Simple Interest

INTRODUCTION

When A borrows some money from B, then A has to pay certain amount to B for the use of this money. This amount paid by A is called *interest*. The total amount of money borrowed by A from B is called the *principal*. The money paid back to B, which comprises the principal and the interest is called the *amount.*

In other words,

$$\text{Amount} = \text{Principal} + \text{Interest}$$

The interest is usually charged according to a specified term, which is expressed as some per cent of the principal and is called the *rate of interest* for the fixed period of time. This fixed period may be a year, six months, three months or a month and correspondingly the rate of interest is charged annually, semi-annually, quarterly or monthly. For example, the rate of interest is 5% per annum means the interest payable on ₹100 for one year is ₹5.

Interest can be of two types:

1. Simple Interest

2. Compound Interest

SIMPLE INTEREST

When the interest is payable on the principal only, it is called *simple interest*. For example, simple interest on ₹100 at 5% per annum will be ₹5 each year, that is, at the end of one year, total amount will be ₹105. At the end of second year, it will be ₹110 and so on.

Thus, simple interest is the interest computed on the principal for the entire period it is borrowed.

In this chapter, we will limit ourselves to simple interest. Compound interest will be discussed in the next chapter.

SOME BASIC FORMULAE

If P stands for principal, R is the rate per cent per annum, T is the number of years, I is the simple interest and A is the amount, then

1. $$\text{Simple Interest} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

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

Illustration 1 Find the simple interest on ₹5200 for 2 years at 6% per annum.

Solution: Here $P = ₹5200$, $T = 2$ years and $R = 6\%$

$$\therefore \quad \text{Simple interest} = \frac{P \times R \times T}{100} = \frac{5200 \times 6 \times 2}{100}$$

$$= ₹624$$

2. $$\text{Principal} = \frac{100 \times \text{Simple Interest}}{\text{Rate} \times \text{Time}}$$

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

Illustration 2 A man earns ₹450 as an interest in 2 years on a certain sum invested with a company at the rate of 12 per cent per annum. Find the sum invested by the man in the company.

Solution: We have $I = ₹450$, $T = 2$ years,

$R = 12\%$ per annum

$$\therefore \quad P = \frac{I \times 100}{R \times T} = \frac{450 \times 100}{12 \times 2} = ₹1875$$

Thus, the money invested by the man was ₹1875

3. $\text{Rate} = \dfrac{100 \times \text{Simple Interest}}{\text{Principal} \times \text{Time}}$

or, $R = \dfrac{100 \times I}{P \times T}$

Illustration 3 At what rate per annum will a sum of ₹5000 amount to ₹6000 in 4 years?

Solution: Here P = ₹5000, A = ₹6000,

T = 4 years

So, $I = A - P$ = ₹(6000 – 5000) = ₹1000

$\therefore \quad R = \dfrac{100 \times I}{P \times T}$

$= \dfrac{100 \times 1000}{5000 \times 4} = 5\%$

4. $\text{Time} = \dfrac{100 \times \text{Simple Interest}}{\text{Rate} \times \text{Principal}}$

or, $T = \dfrac{100 \times I}{R \times P}$

Illustration 4 In what time will ₹1200 earn an interest of ₹240 at 5% per annum?

Solution: Here P = ₹1200, I = ₹240, R = 5%

$\therefore \quad T = \dfrac{100 \times I}{P \times R} = \dfrac{100 \times 240}{1200 \times 5} = 4$ years

5. Amount = Principal + Simple Interest

$= \text{Principal} + \dfrac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$

$= \text{Principal}\left(1 + \dfrac{\text{Rate} \times \text{Time}}{100}\right)$

or, $A = P\left(1 + \dfrac{R \times T}{100}\right)$

Illustration 5 Mahesh borrowed ₹3000 from his friend Suresh at 15% per annum for 3 years. Find the interest and money returned by Mahesh to Suresh

Solution: Here P = ₹3000, R = 15% per annum, T = 3 years

$\therefore \quad I = \dfrac{P \times R \times T}{100} = \dfrac{3000 \times 15 \times 3}{100} = ₹1350$

$\therefore \quad A = P + I$ = ₹3000 + ₹1350 = ₹4350

Thus, Mahesh paid ₹1350 as interest to Suresh and the amount returned by Mahesh to Suresh = ₹4350

SOME USEFUL SHORT-CUT METHODS

1. If a certain sum in T years at R% per annum amounts to ₹A, then the sum will be

$$P = \frac{100 \times A}{100 + R \times T}$$

Explanation

Let the principal be ₹ x

$\therefore$ Simple interest = ₹ $(A - x)$

$\therefore \quad A - x = \dfrac{x \times R \times T}{100}$

$\Rightarrow \quad 100A - 100x = xRT$

$\Rightarrow \quad (100 + RT)x = 100A$

$\therefore \quad x = \dfrac{100 \times A}{100 + R \times T}$

Illustration 6 What principal will amount to ₹570 at 4% per annum in $3\frac{1}{2}$ years?

Solution: We have, A = ₹570, R = 4% per annum,

$T = \dfrac{7}{2}$ years

$\therefore \quad P = \dfrac{100 \times A}{100 + R \times T} = \dfrac{100 \times 570}{100 + 4 \times 7/2}$

$= \dfrac{100 \times 570}{114} = ₹500$

Thus, ₹500 will amount to ₹570 at 4% per annum in $3\frac{1}{2}$ years

2. The annual payment that will discharge a debt of ₹A due in T years at R% per annum is

$$\text{Annual payment} = ₹\left(\frac{100A}{100T + \dfrac{RT(T-1)}{2}}\right)$$

Explanation

Let the annual payment be ₹x.

Since the first instalment is paid at the end of first year,

$\therefore$ Amount of first instalment at the end of t years

$$= x + \frac{(T-1) \times R \times x}{100}$$

Similarly, amount of second instalment at the end of t years

$$= x + \frac{(T-2) \times R \times x}{100}, \text{ and so on}$$

Thus, total amount of T instalments

$$A = \left[x + \frac{(T-1) \times R \times x}{100}\right] + \left[x + \frac{(T-2) \times R \times x}{100}\right] + \ldots + x$$

$$= Tx + \frac{Rx}{100}[(T-1) + (T-2) + \ldots + 1]$$

$$= Tx + \frac{Rx}{100}\left[\frac{(T-1) \times T}{2}\right]$$

or $\quad 100\,Tx + Rx\left[\frac{T(T-1)}{2}\right] = 100\,A$

or $\quad x\left[100T + \frac{RT(T-1)}{2}\right] = 100\,A$

$$\therefore \quad x = \frac{100\,A}{100T + \frac{RT(T-1)}{2}}$$

Illustration 7 Find the annual instalment that will discharge a debt of ₹12900 due in 4 years at 5% per annum simple interest

Solution: Here A = ₹12900, T = 4 years, R = 5% per annum

$$\therefore \text{ Annual instalment } = \frac{100 \times A}{100 \times T + \frac{RT(T-1)}{2}}$$

$$= \frac{100 \times 12900}{(100 \times 4) + \frac{5(4-1) \times 4}{2}}$$

$$= \frac{100 \times 12900}{400 + 30} = \frac{100 \times 12900}{430}$$

$$= ₹3000$$

3. If a certain sum is invested in n types of investments in such a manner that equal amount is obtained on each investment where interest rates are $R_1, R_2, R_3, \ldots, R_n$, respectively and time periods are $T_1, T_2, T_3, \ldots, T_n$, respectively, then the ratio in which the amounts are invested is

$$\frac{1}{100 + R_1T_1} : \frac{1}{100 + R_2T_2} : \frac{1}{100 + R_3T_3} : \ldots \frac{1}{100 + R_nT_n}.$$

Explanation

Let $P_1, P_2, \ldots, P_n$ be invested in n types of investments whose interest rates are $R_1, R_2, \ldots, R_n$ and time periods are $T_1, T_2, \ldots, T_n$.

Then, $\quad P_1 = \frac{100 \times A}{100 + R_1T_1}$

$$P_2 = \frac{100 \times A}{100 + R_2T_2}$$

$$\text{M} \quad \vdots$$

$$P_n = \frac{100 \times A}{100 + R_nT_n}.$$

$$\therefore P_1 : P_2 : \ldots : P_n$$

$$= \frac{100 \times A}{100 + R_1T_1} : \frac{100 \times A}{100 + R_2T_2} : \ldots \frac{100 \times A}{100 + R_nT_n}$$

$$= \frac{1}{100 + R_1T_1} : \frac{1}{100 + R_2T_2} : \ldots \frac{1}{100 + R_nT_n}$$

[$\because$ the amount A is same for all]

Illustration 8 A sum of ₹1586 is divided among three such parts that amount obtained on these three parts of money after 2, 3 and 4 years, respectively at the rate of 5% per annum remains equal. Find such three parts of the sum

Solution: Since the amount accured from each of the three parts of ₹1586 at the rate of 5% p.a. in 2, 3 and 4 years, respectively, remains equal, such three parts of ₹1586 will be in the ratio of

$$\frac{1}{100 + R_1T_1} : \frac{1}{100 + R_2T_2} : \frac{1}{100 + R_3T_3}$$

Hence, the ratio

$$= \frac{1}{100 + 5 \times 2} : \frac{1}{100 + 5 \times 3} : \frac{1}{100 + 5 \times 4}$$

$$= \frac{1}{110} : \frac{1}{115} : \frac{1}{120}$$

$$= \frac{1\times 30360}{110} : \frac{1\times 30360}{115} : \frac{1\times 30360}{120}$$

($\because$ L.C.M. of 110, 115 and 120 is 30360)

$\therefore$ ratio = 276:264:253

Sum of proportionals = 276 + 264 + 253 = 793

$\therefore$ 1st part $= \frac{276}{793}\times 1586 = ₹552$

2nd part $= \frac{264}{793}\times 1586 = ₹528$

and, 3rd part $= \frac{253}{793}\times 1586 = ₹506$

4. If a certain sum of money becomes n times itself in T years at simple interest, then the rate of interest per annum is

$$R = \frac{100(n-1)}{T}\ \%$$

Explanation

Let ₹P become ₹nP in t years

$\therefore$ Simple interest I is given by

$$I = nP - P = (n-1)\,P$$

$\therefore$ Rate of interest R is given by

$$R = \frac{100\times I}{P\times T} = \frac{100\times (n-1)P}{P\times T}$$

$$= \frac{100\,(n-1)}{T}$$

Illustration 9 A certain sum of money trebles itself in 5 years simple interest. Find the rate per cent per annum

Solution: Here $n = 3$, $T = 5$ years

$$\therefore \quad R = \frac{100\,(n-1)}{T}\ \% = \frac{100\,(3-1)}{5}\ \% = 40\%$$

5. If a certain sum of money becomes n times itself at R% per annum simple interest in T years, then

$$T = \left(\frac{n-1}{R}\right) \times 100 \text{ years.}$$

Illustration 10 In what time a sum of money will double itself at a rate of simple interest of 8% per annum?

Solution: Required time $(T) = \frac{(n-1)\times 100}{R}$ years

$$= \frac{(2-1)\times 100}{8} \text{ years}$$

$$= 12\frac{1}{2} \text{ years}$$

6. If a certain sum of money becomes n times itself in T years at a simple interest, then the time T in which it will become m times itself is given by

$$T' = \left(\frac{m-1}{n-1}\right) \times T \text{ years.}$$

Explanation

Let the principal be ₹P.

Let it become m times in T' years.

Then, the amount in T years = ₹nP

and the amount in T' years = ₹mP.

