MATHEMATICS

Class-VII

Topic-18

SIMPLE INTEREST

18 SIMPLE INTEREST

TERMINOLOGIES

Borrower, Money lender, Principal , Interest, Simple Interest, Amount, Compound Interest, Rate of Interest.

INTRODUCTION :

Malini said that they were going to buy a new car . Kanha asked her whether they had enough money to buy it ? She replies that her father was going to take loan from a bank. So the money borrowed is known as sum or principal.This money will be used by the borrower for some time before it is returned .Now for keeping this money for some time, borrower has to pay some extra money to bank,which is known as interest.

18.1 SOME DEFINITIONS AND CONCEPTS

(a)   **Borrower :**

The person who borrows money is called the **borrower**.

(b)   **Money lender :**

The person who lends money is called the **money lender**.

(c)   **Principal :**

The money borrowed from a lender is called the **principal**.

(d)   **Interest :**

The additional money paid by the borrower to the lender for having used his money is called the **interes**t.

(e)   **Simple Interest :**

Interest is said to be simple if it is calculated on the original principal throughout the loan period.
If P = Principal, R = Rate of interest per annum and T = time, then the simple interest is given by

S.I. = $\dfrac{PRT}{100}$.

(f)   **Amount :**

The total money which the borrower pays back to the lender at the end of the specified period is called the **amount**.

NOTE :

(i) In calculating the number of days, we do not count the day on which the money is deposited but the date of withdrawal is counted.

(ii) Number of years = $\dfrac{\text{Number of days}}{365}$.

Illustration 18.1

A sum of Rs. 800 is lent for one year at the rate of 18% per annum. Find the interest.

Sol. Here, we have

P = Principal = Rs. 800, R = Rate of Interest = 18% per annum, T = Time = 1 year

Now, Interest on Rs. 100 for 1 year = Rs. 18

$\therefore$ Interest on Rs. 1 for 1 year = Rs. $\dfrac{18}{100}$

Hence, Interest on Rs. 800 for 1 year

= Rs. $\dfrac{18}{100}$ × 800 = Rs. 144.

Illustration 18.2

Anita borrowed Rs 400 from her friend at the rate of 12% per annum for $2\dfrac{1}{2}$ years. Find the interest and amount paid by her.

Sol. We have,

P = Rs. 400, R = 12%, T = $2\dfrac{1}{2}$ years = $\dfrac{5}{2}$ years

Now, Interest rate = 12% per annum

i.e., Interest on Rs. 100 for 1 year = Rs. 12

$\therefore$ Interest on Rs. 100 for $\dfrac{5}{2}$ years = Rs. 12 × $\dfrac{5}{2}$ = Rs. 30

Interest on Rs. 1 for $\dfrac{5}{2}$ years = Rs.

Hence, Interest on Rs 400 for $\dfrac{5}{2}$ years = Rs. $\dfrac{30}{100}$ × 400 = Rs. 120

Thus, Interest = Rs. 120

$\therefore$ Amount to be paid = Principal + Interest = 400 + 120 = Rs. 520.

Illustration 18.3

Find the interest on Rs 1200 at 6% per annum for 146 days.

Sol. We have,

P = Rs. 1200, R = 6% per annum,

T = 146 days $\dfrac{146}{365}$ = year = $\dfrac{2}{5}$ year

$I = \dfrac{PRT}{100}$ $\Rightarrow$ $I = $ Rs. $\left(\dfrac{1200 \times 6 \times \dfrac{2}{5}}{100} \right)$ $\Rightarrow$ $I = $ Rs. $\dfrac{144}{5}$ = Rs. 28.80.

Illustration 18.4

What principal will amount to Rs 900 in 6 years at 10% simple interest ?

Sol. Let the principal be Rs. 100. We have,
Rate of Interest = 10% per annum
∴ Interest on Rs.100 for 1 year = Rs 10
Interest on Rs. 100 for 6 years = Rs. 10 × 6 = Rs. 60
∴ Amount = Principal + Interest = 100 + 60 = Rs.160
If the Amount is Rs.160, Principal = Rs. 100
∴ If the amount is Rs. 900,

Principal = Rs. $\left(\dfrac{100}{160} \times 900\right)$ = Rs. 562.50.

