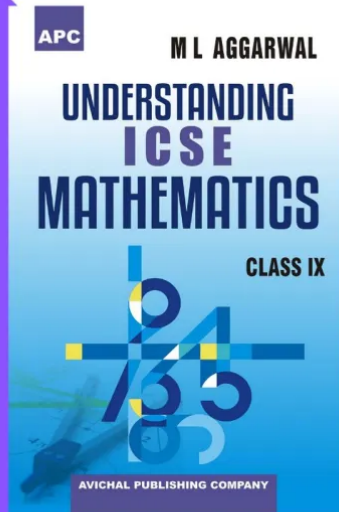


ML Aggarwal Solutions for Class 9 Maths Chapter 2- Compound Interest



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ML Agrawal Solutions

CLASS 9 MATHS

Chapter 2: Compound
Interest

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Chapter 2- Compound Interest

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ML Aggarwal Solutions for Class 9 Maths Chapter 2-Compound Interest

ML Aggarwal 9th Maths Chapter 2, Class 9 Maths Chapter 2 solutions

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

$$= (8000 \times 5 \times 1)/100$$

$$= ₹ 400$$

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

Here

Interest for the second year = $(8400 \times 5 \times 1)/100$

So we get

$$= ₹ 420$$

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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

= $(46875 \times 4 \times 1)/100$

= ₹ 1875

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

Here

Interest for the second year = $(48750 \times 4 \times 1)/100$

So we get

= ₹ 1950

(ii) We know that

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

= ₹ 50700

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

3. Calculate the compound interest for the second year on ₹ 8000 for three years at 10% p.a.

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

$$= (8000 \times 10 \times 1) / 100$$

$$= ₹ 800$$

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

(i) Interest for the second year = $(8800 \times 10 \times 1) / 100$

$$= ₹ 880$$

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

Interest for the third year = $(9680 \times 10 \times 1) / 100$

$$= ₹ 968$$

(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.

Find:

(i) the sum due to Ramesh at the end of the first year.

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(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 = $(12800 \times 10 \times 1) / 100$

= ₹ 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 = $(14080 \times 10 \times 1) / 100$

= ₹ 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 = $(15488 \times 10 \times 1) / 100$

= ₹ 1548.80

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

= ₹ 17036.80

5. The simple interest on a sum of money for 2 years at 12% per annum is ₹ 1380.

Find:

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(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

$$\text{Sum (P)} = (\text{SI} \times 100) / (\text{R} \times \text{T})$$

Substituting the values

$$= (1380 \times 100) / (12 \times 2)$$

$$= ₹ 5750$$

(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

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

Substituting the values

$$= 5750 (1 + 6/100)^2$$

By further calculation

$$= 5750 \times (53/50)^2$$

So we get

$$= 5750 \times 53/50 \times 53/50$$

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$$= ₹ 6460.70$$

Here

$$\text{Compound Interest} = A - P$$

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

$$\text{Principal (P)} = ₹ 10,000$$

$$\text{Period (T)} = 1 \text{ year}$$

$$\text{Sum amount (A)} = ₹ 11,200$$

$$\text{Rate of interest} = ?$$

(i) We know that

$$\text{Interest (I)} = 11200 - 10000 = ₹ 1200$$

So the rate of interest

$$R = (I \times 100) / (P \times T)$$

Substituting the values

$$R = (1200 \times 100) / (10000 \times 1)$$

So we get

$$R = 12\% \text{ p.a.}$$

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

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(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

$$A = 10000 \times 28/25 \times 28/25$$

So we get

$$A = 16 \times 28 \times 28$$

$$A = ₹ 12544$$

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

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So the interest for the first year = $A - P$

Substituting the values

$$= 5325 - 5000$$

$$= ₹ 325$$

Here

$$\text{Rate} = (\text{SI} \times 100) / (P \times T)$$

Substituting the values

$$= (325 \times 100) / (5000 \times 1)$$

So we get

$$= 13/2$$

$$= 6.5 \% \text{ p.a.}$$

(ii) We know that

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

By further calculation

$$= (213 \times 13) / (4 \times 2)$$

So we get

$$= 2769/8$$

$$= ₹ 346.12$$

$$\text{So the amount after second year} = 5325 + 346.12$$

We get

$$= ₹ 5671.12$$

$$= ₹ 5671 \text{ (to the nearest rupee)}$$

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

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(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

$$= (5000 \times r \times 1) / 100$$

$$= 50r$$

Here

$$\text{Amount} = 5000 + 50r$$

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

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

$$= ₹ 672$$

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

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$$= ₹ 6272$$

(iii) We know that

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

$$= ₹ 752.64$$

$$\text{So the amount after third year} = 6272 + 752.64$$

$$= ₹ 7024.64$$

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

Solution:

