Simple and Compound Interest

Exercise 8.1

Solutions

1. Principal (P) = 4000/-
Rate of Interest (R) = 7.5%.
Time (T) = 2 years and 3 months
1 month = \frac{1}{12} year
3 months = \frac{3}{12} year = \frac{1}{4} year

Total Time = 2\frac{3}{4} years = \frac{13}{4} years

Simple interest (I) = \frac{P \times R \times T}{100}
= \frac{4000 \times 13 \times 7.5}{4 \times 100}
= 975

Simple interest (I) = 975/-

Amount = Principal + Interest
= 4000 + 975

Amount = 4975/-

2. Given

Simple Interest (I) = 170.10

Time (T) = 8 years and 3 months
(T) = 8\frac{3}{12} = 8\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/- i.e. Required Sum of money = 1260/-
3. **Given**

   Principal = 800/-
   
   Simple Interest (I) = 130/-
   
   Time = 2 years and 6 months
   
   Time = \( 2 + \frac{6}{12} = 2 + \frac{1}{2} = \frac{5}{2} \text{ years} \)
   
   \[ R = \frac{I \times 100}{P \times T} \]
   
   \[ = \frac{130 \times 100}{800 \times \frac{5}{2}} \]
   
   \[ R = 6.5\% \]
   
   Hence, the required rate of interest = 6.5\% p.a

4. **Given**

   Principal (P) = 3.33 lakhs
   
   P = 330000/-
   
   Rate (R) = 6.5\%
   
   Simple Interest (I) = 75075/-
   
   \[ \text{Time (T)} = \frac{I \times 100}{P \times R} \]
   
   \[ = \frac{75075 \times 100}{330000 \times 6.5} \]
   
   \[ T = 3.5 \text{ years} \]
   
   Hence, the required time = 3 years and 6 months.
5. (i) Simple interest (I) = 2356.25\_currency{/-}

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

T = 2.5 \text{ years}

Rate (R) = 7\frac{1}{4} \% \hspace{1cm} R = 7.25 \%

\begin{align*}
P &= \frac{I \times 100}{T \times R} \\
&= \frac{2356.25 \times 100}{2.5 \times \frac{29}{4}} \\
P &= 13,000\_currency{/-}
\end{align*}

Hence, the required principal is 13,000\_currency{/-}.

(ii) Given

Rate (R) = 4\% \hspace{1cm} \text{Time (T) = 3 years and 3 months}

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

Final Amount = 11300\_currency{/-}

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

\begin{align*}
11300 &= P \left(1 + \frac{12}{100}\right) \\
11300 &= P \left(1 + \frac{\frac{12}{4} \times 4}{100}\right) \\
11300 &= P \left(1 + \frac{13}{100}\right) \\
P &= \frac{11300 \times 100}{113} \\
P &= 10,000\_currency{/-}
\end{align*}

Hence, the required principal is 10,000\_currency{/-}.
6. Given

Interest Rate (\( R \)) = 13 \( \frac{1}{2} \) = \( \frac{4 \times 3}{3} \)

Sum Final Amount = 3 x Principal (P)

\[ P + I = 3P \]
\[ I = 3P - P \]
\[ I = 2P \]
\[ \frac{PTR}{100} = 2P \; \therefore \; I = \frac{PTR}{100} \]
\[ T = \frac{200}{R} \]
\[ T = \frac{200}{40} \]

Time = \( T \) = 15 years

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

7. Given

Principal (P) = 4050

Final Amount = 4576.50

Principal + Simple Interest = 4576.50

4050 + I = 4576.50

\[ I = 526.50 \]

Time = 2 years.

\[ I = \frac{PTR}{100} \]
\[ 526.50 = \frac{4050 \times 2 \times R}{100} \]

\[ R = 6.5\% \; per \; annum \]
Now we have to calculate simple interest for 1 lakh for 3 years at a rate of 6.5% per annum.

\[ I_2 = \frac{P_2 T_2 R}{100} \]

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

\[ I_2 = 19,500 \text{ } \]

**Total Amount** \[ = P_2 + I_2 \]

\[ = 1,00,000 + 19,500 \]

\[ = 1,19,500 \text{ } \]

Hence, the 1 lakh will amount to ₹1,19,500 for 3 years.

