} = 4\frac{1}{6}$$

hence , the rate of interest is $4\frac{1}{6}\%\ p.a$

Question 16.

A sum compounded annually becomes $\frac{25}{16}$ time of itself in two years. Determine the rate of interest.

Solution:

Consider sum (P) = x

Amount (A) = $\frac{25}{16}x$

Period (n) = 2year
We know that

$$\frac{A}{P} = \left(1 + \frac{r}{100}\right)^n$$

Substituting the values

$$\frac{25x}{16x} = \left(1 + \frac{r}{100}\right)^2$$

By further calculation

$$\left(1 + \frac{r}{100}\right)^2 = \left(\frac{5}{4}\right)^2$$

So we get

$$1 + \frac{r}{100} = \frac{5}{4}$$

$$\frac{r}{100} = \frac{5}{4} - \frac{1}{1} = \frac{1}{4}$$

By cross multiplication

$$r = 100 \times \frac{1}{4} = 25$$

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

Question 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

$$\frac{A}{p} = \left(1 + \frac{r}{100}\right)^n$$

Substituting the values

$$\frac{2315.25}{2000} = \left(1 + \frac{r}{100}\right)^3$$

By further calculation

$$\left(1 + \frac{r}{100}\right)^3 = \frac{231525}{100 \times 2000} = \frac{9261}{8000} = \left(\frac{21}{20}\right)^3$$

So we get

$$1 + \frac{r}{100} = \frac{21}{20}$$

It can be written as

$\frac{r}{100} = \frac{21}{20} - 1 = \frac{1}{20}$

$r = \frac{100}{20} = 5$

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

Question 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) = 2year = 4half years

Consider rate of interest = r% p.a = $\frac{r}{2}$ % half yearly
We know that

$\frac{A}{P} = \left(1 + \frac{r}{100}\right)^n$

Substituting the values

$\frac{48620.25}{40000} = \left(1 + \frac{r}{200}\right)^4$

By further calculation

$\left(1 + \frac{r}{200}\right)^4 = \frac{4862025}{(100 \times 40000)} = \frac{194481}{160000}$

So we get

$$\left(1+\frac{r}{200}\right)^4 = \left(\frac{21}{20}\right)^4$$

It can be written as

$$1+\frac{r}{200} = \frac{21}{20}$$

$$\frac{r}{200} = \frac{21}{20} - 1 = \frac{1}{20}$$

By cross multiplication

$r = 200 \times \frac{1}{20} = 10$

hence the rate of interest per annum is 10%

Question 19.

Determine the rate of interest for a sum that becomes compounded semi – annually. A sum compounded annually becomes $\frac{216}{125}$ times of itself in $1\frac{1}{2}$ years.

Solution:

Consider principal (P) = x

Amount (A) = $\frac{216}{125}$ x

Period (n) = $1\frac{1}{2}$ years = 3 half years

Take rate percent per year = 2r% and r% half yearly
We know that

$$\frac{A}{P} = \left(1 + \frac{r}{100}\right)^n$$

Substituting the values

$$\frac{216}{125}x = \left(1 + \frac{r}{100}\right)^3$$

By further calculation

$$\left(1 + \frac{r}{100}\right)^3 = \frac{216}{125} = \left(\frac{6}{5}\right)^3$$

So we get

$$1 + \frac{r}{100} = \frac{6}{5}$$

$$\frac{r}{100} = \frac{6}{5} - 1 = \frac{1}{5}$$

By cross multiplication

$$r = 100 \times \frac{1}{5} = 20\%$$

so the rate percent per year = $2 \times 20 = 40\%$

Question 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 rate of compound interest.