It is given that

$$\text{Principal (P)} = ₹ 2000$$

$$\text{Rate of interest (r)} = 10\% \text{ p.a.}$$

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

We know that

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

Substituting the values

$$= 2000 (1 + 10/100)^2 (1 + 10/(2 \times 100))$$

By further calculation

$$= 2000 \times 11/10 \times 11/10 \times 21/20$$

So we get

$$= ₹ 2541$$

Here

$$\text{Interest} = A - P$$

Substituting the values

$$= 2541 - 2000$$

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= ₹ 541

10. Find the amount and the compound interest on ₹ 50000 for $1\frac{1}{2}$ years at 8% per annum, 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

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

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

$$\text{Compound Interest} = A - P$$

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

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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

$$= 5000 \times 53/50 \times 27/25$$

$$= ₹ 5724$$

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

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Substituting the values

$$= 17000 (1 + 10/100) (1 + 10/100) (1 + 14/100)$$

By further calculation

$$= 17000 \times 11/10 \times 11/10 \times 57/50$$

$$= ₹ 23449.80$$

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

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$$= (9600 \times 10 \times 1) / 100$$

$$= ₹ 960$$

$$(i) \text{ Amount after one year} = 9600 - 960 = ₹ 10560$$

$$\text{So the principal for the second year} = ₹ 10560$$

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

$$= ₹ 1056$$

$$(ii) \text{ Amount after two years} = 10560 + 1056 = ₹ 11616$$

$$(iii) \text{ Compound interest earned in 2 years} = 960 + 1056 = ₹ 2016$$

$$(iv) \text{ Difference between the answers in (ii) and (i)} = 11616 - 10560 = ₹ 1056$$

We know that

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

$$= ₹ 105.60$$

(v) Here

$$\text{Principal for the third year} = ₹ 11616$$

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

$$= ₹ 1161.60$$

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

$$\text{Sum} = (SI \times 100) / (r \times n)$$

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Substituting the values

$$= (1600 \times 100) / (10 \times 2)$$

$$= ₹ 8000$$

Here

$$\text{Amount after 3 years} = P (1 + r/100)^n$$

Substituting the values

$$= 8000 (1 + 10/100)^3$$

By further calculation

$$= 8000 \times 11/10 \times 11/10 \times 11/10$$

$$= ₹ 10648$$

$$\text{So the compound interest} = A - P$$

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

Solution:

First case-

$$\text{Principal} = ₹ 20000$$

$$\text{Rate} = 10\% \text{ p.a.}$$

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

We know that

$$\text{Simple interest} = \text{Prt}/100$$

Substituting the values

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$$= (20000 \times 10 \times 5) / (100 \times 2)$$

$$= ₹ 5000$$

Second case-

Principal = ₹ 20000

Rate = 10% p.a.

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

We know that

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

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

$$\text{Compound Interest} = A - P$$

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:

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It is given that

Principal = ₹ 6000

Rate of interest = 5% p.a.

We know that

Interest for the first year = $\text{Prt}/100$

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

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We know that

$$\text{Amount after first year} = \text{Prt}/100$$

Substituting the values

$$= (100000 \times 11 \times 1)/100$$

By further calculation

$$= 100000 + 11000$$

$$= ₹ 111000$$

$$\text{Amount paid at the end of first year} = ₹ 41000$$

$$\text{So the principal for second year} = 111000 - 41000$$

$$= ₹ 70000$$

We know that

$$\text{Amount after second year} = P + (70000 \times 11)/100$$

By further calculation

$$= 70000 + 7700$$

$$= ₹ 77700$$

$$\text{So the amount paid at the end of second year} = ₹ 47700$$

$$\text{Here the amount outstanding at the beginning year} = 77700 - 47700$$

$$= ₹ 30000$$

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

$$\text{Amount borrowed by Jaya} = ₹ 50000$$

$$\text{Period (n)} = 2 \text{ years}$$

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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