$\therefore$ $$nP - P = \frac{P\times R\times T}{100}$$

or, $$(n-1)\,P = \frac{P\times R\times T}{100} \qquad (1)$$

and, $$(m-1)\,P = \frac{P\times R\times T'}{100} \qquad (2)$$

$\therefore$ $$\frac{(m-1)P}{(n-1)P} = \frac{P\times R\times T'}{100} \times \frac{100}{P\times R\times T}$$

or, $$\frac{m-1}{n-1} = \frac{T'}{T}$$

$\therefore$ $$T' = \left(\frac{m-1}{n-1}\right) T \text{ years.}$$

Illustration 11 A sum of money put out on simple interest doubles itself in $12\frac{1}{2}$ years. In how many years would it treble itself?

Solution: Here, $n = 2$, $m = 3$, $T = \frac{25}{2}$ years.

$\therefore$ Required time $(T') = \left(\frac{m-1}{n-1}\right) \times T$ years

$$= \left(\frac{3-1}{2-1}\right)\times \frac{25}{2} \text{ years}$$

$$= 25 \text{ years}$$

7. Effect of change of P, R and T on simple interest is given by the following formula:

Change in Simple Interest

$$= \frac{\text{Product of fixed parameter}}{100} \times [\text{difference of product of variable parameters}]$$

For example, if rate (R) changes from R_1 to R_2 and P, T are fixed, then

$$\text{Change in SI} = \frac{PT}{100} \times (R_1 - R_2)$$

Similarly, if principal (P) changes from P_1 to P_2 and R, T are fixed, then change in SI $= \frac{RT}{100} \times (P_1 - P_2)$

Also, if rate (R) changes from R_1 to R_2 and time (T) changes from T_1 to T_2 but principal (P) is fixed, then change in SI $= \frac{P}{100} \times (R_1T_1 - R_2T_2)$.

Illustration 12 If simple interest on ₹600 increases by ₹30, when the rate % increases by 4% per annum, find the time

Solution: Here $P = 600$, change in SI $= 30$, $R_1 - R_2 = 4$, $T = ?$

Using, change in SI $= \frac{PT}{100} \times (R_1 - R_2)$

We have, $30 = \frac{600T}{100} \times 4 \Rightarrow T = \frac{5}{4}$, i.e., $1\frac{1}{4}$ years

Illustration 13 If the simple interest on ₹1400 be more than the interest on ₹1000 by ₹60 in 5 years, find the rate per cent per annum

Solution: Here change in SI $= 60$, $P_1 - P_2 = 400$, $T = 5$, $R = ?$

Using change in SI $= \frac{RT}{100} \times (P_1 - P_2)$

We have $60 = \frac{5R}{100} \times 400 \Rightarrow R = 3\%$

Illustration 14 If the simple interest on a certain sum at 4% per annum for 4 years is ₹80 more than the interest on the same sum for 3 years at 5% per annum, find the sum

Solution: Here change in SI $= 80$, $R_1 = 4$, $R_2 = 5$, $T_1 = 4$, $T_2 = 3$, $P = ?$

Using change in SI $= \frac{P}{100} \times (R_1T_1 - R_2T_2)$

We have $80 = \frac{P}{100} \times (4 \times 4 - 5 \times 3)$

$\Rightarrow$ $P = ₹8000$

8. If a debt of ₹Z is paid in 'n' number of instalments and if the value of each instalment is ₹a, then the borrowed (debt) amount is given by

$$Z = na + \frac{Ra}{100 \times b} \times \frac{n(n-1)}{2}$$

where R = rate of interest per annum
b = no. of instalments/year
$b = 1$, when each instalment is paid yearly
$b = 2$, when each instalment is paid half-yearly
$b = 4$, when each instalment is paid quarterly
$b = 12$, when each instalment is paid monthly.

Illustration 15 A sum of ₹2 is lent to be paid back in 3 equal monthly instalments of Re. 1 each. Find the rate per cent

Solution: Here $Z = ₹2$, $a =$ Re. 1, $n = 3$, $b = 12$, $R = ?$

Using the formula

$$Z = na + \frac{Ra}{100 \times b} \times \frac{n(n-1)}{2},$$

we have $2 = 3 \times 1 + \frac{R \times 1}{100 \times 12} \times \frac{3 \times 2}{2} \Rightarrow R = 400\%$

$\therefore$ The rate % p.a. is 400%

9. If a certain sum of money P lent out at SI amounts to A_1 in T_1 years and to A_2 in T_2 years, then

$$P = \frac{A_1T_2 - A_2T_1}{T_2 - T_1}$$

and $$R = \frac{A_1 - A_2}{A_1T_2 - A_2T_1} \times 100\%$$

Illustration 16 If a certain sum of money at simple interest amounts to ₹5184 in 2 years and to ₹5832 in 3 years, what is the sum and the rate of interest?

Solution: Principal $= \frac{A_1T_2 - A_2T_1}{T_2 - T_1}$

$$\left[\begin{matrix}\text{Here } A_1 = 5184, A_2 = 5832 \\ T_1 = 2, T_2 = 3\end{matrix}\right]$$

$$= \frac{5184 \times 3 - 5832 \times 2}{3 - 2} = ₹3888$$

and, Rate $= \dfrac{(A_2 - A_1)\times 100}{T_1A_2 - T_2A_1} = \dfrac{(5832-5184)\times 100}{2\times 5832 - 3\times 5184}$

$= \dfrac{64800}{3888} = 16\dfrac{2}{3}\%$

10. If a certain sum of money P lent out for a certain time T amounts to A_1 at $R_1\%$ per annum and to A_2 at $R_2\%$ per annum, then

$$P = \frac{A_2R_1 - A_1R_2}{R_1 - R_2}$$

and $\quad T = \dfrac{A_1 - A_2}{A_2R_1 - A_1R_2} \times 100$ years

Illustration 17 A certain sum is invested for certain time. It amounts to ₹450 at 7% per annum. But when invested at 5% per annum, it amounts to ₹350. Find the sum and time

Solution: Here $A_1 = 450$, $R_1 = 7$, $A_2 = 350$, $R_2 = 5$

Using the formula,

$$P = \frac{A_2R_1 - A_1R_2}{R_1 - R_2}$$

We get, $\quad P = \dfrac{350\times 7 - 450\times 5}{7-5} = ₹100$

Also, using the formula,

$$T = \left(\frac{A_1 - A_2}{A_2R_1 - A_1R_2}\right) \times 100$$

We get, $\quad T = \left(\dfrac{450-350}{350\times 7 - 450\times 5}\right)\times 100 = 5$ years

11. If an amount P_1 lent at simple interest rate of $R_1\%$ per annum and another amount P_2 at simple interest rate of $R_2\%$ per annum, then the rate of interest for the whole sum is

$$R = \left(\frac{P_1R_1 + P_2R_2}{P_1 + P_2}\right).$$

Illustration 18 Mohan deposits ₹5000 in NSC at 2% per annum and ₹2000 in mutual funds at 4% per annum. Find the rate of interest for the whole sum

Solution: Here $P_1 = 5000$, $R_1 = 2$, $P_2 = 2000$, $R_2 = 4$

Using the formula

$$R = \left(\frac{P_1R_1 + P_2R_2}{P_1 + P_2}\right)$$

We get, $\quad R = \dfrac{5000\times 2 + 2000\times 4}{5000 + 2000} = 2\dfrac{4}{7}\%$

12. If a certain sum of money is lent out in n parts in such a manner that equal sum of money is obtained as simple interest on each part where interest rates are $R_1, R_2, \ldots, R_n$, respectively and time periods are $T_1, T_2, \ldots, T_n$, respectively, then the ratio in which the sum will be divided in n parts is given by

$$\frac{1}{R_1T_1} : \frac{1}{R_2T_2} : \ldots \frac{1}{R_nT_n}$$

Explanation

Let the n equal parts be $P_1, P_2, \ldots, P_n$ and let I be the equal interest earned on each part.

Then, $\quad P_1 = \dfrac{I\times 100}{R_1T_1}$

$$P_2 = \frac{I\times 100}{R_2T_2}$$

$$\vdots \qquad \vdots$$

$$P_N = \frac{I\times 100}{R_nT_n}$$

$\therefore \quad P_1 : P_2 : \ldots : P_N = \dfrac{I\times 100}{R_1T_1} : \dfrac{I\times 100}{R_2T_2} : \ldots \dfrac{I\times 100}{R_nT_n}$

$$= \frac{1}{R_1T_1} : \frac{1}{R_2T_2} : \ldots \frac{1}{R_nT_n}$$

Illustration 19 If a sum of ₹1600 is divided into two such parts that the simple interest on the first part for two and half years at the rate of 4% p.a. equals the simple interest on the second part for 5 years at the rate of 3% p.a., then find two such divisions of the sum

Solution: Ratio of one part to other part of ₹1600

$$= \frac{1}{R_1T_1} : \frac{1}{R_2T_2}$$

$\therefore \quad$ 1st part : 2nd part $= \dfrac{1}{4\times 5/2} : \dfrac{1}{3\times 5}$

[Here $R_1 = 4\%$ p.a., $T_1 = \dfrac{5}{2}$ years, $R_2 = 3\%$ p.a., $T_2 = 5$ years]

or, 1st part : 2nd part $= \dfrac{1}{10} : \dfrac{1}{15} = 3 : 2$

Sum of proportionals = 3 + 2 = 5

$\therefore$ 1st part = $\frac{3}{5}\times 1600 = ₹96$

and, 2nd part = $\frac{2}{5}\times 1600 = ₹640$

13. When there is a change in principal (P), Rate (R) and Time (T), then the value of simple interest I also changes and is given by

$$\frac{I_1}{I_2} = \frac{P_1 \times R_1 \times T_1}{P_2 \times R_2 \times T_2}$$

$$\Rightarrow \quad \frac{A_1 - P_1}{A_2 - P_2} = \frac{P_1 \times R_1 \times T_1}{P_2 \times R_2 \times T_2}$$

as, $I_1 = A_1 - P_1$ and $I_2 = A_2 - P_2$

Illustration 20 If ₹85 amounts to ₹95 in 3 years, what ₹102 will amount to in 5 years at the same rate per cent?

