Example 7. *Selling price of a toy car is ₹540. If the profit made by the shopkeeper is 20%, what is the cost price of this toy?*

Solution. S.P. of toy car = ₹540, profit = 20%.

Let the cost price of toy car be ₹x, then

$$\text{profit} = 20\% \text{ of } ₹x = ₹\left(\frac{20}{100} \times x\right) = ₹\frac{x}{5}.$$

$$\text{S.P. of toy car} = \text{C.P.} + \text{profit} = ₹x + ₹\frac{x}{5} = ₹\left(x + \frac{x}{5}\right) = ₹\left(1 + \frac{1}{5}\right)x = ₹\frac{6x}{5}.$$

According to given condition, $\frac{6x}{5} = 540$

$$\Rightarrow \quad x = 540 \times \frac{5}{6} \Rightarrow x = 450.$$

Hence, the cost price of the toy car = ₹450.

Example 8. *An item was sold for ₹532 at a loss of 5%. What was its cost price?*

Solution. S.P. of an item = ₹532, loss = 5%.

Let the cost price of the item be ₹x, then

$$\text{loss} = 5\% \text{ of } ₹x = ₹\left(\frac{5}{100} \times x\right) = ₹\frac{x}{20}.$$

$$\text{S.P. of the item} = \text{C.P.} - \text{loss} = ₹x - ₹\frac{x}{20} = ₹\left(x - \frac{x}{20}\right) = ₹\left(1 - \frac{1}{20}\right)x = ₹\frac{19}{20}x.$$

According to given condition, $\frac{19}{20}x = 532$

$$\Rightarrow \quad x = 532 \times \frac{20}{19} \Rightarrow x = 28 \times 20 \Rightarrow x = 560.$$

Hence, the cost price of the item = ₹560.

Exercise 7.3

1. Rohan bought a calculator for ₹760 and sold it for ₹874. Find his profit and profit percentage.
2. Kirti bought a saree for ₹2500 and sold it for ₹2300. Find her loss and loss percent.
3. Tell what is profit or loss in the following transactions. Also find profit percent or loss percent in each case:
   (*i*) Gardening shears bought for ₹250 and sold for ₹325.
   (*ii*) A shirt bought for ₹250 and sold at ₹150.
4. Rajinder bought one almirah for ₹4800 and the other for ₹3640. He sold the first almirah at a gain of $13\frac{1}{3}\%$ and the other at a loss of 15%. How much did he gain or lose in the whole deal?
5. In a furniture shop, 24 tables were bought at the rate of ₹450 per table. The shopkeeper sold 16 of them at the rate of ₹ 600 per table and the remaining at the rate of ₹ 400 per table. Find his gain or loss percent.
6. By selling a fan for ₹810, a dealer makes a profit of ₹60. What is the cost price of the fan? What is his profit percent?

7. By selling a steel almirah for ₹3906, a manufacturer suffers a loss of ₹294. Find the cost price of the almirah and his loss percentage.
8. The cost price of a flower vase is ₹120. It the shopkeeper sells it at a loss of 10%, find the price at which it was sold.
9. I buy a T.V. for ₹10000 and sell it at a profit of 20%. How much money do I get for it?
10. A shopkeeper sells an article at ₹300, thus earning a profit of 20%. Find the cost price of the article.
11. A shopkeeper sells an article at ₹320, thus suffering a loss of 20%. Find the cost price of the article.
12. By selling a chair for ₹522, a shopkeeper makes a profit of 16%. What is its cost price?
13. A trader sold some damaged garments for ₹7360 at a loss of 8%. Find the cost price of the garments.
14. By selling a table for ₹3168, Rashid loses 12%. Find its cost price. What percent would he gain or lose by selling the table for ₹3870?
15. By selling an article for ₹4550, Tony incurs a loss of 9%. What percent would he gain or lose by selling it for ₹4825?
16. Arif bought a second hand car for ₹ 80000 and spent 12.5% of the cost of the car on its repairs. At what price should he sell the car to make a profit of 15%?

SIMPLE INTEREST

Money kept in a savings account in a bank increases over time because the bank pays some money on the money deposited. If you borrow some money from a moneylender (or bank), you will repay more money, because the moneylender will charge some additional money in lieu of the money used by you. This additional money is called **interest**.