$$= (50000 \times 12 \times 1) / 100$$

$$= ₹ 6000$$

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 = $(23000 \times 15 \times 1) / 100$

$$= ₹ 3450$$

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

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

Substituting the values

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$$= 5000 (1 + 6/100)^2$$

By further calculation

$$= 5000 \times 53/50 \times 53/50$$

$$= ₹ 5618$$

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

$$\text{Principal (P)} = ₹ 8000$$

$$\text{Rate of interest (r)} = 10\% \text{ p.a.}$$

$$\text{Period (n)} = 4 \text{ years}$$

We know that

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

Substituting the values

$$= 8000 (1 + 10/100)^4$$

By further calculation

$$= 8000 \times 11/10 \times 11/10 \times 11/10 \times 11/10$$

$$= ₹ 11712.80$$

Here

$$CI = A - P$$

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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

$$\text{Principal (P)} = ₹ 7400$$

$$\text{Rate of interest (r)} = 5\%$$

$$\text{Period (n)} = 1 \text{ year}$$

We know that

$$A = P \left(1 + \frac{r}{2 \times 100} \right)^{2 \times n}$$

Substituting the values

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

By further calculation

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

$$= ₹ 7774.63$$

4. Find the amount and the compound interest on ₹ 5000 at 10% p.a. for 1 ½ years, compound interest reckoned semi-annually.

Solution:

It is given that

$$\text{Principal (P)} = ₹ 5000$$

$$\text{Rate of interest} = 10\% \text{ p.a. or } 5\% \text{ half-yearly}$$

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

We know that

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

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

$$= 100000 \times 101/100 \times 101/100 \times 101/100$$

$$= ₹ 103030.10$$

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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

$$\text{Principal (P)} = ₹ 4800$$

$$\text{Rate of interest (r)} = 5\% \text{ p.a.}$$

$$\text{Period (n)} = 2 \text{ years}$$

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

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$$CI = A - P$$

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 ₹ 2500 for 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

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$$CI = A - P$$

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% for 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

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

Substituting the values

$$= 2000 (1 + 4/100) (1 + 3/100)$$

By further calculation

$$= 2000 \times 26/25 \times 103/100$$

$$= ₹ 2142.40$$

Here

$$CI = A - P$$

Substituting the values

$$= 2142.40 - 2000$$

$$= ₹ 142.40$$

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9. Find the compound interest on ₹ 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:

It is given that

Principal (P) = ₹ 3125

Rate of interest for continuous = 4%, 5% and 6%

Period (n) = 3 years

We know that

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

Substituting the values

$$= 3125 (1 + 4/100) (1 + 5/100) (1 + 6/100)$$

By further calculation

$$= 3125 \times 26/25 \times 21/20 \times 53/50$$

$$= ₹ 3617.25$$

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

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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 to ₹ 7803 at the end of one year?

Solution:

It is given that

$$\text{Amount (A)} = ₹ 7803$$

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

$$= 7803 + (51/20)^2$$

$$= 7803 \times 50/51 \times 50/51$$

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$$= ₹ 7500$$

Hence, the principal is ₹ 7500.

12. What sum invested for $1\frac{1}{2}$ years compounded half yearly at the rate of 4% p.a. will amount to ₹132651?

Solution:

It is given that

$$\text{Amount (A)} = ₹ 132651$$

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

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

By further calculation

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

So we get

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

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

$$= ₹ 125000$$

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

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$$CI = ₹ 5712$$

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

$$= P [(676 - 625)/ 625]$$

$$= P \times 51/625$$

Here

$$P = 5712 \times 625/51$$

$$= 112 \times 625$$

$$= ₹ 70000$$

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:

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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 = $(SI \times 100) / (P \times t)$

Substituting the values

$$= (75 \times 100) / (1200 \times 1)$$

By further calculation

$$= 75/12$$

$$= 25/4$$

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

Here

Interest for the second year on ₹ 1275 at the rate of $25/4\% = \text{Pr}t/100$

Substituting the values

$$= (1275 \times 25 \times 1) / (100 \times 4)$$

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

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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