Solution: Here P_1 = ₹85, A_1 = ₹95, T_1 = 3 years, P_2 = ₹102, T_2 = 5 years, $R_1 = R_2 = R$ (say)

Then, using the formula

$$\frac{A_1 - P_1}{A_2 - P_2} = \frac{P_1 \times R_1 \times T_1}{P_2 \times R_2 \times T_2}$$

We have, $\frac{95-85}{A_2 - 102} = \frac{85 \times R \times 3}{102 \times R \times 5}$

$\Rightarrow \quad A_2 - 102 = 20$

$\Rightarrow \quad A_2 = 122$

$\therefore$ The amount is ₹122

14. Out of a certain sum P, $\frac{1}{a}$ part is invested at R_1%, $\frac{1}{b}$ part at R_2% and the remainder $\left(1-\frac{1}{a}-\frac{1}{b}\right)$ say $\frac{1}{c}$ part at R_3% If the annual income from all these investments is ₹A, then the original sum is given by

$$P = \left(\frac{A \times 100}{\frac{R_1}{a} + \frac{R_2}{b} + \frac{R_3}{c}}\right)$$

Illustration 21 Out of a certain sum, one-third is invested at 3% one-sixth at 6% and the rest at 8% If the annual income is ₹300, then the original sum is

Solution: Here, $\frac{1}{a} = \frac{1}{3}, \frac{1}{b} = \frac{1}{6},$

$$\frac{1}{c} = 1 - \left(\frac{1}{3} + \frac{1}{6}\right) = \frac{1}{2},$$

$R_1 = 3\%\ R_2 = 6\%\ R_3 = 8\%\ A = ₹300.$

$\therefore$ The original sum = $\frac{A \times 100}{\frac{R_1}{a} + \frac{R_2}{b} + \frac{R_3}{c}}$

$$= \frac{300 \times 100}{\frac{3}{3} + \frac{6}{6} + \frac{8}{2}} = \frac{30000}{6}$$

$= ₹5000$

Practice Exercises

Difficulty Level-1 (Based on Memory)

1. A sum of money invested at simple interest triples itself in 8 years. How many times will it become in 20 years time?

(a) 8 times (b) 7 times

(c) 6 times (d) None of these

2. Ravi gave ₹1200 on loan. Some amount he gave at 4% per annum simple interest and remaining at 5% per annum simple interest. After two years, he got ₹110 as interest. Then the amounts given at 4% and 5% per annum simple interest are respectively,

(a) ₹500, ₹700 (b) ₹400, ₹800

(c) ₹800, ₹300 (d) ₹1100, ₹1100

[Based on MAT, 2003]

3. Two equal sums of money were invested, one at $4\frac{1}{2}$% and the other at 4% At the end of 7 years, the simple interest received from the latter exceeded that received from the former by ₹31.50. Each sum was:

(a) ₹1,000 (b) ₹500

(c) ₹750 (d) ₹900

[Based on MAT, 2001]

4. I derive an annual income of ₹688.25 from ₹10,000 invested partly at 8% p.a. and partly at 5% p.a. simple interest. How much of my money is invested at 5%

(a) ₹3,725 (b) ₹4225

(c) ₹4,800 (d) ₹5,000

[Based on MAT, 2000]

5. In 4 years, the simple interest on a certain sum of money is 7/25 of the principal. The annual rate of interest is:

(*a*) 4% (*b*) 4.5%

(*c*) 7% (*d*) 9%

[Based on SNAP, 2007]

6. Divide ₹6,000 into two parts so that simple interst on the first part for 2 years at 6% per annum may be equal to simple interest on the second part for 3 years at 8% per annum.

(*a*) ₹4,000, ₹2,000 (*b*) ₹5,000, ₹1,000

(*c*) ₹3,000, ₹3,000 (*d*) None of these

7. ₹25000 amount of ₹2600 in 5 years at simple interest. If the interest rate were increased by 3% it would amount to how much?

(*a*) ₹2900 (*b*) ₹3200

(*c*) ₹3600 (*d*) None of these

[Based on I.P. Univ., 2002]

8. A sum of ₹4000 is lent out in two parts, one at 8% simple interest and other at 10% simple interest. If the annual interest is ₹352, the sum lent at 8% is:

(*a*) ₹1600 (*b*) ₹2400

(*c*) ₹1800 (*d*) ₹2800

[Based on MAT, 2005]

9. If the rate of simple interest is 12% per annum, the amount that would fetch interest of ₹6,000 per annum is:

(*a*) ₹7,200 (*b*) ₹48,000

(*c*) ₹50,000 (*d*) ₹72,000

10. A sum of ₹600 amounts to ₹720 in 4 years at simple interest. What will it amount to if the rate of interest is increased by 2%

(*a*) ₹648 (*b*) ₹768

(*c*) ₹726 (*d*) ₹792

11. A person takes a loan of ₹200 at 5% simple interest. He returns ₹100 at the end of one year. In order to clear his dues at the end of 2 years, he would pay:

(*a*) ₹125.50 (*b*) ₹110

(*c*) ₹115.50 (*d*) None of these

12. ₹2,189 are divided into three parts such that interest on them after 1, 2 and 3 years, respectively may be equal, the rate of simple interest being 4% per annum in all cases. The smallest part is:

(*a*) ₹702 (*b*) ₹398

(*c*) ₹756 (*d*) ₹1,093

13. What should be the least number of years in which the simple interest on ₹2,600 at $6\frac{2}{3}\%$ will be an exact number of rupees?

(*a*) 2 (*b*) 3

(*c*) 4 (*d*) 5

14. ₹1,500 is invested at a rate of 10% simple interest and interest is added to the principal after every 5 years. In how many years will it amount to ₹2,500?

(*a*) $6\frac{1}{9}$ years (*b*) $6\frac{1}{4}$ years

(*c*) 7 years (*d*) None of these

15. If ₹1000 be invested at interest rate of 5% and the interest be added to the principal after 10 year, then the number of years in which it will amount to ₹2000 is:

(*a*) $16\frac{2}{3}$ years (*b*) $16\frac{1}{4}$ years

(*c*) 16 years (*d*) 11 years

[Based on MAT (Sept), 2010]

16. A sum of ₹7700 is to be divided among three brothers Sunil, Sumant and Surat in such a way that simple interest on each part at 5% per annum after 1, 2 and 3 year respectively remains equal. The share of Sunil is more than that of Surat by:

(*a*) ₹2800 (*b*) ₹2500

(*c*) ₹3000 (*d*) ₹2700

[Based on MAT (Sept), 2010]

17. A person invested some amount at the rate of 12% simple interest and a certain amount at the rate of 10% simple interest. He received yearly interest of ₹130. But if he had interchanged the amounts invested, he would have received ₹4 more as interest. How much did he invest at 12% simple interest?

(*a*) ₹700 (*b*) ₹500

(*c*) ₹800 (*d*) ₹400

[Based on MAT (Feb), 2010]

18. A sum was put at simple interest at a certain rate for 3 years. Had it been put at 1% higher rate, it would have fetched ₹5100 more. The sum is:

(*a*) ₹170000 (*b*) ₹150000

(*c*) ₹125000 (*d*) ₹120000

[Based on MAT (Feb), 2010]

19. Prem invested a certain sum of money in a simple interest bond whose value grew to ₹300 at the end of 3 years and to ₹400 at the end of another 5 years. What was the rate of interest in which he invested his sum?

(*a*) 12% (*b*) 12.5%

(*c*) 6.67% (*d*) 8.33%

[Based on MAT (Feb), 2010]

20. A money lender lent out ₹25000 in two parts, one at 8% and the other at 8.5% If the total annual income on the amount is ₹2031.25, the money lent at 8% is:

(*a*) ₹12500 (*b*) ₹6250

(*c*) ₹10000 (*d*) ₹18750

[Based on MAT (Feb), 2010]

21. A man wants to sell his scooter. There are two offers, one at ₹12000 cash and the other at a credit of ₹12880 to be paid after 8 months, money being at 18% per annum. Which is the better offer?

(*a*) ₹12000 in cash (*b*) ₹12880 at credit

(*c*) Both are equal (*d*) None of these

[Based on MAT (Feb), 2009]

22. A trader owes a merchant ₹10028 due 1 year, hence the trader wants to settle the account after 3 months. If the rate of interest is 12% per annum, how much cash should he pay?

(*a*) ₹9025 (*b*) ₹9200

(*c*) ₹9600 (*d*) ₹9200

[Based on MAT (Feb), 2009]

23. Asmita invests an amount of ₹9535 at the rate of 4% per annum, for how many years did she invest the amount to obtain the double her sum?

(*a*) 10 years (*b*) 25 years

(*c*) 5 years (*d*) 4 years

[Based on MAT (May), 2009]

24. Anu owes Biresh ₹1120 payable 2 years hence, Biresh owes Anu ₹1081.50 payable 6 months. If they decide to settle their accounts forthwith by payment of ready money and the rate of interest be 6% per annum, then who should pay and how much?

(*a*) Anu, ₹70 (*b*) Biresh, ₹50

(*c*) Anu, ₹50 (*d*) Biresh, ₹70

[Based on MAT (Sept), 2008]

25. The present worth of bill due 7 months, hence is ₹1200. If the bill were due at the end of two and half years its present worth would be ₹1016. The rate per cent of the bill is:

(*a*) 16% (*b*) 8%

(*c*) 10% (*d*) 18%

[Based on MAT (Sept), 2008]

26. *A* owes *B* ₹1573, payable one and half years hence. Also *B* owes *A* ₹1444.50, payable 6 months hence. If they want to settle the account forthwith, keeping 14% as the rate of interest, then who should pay whom and how much?

(*a*) *A* to *B*, ₹28.50 (*b*) *B* to *A*, ₹37.50

(*c*) *A* to *B*, ₹50 (*d*) *B* to *A*, ₹50

[Based on MAT (Dec), 2006]

27. Consider the following statements:

If a sum of money is lent at simple interest, then the

I. money gets doubled in 5 years, if the rate of interest is $16\frac{2}{3}\%$

II. money gets doubled in 5 years, if the rate of interest is 20%

III. money becomes four times in 10 years, if it gets doubled in 5 years.

Of these statements

(*a*) I and III are correct (*b*) II alone is correct

(*c*) III alone is correct (*d*) II and III are correct

[Based on MAT (Dec), 2006]

28. A man divided his share to his sons *A* and *B* in such a way that the interest received by *A* at 15% per annum for 3 years is double the interest received by *B* at 12% per annum for 5 years. At what ratio was his share divided?

(*a*) 2/3 (*b*) 8/3

(*c*) 3/8 (*d*) 3/2

[Based on MAT (May), 2010]

29. Divide ₹1586 in three parts in such a way that their amounts at the end of 2, 3 and 4 years, respectively, at 5% per annum simple interest be equal:

(*a*) ₹552, ₹528, ₹506 (*b*) ₹560, ₹520, ₹506

(*c*) ₹556, ₹524, ₹506 (*d*) ₹548, ₹528, ₹510

[Based on MAT (Dec), 2006]

30. If a certain sum of money becomes double at simple interest in 12 years, what would be the rate of interest per annum?

(*a*) $8\frac{1}{2}$ (*b*) 10

(*c*) 12 (*d*) 14

[Based on MAT, 1998]

31. Two equal sums were borrowed at 8% simple interest per annum for 2 years and 3 years respectively. The difference in the interests was ₹56. The sums borrowed were:

(*a*) ₹690 (*b*) ₹700

(*c*) ₹740 (*d*) ₹780

[Based on MAT, 1998]

32. What price should a shopkeeper mark on an article costing him ₹153 to gain 20% after allowing a discount of 15%

(*a*) ₹162 (*b*) ₹184

(*c*) ₹216 (*d*) ₹224

[Based on MAT, 1999]

33. *A* lent ₹600 to *B* for 2 years and ₹150 to *C* for 4 years and received altogether from both ₹90 as simple interest. The rate of interest is:

(*a*) 4% (*b*) 5%

(*c*) 10% (*d*) 12%

[Based on MAT, 2000]

34. The rate of interest on a sum of money is 4% per annum for the first 2 years, 6% per annum for the next 4 years and 8% per annum for the period beyond 6 years. If the simple interest accrued by the sum for a total period of 9 years is ₹1,120, what is the sum?

(*a*) ₹1,500 (*b*) ₹2,000

(*c*) ₹2,500 (*d*) ₹4,000

[Based on MAT, 2000]

35. A sum was put at simple interest at a certain rate for 2 years. Had it been put at 1% higher rate, it would have fetched ₹24 more. The sum is:

(*a*) ₹600 (*b*) ₹800

(*c*) ₹1,200 (*d*) ₹480

[Based on MAT, 2000]

36. A sum of ₹2540 is lent out into two parts, one at 12% and another one at 12.5% If the total annual income is ₹311.60, the lent money at 12%

(*a*) ₹1,180 (*b*) ₹1,360

(*c*) ₹1,240 (*d*) ₹1,340

[Based on MAT, 2000]

37. I derive an annual income of ₹688.25 from ₹10,000 invested partly at 8% pa and partly at 5% pa simple interest. How much of my money is invested at 5%

(*a*) ₹3,725 (*b*) ₹4,225

(*c*) ₹4,800 (*d*) ₹5,000

[Based on MAT, 2000]

38. A certain sum is invested for T years. It amounts to ₹400 at 10% per annum. But when invested at 4% per annum, it amounts to ₹200. Find the time (T).