Principal. *The money borrowed (lent or invested) is called* ***principal.***

Interest. *The additional money paid by the borrower to the moneylender in lieu of the money used by him/her is called* ***interest.***

Amount. *The total money paid by the borrower to the moneylender is called* ***amount.***

Thus, ***amount = principal + interest.***

If P denotes the principal, I the interest paid, and A the amount, then

$$A = P + I$$

Rate. *It is the interest paid on ₹100 for one year.*

Thus, a rate of 5% per annum means that the interest paid on ₹100 for one year is ₹5.

Time. *It is the time for which the money is borrowed.*

Simple interest. *It is the interest calculated on the original money (principal) at given rate of interest for any given time.*

Calculation of simple interest

The value of interest depends upon the following three factors:

(*i*) Interest obviously depends upon **principal**. More the money borrowed, more will be the interest.

(ii) Interest depends upon the length of **time** for which the money is borrowed or invested. More the time, more will be interest.

(iii) Interest also depends upon the **rate of interest**. More the rate, more will be interest.

Simple interest is given by the formula:

$$\textit{Simple interest} = \frac{\textit{Principal} \times \textit{Rate} \times \textit{Time}}{100} \quad \textit{i.e. } I = \frac{P \times R \times T}{100}$$

where P denotes the principal, R the rate of interest, T the time for which the money is borrowed and I (or S.I.) the simple interest.

Given any three quantities out of P, R, T and I; we can calculate the fourth quantity by using the above formula.

Example 1. *If ₹3500 is given at 7% per annum simple interest, find the interest which will be received at the end of two years.*

Solution. Here, principal P = ₹3500, rate of interest R = 7% p.a. and time T = 2 years.

$$\therefore \quad \text{Simple interest } I = \frac{P \times R \times T}{100} = ₹\frac{3500 \times 7 \times 2}{100} = ₹(35 \times 7 \times 2) = ₹490.$$

Hence, the interest received at the end of 2 years = ₹490.

Example 2. *Find the simple interest on ₹1500 at 6% per annum for 3 years. Also find the amount.*

Solution. Here, principal P = ₹1500, rate of interest R = 6% per annum and time T = 3 years.

$$\therefore \text{ Simple interest } I = \frac{P \times R \times T}{100} = ₹\frac{1500 \times 6 \times 3}{100} = ₹270.$$

Amount A = P + I = ₹1500 + ₹270 = ₹1770.

Example 3. *If ₹9600 is invested for 2 years 4 months at $7\frac{1}{2}$% per annum simple interest, find the interest and the amount.*

Solution. Here, P = ₹9600, T = 2 years 4 months = $2\frac{4}{12}$ years = $\frac{7}{3}$ years,

$$R = 7\frac{1}{2}\% \text{ per annum} = \frac{15}{2}\% \text{ per annum}$$

$$\therefore \quad \text{Simple interest } I = \frac{P \times R \times T}{100} = ₹\frac{9600 \times \frac{15}{2} \times \frac{7}{3}}{100} = ₹1680.$$

$$\text{Amount} = P + I = ₹9600 + ₹1680 = ₹11280.$$

Example 4. *On a certain sum the interest paid after 3 years is ₹450 at 5% rate of interest per annum. Find the sum.*

Solution. Here, I = ₹450, R = 5% p.a. and T = 3 years.

Let the sum *i.e.* principal be ₹P, we want to find P.

Using the formula $I = \frac{P \times R \times T}{100}$, we get

$$450 = \frac{P \times 5 \times 3}{100} \Rightarrow P = 450 \times \frac{100}{5 \times 3} \Rightarrow P = 3000.$$

Hence, the required sum = ₹3000.

Example 5. *Find the time in which the simple interest on ₹12900 at $8\frac{1}{3}$% per annum will be ₹3225.*

Solution. Here, P = ₹12900, R = $8\frac{1}{3}$% per annum = $\frac{25}{3}$% per annum and

I (simple interest) = ₹3225.

Let T years be the required time.

Using $I = \frac{P \times R \times T}{100}$, we get $3225 = \frac{12900 \times \frac{25}{3} \times T}{100}$

$$\Rightarrow \quad T = \frac{3225 \times 100 \times 3}{12900 \times 25} = \frac{3225 \times 3}{129 \times 25} = 3.$$

Hence, the required time = 3 years.