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

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

16. A sum compounded annually becomes $25/16$ time of itself in two years. Determine the rate of interest per annum.

Solution:

Consider sum (P) = x

Amount (A) = $25/16x$

Period (n) = 2 years

We know that

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

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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

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

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

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

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

$$\text{Principal (P)} = ₹ 40000$$

$$\text{Amount (A)} = ₹ 48620.25$$

$$\text{Period (n)} = 2 \text{ years} = 4 \text{ half years}$$

$$\text{Consider rate of interest} = r\% \text{ p.a.} = r/2\% \text{ half yearly}$$

We know that

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

Substituting the values

$$48620.25/40000 = (1 + r/200)^4$$

By further calculation

$$(1 + r/200)^4 = 48620.25 / (100 \times 40000) = 194481/160000$$

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

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$$r = 200 \times 1/20 = 10$$

Hence the rate of interest per annum is 10%.

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

Solution:

Consider principal (P) = x

Amount (A) = $216/125$ x

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

Take rate percent per year = $2r\%$ and $r\%$ half yearly

We know that

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

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

$$r = 100 \times 1/5 = 20\%$$

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

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

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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

$$r = 1/20 \times 100 = 5$$

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

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$$\text{Rate \%} = (\text{SI} \times 100) / (\text{P} \times \text{t})$$

Substituting the values

$$= (264.60 \times 100) / (5292 \times 1)$$

Multiply and divide by 100

$$= (26460 \times 100) / (100 \times 5292)$$

$$= 5\%$$

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.

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We know that

$$\text{Rate} = (\text{SI} \times 100) / (\text{P} \times \text{t})$$

Substituting the values

$$= (79.86 \times 100) / (798.60 \times 1)$$

Multiply and divide by 100

$$= (7986 \times 100 \times 100) / (79860 \times 100 \times 1)$$

$$= 10\%$$

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

$$\text{Amount (A)} = ₹ 17576$$

$$\text{Principal (P)} = ₹ 15625$$

$$\text{Rate} = 4\% \text{ p.a.}$$

Consider n years as the period

We know that

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

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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

$$1996.50/1500 = (1 + 10/100)^n$$

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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

$$78732/(12500 \times 5) = (27/25)^n$$

$$19683/(3125 \times 5) = (27/25)^n$$

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So we get

$$19683/15625 = (27/25)^n$$

$$(27/25)^3 = (27/25)^n$$

Here Period = 3 years

25. ₹ 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 = $3/2 = 1 \frac{1}{2}$ 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?

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Solution:

It is given that

$$\text{Amount (A)} = ₹ 2782.50$$

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

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

Multiply and divide by 100

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

$$P = ₹ 2500$$

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

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So the difference = $240 - 225 = ₹ 15$

Here ₹ 15 is the interest on ₹ 225 for 1 year

$$(i) \text{ Rate} = (SI \times 100) / (P \times t)$$

Substituting the values

$$= (15 \times 100) / (225 \times 1)$$

So we get

$$= 20/3$$

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

(ii) We know that

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

Substituting the values

$$= (225 \times 100) / (20/3 \times 1)$$

It can be written as

$$= (225 \times 100 \times 3) / (20 \times 1)$$

So we get

$$= 225 \times 15$$

$$= ₹ 3375$$

(iii) Here

$$\text{Amount after second year} = 225 + 240 + 3375 = ₹ 3840$$

$$\text{So the interest for the third year} = \text{Prt}/100$$

Substituting the values

$$= (3840 \times 20 \times 1) / (100 \times 3)$$

$$= ₹ 256$$

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28. On what sum of money will the difference between the compound interest and simple 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

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

Substituting the values

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

$$= ₹ 10$$

So the amount when interest is compounded annually = $P (1 + \frac{R}{100})^n$

Substituting the values

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

By further calculation

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

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

So we get

$$= ₹ 44\frac{1}{4}$$

Here

$$CI = A - P$$

Substituting the values

$$= 44\frac{1}{4} - 100$$

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$$= ₹ 41\frac{1}{4}$$

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

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

If the difference is ₹ 25 then sum = $(100 \times 4) / 1 \times 25 = ₹ 10000$

29. The difference between the compound interest for a year payable half-yearly and the simple interest on a certain sum of money lent out at 10% for a year is ₹ 15. Find the sum of money lent out.

