Simple and Compound Interest

Exercise 8.1

Solutions

1. Principal (P) = 4000/-

Rate of Interest (R) = 7.5%

Time (T) = 3 years and 3 months

1 month = $\frac{1}{12}$ year

3 months = $\frac{3}{12}$ year = $\frac{1}{4}$ year

$\therefore$ Time = $3\frac{1}{4}$ years = $\frac{13}{4}$ years

Simple interest (I) = $\frac{PTR}{100}$

$= \frac{4000 \times \frac{13}{4} \times 7.5}{100}$

Simple interest (I) = 975/-

Amount = Principal + Interest

= 4000 + 975

Amount = 4975/-

2. Given

Simple interest (I) = 170.10

Time (T) = 2 years and 3 months

(T) = $2\frac{3}{12} = 2\frac{1}{4} = \frac{9}{4}$ years

Rate (R) = 6%

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

$= \frac{170.10 \times 100}{6 \times \frac{9}{4}}$

Principal = P = 1260/- $\therefore$ Required sum of money = 1260/-

3. Given

Principal = 800/-

Simple interest (I) = 130/-

Time = 2 years and 6 months

Time $= 2 \cdot \frac{6}{12} = 2 \cdot \frac{1}{2} = \frac{5}{2}$ years

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

$$= \frac{130 \times 100}{800 \times \frac{5}{2}}$$

$$R = 6.5\%$$

Hence, the required rate of Interest = 6.5% p.a

4. Given

Principal (P) = ~~3.3~~ 3.3 Lakhs

P = 330000/-

Rate (R) = 6.5%

Simple Interest (I) = 75075/-

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

$$= \frac{75075 \times 100}{330000 \times 6.5}$$

T = 3.5 years

Hence, the required time = 3 years and 6 months.

5. (i) Simple interest (I) = 2356.25/-

Time (T) = $2.\frac{1}{2}$ years

$T = \frac{5}{2}$ years

Rate (R) = $7.\frac{1}{4}$ %

$R = \frac{29}{4}$ %

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

$= \frac{2356.25 \times 100}{\frac{5}{2} \times \frac{29}{4}}$

P = 13,000/-

Hence, The Required principal is ₹ 13,000/-

(ii) Given

Rate (R) = 4%

Time (T) = 3 years and 3 months

$= 3.\frac{3}{12} = 3.\frac{1}{4} = \frac{13}{4}$

$T = \frac{13}{4}$ years

Final Amount = 11300/-

Final Amount = Principal (P) + Simple interest (I)

$11300 = P + \frac{PTR}{100}$

$11300 = P\left(1 + \frac{TR}{100}\right)$

$11300 = P\left(1 + \frac{\frac{13}{4} \times 4}{100}\right)$

$11300 = P\left(\frac{113}{100}\right)$

$P = \frac{11300 \times 100}{113}$

P = 10,000/-

Hence, The required principal A is 10,000/-

6. Given

Interest Rate (R) = $13\frac{1}{3} = \frac{40}{3}$ %.

Sum Final Amount = 3 × Principal (P)

$P + I = 3P$

$I = 3P - P$

$I = 2P$

$\frac{PTR}{100} = 2P \quad \left(\because I = \frac{PTR}{100}\right)$

$T = \frac{200}{R}$

$T = \frac{200}{\frac{40}{3}}$

Time = T = 15 years

Hence, the required time to triple itself for given Interest rate is 15 years.

7. Given

Principal (P_1) = 4050/-

Final Amount = 4576.50/-

Principal + Simple Interest = 4576.50

$4050 + I_1 = 4576.50$

$I_1 = 526.50/-$

Time = 2 years.

$I_1 = \frac{P_1 T_1 R}{100}$

$526.50 = \frac{4050 \times 2 \times R}{100}$

R = 6.5 % Per Anum.

3. Now we have to Calculate Simple interest for 1 lakh for 3 years at a Rate of 6.5% per anum

$$I_2 = \frac{P_2 T_2 R}{100}$$

$$I_2 = \frac{1,00,000 \times 3 \times 6.5}{100}$$

$$I_2 = 19500/-$$

Total Amount = $P_2 + I_2$

= 1,00,000 + 19,500/-

= 1,19,500/-

∴ Hence, the 1 lakh will amount ₹1,19,500/- for 3 years

8. Let the money invested to be ₹ P.

Given

Principal $P_1 = P$

Rate $R_1 = 7.5\%$

Time $T_1 = 2$ years

Let Interest = I_1

Principal $P_2 = ₹9600$

Rate $R_2 = 10\%$

Time = 3 years and 6 months.