Aliter We have,
A = Rs. 900, T = 6 years, R = 10% per annum
Let P be the Principal and I be the Interest. Then,

$$I = \frac{PRT}{100} \qquad \Rightarrow \qquad I = \left(\frac{P \times 10 \times 6}{100}\right) \text{ Rs. } = \text{Rs. } \frac{3P}{5}$$

Now, A = P + I

$$\Rightarrow \qquad 900 = P + \frac{3P}{5}$$

$$\Rightarrow \qquad 900 = \frac{5P + 3P}{5}$$

$$\Rightarrow \qquad \frac{8P}{5} = 900$$

$$\Rightarrow \qquad P = \frac{900 \times 5}{8} = 562.50$$

Hence, Principal = Rs. 562.50.

Illustration 18.5

In how many years will Rs. 750 amount to Rs. 900 at 4% per annum ?

Sol. Here, P = Rs. 750, A = Rs. 900, R = 4% per annum
Let Rs. 750 amount to Rs. 900 at 4% per annum in T years.
Now,
Interest = Amount – Principal
= Rs 900 – Rs 750 = Rs. 150

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

$$\Rightarrow \qquad 150 = \frac{750 \times 4 \times T}{100}$$

$$\Rightarrow \qquad T = \frac{150 \times 100}{750 \times 4} \text{ years} = 5 \text{ years}.$$

Thus, Rs. 750 amount to Rs 900 at 4% per annum in 5 years.

Illustration 18.6

A sum of money doubles itself in 8 years. What is the rate of interest ?

Sol. Let the principal be Rs. P and the rate of interest be R% per annum.
Since the money doubles itself in 8 years, i.e., it becomes Rs. 2P in 8 years.

∴   S.I. = Amount – Principal

⇒   S.I. = Rs 2P – Rs P = Rs P

Now,

$$S.I. = \frac{PRT}{100}$$

⇒ $P = \frac{P \times R \times 8}{100}$

⇒ $R = \frac{P \times 100}{P \times 8} = \frac{100}{8} = 12.5$

Hence, the rate of interest is 12.5% per annum.

Ask yourself

1. If Sangeeta pays an interest of Rs 1500 for 4 years on a sum of Rs 2500 , find the rate of interest per annum

2. Find the amount received on Rs 3000 for 2 years at the rate of 11 % per annum

3. Aman and Sheena deposited Rs 30000 and Rs 40000 in a company at the rate of 10 % per annum for 3 years and $2\frac{1}{2}$ years respectively. Find the difference of the amounts received by them?

4. If Rs. 5000 becomes Rs.5700 in a year's time at simple interst, what will Rs.7000 become at end of 5 years at the same rate of interest?

5. A certain sum doubles in 3 years under simple interest. In how many years will the sum become 5 times itself?

Answers

1.	15%	2.	3660	3.	11000	4.	Rs.11900	5.	12

Add your knowledge

Till now we have studied that , If **P** is the principal and I is the interest, then the amount **A** is, therefore, given by **A = P + I**. We recall that if principal remains constant for the entire loan period, then the interest obtained is simple interest.

But what if the interest is added with the principal after a specified period of time to form a new principal and the interest for the subsequent period is calculated on the new principal than the interest obtained is called compound interest. In this case, the principal does not remain the same.

Formula for Compound interest

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

Where P = Principal, R = Rate of interest, n = Time

Compound interest (C.I.) = A – P

Hence, C.I. = P. $\left[\left(1 + \frac{R}{100}\right)^n - 1\right]$

e.g. Find the amount of Rs 8000 for 3 years, compounded annually at 5% per annum. Also, find the compound interest.

Sol. Here, P = Rs 8000, R = 5% per annum and n = 3 years.

Using the formula A = P $\left(1 + \frac{R}{100}\right)^n$, we get

Amount after 3 years = Rs. $\left\{8000 \times \left(1 + \frac{5}{100}\right)^3\right\}$ = Rs. $\left(8000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}\right)$

= Rs. 9261

Amount after 3 years = Rs. 9261.