Solution:

It is given that

$$\text{Sum} = ₹ 100$$

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

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

$$= ₹ 44\frac{1}{4}$$

Here

$$\text{CI} = A - P$$

Substituting the values

$$= 44\frac{1}{4} - 100$$

$$= ₹ 4\frac{1}{4}$$

$$\text{SI} = \frac{PRT}{100}$$

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Substituting the values

$$= (100 \times 10 \times 1) / 100$$

$$= ₹ 10$$

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

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

If the difference is ₹ 15 then sum = $(100 \times 4 \times 15) / 1 = ₹ 6000$

30. The amount at compound interest which is calculated yearly on a certain sum of money is ₹ 1250 in one year and ₹ 1375 after two years. Calculate the rate of interest.

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

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

Substituting the values

$$= (125 \times 100) / (1250 \times 1)$$

$$= 10\%$$

31. The simple interest on a certain sum for 3 years is ₹ 225 and the compound interest on the same sum at the same rate for 2 years is ₹ 153. Find the rate of interest and the principal.

Solution:

It is given that

SI for 3 years = ₹ 225

SI for 2 years = $(225 \times 2) / 3 = ₹ 150$

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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

$$\text{Rate} = (\text{SI} \times 100) / (\text{P} \times \text{t})$$

Substituting the values

$$= (3 \times 100) / (75 \times 1)$$

$$= 4\%$$

SI for 3 years = ₹ 225

Rate = 4% p.a.

$$\text{So principal} = (\text{SI} \times 100) / (\text{R} \times \text{t})$$

Substituting the values

$$= (225 \times 100) / (4 \times 3)$$

$$= ₹ 1875$$

32. Find the difference between compound interest on ₹ 8000 for $1\frac{1}{2}$ years at 10% p.a. when 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

Case 1 – When compounded annually

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

Substituting the values

$$= 8000 (1 + 10/100) (1 + 5/100)$$

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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 being 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:

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It is given that

$$\text{Sum} = ₹ 100$$

$$\text{Rate} = 20\% \text{ p.a. or } 10\% \text{ half-yearly}$$

$$\text{Period} = 2 \text{ years or } 4 \text{ half-years}$$

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

$$= 100 \times 11/10 \times 11/10 \times 11/10 \times 11/10$$

$$= ₹ 146.41$$

We know that

$$CI = A - P$$

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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 = $(100 \times 482) / 2.41$

Multiplying and dividing by 100

$$= (100 \times 482 \times 100) / 241$$

$$= ₹ 20000$$

34. A sum of money amounts to ₹ 13230 in one year and to ₹ 13891.50 in $1\frac{1}{2}$ years at compound interest, compounded semi-annually. Find the sum and the rate of interest per annum.

Solution:

It is given that

Amount after one year = ₹ 13230

Amount after $1\frac{1}{2}$ years = ₹ 13891.50

So the difference = $13891.50 - 13230 = ₹ 661.50$

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

We know that

$$\text{Rate} = (661.50 \times 100 \times 2) / (13230 \times 1)$$

Multiplying and dividing by 100

$$= (66150 \times 100 \times 2) / (13230 \times 1 \times 100)$$

$$= 10\% \text{ p.a.}$$

Here

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

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Substituting the values

$$13891.50 = P (1 + 5/100)^3$$

By further calculation

$$13891.50 = P \times 21/20 \times 21/20 \times 21/20$$

So we get

$$P = 13891.50 \times 20/21 \times 20/21 \times 20/21$$

$$P = ₹ 12000$$

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 two years.