Time $T_2 = 3 \cdot \frac{1}{2} = \frac{7}{2}$ years

Let Simple Interest = I_2

6

$$\therefore I_1 = 2 \times I_2$$

$$\frac{P_1 T_1 R_1}{100} = 2 \times \frac{P_2 T_2 R_2}{100}$$

$$\frac{P \times 2 \times 7.5}{100} = \frac{2 \times 9600 \times \frac{7}{2} \times 10}{100}$$

$$P = ₹4,48,000/- = ₹44,800/-$$

∴ Hence, the required Sum of money ₹44,800/-

Exercise 8.2

1. Given

Principal $P = ₹6000/-$

Rate $R = 10\%$

Time $T = 2$ years

Interest for first year $= \frac{PTR}{100}$

$= \frac{6000 \times 1 \times 10}{100}$

$I_1 = 1200\ 600/-$

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

$= ₹6600/-$

Principal for second year $= ₹6600/-$

Interest for second year $= \frac{PTR}{100}$

$= \frac{6600 \times 1 \times 10}{100}$

$I_2 = ₹660$

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

$= ₹7260/-$

∴ Compound Interest for 2 years = Final Amount − (original) Principal

$= 7260 - 6000$

$= ₹1260/-$

2.

Principal for first year $(P_1) = ₹1875/-$

Rate $(R) = 4\%$

Time $(T) = 2$ years.

Interest for first year $(I_1) = \frac{P_1 \times T_1 \times R}{100}$

$= \frac{1875 \times 1 \times 4}{100}$

$I_1 = ₹75/-$.

Amount at the end of first year = 1875 + 75

= ₹ 1950/-

Principal Amount for Second year (P_2) = ₹ 1950/-

Interest for Second year $I_2 = \frac{1950 \times 1 \times 4}{100}$

I_2 = ₹ 78/-

∴ Compound Interest after 2 year = $I_1 + I_2$

= 75 + 78

= ₹ 153/-

∴ Hence, Salma has to pay ₹ 153 as Compound Interest to the Mahila Samity.

3. Principal for first year (P_1) = ₹ 12000

Rate = 10%, Time = 3 years

Interest for first year (I_1) = $\frac{12000 \times 1 \times 10}{100}$

I_1 = ₹ 1200/-

Total amount at the end of first year = 12000 + 1200

= ₹ 13200/-

Principal for Second year (P_2) = ₹ 13200/-

Interest for second year $I_2 = \frac{13200 \times 1 \times 10}{100}$

= ₹ 1320/-

Total amount at the end of the second year

is 13200 + 1320 = ₹ 14520

Principal amount for third year (P) = ₹ 14520

Interest for third year $I_3 = \frac{14520 \times 1 \times 10}{100}$

$I_3 = ₹ 1452$

Total amount at the end of third year = 14520 + 1452

= ₹ 15972

Compound Interest for 3 years = Final amount − Principal (P_1)

= 15972 − 12000

= ₹ 3972

Hence, At the end of 3 year Jacob will get total Amount as ₹ 15972 and Compound interest ₹ 3972

4. Given Principal (P_1) = ₹ 46875

Rate (R) = 4%, Time = 3 years.

Principal amount for first year (P) = ₹ 46875

(i) Interest for first year (I_1) = $\frac{46875 \times 1 \times 4}{100}$

$I_1 = ₹ 1875$

Total amount at the end of first year = 46875 + 1875

= 48750

Principal amount for second year (P) = ₹ 48750

Interest for second year (I_2) = $\frac{48750 \times 4 \times 1}{100}$

$I_2 = ₹ 1950$

(ii) Total amount at the end of second year

= 48750 + 1950

= ₹ 50700

Principal for third year (P_3) = ₹ 50700

(iii) Interest for third year $(I_3) = \frac{50700 \times 1 \times 4}{100}$

= ₹ 2028

Hence,

i. The interest for first year = ₹ 1875

ii. The Amount standing to his credit at the end of second year is ₹ 50700

iii. The interest for third year = ₹ 2028

5. Given Principal = ₹ 6000/- , Time = 3 years

Rate = 10%.

Principal amount for first year (P_1) = ₹ 6000

Interest for first year $(I_1) = \frac{6000 \times 1 \times 10}{100}$

I_1 = ₹ 600

Total amount at the end of first year = 6000 + 600

= ₹ 6600

Principal for second year (P_2) = ₹ 6600

(i) Interest for second year $(I_2) = \frac{6600 \times 1 \times 10}{100}$

I_2 = ₹ 660

Total amount at the end of second year = 6600 + 660

= ₹ 7260

Principal for third year (P_3) = ₹ 7260

Interest for third year $(I_3) = \frac{7260 \times 1 \times 10}{100}$

I_3 = 726/-

(ii) Total amount at the end of third year = 7260 + 726

= ₹ 7986

Hence i. Compound interest for second year = ₹ 660

ii. Total amount at the end of the third year = ₹ 7986

6.