And, compound interest = Rs. (9261 – 8000) = Rs. 1261

Concept Map

Simple Interest (S.I.)

Principal (P)   Time in Years(T)

Rate of Interest in Per Annum (R)

Amount (A)

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

A = P + S. I

Summary

1. The person who borrows money is called the **borrower**.

2. The person who lends money is called the **money lender**.

3. The money borrowed from a lender is called the **principal**.

4. The additional money paid by the borrower to the lender for having used his money is called the **interest**.

5. Interest is said to be simple if it is calculated on the original principal throughout the loan period.
   If P = Principal, R = Rate of interest per annum and T = time, then the simple interest is given by

   $$S.I. = \frac{PRT}{100}.$$

6. The total money which the borrower pays back to the lender at the end of the specified period is called the **amount**.
   Amount = Principal + Interest

EXERCISE » 01

SECTION -A (FIXED RESPONSE TYPE)

MULTIPLE CHOICE QUESTIONS

1. What will be the interest on Rs. 3700 after 2½ years at the rate of 5½ P.A. ?
   (A) Rs. 508.75   (B) Rs. 618.25   (C) Rs. 706   (D) Rs. 900

2. Find the interest on Rs. 2400 for 6 months at the rate of 8%.
   (A) 86   (B) 80   (C) 96   (D) 60

3. Interest on Rs 12000 for 1 month at the rate of 10% per annum is
   (A) Rs 1200   (B) Rs 600   (C) Rs 100   (D) Rs 12100

4. Find the interest on Rs 12500 at 18% per annum for a period of 2 years and 4 months
   (A) Rs 5250   (B) Rs 5010   (C) Rs 4250   (D) Rs 4200

5. Find the interest on Rs 350 at 5% per annum for 73 days.
   (A) Rs 2.5   (B) Rs 3.5   (C) Rs 4.5   (D) Rs 5

6. A man earn Rs. 450 as an interest in 2 yrs on a certain sum invested with company at the rate of 12% per annum. Find sum invested by the man in the company.
   (A) Rs. 1875   (B) Rs.1830   (C) Rs. 1825   (D) Rs.1810

7. Find the simple interest that Ram has to pay if he borrows Rs. 500 for a period of 5 years at the rate of 5% p.a.
   (A) Rs. 200   (B) Rs. 150   (C) Rs. 100   (D) Rs. 125

8. Two equal sums are lent at simple interest. The first sum is recovered in 3 years and the second sum in 6 years, The rate of interest per annum on the first sum is 2% more than that on the second sum. Find the total sum lent if the amount in each case is Rs.560.
   (A) Rs.530   (B) Rs.500   (C) Rs.1480   (D) Rs.1000

9. Shashi makes a fixed deposit of Rs. 50000 in a Bank for 73 days. If the rate of interest be 6.5% per annum what amount does she get on maturity of FD ?
   (A) Rs.6650   (B) Rs.49350   (C) Rs.50650   (D) None of these

10. A certain sum lent for a period of $2\frac{1}{2}$ years under simple interest at 9% p.a. and earned an interest of Rs.234. Find the sum that was lent from the following option.
    (A) Rs.960   (B) Rs.1040   (C) Rs.1246   (D) Rs.1146

11. In how much time will the simple interest be half of its principal 10% per annum.
    (A) 2 years   (B) 4 years   (C) 5 years   (D) None of these

12. The rate at which a sum becomes four times of itself in 15 years at S.I., will be :
    (A) 15%   (B) $17\frac{1}{2}$ %   (C) 20%   (D) 25%

13. If 4/25 part of a sum can be earned from the sum in 2 years at simple interest, then, find the rate of interest.
    (A) 8%   (B) 4%   (C) 6%   (D) 3%

14. In what time a capital becomes five times at the interest rate of 10%.

(A) 10 years   (B) 30 years   (C) 40 years   (D) 50 years

15. One-third of a certain sum is invested at 3% per annum; one sixth of the sum is invested at 6% per annum and the remaining sum at 8% per annum. If the annual simple interest from all these investments is Rs. 600, the original sum is :

(A) Rs. 6000   (B) Rs. 6666   (C) Rs. 7500   (D) Rs. 10000

16. A borrowed Rs. 500 at the rate of 5% annum and Rs. 1000 at the rate of 4% per annum on simple interest from B on the same day, under conditions that the loan and interest will be paid when the amount in both cases together will be Rs. 2020. How many years will it take to repay the loans ?