Solution:

It is given that

Principal (P) = 80000

Amount (A) = 88200

Period (n) = 2year

Consider r% per annum as the rate of interest percent

We know that

$$\frac{A}{P} = \left(1 + \frac{r}{100}\right)^n$$

Substituting the values

$$\frac{88200}{80000} = \left(1 + \frac{r}{100}\right)^2$$

By further calculation

$$\left(1 + \frac{r}{100}\right)^2 = \frac{441}{400} = \left(\frac{21}{20}\right)^2$$

So we get

$$1 + \frac{r}{100} = \frac{21}{20}$$

$$\frac{r}{100} = \frac{21}{20} - 1 = \frac{1}{20}$$

By cross multiplication

$$r = \frac{1}{20} \times 100 = 5$$

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

Question 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 – 5292 = 264.60
Here 264.60 is the interest on 5292 for one year
We know that

Rate % = $\left(\frac{SI \times 100}{P \times T}\right)$

Substituting the values

$= \frac{(264.60 \times 100)}{(5292 \times 1)}$

Multiply and divide by 100

$= \frac{(26460 \times 100)}{(100 \times 5292)}$
= 5%

Here
A = P $\left(1 + \frac{r}{100}\right)^n$

Substituting the values

$5292 = P\left(1 + \frac{5}{100}\right)^2$

By further calculation

$P = 5292 \div \left(1 + \frac{5}{100}\right)^2$

So we get

$P = 5292 \div \left(\frac{21}{20}\right)^2$

$P = 5292 \times \frac{21}{20} \times \frac{21}{20}$

$P = 4800$

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

Question 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

$\text{Rate} = \left(\frac{\text{SI} \times 100}{\text{P} \times \text{t}}\right)$

Substituting the values

$= \frac{79.86 \times 100}{798.60 \times 1}$

= 10 %

Here

$A = P\left(1 + \frac{r}{100}\right)^n$

It can be written as

$P = A \div \left(1 + \frac{r}{100}\right)^n$

Substituting the values

$P = 798.60 \div \left(1 + \frac{10}{100}\right)^3$

By further calculation

$P = \frac{79860}{100} \times \frac{10}{11} \times \frac{10}{11} \times \frac{10}{11}$

P = 600

Question 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%
Consider n years as the period
We know that

$$\frac{A}{P} = \left(1 + \frac{r}{100}\right)^n$$

Substituting the values

$$\frac{17576}{15625} = \left(1 + \frac{4}{100}\right)^n$$

By further calculation

$$\left(\frac{26}{25}\right)^3 = \left(\frac{26}{25}\right)^n$$

So we get
n = 3

Question 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

So teh amount (A) = P + SI

Substituting the values

= 1500 + 496 .50

= 1996.50

Rate (r) = 10% p.a

We know that

$$A = P\left(1 + \frac{r}{100}\right)^n$$

It can be written as

$$\frac{A}{P} = \left(1 + \frac{r}{100}\right)^n$$

Substituting the values

$$\frac{1996.50}{1500} = \left(1 + \frac{10}{100}\right)^n$$

By further calculation

$$\frac{199650}{(1500 \times 100)} = \left(\frac{11}{10}\right)^n$$

So we get

$\frac{1331}{1000} = \left(\frac{11}{10}\right)^n$

$\left(\frac{11}{10}\right)^3 = \left(\frac{11}{10}\right)^n$

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 $\left(1 + \frac{r}{100}\right)^n$
It can be written as
$\frac{A}{P} = \left(1 + \frac{r}{100}\right)^n$
Substituting the values
$\frac{15746.40}{12500} = \left(1 + \frac{8}{100}\right)^n$
Multiply and divide by 100
$\frac{1574640}{(12500 \times 100)} = \left(\frac{27}{25}\right)^n$
By further calculation
$\frac{78732}{(12500 \times 5)} = \left(\frac{27}{25}\right)^n$