Principal amount for first year (P_1) = ₹ 5000

Rate of interest for first year (R_1) = 6%

Interest for first year = $\frac{5000 \times 1 \times 6}{100}$

(I_1) = ₹ 300

Total amount at the end of first year = 5000 + 300

= 5300/-

Principal amount for second year (P_2) = 5300

Rate of Interest for second year = 8%

Compound Interest for second year = $\frac{5300 \times 1 \times 8}{100}$

(I_2) = ₹ 424

Total amount at the end of second year = 5300 + 424

= ₹ 5724

Compound interest for 2 years = Final amount − Principal (P_1)

= 5724 − 5000

= ₹ 724

Hence Total amount after 2 year = ₹ 5724

Compound interest for 2 year = ₹ 724

7. Given Principal = ₹ 20000

Time = 2 year

Rate of Interest = 8%.

Simple Interest (I) = $\frac{PTR}{100}$

= $\frac{20000 \times 2 \times 8}{100}$

Simple Interest (I) = ₹3200

Simple Let Compound Interest as C

Intest for first year: $\frac{20000 \times 1 \times 8}{100}$

I_1 = 1600

Total amount at the end of first year = 20000 + 1600

= 21600

Compound Interest for Second year = $\frac{21600 \times 1 \times 8}{100}$

(I_2) = ₹1728

∴ Total Compound Interest for 2 year = $I_1 + I_2$

= 1600 + 1728

C = 3328

∴ Difference between the Compound interest and Simple interest is (C − I) = 3328 − 3200

= ₹128

Exercise 8.3

1.

(i) Given Principal = ₹ 15000

Time = 2 years ; n = 2

Rate of interest = 10%

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

$$= 15000\left(1+\frac{10}{100}\right)^2$$

Total Amount (A) = 18150

Compound interest C = A − P

= 18150 − 15000

Compound interest = 3150

Hence, Amount is ₹ 18150 and Compound interest ₹ 2496

(ii) Given Principal (P) = ₹ 156250

Time (n) = $1\frac{1}{2} = 3/2$

Rate of Interest (R) = 8% per anum

Compound half yearly

So $R = \frac{8\%}{2} = 4\%$ (Half yearly)

$$n = \frac{3/2}{1/2} = 3.$$

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

$$= 156250\left(1+\frac{4}{100}\right)^3$$

A = ₹ 175760

$$C.I = A - P$$

$$= 175760 - 156250$$

$$C.I = 19510$$

Hence, Total Amount ₹ 175760 and Compound interest is ₹ 19510

(iii) Given

$P = 100000$, Time = 9 months, $R = 4\%$ p.a

Compounded for quaterly means 3 months

$$R = \frac{4}{4} = 1\% \text{ per 3 months}$$

$$n = \frac{9 \text{ months}}{3 \text{ months}} = 3.$$

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

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

$$A = ₹ 103030.1$$

$$C = A - P$$

$$= 103030.1 - 100000$$

$$C = ₹ 3030.1$$

Hence, Amount ₹ 103030.1 and Compound interest ₹ 3030.1

2. Given

Principal (P) = ₹4800

Rate of interest (R) = 5% p.a , Time = 2 years

n = 2

Simple interest (S.I) = $\frac{PTR}{100}$

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

S.I = ₹480

Compounded interest (C.I) = A - P

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

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

A = ₹5292

Compound interest C.I = A - P

= 5292 - 4800

C.I = 492

Difference between C.I & S.I = 492 - 480

= ₹12

3.

Principal amount for first year (P_1) = ₹3125

Rate of interest for first year (R_1) = 4%

Interest for first year (I_1) = $\frac{3125 \times 1 \times 4}{100}$

= ₹125

3. Principal (P) = ₹ 3125

Rate of interest for first year (R_1) = 4%

Rate of interest for second year (R_2) = 5%

Rate of interest for Third year (R_3) = 6%

$$\text{Amount } (A) = P\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)\left(1+\frac{R_3}{100}\right)$$