(A) 6 years   (B) 8 years   (C) 10 years   (D) 12 years

17. A sum amounts to Rs 4872 at 4% per annum in 4 years. Find the sum.

(A) Rs. 304.2   (B) Rs. 4200   (C) Rs. 4000   (D) Rs. 872

18. At what rate of interest per annum a sum becomes $1\frac{1}{2}$ time itself in 10 years.

(A) 5%   (B) 15%   (C) 10%   (D) 2%

19. The difference between the simple interest received from two different sources on Rs. 1500 for 3 years is Rs. 13.50. The difference between their rates of interest is :

(A) 0.1%   (B) 0.2%   (C) 0.3%   (D) 0.4%

20. Simple interest on a certain amount is $\frac{9}{16}$ of the principal. If the number representing the rate of interest in percent and time in years be equal, then time, for which the principal is lent out, is :

(A) $5\frac{1}{2}$ years   (B) $6\frac{1}{2}$ years   (C) 7 years   (D) $7\frac{1}{2}$ years

FILL IN THE BLANKS

1. Money borrowed by a borrower is _____

2. Amount – Principal = _____

3. Ramesh borrowed Rs. 20,000 from a bank and he returned Rs 25,000 to the bank after 3 years. He paid a S.I. of _____

4. Simple interst for the Rs. 2000 at 10% p.a for 3 years is _____

5. Fomula for calculating principal = _____

TRUE / FALSE

1. Amount equal to sum of principle and simple interest.

2. The interest period is the time period for which interest is charged.

3. In S.I. formula, T is always expressed in years.

4. In the simple interest formula, S.I. $= \dfrac{PRT}{100}$, S.I. always refer to the rate of interest charged for the use of money.

5. Simple interest on Rs.3750 at $5\frac{1}{2}$% per annum for the period from 3rd February 2007 to 29th June 2007 is Rs.87.5

MATCH THE COLUMN

1. Read the problem below and match column A with B Seema borrowed Rs. 50,000 from a money lenders. She paid simple interest at the rate of 8% S.I. p.a. for 3 years.

Column – A		Column – B	
(A)	Rs. 12,000	(p)	Principal
(B)	Rs. 62,000	(q)	Rate
(C)	8% p.a.	(r)	Time Period
(D)	Rs. 50000	(s)	Interest
(E)	3 year	(t)	Amount

SECTION -B (FREE RESPONSE TYPE)

VERY SHORT ANSWER TYPE

1. Find the simple interest on principal Rs 300 , rate 12% and time 8 months

2. At what rate will Rs 6250 amounts to Rs 7000 in 4 years ?

3. What is the rate of interest which yields an interest of Rs. 2800 on a sum of Rs. 56000 for 2 years.

4. Find the time in which a sum of money doubles itself at simple rate of 5%

SHORT ANSWER TYPE

5. Find the simple interest on Rs.3750 at $5\frac{1}{2}$% per annum for the period from 3rd February 2007 to 29th June 2007.

6. How long will it take a sum of money invested at 5% p.a. S.I. to increase its value by 40% ?

7. The simple interest on a certain sum of money at the rate of 5% p.a. for 8 years is Rs. 840. At what rate of interest the same amount of interest can be received on the same sum after 5 years?

8. If a sum of money doubles at 12.5% p.a. interest. What is the time period in case of S.I. ?

9. If a sum becomes $\frac{28}{25}$ of itself in 5 years then find the rate of interest ?

10. The interest on a certain deposit at 4.5% p.a. is Rs. 202.50 in one year. How much will the additional interest in one year be on the same deposit at 5% p.a. ?

LONG ANSWER TYPE

11. Ram and Puneet borrowed Rs. 750 each, from Rakesh at the same rate of simple interest. Ram paid back Rs. 930 after 3 years. If Puneet wants to settle his accounts after 5 years how much money will he pay to Rakesh.