$$\frac{19683}{(3125 \times 5)} = \left(\frac{27}{25}\right)^n$$

So we get

$$\frac{19683}{15625} = \left(\frac{27}{25}\right)^n$$

$$\left(\frac{27}{25}\right)^3 = \left(\frac{27}{25}\right)^n$$

Here period = 3 years

Question 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

$$\frac{A}{P} = \left(1 + \frac{r}{100}\right)^n$$

Substituting the values

$$\frac{18522}{16000} = \left(1 + \frac{5}{100}\right)^n$$

By further calculation

$$\frac{9261}{8000} = \left(\frac{21}{20}\right)^n$$

So we get

$$\left(\frac{21}{20}\right)^3 = \left(\frac{21}{20}\right)^n$$

n = 3 half years
here

time = $\frac{3}{2} = 1\frac{1}{2}$

Question 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

$$A = P\left(1 + \frac{r}{100}\right)^n$$

Substituting the values

$$2782.50 = P\left(1 + \frac{5}{100}\right)\left(1 + \frac{6}{100}\right)$$

By further calculation

$$2782.50 = P \times \frac{21}{20} \times \frac{53}{50}$$

So we get

$P = 2782.50 \times \frac{21}{20} \times \frac{53}{50}$

Multiply and divide by 100

$P = \frac{278250}{100} \times \frac{21}{20} \times \frac{53}{50}$

P = 2500
Hence, the principal is 2500

Question 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 $= \frac{(SI \times 100)}{(P \times t)}$

Substituting the values

$= \frac{(15 \times 100)}{(225 \times 1)}$

So we get

$= \frac{20}{3}$

$= 6\frac{2}{3}\%$ p.a

(ii) we know that

Sum $= \frac{(SI \times 100)}{(R \times t)}$

Substituting the values

$= \left(\frac{225 \times 100}{\frac{20}{3} \times 1} \right)$

It can be written as

$= \frac{225 \times 100 \times 3}{20 \times 1}$

So we get

$= 225 \times 15$

$= 3375$

(iii) here

Amount after second year = 225 + 240 + 3375 = 3840

So the interest for the third year = $\frac{prt}{100}$

Substituting the values

$\frac{(3840 \times 20 \times 1)}{(100 \times 3)}$

= 256

Question 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) = 2year

We know that

SI = $\frac{prt}{100}$

Substituting the values

$= \frac{(100 \times 5 \times 2)}{100}$

$= 10$

So the amount when interest is compounded annually

$= P\left(1 + \frac{r}{100}\right)^n$

Substituting the values

$= 100\left(1 + \frac{5}{100}\right)^2$

By further calculation

$= 100 \times \left(\frac{21}{20}\right)^2$

$= 100 \times \frac{21}{20} \times \frac{21}{20}$

So we get

$= \frac{441}{4}$

Here
CI = A – P

Substituting the values

$= \frac{441}{4} - 100$

$= \frac{41}{4}$

So the difference between CI and SI = $\frac{41}{4} - 10 = \frac{1}{4}$

If the difference is $\frac{1}{4}$ then sum = 100

If the difference is 25 then sum = $\frac{100 \times 4}{1} \times 25$ = 10000

Question 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

$A = P\left(1 + \frac{R}{100}\right)^n$

Substituting the values

$= 100\left(1 + \frac{5}{100}\right)^2$

By further calculation

$= 100 \times \frac{21}{20} \times \frac{21}{20}$

$= \frac{441}{4}$

Here

CI = A – P

Substituting the values

$= 100 \left(1 + \frac{5}{100}\right)^2$

By further calculation

$= 100 \times \frac{21}{20} \times \frac{21}{20}$

$= \frac{441}{4}$

Here

CI = A – P

Substituting the values

$= \frac{441}{4} - 100$

$= \frac{441}{4}$

SI = $\frac{prt}{100}$

Substituting the values

$= \frac{100 \times 10 \times 1}{100}$

= 10

So the difference between CI and SI = $\frac{41}{4} - 10 = \frac{1}{4}$

Here if the difference is $\frac{1}{4}$ then sum = 100

If the difference is 15 then sum = $\frac{100 \times 4 \times 15}{1}$ = 6000

Question 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 o 1250 for 1 year

We know that

Rate of interest = $\frac{(SI \times 100)}{(P \times t)}$

Substituting the values

= $\frac{(125 \times 100)}{(1250 \times 1)}$

= 10%

Question 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 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 = $\frac{225 \times 2}{3}$ = 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 = $\frac{(SI \times 100)}{(P \times t)}$