8. Let the money invested to be ₹P.

Given:

- Principal \( P_1 = P \)
- Principal \( P_2 = ₹9,600 \)
- Rate \( R_1 = 7.5\% \)
- Rate \( R_2 = 10\% \)
- Time \( T_1 = 2 \text{ years} \)
- Time = 3 years and 6 months.
- Time \( T_2 = 3 \frac{1}{2} = \frac{7}{2} \text{ years} \)
- Let Interest = \( I_1 \)
- Time \( T_2 = 3 \frac{1}{2} = \frac{7}{2} \text{ years} \)
- Let Simple Interest = \( I_2 \)

\[ I_1 = 2 \times I_2 \]

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

\[ P \times 2 \times 7.5 \]

\[ = \frac{2 \times 9,600 \times \frac{7}{2} \times 10}{100} \]

\[ P = ₹4,1,48,000 \]

Hence, the required sum of money is ₹4,1,48,000.


1. Given

Principal \( P = \text{Rs}\, 36000 \)

Rate \( R = 10\% \)

Time \( T = 2 \) years

Interest for first year = \( \frac{P \times R \times T}{100} \)

\[ = \frac{36000 \times 10 \times 1}{100} \]

\[ = \text{Rs}\, 3600 \]

Amount at the end of the first year = \( \text{Rs}\, 3600 + 3600 = \text{Rs}\, 7200 \)

Principal for second year = \( \text{Rs}\, 7200 \)

Interest for second year = \( \frac{P \times R \times T}{100} \)

\[ = \frac{7200 \times 10 \times 1}{100} \]

\[ = \text{Rs}\, 720 \]

Amount at the end of the second year = \( \text{Rs}\, 7200 + 720 = \text{Rs}\, 7920 \)

\[ \therefore \text{Compound Interest for 2 years} = \text{Final Amount} - \text{(Original) Principal} \]

\[ = \text{Rs}\, 7920 - \text{Rs}\, 3600 \]

\[ = \text{Rs}\, 4320 \]

Principal for first year \( P_1 = \text{Rs}\, 1875 \)

Rate \( R = 4\% \)

Time \( T = 2 \) years

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

\[ = \frac{1875 \times 4 \times 2}{100} \]

\[ = \text{Rs}\, 150 \]
Amount at the end of first year = 1875 + 75
= $ 1950/-

Principal Amount for Second year (P2) = $ 1950/-

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

\( I_2 = 78/- \)

\[ \text{Compound Interest after 2 years} = I_1 + I_2 \]

\[ = 75 + 78 \]

\[ = 153/- \]

Hence, Salma has to pay $ 153 as Compound Interest to the Mahila Samiti.

3. Principal for first year (P1) = $ 12000

\[ \text{Rate} = 10\%, \text{Time} = 3 \text{years} \]

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 (P2) = $ 13200/-

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

\[ = $ 1320/- \]

Total amount at the end of the second year

\[ = 13200 + 1320 = $ 14520 \]
Principal amount for third year = ₹ 14,520

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

\( I_3 = ₹ 1452 \)

Total amount at the end of third year = ₹ 14,520 + 14,520 = ₹ 15,972

Compound Interest for 3 years = Final Amount - Principal (P)

\( = 15,972 - 12,000 \)

\( = ₹ 3,972 \)

Hence, at the end of 3 years, Jacob will get total amount as ₹ 15,972 and compound interest = ₹ 3,972

4.

Given: Principal (P) = ₹ 4,687.5,
Rate (R) = 4.5\%, Time = 3 years.

Principal amount for first year (P) = ₹ 4,687.5

(i) Interest for first year \( I_1 = \frac{4,687.5 \times 1 \times 4.5}{100} \)

\( I_1 = ₹ 187.5 \)

Total amount at the end of first year = ₹ 4,687.5 + 187.5

\( = ₹ 4,875 \)

Principal amount for second year (P) = ₹ 4,875

Interest for second year \( I_2 = \frac{4,875 \times 4.5 \times 1}{100} \)

\( I_2 = ₹ 219.5 \)

(ii) Total amount at the end of second year

\( = ₹ 4,875 + 219.5 \)

\( = ₹ 5,094.5 \)
Principal for third year \((P_3)\) = £50,700

(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 = £50,700

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 (P₁) = ₹5000

Rate of interest for first year (R₁) = 6%.