12. What amount will earn a monthly interest of Rs. 20 at 6 paise per rupee per year simple interest?

13. A farmer borrowed Rs. 2500 and Rs. 4500 from a bank for buying seeds and fixing a tubewell respectively at simple interest with the same rate. He paid after 3 years 3 months Rs 520 more interest on the sum borrowed for tubewell. Find the rate of interest per annum.

14. A certain sum amounts to Rs.77,000 in 5 years and to Rs.68,200 in 3 years, under simple interest. If the rate of interest in increased by 2% points, in how many years will it double itself?

EXERCISE » 02

SECTION -A (COMPETITIVE EXAMINATION QUESTION)

MULTIPLE CHOICE QUESTIONS

1. If the simple interest on x is y and that on y is z for the same time and same rate, then the relation between   x, y and z is :
(A) $x^2 = yz$ (B) $y^2 = zx$ (C) $z^2 = xy$ (D) $xyz = 1$

2. What will be the ratio of simple interest earned by certain amount at the same rate of interest for 6 years and that for 9 years ?
(A) 1 : 3   (B) 1 : 4   (C) Data inadequate   (D) None of these

3. Which sum will amount to Rs. 7000 in 5 years at $3\frac{1}{3}\%$ simple interest ?
(A) Rs. 6000   (B) Rs. 6100   (C) Rs. 6090   (D) Rs. 6080

4. The difference between simple interest on Rs. 500 for 4 years and the simple interest on Rs. 600 for 3 years is Rs. 10. The rate of interest is :
(A) 2%   (B) 3%   (C) 4%   (D) 5%

5. Rajni and mohini deposited Rs 3000 and Rs 4000 in a company at the rate of 10% per annum for 3 years and $2\frac{1}{2}$ years respectively. The difference of the amounts received by them will be
(A) Rs. 100   (B) Rs. 1000   (C) Rs. 900   (D) Rs. 1100

6. Equal sums of Rs 7200 were lent to Megha and Priya at 5% per annum for a period of 4 years and 5 years respectively . Find the difference of the interest paid by Megha and Priya.
(A) Rs 140   (B) Rs 560   (C) Rs 260   (D) Rs 360

7. A sum was borrowed at simple interest at R% pa for 2 years. If it had been borrowed at (R+5)% pa it would have become Rs.200 more. Find the sum (inRs.).

(A) 2500   (B) 2000   (C) 3000   (D) 1500

8. Ram deposits a certain sum of money in a bank .If the interest rate of the bank decreases from $3\frac{3}{4}$% to $3\frac{1}{2}$% per annum, he receives Rs.100 less in 2 years. Find the sum of money he deposit.

(A) Rs. 20000   (B) Rs. 18000   (C) Rs. 16000   (D) Rs. 22000

9. A sum of Rs.1750 is lent out at simple interest into two parts, smaller part being lent at 7% p.a. and larger part at 5% p.a. If the total interest in one year is Rs.98, then find the part which is lent at 5% p.a. rate of interest.

(A) Rs.525   (B) Rs.975   (C) Rs.1225   (D) Rs.1350

SECTION - B (TECHIE STUFF)

10. A sum amount to Rs. 2970.25 in two years at 9% per annum compounded annually, then the sum is :

(A) Rs.2500   (B) Rs.2600   (C) Rs.2550   (D) Rs. 2475

11. A certain sum of money doubles itself at a compound interest in 10 years. It becomes eight times in :

(A) 20 years   (B) 30 years   (C) 15 years   (D) 13 years

12. The difference of compound interest and simple interest on an amount at the rate of 12% per annum for 2 years is Rs. 90/- then the amount will be -

(A) Rs. 2500   (B) Rs. 6250   (C) Rs. 12500   (D) 12500

EXERCISE >> 03

(PREVIOUS YEAR EXAMINATION QUESTIONS)

1. A sum of money of Rs 1600 lent at S.I of 12.5% per annum will become twice in :

[NSTSE 2009]