Example 6. *At what rate percent per annum will the simple interest on ₹5650 be ₹1695 in 2 years 6 months?*

Solution. Here, P = ₹5650, T = 2 years 6 months = $2\frac{6}{12}$ years = $\frac{5}{2}$ years and I (simple interest) = ₹1695.

Let R be the rate percent of simple interest per annum.

Using $I = \frac{P \times R \times T}{100}$, we get $1695 = \frac{5650 \times R \times \frac{5}{2}}{100}$

$$\Rightarrow \quad R = \frac{1695 \times 100 \times 2}{5650 \times 5} = \frac{3 \times 100 \times 2}{10 \times 5} = 12.$$

Hence, the rate of interest = 12% per annum.

Example 7. *How long will it take for ₹2500 invested at the rate of 8% per annum simple interest to amount to ₹3100?*

Solution. Here, P (principal) = ₹2500, R (rate of interest) = 8% per annum and

A (final amount) = ₹3100.

Since amount = principal + interest

$\Rightarrow$ interest = amount − principal = ₹3100 − ₹2500 = ₹600.

Let T years be the required time.

Using $I = \frac{P \times R \times T}{100}$, we get $600 = \frac{2500 \times 8 \times T}{100}$

$$\Rightarrow \quad T = \frac{600 \times 100}{2500 \times 8} = 3.$$

Hence, the required time = 3 years.

Exercise 7.4

1. Find the simple interest on :
   (*i*) ₹350 for 2 years at 11% per annum
   (*ii*) ₹20000 for $4\frac{1}{2}$ years at $8\frac{1}{2}$% per annum
   (*iii*) ₹648 for 8 months at $16\frac{2}{3}$% per annum.
   Also find the amount in each case.
2. Find the time when :
   (*i*) simple interest on ₹2500 at 4% per annum is ₹200
   (*ii*) simple interest on ₹12000 at $6\frac{1}{2}$% per annum is ₹2730.
3. Find the rate of interest when :
   (*i*) simple interest on ₹1560 in 3 years is ₹585
   (*ii*) simple interest on ₹1625 in $2\frac{1}{2}$ years is ₹325.
4. Find the principal when :
   (*i*) simple interest at 16% per annum for $2\frac{1}{2}$ years is ₹3840
   (*ii*) simple interest at $7\frac{1}{2}$% per annum for 2 years 4 months is ₹2730.
5. Find the rate of interest when :
   (*i*) ₹1200 amounts to ₹1320 in 2 years
   (*ii*) ₹300 amounts to ₹400 in 2 years.
6. Find the time when :
   (*i*) ₹1250 amounts to ₹1950 at 16% per annum
   (*ii*) ₹6540 amounts to ₹8447.50 at $12\frac{1}{2}$ per annum.
7. ₹14000 is invested at 4% per annum simple interest. How long will it take for the amount to reach ₹16240?
8. An amount of money invested trebled in 6 years. Find the rate of interest earned.
9. Find the principal when :
   (*i*) final amount is ₹4500 at 20% per annum for 5 years
   (*ii*) final amount is ₹2420 at 4% per annum for $2\frac{1}{2}$ years.
10. If the simple interest on a certain sum of money for 3 years is three-tenth of the sum, then find the rate of interest per annum.
11. What sum of money will amount to ₹2760 in 3 years at 5% per annum simple interest?
12. A sum of ₹ 6000 amounts to ₹ 6900 in 3 years. What will it amount to if the rate of interest is increased by 2%?

Objective Type Questions

MENTAL MATHS

1. Fill in the blanks:

(*i*) 6% of ₹50 = ...

(*ii*) If 25% of a number is 12, then the number is ....

(*iii*) The mixed fraction $1\frac{3}{4}$ converted to percentage form is ....

(*iv*) If a number increases from 20 to 28, then the increase percentage is ...

(*v*) If cost price is ₹400 and loss is 15%, then selling price is ....

(*vi*) The profit or loss percentage is always calculated on .....

(*vii*) The simple interest on a sum of ₹5600 at 8% p.a. for one year is ....