Substituting the values

= $\frac{(3 \times 100)}{(75 \times 1)}$

= 4%

SI for 3 years = 225
Rate = 4% p.a

So principal = $\frac{SI \times 100}{R \times t}$

Substituting the values

= $\frac{(225 \times 100)}{(4 \times 3)}$

= 1875

Question 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 = $1\frac{1}{2}$ years or 3 half years

$A = P\left(1 + \frac{R}{100}\right)^n$

Substituting the values

$= 8000\left(1 + \frac{10}{100}\right)\left(1 + \frac{5}{100}\right)$

By further calculation

$8000 \times \frac{11}{10} \times \frac{21}{20}$

$= 9240$

We know that

CI = A – P

Substituting the values

$= 9240 – 8000$

$= 1240$

Case 2 – when compounded half – yearly

$A = P\left(1 + \frac{R}{100}\right)^n$

Substituting the values

$= 8000\left(1 + \frac{5}{100}\right)^3$

By further calculation

$= 8000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}$

$= 9261$

We know that

CI = A – P

Substituting the values

= 9261 – 8000

= 1261

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

Question 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

$A = P\left(1 + \frac{R}{100}\right)^n$

Substituting the values

$= 100\left(1 + \frac{20}{100}\right)^2$

By further calculation

$= 100 \times \frac{6}{5} \times \frac{6}{5}$

$= 144$

We know that

$CI = A - P$

Substituting the values

$= 144 - 100$

$= 44$

Case 2 – when the interest is reckoned half – yearly

$A = P\left(1 + \frac{R}{100}\right)^n$

Substituting the values

$= 100\left(1 + \frac{10}{100}\right)^4$

By further calculation

$= 100 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}$

$= 146.41$

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 = $\frac{100 \times 482}{2.41}$

Multiplying and dividing by 100

$= \frac{100 \times 482 \times 100}{241}$

= 20000

Question 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 $1\frac{1}{2}$ year = 13891 .50 – 13230 = 661.50

Here 661.50 is the interest on 13230 for $\frac{1}{2}$ years

We know that

Rate = $\frac{661.50 \times 100 \times 2}{13230 \times 1}$

Multiplying and dividing by 100

$= \frac{66150 \times 100 \times 2}{13230 \times 1 \times 100}$

= 10%

Here

$$A = P\left(1 + \frac{R}{100}\right)^{n}$$

Substituting the values

$$13891.50 = P\left(1 + \frac{5}{100}\right)^{3}$$

By further calculation

$$13891.50 = P \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}$$

So we get

$$P = 13891.50 \times \frac{20}{21} \times \frac{20}{21} \times \frac{20}{21}$$

$$P = 12000$$

Exercise 2.3

Question 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 year .

Solution:

We know that

Population after 2 years = present population $\times \left(1 + \frac{R}{100}\right)^n$

Here the present population = 200000

Population after first year = $200000 \times \left(1 + \frac{10}{100}\right)^1$

By further calculation

$= 200000 \times \frac{11}{10}$

$= 220000$

Population after two years = $220000 \times \left(1 + \frac{15}{100}\right)^1$

By further calculation

$= 220000 \times \frac{23}{20}$

$= 253000$

Question 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) = 3year

We know that

Population after 3 years = $P\left(1 + \frac{R}{100}\right)^n$

Substituting the values

$= 15625 \left(1 + \frac{4}{100}\right)^3$

By further calculation

$= 15625 \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25}$

$= 17576$

So the increase = 17576 – 15625 = 1951

Question 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%

(i) we know that

Population 2 years hence = $P\left(1 + \frac{R}{100}\right)^2$

Substituting the values

$= 6760000$

By further calculation

$= 6760000 \times \frac{26}{25} \times \frac{26}{25}$

$= 7311616$

(ii) we know that A = 6760000

Population 2 year ago $P = A + \left(1 + \frac{r}{100}\right)^2$

Substituting the values

$= 6760000 + \left(1 + \frac{4}{100}\right)^2$

By further calculation

$= 6760000 + \left(\frac{26}{25}\right)^2$

$= 6760000 \times \frac{25}{26} \times \frac{25}{26}$

$= 6250000$

Question 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) = 2years
We know that