(*a*) 41 years (*b*) 39 years

(*c*) 50 years (*d*) None of these

39. Muan received ₹12000 as puja Bonus. He invested a part of it at 5% per annum and the remaining at 6% per annum, simple interest being allowed in each case. The total interest earned by him in 4 years is ₹2580. The sum invested at 5% per annum is:

(*a*) ₹7500 (*b*) ₹4500

(*c*) ₹4000 (*d*) ₹8000

[Based on MAT, 2011]

40. A money-lender, lends a part of his money at 10% per annum and the rest at 15% per annum. His annual income is ₹1900. However, if he had interchanged the rate of his interest on the two sums, he would have earned ₹200 more. The amount lent will fetch what amount at 15%

(*a*) ₹6000 (*b*) ₹4000

(*c*) ₹10000 (*d*) ₹4400

[Based on MAT (Feb), 2012]

41. What will be the ratio of simple interest earned by a cartain amount at the same rate of interest for 6 years and 9 years?

(*a*) 1 : 3 (*b*) 1 : 4

(*c*) 2 : 3 (*d*) Data inadequate

[Based on MAT, 2012]

42. An automobile financier claims to be lending money at simple interest but he includes the interest every six months for calculating the principal. If he is charging an interest of 10% the effective rate of interest becomes:

(*a*) 10% (*b*) 10.25%

(*c*) 10.5% (*d*) None of these

[Based on MAT, 2012]

43. Harris invested ₹4000 in two different ventures A and B. The yearly return on B was 12% and the yearly return on A was 8% If the total return was ₹4000, how much did Harris invest in B?

(*a*) ₹8000 (*b*) ₹20000

(*c*) ₹14000 (*d*) ₹22000

[Based on MAT, 2013]

44. The simple interest on a sum of money is 1/9 of the principal and the number of years is equal to the rate percent per annum. The rate percent per annum is:

(*a*) 3% (*b*) 0.33%

(*b*) 3.33% (*d*) 2.3%

[Based on MAT, 2013]

45. Ashok borrows ₹1500 from two moneylenders. He pays interest at the rate of 12% per annum for one loan and at the rate of 14% per annum for the other. The total interest he pays for the entire year is ₹186. How much does he borrow at the rate of 12%?

(*a*) ₹1200 (*b*) ₹1300

(*c*) ₹1400 (*d*) ₹1000

[Based on MAT, 2014]

46. Divide ₹6000 into two parts, so that simple interest on the first part for 2 years at 6% per annum may be equal to the simple interest on the second part for 3 years at 8% per annum?

(*a*) ₹4000, ₹2000

(*b*) ₹5000, ₹1000

(*c*) ₹3000, ₹3000

(*d*) None of these

[Based on MAT, 2014]

47. A part of ₹38800 is lent out at 6% per six month. The rest of the amount is lent out at 5% per annum after 1 years. The ratio of interest after 3 years from the time when first amount was lent out is 5:4. Find the second part that was lent out at 5%?

(*a*) ₹26600 (*b*) ₹28800

(*c*) ₹7500 (*d*) ₹28000

[Based on MAT, 2014]

Difficulty Level-2
(Based on Memory)

1. A certain sum amounts to ₹2,300 in 3 years and ₹2,500 in 5 years at simple interest. Find the sum and the rate of interest.

(*a*) ₹1200, 6% (*b*) ₹1800, 5%

(*c*) ₹2000, 5% (*d*) ₹1500, 6%

[Based on IIT Joint Man. Ent. Test, 2004]

2. Mr Anand deposited a total amount of ₹65000 in three different schemes *A*, *B* and *C* with rates of interest 12% per annum, 16% per annum and 18% per annum, respectively and earned a total interest of ₹10,180 in one year. If the amount invested in Scheme *A* was 72% of the amount invested in Scheme *C*, then what was the amount invested in Scheme *B*?

(*a*) ₹25000 (*b*) ₹22000

(*c*) ₹18000 (*d*) Cannot be determined,

[Based on Based on IRMA, 2002]

3. The simple interest on a certain sum at 5% for 9 months is ₹10 greater than the simple interest on the same sum at the rate of 3% for 14 months. What is the sum of interest in both the cases (i.e., total sum of interest)?

(*a*) ₹130 (*b*) ₹290

(*c*) ₹120 (*d*) ₹330

4. The simple interest on a sum of money is one-ninth of the sum. The number of years is numerically equal to the rate per cent per annum. The rate per cent is:

(*a*) $3\frac{1}{3}$ (*b*) 5

(*c*) $6\frac{2}{3}$ (*d*) 10

5. The rates of simple interest in two banks *A* and *B* are in the ratio 5:4. A person wants to deposit his total savings in two banks in such a way that he recieves equal half yearly interest from both. He should deposit the savings in banks *A* and *B* in the ratio:

(*a*) 2:5 (*b*) 4:5

(*c*) 5:2 (*d*) 5:4

6. Some amount was lent at 6% per annum simple interest. After 1 year, ₹6,800 is repaid and the rest of the amount is repaid at 5% per annum. If the second year's interest is $\frac{11}{20}$ of the first year's interest, find what amount of money was lent out.

(*a*) ₹17,000 (*b*) ₹16,800

(*c*) ₹16,500 (*d*) ₹17,500

7. A bicycle can be purchased on cash payment of ₹1,500. The same bicycle can also be purchased at the down payment (initial payment, at the time of purchasing) of ₹350 and rest can be paid in 3 equal installments of ₹400 for next 3 months. The rate of SI per annum charged by the dealer is:

(*a*) $23\frac{9}{17}\%$ (*b*) $17\frac{9}{23}\%$

(*c*) $13\frac{9}{17}\%$ (*d*) None of these

8. An article costing ₹9,000 is sold at a discount which is equal to the simple interest on ₹3,000 for *N* months. Find *N* if the rate of discount is same as the rate of interest.

(*a*) 4 months (*b*) 6 months

(*c*) 5 months (*d*) 36 months

9. Pratibha invests an amount of ₹15,860 in the names of her three daughters *A*, *B* and *C* in such a way that they get the same interest after 2, 3 and 4 years, respectively. If the rate of simple interest is 5% p.a., then the ratio of the amounts invested among *A*, *B* and *C* will be:

(*a*) $\frac{1}{15}:\frac{1}{10}:\frac{1}{20}$ (*b*) $\frac{1}{10}:\frac{1}{15}:\frac{1}{20}$

(*c*) $\frac{1}{15}:\frac{1}{20}:10$ (*d*) None of these

10. If *x* is the simple interest on *y* and *y* is the simple interest on *z*, the rate per cent and the time being the same in both cases, what is the relation between *x*, *y* and *z*?

(*a*) $x^2 = yz$ (*b*) $y^2 = xz$

(*c*) $z^2 = xy$ (*d*) $xyz = 1$

11. A sum of ₹18,750 is left by will by a father to be divided between two sons, 12 and 14 years of age, so that when they attain maturity at 18, the amount (principal + interest) received by each at 5% simple interest will be the same. Find the sum allotted at present to each son.

(*a*) ₹9,500, ₹9,250 (*b*) ₹8,000, ₹1,750

(*c*) ₹9,000, ₹9,750 (*d*) None of these

12. A sum of ₹1,440 is lent out in three parts in such a way that the interest on first part at 2% for 3 years, second part at 3% for 4 years and third part at 4% for 5 years are equal. Then the difference between the largest and the smallest sum is:

(*a*) ₹400 (*b*) ₹560

(*c*) ₹460 (*d*) ₹200

13. Arun borrowed a sum of money from Jayant at the rate of 8% per annum simple interest for the first four years, 10% per annum for the next 6 years and 12% per annum for the period beyond 10 years. If he pays a total of ₹12,160 as interest only at the end of 15 years, how much money did he borrow?

(*a*) ₹12,000 (*b*) ₹10,000

(*c*) ₹8,000 (*d*) ₹9,000

14. Two equal sums of money are lent at the same time at 8% and 7% per annum simple interest. The former is recovered 6 months earlier than the later and the amount in each case is ₹2,560. The sum and the time for which the sums of money are lent out are:

(*a*) ₹1,500, 3.5 years and 4 years

(*b*) ₹2,000, 3.5 years and 4 years

(*c*) ₹2,000, 4 years and 5.5 years

(*d*) ₹3,000, 4 years and 4.5 years

15. Subbarao was approached by two neighbours for loan. He had ₹2,540, a part of which he lent to one person at 12% interest per annum, and the other part was lent to the second person at 12.5% At the end of a year, Subbarao received ₹311.60 as interest on the total loan. Calculate the amount of money lent by him at 12% interest.

(*a*) ₹1,360 (*b*) ₹1,340

(*c*) ₹1,240 (*d*) ₹1,180

16. Vikram borrowed ₹6,450 at 5 per cent simple interest repayable in 4 equal instalments. What will be the annual instalment payable by him?

(*a*) ₹1,710 (*b*) ₹1,810

(*c*) ₹1,910 (*d*) ₹1,860

17. A person closes his account in an investment scheme by withdrawing ₹10,000. One year ago, he had withdrawn ₹6,000. Two years ago he had withdrawn ₹5,000. Three years ago he had not withdrawn any money. How much money had he deposited approximately at the time of opening the account 4 years ago, if the annual simple interest is 10%

(*a*) ₹15,600 (*b*) ₹16,500

(*c*) ₹17,280 (*d*) None of these

18. Two equal sums of money were invested, one at 4% and the other at $4\frac{1}{2}$% At the end of 7 years, the simple interest received from the latter exceeded that received from the former by ₹31.50. Each sum was:

(*a*) ₹1,000 (*b*) ₹500

(*c*) ₹750 (*d*) ₹900

19. The rate of interest on a sum of money is 4% per annum for the first 2 years, 6% per annum for the next 4 years and 8% per annum for the period beyond 6 years. If the simple interest accrued by the sum for a total period of 9 years is ₹1,120, then the sum is:

(*a*) ₹2,400 (*b*) ₹2,200

(*c*) ₹2,000 (*d*) None of these

20. Brinda borrowed ₹1,000 to build a hut. She pays 5% simple interest. She lets the hut to Ramu and receives the rent of ₹$12\frac{1}{2}$ per month from Ramu. In how many years Brinda ought to clear off the debt?

(*a*) 10 years (*b*) $10\frac{1}{4}$ years

(*c*) $10\frac{1}{2}$ years (*d*) None of these

21. Sumit lent some money to Mohit at 5% per annum simple interest. Mohit lent the entire amount to Birju on the same day at $8\frac{1}{2}$% per annum. In this transaction after a year Mohit earned a profit of ₹350. Find the sum of money lent by Sumit to Mohit.

(*a*) ₹9,000 (*b*) ₹10,000

(*c*) ₹10,200 (*d*) None of these

22. The simple interest on a sum of money will be ₹600 after 10 years. If the principal is trebled after 5 years, what will be the total interest at the end of the tenth year?