Solution:

We know that

$$\text{Population after 2 years} = \text{Present population} \times (1 + r/100)^n$$

$$\text{Here the present population} = 200000$$

$$\text{Population after first year} = 200000 \times (1 + 10/100)^1$$

By further calculation

$$= 200000 \times 11/10$$

$$= 220000$$

$$\text{Population after two years} = 220000 \times (1 + 15/100)^1$$

By further calculation

$$= 220000 \times 23/20$$

$$= 253000$$

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:

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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

$$= 15625 \times 26/25 \times 26/25 \times 26/25$$

$$= 17576$$

$$\text{So the increase} = 17576 - 15625 = 1951$$

3. The population of a city increase each year by 4% of what it had been at the beginning of 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

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$$= 6760000 \times 26/25 \times 26/25$$

$$= 7311616$$

(ii) We know that $A = 6760000$

$$\text{Population 2 years ago } P = A + (1 + r/100)^2$$

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

$$\text{Present value (P)} = ₹ 9000$$

$$\text{Rate of depreciation (r)} = 5\% \text{ p.a.}$$

$$\text{Period (n)} = 2 \text{ years}$$

We know that

$$\text{Value after 2 years} = P (1 - r/100)^n$$

Substituting the values

$$= 9000 (1 - 5/100)^2$$

By further calculation

$$= 9000 \times 19/20 \times 19/20$$

$$= ₹ 8122.50$$

$$\text{So the total depreciation} = 9000 - 8122.50 = ₹ 877.50$$

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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 he 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

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$$= 2187 \div (27/25)^2$$

So we get

$$= 2187 \times 25/27 \times 25/27$$

$$= 1875 \text{ quintals}$$

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

$$\text{Value of property 3 years ago} = A \div (1 - r/100)^n$$

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

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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

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

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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

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$$n = 3$$

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:

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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

$$= 2500000 \times 21/20 \times 11/10$$

$$= ₹ 2887500$$

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

$$= 100 (1 + 25/100)^3$$

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By further calculation

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

$$= ₹ 3125/16$$

Here

$$\text{Increased value} = 3125/16 - 100$$

Taking LCM

$$= (3125 - 1600)/16$$

$$= 1525/16$$

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

14. Mr. Durani bought a plot of land for ₹ 180000 and a car for ₹ 320000 at the same time. The value of the plot of land grows uniformly at the rate of 30% p.a., while the value of the car depreciates by 20% in the first year and by 15% p.a. thereafter. If he sells the plot of land as well as the car after 3 years, what will be his profit or loss?

Solution:

It is given that

$$\text{Price of plot of land} = ₹ 180000$$

$$\text{Growth rate} = 30\% \text{ p.a.}$$

$$\text{Period (n)} = 3 \text{ years}$$

We know that

$$\text{Amount after 3 years} = P (1 + R/100)^n$$

Substituting the values

$$= 180000 (1 + 30/100)^3$$

By further calculation

$$= 180000 \times (13/10)^3$$

It can be written as

$$= 180000 \times 13/10 \times 13/10 \times 13/10$$

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$$= ₹ 395460$$

Here

Price of car = ₹ 320000

Rate of depreciation = 20% for the first year and 15% for next period

Period (n) = 3 years

We know that

$$\text{Amount after 3 years} = A (1 - R_1/100)^n \times (1 - R_2/100)^2$$

Substituting the values

$$= 320000 (1 - 20/100) (1 - 15/100)^2$$

By further calculation

$$= 320000 \times 4/5 \times (17/20)^2$$

So we get

$$= 320000 \times 4/5 \times 17/20 \times 17/20$$

$$= ₹ 184960$$

Here

$$\text{Total cost of plot and car} = 180000 + 320000 = ₹ 500000$$

$$\text{Total sale price of plot and car} = 395460 + 184960 = ₹ 580420$$

We know that

$$\text{Profit} = \text{S.P.} - \text{C.P.}$$

Substituting the values

$$= 580420 - 500000$$

$$= ₹ 80420$$

Chapter Test

<https://www.indcareer.com/schools/ml-aggarwal-solutions-for-class-9-maths-chapter-2-compound-interest/>

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

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

Substituting the values

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

By further calculation

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

$$= ₹ 11000$$

Here

$$\text{Interest} = A - P$$

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

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

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Substituting the values

$$= 10000 (1 + 5/100)^2$$

By further calculation

$$= 10000 \times 21/20 \times 21/20$$

$$= ₹ 11025$$

Here

$$\text{Interest} = A - P$$

Substituting the values

$$= 11025 - 10000$$

$$= ₹ 1025$$

$$\text{So the difference between the two interests} = 1025 - 1000 = ₹ 25$$

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 2nd year.