Interest for first year = \[
\frac{5000 \times 1 \times 6}{100} = ₹300
\]

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

= ₹5300

Principal amount for second year (P₂) = ₹5300

Rate of interest for second year = 8%.

Compound interest for second year = \[
\frac{5300 \times 1 \times 8}{100} = ₹424
\]

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

= ₹5724

Compound interest for two years = final amount - principal (P₁)

= 5724 - 5000

= ₹724

Hence, Total amount after 2 years = ₹5724

Compound interest for 2 years = ₹724
7. Given Principal = ₹ 20000
   Time = 2 year
   Rate of Interest = 8.1.

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

\[
= \frac{20000 \times 2 \times 8}{100} 
\]

Simple Interest (I) = ₹3200

Simple interest on compound interest as 'C'.

Interest 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 years = \( I_1 + I_2 \)

\( = 1600 + 1728 \)

\( C = 3328 \)

:. Difference between the compound interest and simple interest is \( (C - I) = 3328 - 3200 \)

\( = ₹128 \)
Exercise 8.3

1.

(i) Given

- Principal = ₹15,000
- Time = 2 years; $n = 2$
- Rate of Interest = 10%.

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) = ₹15,6250
- Time (n) = 1\frac{1}{2} = 3/2
- Rate of Interest (R) = 8\frac{1}{2}\% per annum

Compound half yearly.

So

$R = \frac{8.5}{2} = 4.25$ (Half yearly)

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

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

$= 156250 \left(1 + \frac{4.25}{100}\right)^3$

$A = ₹175760$
\[ C.I = A - P \]
\[ = 175760 - 156250 \]
\[ C.I = 19510 \]

Hence, Total Amount \( \$175760 \) and Compound Interest is \( \$19510 \)

(iii) Given

\[ P = 100000, \text{ Time } = 9 \text{ months}, \text{ } R = 4 \text{ } \% \text{ p.a} \]

Compounded for quarterly means 3 months

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

\[ n = \frac{9 \text{ months}}{3 \text{ months}} = 3 \]

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\% \text{ p.a.}\), Time = 2 years
No. = 2

Simple interest (S.I) = \frac{P \times R \times T}{100}
= \frac{4800 \times 2 \times 5}{100}
= ₹ 480

Compounded interest (C.I) = A - P

Amount (A) = P \left(1 + \frac{R}{100}\right)^T
= 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) = ₹ 3125
Rate of interest for first year (R) = 4.1\%
Interest for first year \(I_1\) = \frac{3125 \times 1 \times 4}{100}
= ₹ 125
3. Principal (P) = ₹ 3125
   Rate of Interest for first year (R₁) = 4\% \text{ p.a.}
   Rate of Interest for second year (R₂) = 5\% \text{ p.a.}
   Rate of Interest for third year (R₃) = 6\% \text{ p.a.}

   \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\% \text{ p.a.}
   Time = 2 years and 4 months

   \text{Amount (A)} = P \left(1 + \frac{R}{100}\right)^n \left(1 + \frac{\frac{R}{100}}{12}\right)
   n = 2; x = \frac{4}{12} \quad \text{when time is in fraction}
   A = 26400 \left(1 + \frac{15}{100}\right)^2 \left(1 + \frac{\frac{15}{12}}{100}\right)
   A = ₹ 36659.7

   Hence, Kamala has to pay ₹ 36659.7 to clear the loan.
5. Principal \( (P) = £18000 \)

Rate of interest \( (R) = 8\% \text{ p.a.} \)

Time = 2 years

Simple interest \( (S.I) = \frac{P 	imes R 	imes T}{100} \)

\[ = \frac{18000 \times 2 \times 8}{100} \]

\[ S.I = 2880 \]

Compound Interest = \( A - P \)

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

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

\[ A = £20995.2 \]

Compound interest \( (C.I) = 20995.2 - 18000 \)

\[ = £2995.2 \]

Difference \( S.I \& C.I = 2995.2 - 2880 \)

\[ = £115.2 \]

\[ \therefore \text{ The extra amount Amil has to pay in } £115.2 \]