(*a*) ₹1,200 (*b*) ₹1,190

(*c*) ₹1,210 (*d*) None of these

23. A man purchased 40 fruits; apples and oranges for ₹17. Had he purchased as many oranges as apples and as many apples as oranges, he would have paid ₹15. Find the cost of one pair of an apple and an orange,

(*a*) 70 paise (*b*) 60 paise

(*c*) 80 paise (*d*) 1 rupee

[Based on SNAP, 2007]

24. A man earns 6% SI on his deposits in Bank *A* while he earns 8% simple interest on his deposits in the Bank. If the total interest he earns is ₹1800 in three years on an investment *M* of ₹9000, what is the amount invested at 6%

(*a*) ₹3000 (*b*) ₹6000

(*c*) ₹4000 (*d*) ₹4500

[Based on SNAP, 2007]

25. In 4 years, ₹6000 amounts to ₹8000. In what time at the same rate will ₹525 amount to ₹700?

(*a*) 2 years (*b*) 3 years

(*c*) 4 years (*d*) 5 years

[Based on SNAP, 2009]

26. A man invested one-third of his capital at 7%, one-fourth at 8% and the remainder at 10% at simple interest. If his annual income is ₹561, the capital is:

(*a*) ₹5400 (*b*) ₹6000

(*c*) ₹6600 (*d*) ₹7200

[Based on FMS (MS), 2006]

27. A part of ₹9600 is invested at a 5% annual return, while the remainder is invested at a 3% annual return. If the annual income from both portions is the same, what is the total income from the two investments?

(*a*) ₹380 (*b*) ₹320

(*c*) ₹440 (*d*) None of these

[Based on MHT-CET MBA, 2010]

28. Mr Mani invested an amount of ₹12,000 at the simple interest rate of 10% per annum and another amount at the simple interest rate of 20% per annum. The total interest earned at the end of one year on the total amount invested became 14% per annum. Find the total amount invested.

(*a*) ₹20,000 (*b*) ₹20,800

(*c*) ₹21,000 (*d*) None of these

29. A sum of ₹7,700 is to be divided among three brothers Vikas, Vijay and Viraj in such a way that simple interest on each part at 5% per annum after 1, 2 and 3 years, respectively remains equal. The share of Vikas is more than that of Viraj by:

(*a*) ₹2,800 (*b*) ₹2,500

(*c*) ₹3,000 (*d*) None of these

30. Arun borrowed a sum of money from Jayant at the rate of 8% per annum simple interest of the first 4 years, 10% per annum for the next 6 years and 12% per annum for the period beyond 10 years. If he pays a total of ₹12160 as interest only at the end of 15 years, how much money did he borrow?

(*a*) ₹12000 (*b*) ₹10000

(*c*) ₹8000 (*d*) ₹9000

[Based on NMAT, 2005]

31. A sum of ₹1440 is lent out in three parts in such a way that the interests on first part at 2% for 3 years, second part at 3% for 4 years and third part at 4% for 5 years are equal. Than the difference between the largest and the smallest sum is:

(*a*) ₹400 (*b*) ₹560

(*c*) ₹460 (*d*) ₹200

[Based on NMAT, 2005]

32. A sum of ₹18750 is left by will by a father to be divided between two sons, 12 and 14 years of age, so that when they attain maturity at 18, the amount (principal + interest) received by each at 5% simple interest will be the same. Find the sum allotted at present to each son.

(*a*) ₹9500, ₹9250 (*b*) ₹8000, ₹1750

(*c*) ₹9000, ₹9750 (*d*) None of these

[Based on NMAT, 2005]

33. Ms. Rao paid equated monthly installments (EMIs) of ₹25000 each in January and February towards her home loan, whose outstanding principal amount was ₹1000000 in December. Each EMI consists of interest of outstanding loan amount for the month and part payment of the loan amount. If the interest on the loan is 12% per annum (interest is paid monthly) on the diminishing outstanding in January and February was:

(*a*) ₹30150 (*b*) ₹20000

(*c*) ₹19850 (*d*) ₹19700

[Based on JMET, 2006]

34. A certain sum of money is invested at an interest rate of 5% per annum and a second sum, twice as large as the first, is invested at 5.5% per annum. The total amount of interest earned from the two investments together is ₹1000 per year and the interest is withdrawn every year. The second sum invested is:

(*a*) ₹6250 (*b*) ₹10500

(*c*) ₹12500 (*d*) ₹15000

[Based on JMET, 2006]

35. A man invests ₹3,965 in the names of his three daughters Neeta, Sita and Gita in such a way that they get the same amount after 2, 3 and 4 years, respectively. If the rate of interest is 5% per annum, then the amount invested for Neeta, Sita and Gita is:

(*a*) ₹1,380, ₹1,320, ₹1,265 (*b*) ₹1,330, ₹1,360, ₹1,380

(*c*) ₹1,265, ₹1,320, ₹1,340 (*d*) None of these

36. If the amount obtained by Mahesh by investing ₹1,500 for two and half years at the rate of 8% per annum is equal to the amount obtained by Suresh by investing a certain sum for 2 years at 5% per annum simple interest, then the sum invested by Suresh is:

(*a*) ₹1636 (*b*) ₹1,636

(*c*) ₹1636 (*d*) None of these

37. A xerox machine is available for ₹78000 cash or for $33\frac{1}{3}\%$ cash down payment and 11 equal monthly installments of ₹4900 each. What is the rate of interest charged?

(*a*) 2.43% (*b*) 8.54%

(*c*) 9% (*d*) 6.5%

[Based on MAT, 2013]

Answer Keys

Difficulty Level-1

1. (*c*)	**2.** (*a*)	**3.** (*d*)	**4.** (*a*)	**5.** (*c*)	**6.** (*a*)	**7.** (*a*)	**8.** (*b*)	**9.** (*c*)	**10.** (*b*)	**11.** (*c*)	**12.** (*b*)	**13.** (*b*)
14. (*a*)	**15.** (*a*)	**16.** (*a*)	**17.** (*b*)	**18.** (*a*)	**19.** (*d*)	**20.** (*d*)	**21.** (*a*)	**22.** (*b*)	**23.** (*b*)	**24.** (*b*)	**25.** (*c*)	**26.** (*d*)
27. (*b*)	**28.** (*b*)	**29.** (*a*)	**30.** (*a*)	**31.** (*b*)	**32.** (*c*)	**33.** (*b*)	**34.** (*b*)	**35.** (*c*)	**36.** (*a*)	**37.** (*a*)	**38.** (*c*)	**39.** (*a*)
40. (*a*)	**41.** (*c*)	**42.** (*b*)	**43.** (*b*)	**44.** (*c*)	**45.** (*a*)	**46.** (*a*)	**47.** (*b*)					

Difficulty Level-2

1. (*c*)	**2.** (*b*)	**3.** (*b*)	**4.** (*a*)	**5.** (*b*)	**6.** (*a*)	**7.** (*d*)	**8.** (*d*)	**9.** (*b*)	**10.** (*b*)	**11.** (*c*)	**12.** (*b*)	**13.** (*c*)
14. (*b*)	**15.** (*d*)	**16.** (*b*)	**17.** (*d*)	**18.** (*d*)	**19.** (*c*)	**20.** (*a*)	**21.** (*b*)	**22.** (*a*)	**23.** (*c*)	**24.** (*b*)	**25.** (*c*)	**26.** (*c*)
27. (*d*)	**28.** (*a*)	**29.** (*a*)	**30.** (*c*)	**31.** (*b*)	**32.** (*c*)	**33.** (*c*)	**34.** (*c*)	**35.** (*a*)	**36.** (*a*)	**37.** (*a*)		

Explanatory Answers

Difficulty Level-1

1. (*c*) $2P = \dfrac{P \times 8 \times R}{100} \Rightarrow R = 25\%$

$$\text{S.I.} = \frac{P \times 25 \times 20}{100} = 5P$$

$\therefore$ Amount $= (5P + P) = 6P$

Therefore, it will become 6 times in 20 years time.

2. (*a*) Let the amount given at 4% per annum be ₹x

$\therefore$ Amount given at 5% per annum = ₹ $(1200 - x)$

$$\Rightarrow \frac{x \times 4 \times 2}{100} + \frac{(1200 - x) \times 5 \times 2}{100} = 110$$

$$\Rightarrow x = 500.$$

3. (*d*) Let each sum be ₹x

$$\therefore \frac{x \times 4\frac{1}{2} \times 7}{100} - \frac{x \times 4 \times 7}{100} = 31.50$$

$$\Rightarrow \frac{7x}{100} \times \frac{1}{2} = \frac{63}{2}$$

$$\Rightarrow x = 900.$$

4. (*a*) Let money invested at 5% be ₹k

$$\therefore \frac{k \times 1 \times 5}{100} + \frac{(10000 - k) \times 1 \times 8}{100} = 688.25$$

$$\Rightarrow 5k - 8k + 80000 = 68825$$

$$\Rightarrow 3k = 11175$$

$$\Rightarrow k = 3725.$$

5. (*c*) $\text{Interest} = \dfrac{P \times R \times T}{100}$

$$\frac{7}{25}x = \frac{x \times r4 \times r}{100}$$

$$r = \frac{7x \times 100}{25 \times 400} = 7\%$$

6. (*a*) Let one part be ₹x and other = ₹$(6,000 - x)$

$$\frac{x \times 2 \times 6}{100} = \frac{(6000 - x) \times 3 \times 8}{100}$$

$$12x = 144000 - 24x$$

x = ₹4,000 and other part

$= (6000 - 4000)$ = ₹2,000.

7. (*a*) $I = \dfrac{P \times R \times T}{100}$

$$600 = \frac{2000 \times 5}{100}$$

$R = 6\%$

New, $R = 6 + 3 = 9\%$

$$I = \frac{200 \times 9 \times 5}{100}$$

$= 900$

Amount $= P = I = 2000 + 900$

= ₹2900.

8. (*b*) Total interest on ₹4000 in 1 year = ₹352

$$\text{Average rate} = \frac{352 \times 100}{4000 \times 1} = 8.8\%$$

1.2:0.8 = 3.2

First part = ₹2400.

9. (*c*) $6000 = \dfrac{P \times 12 \times 1}{100}$

$\Rightarrow$ P = ₹50,000.

10. (*b*) $120 = \dfrac{600 \times 4 \times R}{100}$

$\Rightarrow$ $R = \dfrac{120}{24}\%$

= 5% new rate = (5 + 2) = 7%

$\therefore$ S.I. at the new rate = $\dfrac{600 \times 4 \times 7}{100}$ = ₹168

Therefore, amount = ₹(600 + 168) = ₹768.

11. (*c*) Amount to be paid in first year

$$\frac{200 \times 5 \times 1}{100} = +200 = 210$$

Amount left as a principal for the second year

= 210 – 100 = 110

$\therefore$ Amount paid in second year

$$= 110 + \frac{110 \times 5 \times 1}{100} = 115.5.$$

12. (*b*) Let the amount invested for 1 year, 2 years and 3 years be x, y and z, respectively.

then, $\dfrac{x \times 1 \times 4}{100} = \dfrac{y \times 2 \times 4}{100} = \dfrac{z \times 3 \times 4}{100}$

$\therefore$ $x = 25K,\ y = \dfrac{25}{2}K,\ z = \dfrac{25}{3}K$

$$x : y : z = 25 : \frac{25}{2} : \frac{25}{3} = 6:3:2$$

Smallest part = $\dfrac{2}{11} \times 2189$ = ₹398.

13. (*b*) S.I. = $\dfrac{2600 \times 20 \times T}{3 \times 100} = \dfrac{250 \times T}{3}$

To make simple interest in exact number of rupees t should be 3.

14. (*a*) The simple interest on ₹1,500 invested at a rate of 10% p.a. for 5 years is

$$= \frac{1500 \times 10 \times 5}{100} = ₹\,750$$

Now, principal after 5 years = ₹1,500 + 750

= ₹2,250.

Also, final amount = ₹2,500.

$\therefore$ Simple interest = ₹2,500 – 2,250 = ₹250

$\therefore$ Time (T) = $\dfrac{250 \times 100}{2250 \times 10} = \dfrac{10}{9}$ years

Hence, total time = $5 + \dfrac{10}{9} = \dfrac{55}{9}$ or $6\dfrac{1}{9}$ years.