(*viii*) 135% converted to decimals is ....

(*ix*) .... is 50% more than 60.

(*x*) 25 mL is .... percent of 5 litres.

2. State whether the following statements are true (T) or false (F):

(*i*) 20% more than 30 is 36.

(*ii*) The ratio 2 : 5 converted to percentage is 60%.

(*iii*) $6\frac{1}{4}$% expressed as a fraction is $\frac{1}{16}$.

(*iv*) 80% of 450 m is equal to 360 m.

(*v*) If a number decreases from 20 to 15, then the decrease is 25%.

(*vi*) If Feroz obtains 336 marks out of 600 marks, then percentage of marks obtained by him is 33.6

(*vii*) 0.018 is equivalent to 8%.

(*viii*) 250 cm is 4% of 1 km.

(*ix*) If S.P. of an article is ₹540 and loss is ₹40, then its C.P. is ₹500.

(*x*) By selling a book for ₹ 50, a shopkeeper suffers a loss of 10%. The cost price of the book is ₹ 60.

MULTIPLE CHOICE QUESTIONS

Choose the correct answer from the given four options (3 to 14):

3. The ratio of Fatima's income to her saving is 4 : 1. The percentage of money saved by her is

(*a*) 20% (*b*) 25% (*c*) 40% (*d*) 80%

4. 225% is equal to

(*a*) 2 : 3 (*b*) 3 : 2 (*c*) 4 : 9 (*d*) 9 : 4

5. If 30% of x is 72, then x is equal to

(*a*) 120 (*b*) 240 (*c*) 360 (*d*) 480

6. If x% of 80 = 12, then x is equal to

(*a*) 15 (*b*) 20 (*c*) 25 (*d*) 30

7. 0.025 when expressed as a percent is

(*a*) 250% (*b*) 25% (*c*) 4% (*d*) 2.5%

8. In a class, 45% of students are girls. If there are 22 boys in the class, then the total number of students in the class is
(a) 30 (b) 36 (c) 40 (d) 44

9. If a man buys an article for ₹80 and sells it for ₹100, then gain percentage is
(a) 20% (b) 25% (c) 40% (d) 125%

10. If a man buys an article for ₹120 and sells it for ₹100, then his loss percentage is
(a) 10% (b) 20% (c) 25% (d) $16\frac{2}{3}\%$

11. The salary of a man is ₹24000 per month. If he gets an increase of 25% in the salary, then the new salary per month is
(a) ₹2500 (b) ₹28000 (c) ₹30000 (d) ₹36000

12. On selling an article for ₹100, Renu gains ₹20. Her gain percentage is
(a) 25% (b) 20% (c) 15% (d) 40%

13. The simple interest on ₹6000 at 8% p.a. for one year is
(a) ₹600 (b) ₹480 (c) ₹400 (d) ₹240

14. If Rohit borrows ₹4800 at 5% p.a. simple interest, then the amount he has to return at the end of 2 years is
(a) ₹480 (b) ₹5040 (c) ₹5280 (d) ₹5600.

Higher Order Thinking Skills (HOTS)

1. Medha deposited 20% of her money in a bank. After spending 20% of the remainder, she has ₹ 48000 left with her. How much did she originally have?
2. If Mohan's income is 25% more than Raman's income, then by what percent is Raman's income less than Mohan's income?
3. A person preparing medicine wants to convert 15% alcohol solution into 32% alcohol solution. Find how much pure alcohol should he mix with 400 mL of 15% alcohol solution to obtain it.
4. A manufacturer sells an item to an agency at a profit of 25%. The agency sells the item to a shopkeeper at 10% profit and shopkeeper sells the item at a profit of 20%. If the selling price of the item is ₹ 594, find the manufacturing price.

Summary

★ Percent means per hundred or out of hundred. The symbol % stands for percent *i.e.* $\frac{1}{100}$.

★ Percentage is the numerator of a fraction whose denominator is 100.

★ In the fraction $\frac{r}{100}$, percentage = r. It is written as $r\%$. r is also called rate percent. Thus, rate percent = percentage.

★ To convert a percentage into a fraction, replace the % sign with $\frac{1}{100}$ and simplify.

★ To convert a fraction into a percentage, multiply the fraction by 100 and put the % sign.