Value after 2 years = $P\left(1-\frac{R}{100}\right)^{n}$

Substituting the values

$= 9000\left(1-\frac{5}{100}\right)^{2}$

By further calculation

$= 9000 \times \frac{19}{20} \times \frac{19}{20}$

$= 8122.50$

So the total depreciation = 9000 – 8122.50 = 877.50

Question 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) = 3Year

We know that

Value after 3 years = $P\left(1-\frac{R}{100}\right)^{n}$

Substituting the values

$= 24000\left(1-\frac{5}{100}\right)^{3}$

By further calculation

$= 24000 \times \frac{19}{20} \times \frac{19}{20} \times \frac{19}{20}$

$= 20577$

Question 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 = $A \div \left(1 + \frac{r}{100}\right)^2$

Substituting the values

$= 2187 \div \left(1 + \frac{8}{100}\right)^2$

By further calculation

$= 2187 \div \left(\frac{27}{25}\right)^2$

So we get

$= 2187 \times \frac{25}{27} \times \frac{25}{27}$

= 1875 quintals

Question 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 = $A \div \left(1 - \frac{r}{100}\right)^n$

Substituting the values

$= 411540 \div \left(1 - \frac{5}{100}\right)^3$

By further calculation

$= 411540 \div \left(\frac{19}{20}\right)^3$

So we get

$= 411540 \times \frac{20}{19} \times \frac{20}{19} \times \frac{20}{19}$

$= 480000$

Question 8.

Ahmed purchased an old scooter for 16000. If the cost of the scooter after 2 year 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

$$\frac{A}{P} = \left(1 - \frac{r}{100}\right)^{n}$$

Substituting the values

$$\frac{14440}{16000} = \left(1 - \frac{r}{100}\right)^{2}$$

By further calculation

$$\frac{361}{400} = \left(1 - \frac{r}{100}\right)^{2}$$
$$\left(\frac{19}{20}\right)^{2} = \left(1 - \frac{r}{100}\right)^{2}$$

We can write it as

$1 - \frac{r}{100} = \frac{19}{20}$

So we get

$\frac{r}{100} = 1 - \frac{19}{20} = \frac{1}{20}$

By cross multiplication

$r = \frac{1}{20} \times 100 = 5\%$

hence, the rate of depreciation is 5%

Question 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 = 92650

Period (n) = 3 years

Consider r% as the rate of increase

We know that

$$\frac{A}{P} = \left(1 + \frac{r}{100}\right)^{n}$$

Substituting the values

$$\frac{92610}{80000} = \left(1 + \frac{r}{100}\right)^{3}$$

By further calculation

$$\left(\frac{21}{20}\right)^{3} = \left(1 + \frac{r}{100}\right)^{3}$$

We can write it as

$$1 + \frac{r}{100} = \frac{21}{20}$$

$$\frac{r}{100} = \frac{21}{20} - 1 = \frac{1}{20}$$

By cross multiplication

$$r = \frac{1}{20} \times 100 = 5$$

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

Question 10.

The value of a machine worth 500000 is depreciating at the rate of 10% every year. In now many 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

$$\frac{A}{P} = \left(1 - \frac{r}{100}\right)^n$$

Substituting the values

$$\frac{364500}{500000} = \left(1 - \frac{10}{100}\right)^n$$

By further calculation

$$\left(\frac{9}{10}\right)^n = \frac{729}{1000} = \left(\frac{9}{10}\right)^3$$

So we get

N = 3

Therefore, the period in which its value be reduced to 36400 is 3 years.