Solution:

It is given that

$$\text{Principal (P)} = ₹ 3072$$

$$\text{Amount (A)} = ₹ 3264$$

$$\text{Period (n)} = 1 \text{ year}$$

We know that

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

Substituting the values

$$3264/3072 = (1 + r/100)^1$$

By further calculation

$$1 + r/100 = 17/16$$

$$r/100 = 17/16 - 1 = 1/16$$

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By cross multiplication

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

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

Here

$$\text{Amount after 2 years} = 3072 (1 + 25/ (4 \times 100))^2$$

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

$$\text{Amount (A)} = ₹ 28090$$

$$\text{Rate (r)} = 6\% \text{ p.a.}$$

$$\text{Period (n)} = 2 \text{ years}$$

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

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$$= 28090 \times 50/53 \times 50/53$$

$$= ₹ 25000$$

Here

$$\text{Amount of CI} = A - P$$

Substituting the values

$$= 28090 - 25000$$

$$= ₹ 3090$$

4. Two equal sums were lent at 5% and 6% per annum compound interest for 2 years. If the difference in the compound interest was ₹ 422, find:

(i) the equal sums

(ii) compound interest for each sum.

Solution:

Consider ₹ 100 as each equal sum

Case I –

$$\text{Rate (r)} = 5\%$$

$$\text{Period (n)} = 2 \text{ years}$$

We know that

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

Substituting the values

$$= 100 (1 + 5/100)^2$$

It can be written as

$$= 100 \times 21/20 \times 21/20$$

$$= ₹ 441/4$$

Here

$$\text{CI} = A - P$$

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Substituting the values

$$= 441/4 - 100$$

$$= ₹ 41/4$$

Case II –

$$\text{Rate of interest (R)} = 6\%$$

$$\text{Period (n)} = 2 \text{ years}$$

We know that

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

Substituting the values

$$= 100 (1 + 6/100)^2$$

It can be written as

$$= 100 \times 53/50 \times 53/50$$

$$= ₹ 2809/25$$

Here

$$CI = A - P$$

Substituting the values

$$= 2809/25 - 100$$

$$= ₹ 309/25$$

$$\text{So the difference between the two interests} = 309/25 - 41/4$$

Taking LCM

$$= (1236 - 1025)/ 100$$

$$= ₹ 211/100$$

$$\text{If the difference is ₹ 211/100, then equal sum} = ₹ 100$$

$$\text{If the difference is ₹ 422, then equal sum} = (100 \times 422 \times 100)/ 211 = ₹ 20000$$

Here

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Amount in first case = $20000 (1 + 5/100)^2$

So we get

$$= 20000 \times (21/20)^2$$

It can be written as

$$= 20000 \times 21/20 \times 21/20$$

So we get

$$= 44100/2$$

$$= ₹ 22050$$

$$CI = 22050 - 20000 = ₹ 2050$$

Amount in second case = $20000 (1 + 6/100)^2$

It can be written as

$$= 20000 \times 53/50 \times 53/50$$

$$= ₹ 22472$$

$$CI = 22472 - 20000 = ₹ 2472$$

5. 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

$$CI \text{ for 2 years} = ₹ 1331.20$$

$$SI \text{ for 2 years} = ₹ 1280$$

$$\text{So the difference} = 1331.20 - 1280 = ₹ 51.20$$

Here ₹ 51.20 is the simple interest on $1280/2 = ₹ 640$ for one year

We know that

$$\text{Rate} = (SI \times 100) / (P \times t)$$

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Substituting the values

$$= (51.20 \times 100) / (640 \times 1)$$

Multiplying and dividing by 100

$$= (5120 \times 100) / (100 \times 640)$$

$$= 8\% \text{ p.a.}$$

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

$$\text{Sum} = (\text{SI} \times 100) / (r \times t)$$

Substituting the values

$$= (1280 \times 100) / (8 \times 2)$$

$$= ₹ 8000$$

6. On what sum will the difference between the simple and compound interest for 3 years if the rate of interest is 10% p.a. is ₹ 232.50?