15. (*a*) SI for 10 year = $\dfrac{1000 \times 5 \times 10}{100}$ = ₹ 500

Now, P = ₹1500,

A = ₹2000

$\therefore$ SI = ₹500

$\therefore$ $500 = \dfrac{1500 \times 5 \times T}{100}$

$\Rightarrow$ $T = \dfrac{500 \times 100}{1500 \times 5} = 6\dfrac{2}{3}$ year

$\therefore$ Total time = $16\dfrac{2}{3}$ year.

16. (*a*) Let Sunil, Sumant and Surat get x, y and z amount, respectively.

$$\frac{x \times 5 \times 1}{100} = \frac{y \times 5 \times 2}{100} = \frac{z \times 5 \times 3}{100}$$

$\Rightarrow$ $x = 2y = 32$

$\Rightarrow$ $x:y:z = 6:3:2$

$\therefore$ Required amount = $\dfrac{6-2}{6+3+2} \times 7700$ = ₹2800.

17. (*b*) Amount invested at 12% = ₹x

Amount invested at 10% = ₹x

$$130 = \frac{x \times 12 \times 1}{100} + \frac{y \times 10 \times 1}{100}$$

$\Rightarrow$ $13000 = 12x + 10y$ (1)

and, $134 = \dfrac{x \times 10 \times 1}{100} + \dfrac{y \times 12 \times 1}{100}$

$\Rightarrow$ $13400 = 10x + 12y$ (2)

Solving Eqs. (1) and (2), we get

x = ₹500

So, amount invested at 12% is ₹500.

18. (*a*) Simple interest for 1 year = $\dfrac{5100}{3}$ = ₹1700

1% of sum = 17000

$\therefore$ Sum = $\dfrac{1700 \times 100}{1}$ = ₹170000.

19. (*d*) Let principle be P and rate of interest is r.

Then,

$$\frac{P \times r \times 3}{100} + P = 300 \quad (1)$$

and, $$\frac{P \times r \times 8}{100} + P = 400 \quad (2)$$

Subtracting Eq. (1) from Eq. (2), we get

$$\frac{P \times r \times 5}{100} = 100$$

$\therefore \quad P \times r = 2000$

From Eq. (1),

$$\frac{2000 \times 3}{100} + P = 300 \Rightarrow P = ₹240$$

$\therefore \quad 240 \times r = 2000$

$\Rightarrow \quad r = 8.33\%$

20. (*d*) Let the amount in lented at 8% be ₹x.

Then, amount lented at 8.5% be $(25000 - x)$.

$$\therefore \quad \frac{x \times 8 \times 1}{100} + \frac{(25000 - x) \times 8.5 \times 1}{100} = 2031.25$$

$\Rightarrow 8x + 212500 - 8.5x = 203125$

$\Rightarrow \quad -0.5x = -9375$

$\Rightarrow \quad x = ₹18750.$

21. (*a*) In Ist case, the amount is ₹12000

In IInd case, let the present value of money be x

$$\therefore \quad \frac{x \times 18 \times 8}{12 \times 100} + x = 12880$$

$\Rightarrow \quad 0.12x + x = 12880$

$$\Rightarrow \quad x = \frac{12880}{1.12} = ₹11500$$

$\therefore$ ₹12000 in cash is the better offer.

22. (*b*) Let the present value of money be x

Then, $$\frac{x \times 12}{100} + x = 10028$$

$\Rightarrow \quad 0.12x + x = 10028$

$$\Rightarrow \quad x = \frac{10028}{1.12}$$

This amount after 3 months

$$= \frac{\frac{10028}{1.12} \times 12 \times 3}{12 \times 100} + \frac{10028}{1.12}$$

$$= \frac{10028 \times 3}{1.12 \times 100} + \frac{10028}{1.12}$$

$$= \frac{10028 \times 103}{112} = 9222.17 \approx ₹\ 9200.$$

23. (*b*) Let she invest for x year

A sum will be double when interest is equal to principal

$$\therefore \quad 9535 = \frac{9535 \times 4 \times x}{100}$$

$\Rightarrow \quad 4x = 100$

$\Rightarrow \quad x = 25$ years.

24. (*b*) Present worth of money for Anu

$$1120 - P = \frac{P \times 6 \times 2}{100} \Rightarrow P = ₹1000$$

Present worth of money for Biresh

$$1081.50 - P = \frac{P \times 6 \times 1}{2 \times 100}$$

$\Rightarrow 108150 - 100P = 3P$

$\Rightarrow \quad P = ₹1050$

$\therefore$ Biresh should pay ₹50.

25. (*c*) Let the rate of interest be r %

Then,

$$A = 1200 + \frac{1200 \times r \times 7}{12 \times 100}$$

$\Rightarrow \quad A = 1200 + 7r$

Again, $1200 + 7r = 1016 + \frac{1016 \times r \times 2.5}{100}$

$\Rightarrow 1200 + 7r = 1016 + 25.4r$

$\Rightarrow \quad 18.4r = 184$

$$\therefore \quad r = \frac{184}{18.4} = 10\%$$

26. (*d*) Let the present value of what A owes B be ₹x.

Then, $$x + \frac{x \times 14 \times 3}{2 \times 100} = 1573$$

$$\Rightarrow x + \frac{21}{100}x = 1573$$

$$\Rightarrow \frac{121x}{100} = 1573$$

$$\Rightarrow x = \frac{1573 \times 100}{121} = ₹1300$$

Let y be the present value of what B owes A.

Then, $$y + y \times \frac{1}{2} \times \frac{14}{100} = ₹1444.50$$

$$\Rightarrow \quad y + \frac{7}{100}y = 1444.50$$

$$\Rightarrow \qquad y = \frac{1444.50 \times 100}{107} = ₹1350$$

Hence, B pay ₹50 to A.

27. (b) Let the sum of money lent be ₹P.

Then,

SI received after 5 years $= \dfrac{P \times 50 \times 5}{3 \times 100} = \dfrac{5}{6}P$

Amount after 5 years $= P + \dfrac{5}{6}P = \dfrac{11P}{6}$

Therefore, I is not correct

II. SI after 5 years $= \dfrac{P \times 20 \times 5}{100} = P$

Amount after 5 years $= P + P = 2P$

Therefore, II is correct

III. Amount after 10 years at the rate of 20%

$$= P + \frac{P \times 20 \times 10}{100} = \text{P} + 2\text{P} = 3\text{P}$$

Therefore, III is not correct

Hence, (b) is the correct option.

28. (b) Let A and B received x and y amount, respectively.

Then, $\dfrac{x \times 15 \times 3}{100} = 2 \times \dfrac{y \times 12 \times 5}{100}$

$$\Rightarrow \qquad \frac{x}{y} = \frac{2 \times 12 \times 5}{15 \times 3} = \frac{8}{3}.$$

29. (a) Let the three parts be ₹x, ₹y and ₹z.

According to question,

$$x + \frac{x \times 2 \times 5}{100} = y + \frac{y \times 3 \times 5}{100}$$

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

$$\Rightarrow \qquad 1.1x = 1.15 = 1.2z$$

$$\Rightarrow \qquad \frac{x}{y} = \frac{1.15}{1.1} = \frac{23}{22}$$

and, $\qquad \dfrac{y}{z} = \dfrac{1.2}{1.15} = \dfrac{24}{23}$

$$\Rightarrow \qquad x : y : z = 276 : 264 : 253$$

$$\Rightarrow \qquad x = \frac{276}{793} \times 1586 = ₹552,$$

$$y = \frac{276}{793} \times 1586 = ₹528$$

and, $\qquad z = \dfrac{253}{793} \times 1586 = ₹506$

Hence, the required three parts are ₹552, ₹528 and ₹506.

30. (a) Suppose sum $= P$, SI $= P$

$t = 12$ years

$$\text{Rate \%} = \frac{P \times 100}{P \times 12} = 8\frac{1}{2}.$$

31. (b) Let S be the sum.

$$\therefore \quad \frac{S \times 8(3-2)}{100} = 56 \Rightarrow S = ₹700.$$

32. (c) $\qquad CP = ₹153$

$SP = 153 + 20\%$ of 153

$= 153 + 30.60 = ₹183.60$

Let marked price be ₹x

$\therefore$ $x - 15\%$ of $x = 183.60$

$$\Rightarrow \qquad \frac{85x}{100} = 183.60 \Rightarrow x = 216.$$

33. (b) Suppose rate $= r$ % pa

In 1st case:

Sum (P) = ₹600; Time $(T) = 2$ years

$$\therefore \text{ Simple Interest} = ₹\frac{600 \times 2 \times r}{100} = ₹12\text{r}$$

In 2nd case:

Sum (P) = ₹150; Time $(T) = 4$ years

$$\therefore \text{ Simple Interest} = ₹\frac{150 \times 4 \times r}{100} = ₹6r$$

According to the question,

$$12r + 6r = 90$$

or, $\qquad 18r = 90$

$\therefore \qquad r = 5\%$

34. (b) Suppose sum = ₹P

Total interest earned in 9 years

$$= ₹\frac{P \times 4 \times 2}{100} + ₹\frac{P \times 6 \times 4}{100} + ₹\frac{P \times 8 \times 3}{100}$$

According to the question,

$$\frac{8P}{100} + \frac{24P}{100} + \frac{24P}{100} = 1120$$

or, $\qquad 14P = 1120 \times 25$

$= 28000$

or, $\qquad P = ₹2000.$

35. (*c*) Suppose sum = ₹P

Simple interest at certain rate r% for 2 years

$$= ₹\frac{P \times r \times 2}{100} = ₹\frac{Pr}{50}$$

Also, simple interest at $(r+1)$% for 2 years

$$= ₹\frac{P \times (r+1) \times 2}{100} = ₹\frac{P(r+1)}{50}$$

According to the question,

$$\frac{P(r+1)}{50} - \frac{Pr}{50} = 24$$

or, $\quad \frac{P}{50} = 24$

$\therefore \quad P = ₹1200.$

36. (*a*) Suppose first part = ₹x

$\therefore$ Second part = ₹$(2540 - x)$

Time (t) = 1 year

In 1st case:

Rate (r) = 12.5%

$\therefore$ Simple Interest = $₹\frac{x \times 12.5 \times 1}{100}$

In 2nd case:

Rate (r) = 12%

$\therefore$ Simple Interest = $₹\frac{(2540 - x) \times 12 \times 1}{100}$

According to the question,

$$\frac{12.5x}{100} + \frac{(2540 - x)12}{100} = 311.60$$

or, $\quad 0.5x + 30480 = 31160$

or, $\quad 0.5x = 680$

$\therefore \quad x = 1360$

Hence, the money lent at 12%

$= ₹(2540 - 1360)$

$= ₹1180.$

37. (*a*) Let money invested at 5% be ₹k.

$$\frac{k \times 1 \times 5}{100} + \frac{(10000 - k) \times 1 \times 8}{100} = 688.25$$

$\Rightarrow 5k - 8k + 80000 = 68825$

$\Rightarrow \quad 3k = 11175$

$\Rightarrow \quad k = 3725.$

38. (*c*) We have $A_1 = ₹400, A_2 = ₹200, R_1 = 10\%\ R_2 = 4\%$

$$\therefore \quad \text{Time } (T) = \frac{A_1 - A_2}{A_2R_1 - A_1R_2} \times 100$$

$$= \frac{400 - 200}{200 \times 10 - 400 \times 4} \times 100$$

$$= \frac{20000}{400}$$

$= 50$ years.