6. Given

Principal \( (P) = £75000 \)

Rate of interest \( = 12\% \text{ p.a.} \)

(i) Compounded Annually

Time = \( \frac{1}{2} \text{ year} \)

\[ n = 1; \; x = \frac{1}{2} \]
\[ \text{Amount (A)} = P \left( 1 + \frac{R}{100} \right)^n \left( 1 + \frac{R}{100} \right) \]

\[ = \frac{5000}{11} \left( 1 + \frac{12}{100} \right) \left( 1 + \frac{1}{5} \times 12 \right) \]

\[ A_1 = \frac{5}{8904.0} \]

(ii) Compounded half-yearly.

\[ n = \frac{3}{2} = 3 \]

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

\[ = \frac{5000}{11} \left( 1 + \frac{12}{100} \right)^3 \]

\[ A_2 = 105369.6 \]

Hence, Mukesh has to pay more when compounded half-yearly than that of compounded yearly.

7. Given: Principal (P) = 10000

Rate of interest (R) = 7\% per annum

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

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

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

\[ A_2 = 8114.49 \]
(ii) Interest for 3rd year
Amount received at the end of 3rd year
\[ A_3 = P \left(1 + \frac{R}{100}\right)^3 \]
\[ = 10000 \times \left(1 + \frac{7}{100}\right)^3 \]
\[ = 12250.43 \]
Interest for 3rd year = \[ A_3 - A_2 \]
\[ = 12250.43 - 11449 \]
\[ = 801.49 \]
Hence, Arunyan receives interest for 3rd year is 801.49.

8.
Given
Amount \[ (A) = 9261 \]
Time = 3 years; compounded annually
Rate of interest \[ (R) = 5\% \text{ p.a} \]
\[ n = 3 \]
\[ A = P \left(1 + \frac{R}{100}\right)^n \]
\[ 9261 = P \left(1 + \frac{5}{100}\right)^3 \]
\[ P = 8000 \]
Hence, the sum of money is 8000.
9. Given

Amount \( (A) = 2 \, 14,060 \)  
Time = \( 1 \frac{1}{2} \) years  
Compounded half-yearly  
\( n = 3 \)  
Rate of interest = 8\% per annum  
\( R = 4 \% \) per half-year  

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

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

\[ P = \frac{140608}{1.124} \]

\[ P = 2 \, 125,000 \]

Hence, the principal amount is 2,125,000

10. Given

Principal \((P) = 2 \, 2000\)

Total Amount \((A) = 2 \, 2315.25\)

Time = 3 years; \( n = 3 \) (Compounded annually)

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

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

\[ 1 + \frac{R}{100} = \frac{23}{20} \]

\[ \frac{R}{100} = \frac{3}{20} \]

\[ R = 15 \% \] per annum.

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

Principal (P) = ₹ 40000

Amount (A) = ₹ 46305

Time = 1½ year

Compounded half-yearly

$n = 3$

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

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

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

$R = 5\frac{1}{2}$% per half-year

$R = 10\frac{1}{2}$% per annum.

Hence, Rate of interest = 10½% per annum.

12. Given

Principal = ₹ 17576

Amount (A) = ₹ 17576

Principal (P) = ₹ 15625

Rate of interest = 4% p.a.

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

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

$1 + \frac{4}{100} = 1.04$

$1.1248 = (1.04)^n$

Apply 'log' on both sides

$\log_{e}(1.1248) = n \cdot \log_{e}(1.04)$

$\frac{n}{3}$

Hence, the required time is 3 years.
13. **Principal = $16000**

**Amount = $18522**

**Rate of interest (R) = 10\% p.a.**

**Compounded Semi-annually**

\[ R = \frac{10\%}{2} \text{ per half-year} \]

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

\[ 18522 = 16000 \left(1 + \frac{10}{100}\right)^n \]

\[ n \log_e (1.05) = \log_e (1.1576) \]

\[ n = 3 \]

\[ \therefore \text{ Time } = 3 \times \frac{1}{2} = 1 \frac{1}{2} \text{ years} \]

\[ \therefore \text{ The required time } = 1 \frac{1}{2} \text{ years} \]