Question 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

$\frac{A}{P} = \left(1 - \frac{r}{100}\right)^n$

Substituting the values

$\frac{14440}{16000} = \left(1 - \frac{r}{100}\right)^2$

By further calculation

$\frac{361}{400} = \left(1 - \frac{r}{100}\right)^2$

$\left(\frac{19}{20}\right)^2 = \left(1 - \frac{r}{100}\right)^2$

So we get

$\frac{19}{20} = 1 - \frac{r}{100}$

$\frac{r}{100} = 1 - \frac{19}{20} = \frac{20 - 19}{20} = \frac{1}{20}$

By cross multiplication

$r = \frac{100}{20} = 5$

hence, the rate of depreciation is 5%

Question 12.

Mahindra set up a factory by investing 250000. 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) = $P\left(1 + \frac{r}{100}\right)^n$

Substituting the values

$= 2500000\left(1 + \frac{5}{100}\right)\left(1 + \frac{10}{100}\right)$

By further calculation

$= 2500000 \times \frac{21}{20} \times \frac{11}{10}$

= 2887500

So the net profit = A – P

Substituting the values

= 2887500 – 2500000
= 387500

Question 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) = 3year
We know that
Increased value after 3 years = $P\left(1 + \frac{r}{100}\right)^n$

Substituting the values

$= 100\left(1 + \frac{25}{100}\right)^3$

By further calculation

$= 100 \times \frac{5}{4} \times \frac{5}{4} \times \frac{5}{4}$

$= \frac{3125}{16}$

Here

Increased value = $\frac{3125}{16} - 100$

Taking LCM

$= \frac{3125-1600}{16}$

$= \frac{1525}{16}$

So the percent increase after 3 years = $\frac{1525}{16} = 95\frac{5}{16}\%$

Chapter test

Question 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 = 1year

We know that

$A = P\left(1 + \frac{r}{100}\right)^n$

Substituting the values

$= 10000 \left(1 + \frac{10}{100}\right)^1$

By further calculation

$= 10000 \times \frac{11}{10}$

$= 11000$

Here

Interest = A – P

Substituting the values

$= 110000 – 10000$

$= 1000$

In case 2,

Rate (r) = 10% p.a or 5% half – yearly

Period (n) = 1 year or 2 half – years

We know that

$A = P \left(1 + \frac{r}{100}\right)^n$

Substituting the values

$= 10000\left(1 + \frac{5}{100}\right)^2$

By further calculation

$= 10000 \times \frac{21}{20} \times \frac{21}{20}$

= 11025

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

= 1025

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

Question 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

$$\frac{A}{P} = \left(1 + \frac{r}{100}\right)^n$$

Substituting the values

$$\frac{3264}{3072} = \left(1 + \frac{r}{100}\right)^1$$

By further calculation

$$1 + \frac{r}{100} = \frac{17}{16}$$

$$\frac{r}{100} = \frac{17}{16} - 1 = \frac{1}{16}$$

By cross multiplication

$$r = 100 \times \frac{1}{16} = \frac{25}{4} = 6\frac{1}{4}$$

hence, the rate of interest is $6\frac{1}{4}\%$

here

amount after 2 years = $3072\left(1 + \frac{25}{4\times100}\right)^2$

by further calculation

$$= 3072\left(1 + \frac{1}{16}\right)^2$$

So we get

$$= 3072 \times \frac{17}{16} \times \frac{17}{16}$$

$$= 3468$$

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

Question 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) = 2year
We know that

$$P = A \div \left(1 + \frac{r}{100}\right)^n$$

Substituting the values

$$= 28090 \div \left(1 + \frac{6}{100}\right)^2$$

By further calculation

$$= 28090 \div \left(\frac{53}{50}\right)^2$$

So we get

$$= 28090 \times \frac{50}{53} \times \frac{50}{53}$$

$$= 250000$$

Here
Amount of CI = A - P

Substituting the values

= 28090 – 25000
= 3090

Question 4.