39. (*a*) According to the question,

$$\frac{x \times 5 \times 4}{100} + \frac{(12000 - x) \times 6 \times 4}{100} = 2580$$

(where x = sum investment at 5% per annum)

$\Rightarrow \quad 5x + 72000 - 6x = 64500$

$\Rightarrow \quad x = ₹7500.$

40. (*a*) Let the parts of money invested at 10% and 15% per annum be P_1 and P_2 respectively.

$$\therefore \quad \frac{P_1 \times 10 \times 1}{100} + \frac{P_2 \times 15 \times 1}{100} = 1900$$

$\Rightarrow \quad 10P_1 + 15P_2 = 190000$

$\Rightarrow \quad 2P_1 + 3P_2 = 38000 \qquad (1)$

Also,

$$\frac{P_1 \times 15 \times 1}{100} + \frac{P_2 \times 10 \times 1}{100} = 2100$$

$$15P_1 + 10P_2 = 210000$$

$$3P_1 + 2P_2 = 42000$$

On solving Eqs. (1) and (2), we get $P_2 = ₹6000$.

41. (*c*) Ratio of simple interests earned by a certain amount at the same rate of interest for different years is equal to the ratio of years. Therefore, ratio of simple interests = 6:9 = 2:3.

42. (*b*) Let principal amount = ₹100

In first six months, SI = $\frac{100 \times 5 \times 1}{100} = ₹5$

$\therefore$ Amount after six months = ₹105

Now, SI for next six months = $\frac{105 \times 5 \times 1}{100} = ₹5.25$

$\therefore$ Amount = ₹110.25

Effective rate = 110.25 − 100 = 10.25%

43. (*b*) Let the money invested by Harris in B = ₹x

Then, money invested in A = ₹$(40000 - x)$

We are given,

$$\frac{x \times 12 \times 1}{100} + \frac{(40000 - x) \times 8 \times 1}{100} = ₹4000$$

$$\Rightarrow \frac{12x}{100} + \frac{320000 - 8x}{100} = 4000$$

$$\Rightarrow \frac{12x + 320000 - 8x}{100} = 4000$$

$$\Rightarrow 4x + 320000 = 400000$$

$$4x = 400000 - 320000$$

$$x = \frac{80000}{4} = 20000$$

$\therefore$ Harris invested ₹20000 in B

44. (*c*) Let rate of interest = number of years = x

Also, if principal = P

Then,

$$SI = \frac{P}{9}$$

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

$$\Rightarrow \frac{P}{9} = \frac{P \times x \times x}{100}$$

$$\Rightarrow \frac{100}{9} = x^2$$

$$\Rightarrow x^2 = \sqrt{\frac{100}{9}} = \frac{10}{3} = 3{,}33$$

45. (*a*) Let the loan @ 12% = ₹x

and the loan @ 14% = ₹$(1500 - x)$

Interest for 1 years = ₹186

We are given,

$$\frac{x \times 12 \times 1}{100} + \frac{(1500 - x) \times 14 \times 1}{100} = 186$$

$$\Rightarrow 12x + 21000 - 14x = 18600$$

$$\Rightarrow 2x = 2400$$

$$\Rightarrow x = \frac{2400}{2}$$

$\therefore$ x = ₹1200

Hence, the loan @12% = ₹1200

46. (*a*) Let first part of money = ₹x

and second part of money = ₹$(6000 - x)$

We are given,

$$\frac{x \times 6 \times 2}{100} = \frac{(6000 - x) \times 8 \times 3}{100}$$

$$\Rightarrow x = 12000 - 2x$$

$$\Rightarrow 3x = 12000$$

$\therefore$ $x = 4000$

So, first part of money = ₹4000 and second part of money = ₹2000.

47. (*b*) Let the first amount lent out @ 6% = ₹x

and the second amount lent out @ 5% = ₹$(38800 - x)$

Ratio of interest = 5:4

$$\therefore \frac{x \times 6 \times 6}{100} : \frac{(38800 - x) \times 5 \times 2}{100} = 5:4$$

$$\Rightarrow \frac{\frac{x \times 6 \times 6}{100}}{\frac{(38800 - x) \times 5 \times 2}{100}} = \frac{5}{4}$$

$$\Rightarrow \frac{36x}{(38800 - x) \times 10} = \frac{5}{4}$$

$$\Rightarrow \frac{18x}{(38800 - x) \times 5} = \frac{5}{4}$$

$$\Rightarrow 72x = 970000 - 25x$$

$$\Rightarrow 97x = 970000$$

$$\therefore x = 10000$$

$\therefore$ So, second part of money that was lent out @5%

$= 38800 - 10000$

$=$ ₹28800

DIFFICULTY LEVEL-2

1. (*c*) Let P be the sum and R be the rate %

$$\therefore \quad P + \frac{P \times 3 \times R}{100} = 2300 \qquad (1)$$

$$\text{and,} \quad P + \frac{P \times 5 \times R}{100} = 2500 \qquad (2)$$

(1) – (2) gives $\frac{2PR}{100} = 2000 \Rightarrow PR = 10000$, which is satisfied only by alternative (*c*).

2. (*b*) Suppose Amount invested in scheme A = ₹ x

Amount invested in scheme B = ₹y

Amount invested in scheme C = ₹z

$$\therefore \quad x + y + z = 65000 \qquad (1)$$

$$x = 72\% \text{ of } z = \frac{18}{25}z \qquad (2)$$

$$12x + 16y + 18z = 1018000$$

$$\text{i.e.,} \quad 6x + 8y + 9z = 509000 \qquad (3)$$

Using (2) in (1) and (3), we get

$$\frac{43}{25}z + y = 65000 \qquad (4)$$

$$\frac{108}{25}z + 8y + 9z = 509000$$

$$\Rightarrow \frac{333}{25}z + 8y = 509000 \qquad (5)$$

From (4), we have

$$\frac{344}{5z} + 8y = 520000 \qquad (6)$$

$\therefore$ (6) – (5)

$$\Rightarrow \quad \frac{11z}{25} = 11000$$

$$11z = 275000$$

$$z = 25000$$

$$\therefore \quad x = 18000,$$

$$y = 22000.$$

3. (*b*) $\quad \dfrac{P \times 5 \times 9}{100 \times 12} - \dfrac{P \times 14 \times 3}{100 \times 12} = 10$

$$\Rightarrow \quad P = ₹4{,}000$$

Now, $\dfrac{4000}{100 \times 12}\ [5 \times 9 + 14 \times 3] = ₹290.$

4. (*a*)

5. (*b*) Rate of interest = $5x$ and $4x$

Let he invests ₹P in bank A and Q in bank B

then, $\dfrac{P \times 5x \times 1}{2 \times 100} = \dfrac{Q \times 4x \times 1}{2 \times 100}$

$$5P = 4Q \text{ or, } P{:}Q = 4{:}5.$$

6. (*a*) Let the amount of money lent out be ₹P.

then first year interest = $\dfrac{P \times 6}{100} = ₹\dfrac{3P}{50}$

Amount to be returned = $P + \dfrac{3P}{50} = ₹\dfrac{53P}{50}s$

Amount returned = ₹6,800,

Balance amount = $\left(\dfrac{53P}{50} - 6800\right)$

Second year interest = $\dfrac{\left(\dfrac{53P}{50} - 6800\right) \times 5}{100}$

$$= ₹\frac{53P - 340000}{1000}$$

It is given that second year interest = $\dfrac{11}{20} \times \dfrac{3P}{50}$

$$\therefore \quad \frac{33P}{1000} = \frac{53P - 340000}{100}$$

$$\Rightarrow \quad P = \frac{340000}{20} = ₹17{,}000.$$

7. (*d*) $\quad P = \dfrac{P \times r \times 20}{100}$

(Interest = Amount – Principal)

$r = 5\%$ p.a.

8. (*d*) Let R be the rate of interest.

$$\text{Discount} = \frac{900 \times R}{100}$$

$$\text{Interest} = \frac{3000 \times R \times T}{100}$$

By the given information; $\dfrac{900 \times R}{100}$

$$= \frac{3000 \times R \times T}{100}$$

$T = 3$ years $= 36$ months.

9. (b) $\quad \dfrac{P_1 \times 2 \times 5}{100} = \dfrac{P_2 \times 3 \times 5}{100} = \dfrac{P_3 \times 4 \times 5}{100}$

$$\Rightarrow \quad 10P_1 = 15P_2 = 20P_3$$

$$\Rightarrow P_1 : P_2 : P_3 = 30 : 20 : 15 = \frac{1}{10} : \frac{1}{15} : \frac{1}{20}$$

10. (*b*) $\quad x = \dfrac{y \times R \times T}{100} \quad \therefore RT = \dfrac{100x}{y} \qquad (1)$

and, $y = \dfrac{z \times R \times T}{100} \quad \therefore RT = \dfrac{100y}{z} \qquad (2)$

Equations (1) and (2)

$$\frac{100x}{y} = \frac{100y}{z} \Rightarrow y^2 = xz.$$

11. (*c*) $\quad x + \dfrac{x \times 5 \times (18-2)}{100} = (18750 - x)$

$$+ (18750 - x) \times \frac{5 \times 4}{100}$$

$$\Rightarrow \quad x = ₹9{,}000$$

$\therefore$ Other son gets = ₹9,750.

12. (*b*) $\quad \dfrac{x \times 2 \times 3}{100} = \dfrac{y \times 3 \times 4}{100} = \dfrac{z \times 4 \times 5}{100}$

$$\Rightarrow \quad 3x = 6y = 10z = k$$

$$\Rightarrow \quad x = \frac{k}{3}, y = \frac{k}{6}, z = \frac{k}{10} \quad x + y + z = 1440$$

$$\frac{k}{3}+\frac{k}{6}+\frac{k}{10}=1440 \Rightarrow k=2400$$

$$\therefore \quad \frac{k}{3}-\frac{k}{10}=\frac{7k}{30}=\frac{7}{30}\times 2400=560$$

13. (*c*) $x\times\frac{8\times 4}{100}+x\times\frac{10\times 6}{100}+x\times\frac{12\times 5}{100}=12160$

$\Rightarrow \quad x=₹8{,}000.$

14. (*b*) Let the sum be ₹x

$\therefore$ ₹x are lent at 8% for t years and ₹x are lent at 7% for $\left(t+\frac{1}{2}\right)$ years

$$\therefore \quad \frac{x\times t\times 8}{100}+x=2560 \qquad (1)$$

and $$\frac{x+(2t+1)\times 7}{2\times 100}+x=2560 \qquad (2)$$

Solving Eqs. (1) and (2), we get

$x=₹2{,}000,\ t=3.5$ years.

15. (*d*) Let the amount of money lent at 12% interest be ₹x.

$\therefore$ Amount of money lent at 12.5% interest

$=₹(2540-x)$

$$\therefore \quad \frac{x\times 12\times 1}{100}+\frac{(2540-x)12.5\times 1}{100}=311.60$$

$$\Rightarrow \quad \frac{-0.5x}{100}+\frac{31750}{100}=311.60$$

$$\Rightarrow \quad 0.5x=31750-31160=590$$

$$\Rightarrow \quad x=₹1{,}180$$

16. (*b*) Let the annual instalment be ₹x

Amount of ₹100 after 4 years

$$=₹\left(100+\frac{100\times 5\times 4}{100}\right)=₹120$$

$\therefore$ Present Value (P.V.) of ₹120 due after 4 years

$=₹100$

Present Value (P.V.) of ₹x due after 4 years

$$=\frac{100}{120}x=\frac{5}{6}x$$

Similarly, P.V. of ₹x due after 3 years $=\frac{20}{23}x$

P.V. of ₹x due after 2 years $=\frac{10}{11}x$

P.V. of ₹x due after 1 year $=\frac{20}{21}x$

Hence

$$\frac{5}{6}x+\frac{20}{23}x+\frac{10}{11}x+\frac{20}{21}x=6450$$

$$\Rightarrow \quad x\approx ₹1{,}810$$

17. (*d*) Suppose the person had deposited ₹x at the time of opening the account.