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

$$= 100 \times 11/10 \times 11/10 \times 11/10$$

$$= ₹ 133.10$$

Here

$$\text{CI} = A - P$$

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Substituting the values

$$= 133.10 - 100$$

$$= ₹ 33.10$$

So the simple interest = $PRT/100$

Substituting the values

$$= (100 \times 10 \times 3) / 100$$

$$= ₹ 30$$

$$\text{Difference} = 33.10 - 30 = ₹ 3.10$$

Here if the difference is ₹ 3.10 then sum = ₹ 100

If the difference is ₹ 232.50 then sum = $(100 \times 232.50) / 3.10$

Multiplying and dividing by 100

$$= (100 \times 23250) / 310$$

$$= ₹ 7500$$

7. 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

$$\text{SI for 3 years} = ₹ 1080$$

$$\text{SI for 2 years} = (1080 \times 2) / 3 = ₹ 720$$

$$\text{CI for 2 years} = ₹ 741.60$$

$$\text{So the difference} = 741.60 - 720 = ₹ 21.60$$

Here ₹ 21.60 is the SI on $720/2 = ₹ 360$ for one year

(i) We know that

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$$\text{Rate} = (\text{SI} \times 100) / (\text{P} \times \text{t})$$

Substituting the values

$$= (21.60 \times 100) / (360 \times 1)$$

Multiply and divide by 100

$$= (2160 \times 100) / (100 \times 360 \times 1)$$

$$= 6\%$$

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

$$\text{So the principal} = (\text{SI} \times 100) / (\text{r} \times \text{t})$$

Substituting the values

$$= (1080 \times 100) / (6 \times 3)$$

$$= ₹ 6000$$

8. In what time will ₹ 2400 amount to ₹ 2646 at 10% p.a. compounded semi-annually?

Solution:

It is given that

$$\text{Amount (A)} = ₹ 2646$$

$$\text{Principal (P)} = ₹ 2400$$

$$\text{Rate (r)} = 10\% \text{ p.a. or } 5\% \text{ semi-annually}$$

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

$$(21/20)^n = 441/400 = (21/20)^2$$

$$n = 2$$

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

9. Sudarshan invested ₹ 60000 in a finance company and received ₹ 79860 after 1 ½ 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

$$r = 1/10 \times 100 = 10\% \text{ half-yearly}$$

$$r = 10 \times 2 = 20\% \text{ p.a.}$$

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

10. The population of a city is 320000. If the annual birth rate is 9.2% and the annual death rate is 1.7%, calculate the population of the town after 3 years.

Solution:

It is given that

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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

$$= 320000 \times 43/40 \times 43/40 \times 43/40$$

$$= 397535$$

11. 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) its purchase price

(ii) its value after 3 years

Solution:

It is given that

Present value of car = ₹ 315600

Rate of depreciation (r) = 20%

(i) We know that

$$\text{Purchase price} = A \div (1 - r/100)^n$$

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Substituting the values

$$= 315600 \div (1 - 20/100)^2$$

By further calculation

$$= 315600 \times 5/4 \times 5/4$$

$$= ₹ 493125$$

(ii) We know that

$$\text{Value after 3 years} = 315600 \times (1 - 20/100)^3$$

By further calculation

$$= 315600 \times 4/5 \times 4/5 \times 4/5$$

$$= ₹ 161587.20$$

12. Amar Singh started a business with an initial investment of ₹ 400000. In the first year he incurred a loss of 4%. However, during the second year, he earned a profit of 5% which in the third year rose to 10%. Calculate his net profit for the entire period of 3 years.

Solution:

It is given that

$$\text{Investment (P)} = ₹ 400000$$

$$\text{Loss in the first year} = 4\%$$

$$\text{Profit in the second year} = 5\%$$

$$\text{Profit in the third year} = 10\%$$

We know that

$$\text{Total amount after 3 years} = P (1 + r/100)^n$$

Substituting the values

$$= 400000 (1 - 4/100) (1 + 5/100) (1 + 10/100)$$

By further calculation

$$= 400000 \times 24/25 \times 21/20 \times 11/10$$

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= ₹ 443520

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



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About ML Aggarwal

M. L. Aggarwal, is an Indian mechanical engineer, educator. His achievements include research in solutions of industrial problems related to fatigue design. Recipient Best Paper award, Manipal Institute of Technology, 2004. Member of TSTE.

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