The compound interest on a sum of money for 2 years is 1331.20 and the simple interest on the same 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 year = 1280

So the difference = 1331.20 – 1280 = 51.20

Here 51.20 is the simple interest on $\frac{1280}{2} = 640$ for one year we know that

$$\text{Rate} = \frac{\text{SI} \times 100}{\text{P} \times \text{t}}$$

Substituting the values

$$= \frac{51.20 \times 100}{640 \times 1}$$

Multiplying and dividing by 100

$$= \frac{5120 \times 100}{100 \times 640}$$

= 8% p.a

So the SI for two years at the rate of 8% pa

Sum = $\frac{\text{SI} \times 100}{\text{r} \times \text{t}}$

Substituting the values

= $\frac{1280 \times 100}{8 \times 2}$

= 8000

Question 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

$A = P\left(1 + \frac{r}{100}\right)^n$

Substituting the values

$= 100\left(1 + \frac{10}{100}\right)^3$

By further calculation

$= 100 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}$

$= 133.10$

Here

$CI = A - p$

Substituting the values

$= \frac{100 \times 10 \times 3}{100}$

$= 30$

Difference $= 33.10 - 30 = 3.10$

Here if the difference is 3.10 then sum = 100

If the difference is 232.50 then sum = $\frac{100 \times 232.50}{3.10}$

Multiplying and dividing by 100

$= \frac{100 \times 23250}{310}$

$= 7500$

Question 6.

The simple interest on a certain sum for 3 years is 1080 and the compound interest on 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 = $\frac{1080 \times 2}{3}$ = 720

CI for 2 years = 741.60

So the difference = 741.60 – 720 = 21.60

Here 21.60 is the SI on $\frac{720}{2}$ = 360 for one year

(i) we know that

Rate = $\frac{\text{SI} \times 100}{\text{P} \times \text{t}}$

Substituting the values

= $\frac{21.60 \times 100}{360 \times 1}$

= 6%

(ii) 1080 is SI for 3 years at the rate of 6% p.a

So the principal = $\frac{\text{SI} \times 100}{\text{r} \times \text{t}}$

Substituting the values

$= \frac{1080 \times 100}{6 \times 3}$

= 6000

Question 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

$\frac{A}{P} = \left(1 + \frac{r}{100}\right)^n$

Substituting the values

$\frac{2646}{2400} = \left(1 + \frac{5}{100}\right)^n$

By further calculation

$\left(\frac{21}{20}\right)^n = \frac{441}{400} = \left(\frac{21}{20}\right)^2$

n = 2
therefore, the time period is 2 half years or 1 year.

Question 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) = $1\frac{1}{2}$ years = 3 half – years

We know that

$\frac{A}{P} = \left(1 + \frac{r}{100}\right)^{n}$

Substituting the values

$\frac{79860}{60000} = \left(1 + \frac{r}{100}\right)^{3}$

By further calculation

$$\left(1 + \frac{r}{100}\right)^3 = \frac{1331}{1000} = \left(\frac{11}{10}\right)^3$$

We get

$$1 + \frac{r}{100} = \frac{11}{10}$$

$$\frac{r}{100} = \frac{11}{10} - 1 = \frac{1}{10}$$

By cross multiplication

$$r = \frac{1}{10} \times 100 = 10\% \text{ half – yearly}$$

r = 10× 2 = 20%
therefore, the rate of interest per annum compounded half – yearly is 20%

Question 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) = 3year

We know that

Population after 3 years (A) = $P\left(1 + \frac{r}{100}\right)^n$

Substituting the values

$= 320000\left(1 + \frac{7.5}{100}\right)^3$

By further calculation

$= 320000 \times \frac{43}{40} \times \frac{43}{40} \times \frac{43}{40}$

$= 397535$

Question 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 = $A \div \left(1 - \frac{r}{100}\right)^n$

Substituting the values

$= 315600 \div \left(1 - \frac{20}{100}\right)^2$

By further calculation

$= 315600 \times \frac{5}{4} \times \frac{5}{4}$

$= 161587.20$

Question 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 = $P\left(1 + \frac{r}{100}\right)^n$

Substituting the values

$= 400000\left(1 - \frac{4}{100}\right)\left(1 + \frac{5}{100}\right)\left(1 + \frac{10}{100}\right)$

By further calculation

$= 400000 \times \frac{24}{25} \times \frac{21}{20} \times \frac{11}{10}$

$= 443520$

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