$\therefore$ After one year, he had

$$₹\left[x+\frac{x\times 10\times 1}{100}\right]=₹\frac{11x}{10}$$

After two years, he had

$$₹\left[\frac{11x}{10}+\frac{11x}{10}\times\frac{10\times 1}{100}\right]=\frac{121x}{100} \qquad (1)$$

After withdrawing ₹5,000 from ₹$\frac{121x}{100}$, the balance = ₹$\frac{121x-500000}{100}$

After 3 years, he had

$$\frac{121x-500000}{100}+\frac{121x-500000}{100}\times\frac{10\times 1}{100}$$

$$=\frac{11(121x-500000)}{1000} \qquad (2)$$

After withdrawing ₹6,000 from amount (2), the balance

$$=₹\left[\frac{1331x}{1000}-11500\right]$$

$\therefore$ After 4 years, he had

$$₹\left[\frac{1331x-5500000}{1000}\right]+10\%\text{ of }₹\left[\frac{1331x-5500000}{1000}\right]$$

$$=₹\frac{11}{10}\left[\frac{1331x}{1000}-11500\right] \qquad (3)$$

[After withdrawing ₹10,000 from amount (3), the balance = 0]

$$\therefore \frac{11}{10}\left[\frac{1331x}{1000}-11500\right]-10{,}000=0$$

$$\Rightarrow \quad x=₹15{,}470.$$

18. (*d*) Let each sum be ₹x

$$\therefore \quad \frac{x\times 4\frac{1}{2}\times 7}{100}-\frac{x\times 4\times 7}{100}=31.50 \Rightarrow \frac{7x}{100}\times\frac{1}{2}=\frac{63}{2}$$

$$\Rightarrow \quad x=900$$

19. (*c*) Let the sum be ₹x.

Given: $\frac{x\times 4\times 2}{100}+\frac{x\times 6\times 4}{100}+\frac{x\times 8\times 3}{100}=1120$

$\Rightarrow 56x=112000$ or, $x=\frac{112000}{56}=₹2{,}000$

20. (*a*) Simple interest paid by Brinda on ₹1,000 for 1 year = $\frac{1000 \times 5 \times 1}{100} = ₹50.$

Rent received by Brinda from Ramu in 1 year

$$= 12\frac{1}{2} \times 12 = ₹150.$$

$\therefore$ Net savings = ₹100.

Thus, Brinda will clear the debt of ₹1,000 in 10 years.

21. (*b*) Let the sum of money lent by Sumit to Mohit be ₹x.

Then, simple interest paid by Mohit after 1 year

$$= \frac{x \times 5 \times 1}{100} = ₹\frac{5x}{100}.$$

Also, the simple interest received by Mohit from Birju after 1 year

$$= \frac{x \times \frac{17}{2} \times 1}{100} = ₹\frac{17x}{200}.$$

Given: $\frac{5x}{100} + 350 = \frac{17x}{200}$

$\Rightarrow \quad \frac{5x + 35000}{100} = \frac{17x}{200}$

$\Rightarrow \quad 1700x - 1000x = 7000000$

or, $\quad 700x = 7000000$

or, $\quad x = \frac{7000000}{700} = ₹10,000.$

Thus, the sum of money lent by Sumit to Mohit is ₹10,000.

22. (*a*) Interest for 5 years on the sum = ₹300.

When the principal is tripled, the interest is also tripled.

$\therefore$ Interest for another 5 years on this increased sum = ₹(300 × 3) = ₹900.

$\therefore$ Total interest = ₹300 + ₹900 = ₹1,200.

23. (*c*) Man buys x apples at m price and y oranges at n price, then,

$$x + y = 40$$

$$mx + ny = 17 \qquad (1)$$

Also, $nx + my = 15 \qquad (2)$

From Eqs. (1) and (2),

$$(m + n)(x + y) = 17 + 15$$

$\Rightarrow \quad (m + n) = \frac{32}{40} = ₹0.80 = 80$ paise.

24. (*b*) Suppose, the man invests x in 6% and y in 8%

$$x + y = 9000 \qquad (1)$$

and, $3 \times \left(\frac{x \times 6}{100} + \frac{y \times 8}{100}\right) = 1800$

$\Rightarrow \quad 3x + 4y = 30000 \qquad (2)$

From Eqs. (1) and (2), we get

$\therefore \quad x = ₹6000.$

25. (*c*) Let the rate of interest is 'r'

$\therefore \quad \frac{6000 \times r \times 4}{100} = 2000$

$\Rightarrow \quad r = \frac{25}{3}\%$

Now, calculate for ₹525.

26. (*c*) Let capital be $12x$.

$\therefore \quad 4x \times 7\% + 3x \times 8\% + 5x \times 10\% = 561$

$$x = 550$$

$\therefore \quad 550 \times 12 = ₹6600$

27. (*d*) Let the annual amount investment at 5% and 3% be ₹x and ₹$(9600 - x)$, respectively.

Then, $\frac{x \times 5 \times 1}{100} = \frac{(9600 - x) \times 3 \times 1}{100}$

$\Rightarrow \quad 5x = 28800 - 3x$

$\Rightarrow \quad 8x = ₹28800$

$\Rightarrow \quad x = ₹\frac{28800}{8}$

$= ₹3600$

So the total income

$$= \frac{3600 \times 5 \times 1}{100} + \frac{(9600 - 3600) \times 3 \times 1}{100}$$

$= ₹180 + ₹180 = ₹360.$

28. (*a*) Here $P_1 = ₹12,000$, $R_1 = 10\%$, $P_2 = ?$, $R_2 = 20\%$, $R = 14\%$

Therefore, using the formula

$$R = \frac{P_1R_1 + P_2R_2}{P_1 + P_2}$$

We get, $\quad 14 = \frac{12000 \times 10 + P_2 \times 20}{12000 + P_2}$

or, $\quad P_2 = ₹8,000.$

$\therefore$ Total amount invested

$$= ₹(12000 + 8000)$$

$$= ₹20,000.$$

29. (*a*) Here $T_1 = 1, T_2 = 2, T_3 = 3,$

$R_1 = R_2 = R_3 = 5\%$

The shares of Vikas, Vijay and Viraj will be in the ratio

$$\frac{1}{R_1T_1} : \frac{1}{R_2T_2} : \frac{1}{R_3T_3} = \frac{1}{1\times5} : \frac{1}{2\times5} : \frac{1}{3\times5}$$

$$= \frac{1}{1} : \frac{1}{2} : \frac{1}{3} = 6 : 3 : 2.$$

Sum of proportionals = 6 + 3 + 2 = 11.

$\therefore$ Share of Vikas = $\frac{6}{11} \times 7700 = ₹4,200$

Share of Vijay = $\frac{3}{11} \times 7700 = ₹2,100$

Share of Viraj = $\frac{2}{11} \times 7700 = ₹1,400$

Therefore, Vikas's share is 4200 – 1400 = ₹2,800 more than that of Viraj.

30. (*c*) Simple interest

$= (8 \times 4)\% + (10 \times 6)\% + (12 \times 5)\% = 12160$

$\Rightarrow$ $152\% = 12160$

$\Rightarrow$ $100\% = ₹8000.$

31. (*b*) $SI_1 = SI_2 = SI_3$

$\therefore$ $x \times 6\% = y \times 12\% = z \times 20\% = k$

$\therefore$ $x:y:z = \frac{k}{6} : \frac{k}{12} : \frac{k}{20} \times 60 = 10:5:3$

$\therefore$ Required difference = $\frac{7}{18} \times 1440 = ₹560.$

32. (*c*) Let principal of two sons are x and y, respectively.

$\therefore$ $\frac{x\times130}{100} = \frac{y\times120}{100} \Rightarrow \frac{x}{y} = \frac{12}{13}$

$\therefore$ $x = \frac{12}{25} \times 18750 = ₹9000$

$y = \frac{13}{25} \times 18750 = ₹9750.$

33. (*c*) Outstanding amount in December = ₹1000000

Interest to be paid in January = 1% of ₹1000000

= ₹10000 (1)

(Since, 12% per annum $\Rightarrow$ 1% per month)

Past payment = ₹25000 – ₹10000

= ₹15000

Outstanding amount in January

= ₹1000000 – ₹15000 = 985000

Interest to be paid in February = 1% of 985000

= 9850 (2)

Total interest paid = ₹10000 + ₹9850

= ₹19850

34. (*c*) Let the sum of money be x and $2x$.

Interest on both the sums

$$= \frac{x\times5\times1}{100} + \frac{2x\times5.5\times1}{100}$$

$$= \frac{5x}{100} + \frac{11x}{100} = \frac{16x}{100}$$

According to questions,

$$\frac{16x}{100} = 1000$$

$$\Rightarrow \quad x = \frac{1000\times100}{16} = ₹6250$$

Hence, second sum invested = $2x$ = ₹12500.

35. (*a*) We have $T_1 = 2$ years, $T_2 = 3$ years, $T_3 = 4$ years.

$R_1 = R_2 = R_3 = 5\%$ p.a.

$\therefore$ The ratio in which the amount is invested

$$= \frac{1}{100 + R_1T_1} : \frac{1}{100 + R_2T_2} : \frac{1}{100 + R_3T_3}$$

i.e., $\frac{1}{100 + 2\times5} : \frac{1}{100 + 3\times5} : \frac{1}{100 + 4\times5}$

i.e., $\frac{1}{110} : \frac{1}{115} : \frac{1}{120}$ or, 276 : 264 : 253.

Their sum = 276 + 264 + 253 = 793

$\therefore$ The amount invested for

Neeta = $\frac{3965}{793} \times 276 = ₹1,380$

Sita = $\frac{3965}{793} \times 264 = ₹1,320$

Gita = $\frac{3965}{793} \times 253 = ₹1,265.$

36. (*a*) Let the sum of money invested by Suresh be ₹x.

Since the amount obtained in both the cases is equal, the ratio in which the sums are invested is

$$\frac{1}{100 + R_1T_1} : \frac{1}{100 + R_2T_2}$$

where $R_1 = 8\%, T_1 = \frac{5}{2}$ years, $R_2 = 5\%$

$T_2 = 2$ years.

That is, $\frac{1}{100+8\times\frac{5}{2}}:\frac{1}{100+5\times 2}$ or, $\frac{1}{120}:\frac{1}{110}$

Given $1500 : x :: \frac{1}{120}:\frac{1}{110}$

$\Rightarrow \frac{1500\times 1}{110} = \frac{1}{120}\times x$

or, $x = \frac{1500\times 1\times 120}{110} = 1636\frac{4}{11}$.

$\therefore$ The sum invested by Suresh is ₹$1,636\frac{4}{11}$

37. (*a*) Xerox machine is available at $33\frac{1}{3}\%$ cash down payment and 11 equal monthly instalments of ₹4900 each.

Then, $33\frac{1}{3}\%$ of ₹78000

$= \frac{100}{3}\times\frac{78000}{100}$ = ₹26000

Now, 11 monthly instalments of ₹4900 each.

Then, it is equal to $11 \times 4900 =$ ₹53900

Therefore, total cost of machine on instalment 26000 + 53900 = ₹79900

Now, interest = (79900 – 78000) = ₹1900

Let the rate of interest by R.

Then,

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

$\Rightarrow 1900 = \frac{78000\times R\times 1}{100}$

$\Rightarrow R = \frac{1900\times 100}{78000} = 2.43\%$