(A) 8 years   (B) 16 years   (C) 12 years   (D) 20 years

2. A sum of money becomes 4 times at simple interest in 10 years. What is the rate of interest ? **[NSTSE 2010]**

(A) 10%   (B) 20%   (C) 30%   (D) 40%

3. At what rate percent per annum will a sum of money double in 8 years? **[NSTSE 2011]**

(A) $3\frac{1}{3}$%   (B) $12\frac{1}{2}$%   (C) $33\frac{1}{3}$%   (D) $3\frac{1}{2}$%

4. In how many years will Rs 900 yield an interest of Rs 324 at 12% per annum simple interest ? **[NSTSE 2012]**

(A) 1 years   (B) 2 years   (C) 3 years   (D) 4 years

5. Dipanshu invested a sum of money for a period from May 2006 to May 2008 at the rate of 12% per annum. If the interest received by him is Rs.1620, then find the sum. **[IMO-2012]**
(A) Rs.5000   (B) Rs. 6500   (C) Rs.6000   (D) Rs.6750

6. The S.I on a sum of money is $\frac{1}{9}$ th of the principal and the number of years is equal to the rate percent per annum . Find the rate percent ?   **[NSTSE 2013]**
(A) $2\frac{1}{3}$ %   (B) $3\frac{1}{3}$ %   (C) $4\frac{1}{2}$ %   (D) $3\frac{1}{2}$ %

7. A businessman borrowed some money at 1% per month. After some time, he settled the debt by paying Rs.14750. If the total interest was Rs2950, find the time   **[IMO-2013]**
(A) 2 years 1 month   (B) 3 years   (C) 2½ years   (D) 1 year 8 month

8. A sum of money invested at simple interest triples itself in 8 years. How many times will it become in 20 years time?   **[IMO-2013]**
(A) 8 times   (B) 7 times   (C) 6 times   (D) None of these

9. Anish borrowed 15000 at the rate of 12% and another amount at the rate of 15% for two years. The total interest paid by him was Rs.9000. How much did he borrow? **[IMO-2013]**
(A) Rs.31000   (B) Rs.33000   (C) Rs.28000   (D) Rs.18000

10. A car was purchased for Rs.80,000. Its value depreciates every year by 20%. Find the value of the car at the end of 2 years.   **[IMO-2013]**
(A) Rs.51,600   (B) Rs.51,200   (C) Rs.52,100   (D) Rs.52,400

11. In the given question, a question is asked and is followed by three statements. While answering the question. you may or may not require the data provided in all the statements. You have to read, the question and the three statements and then decide whether the question can be answered with any one or two of the statements or all the three statements are required to answer the question. Select the correct option.
What is the principal sum?   **[IMO-2013]**
(i) The sum amounts to Rs.690 in 3 years at S.I.
(ii) The sum amounts to Rs.750 in 5 years at S.I.
(iii) The rate of interest is 5% p.a.
(A) I and III only   (B) II and III only
(C) I and II only   (D) Any two of the three

ANSWER KEY »

EXERCISE » 01

SECTION -A (FIXED RESPONSE TYPE)
MULTIPLE CHOICE QUESTIONS :

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	A	C	C	A	B	A	D	D	C	B	C	C	A	C	D
Ques.	16	17	18	19	20										
Ans.	B	B	A	C	D										

FILL IN THE BLANKS

1. Principle   **2.** S.I   **3.** 5000   **4.** 600   **5.** $\dfrac{S.I \times 100}{R \times T}$

TRUE / FALSE

1. True   **2.** True   **3.** True   **4.** False   **5.** False

MATCH THE COLUMN

1. (a) $\rightarrow$ s , (b) $\rightarrow$ t , (c) $\rightarrow$ q , (d) $\rightarrow$ p , (e) $\rightarrow$ r

SECTION -B (FREE RESPONSE TYPE)
VERY SHORT ANSWER TYPE

1. 24   **2.** 3 %   **3.** 2.5% p.a   **4.** 20 years

SHORT ANSWER TYPE

5. Rs. 82.5   **6.** 8 years   **7.** 8%   **8.** 8 years

9. $\dfrac{12}{5}$ %   **10.** Rs. 22.5

LONG ANSWER TYPE

11. Rs. 1050   **12.** Rs. 4000   **13.** 8%   **14.** 10 years