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

$$A = ₹\ 3617.25$$

$$\text{Compound Interest } (C.I) = A - P$$

$$= 3617.25 - 3125$$

$$C.I = 492.25$$

4. Principal = ₹ 26400

Rate of interest (R) = 15% p.a

Time = 2 years and 4 months

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

$n = 2$; $x = \frac{4}{12}$ when time is in fraction $(\because x < 1)$

$$A = 26400\left(1+\frac{15}{100}\right)^n\left(1+\frac{\frac{4}{12}\times 15}{100}\right)$$

$$A = ₹\ 36659.7$$

Hence, Kamala has to pay ₹ 36659.7 to clear the loan

5. Principal (P) = ₹ 18000

Rate of interest (R) = 8% p.a

Time = 2 year

Simple interest (S.I) = $\frac{PTR}{100}$

$= \frac{18000 \times 2 \times 8}{100}$

S.I = 2880

Compound Interest = A − P

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

$= 18000\left(1+\frac{8}{100}\right)^2$

A = ₹ 20995.2

Compound interest (C.I) = 20995.2 − 18000

= ₹ 2995.2

Difference b/w C.I & S.I = 2995.2 − 2880

= 115.2

∴ The extra amount Anil has to pay is ₹ 115.2

6. Given

Principal (P) = ₹ 75000/-

Rate of interest = 12% p.a

(i) Compounded annually

Time = $1\frac{1}{2}$ year

$n = 1$; $x = 1/2$

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

$= 75000\left(1+\frac{12}{100}\right)\left(1+\frac{\frac{1}{2}\times 12}{100}\right)$

$A_1 = ₹\ 89040$

(ii) Compounded half-yearly

$n = \frac{3/2}{1/2} = 3$

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

$= 75000\left(1+\frac{12}{100}\right)^3$

$A_2 = 105369.6$

Hence, Mukesh has to pay more when Compounded Half-yearly than that of when Compounded yearly.

7. Given Principal $(P) = 10000$

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

(i) Amount received by by Aryman at the end of 2 years

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

$= 10000\left(1+\frac{7}{100}\right)^2$

$A_2 = ₹11449$

(ii) interest for 3rd year

Amount received at the end of 3rd year

$$A_3 = P\left(1+\frac{R}{100}\right)^3$$

$$= 10000 \times \left(1+\frac{7}{100}\right)^3$$

$$A_3 = 12250.43$$

Interest for 3rd year = $A_3 - A_2$

$$= 12250.43 - 11449$$

$$= ₹801.49$$

Hence, Aryman receives interest for 3rd year is ₹801.49

8.

Given

Amount (A) = 9261

Time = 3 year ; Compounded anually

Rate of interest (R) = 5% p.a

$n = 3$

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

$$9261 = P\left(1+\frac{5}{100}\right)^3$$

$$P = 9261$$

$$P = ₹8000$$

Hence, the sum of money is ₹8000

9. Given

Amount (A) = ₹ 140608

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

Compounded half-yearly

$n = 3$

Rate of interest = 8% p.a

$R = 4\%$ per-half-year

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

$$140608 = P\left(1 + \frac{4}{100}\right)^3$$

$$P = \frac{140608}{1.124}$$

$$P = ₹\,125000$$

Hence the principal amount is ₹ 125000

10. Given

Principal (P) = ₹ 2000

Total Amount (A) = ₹ 2315.25

Time = 3 years : $n = 3$ (∵ Compounded annually)

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

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

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

$$\frac{R}{100} = \frac{1}{20}$$

$R = 5\%$ Per anum.

Hence, Rate interest is 5% per anum

11. Given

Principal (P) = ₹ 40000

Amount (A) = ₹ 46305

Time = $1\frac{1}{2}$ year

Compounded half-yearly

$n = 3$

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

$46305 = 40000\left(1 + \frac{R}{100}\right)^3$

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

$R = 5\%$ per half-year

$R = 10\%$ per Anum.

Hence, Rate of interest 10% per Anum

12. Given

Principal = 17576

Amount (A) = ₹ 17576

Principal (P) = ₹ 15625

Rate of interest = 4% P.a

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

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

$1.1248 = (1.04)^n$

Apply 'log' on both Side

$\log_e(1.1248) = n \cdot \log_e(1.04)$

$\boxed{n = 3}$

Hence, the required time is 3 years

13. Principal = ₹ 16000

Amount = ₹ 18522

Rate of interest (R) = 10% P.a

Compounded Semi-annually

R = 5% per half-year

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

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

$\Rightarrow (1.05)^n = 1.1576$

Apply 'log' on both sides

$n \cdot \log_e(1.05) = \log_e(1.1576)$

$\boxed{n = 3}$

$\therefore$ Time $= 3 \times \frac{1}{2} = 1\frac{1}{2}$ year.

$\therefore$ The required time $= 1\frac{1}{2}$ years.