

PERCENTAGE AND SIMPLE INTEREST



P1M6D2

Learning Objectives

- To understand the meaning of per cent.
- To convert a fraction into percentage and vice-versa.
- To convert a decimal number into percentage and vice-versa.
- To solve problems on percentage.
- To find simple interest by formula.
- To apply simple interest formula in different situations.

2.1 Introduction

We have already been introduced to the concepts such as ‘Ratio and proportion’, unitary method and its use in solving day-to-day application problems. Also, ratio has been explained as a method of comparison by division. One of the most common methods to compare two quantities is by using percentage.

Situation

Geetha scored 475 marks out of 600 and Seetha scored 425 out of 500. Can we conclude Geetha has scored higher marks than Seetha? Is it right? Whom do you think has done better?

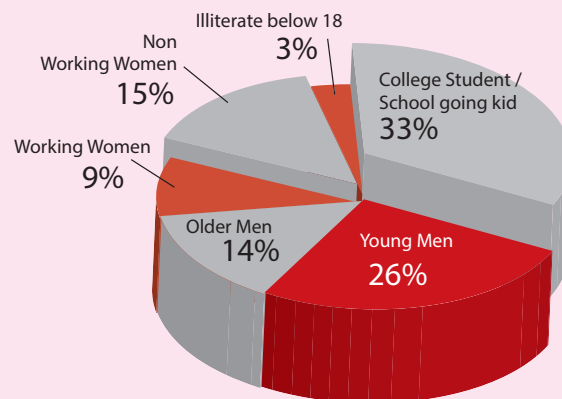
We cannot decide who has done better by just comparing the marks, they have scored because the maximum marks in both the cases are different.

To get an answer for these situations, we use “Percentage”. We are going to see about “percentage” in this chapter.

MATHEMATICS ALIVE-Percentage in real Life



Advertisement of a shop



Internet user demographic profile

Per cent is derived from the Latin word 'Per centum' meaning 'per hundred'. Per cent is denoted by the symbol '%' and means hundredth too. That is 1% means 1 out of hundred or

one hundredth which can be written as $1\% = \frac{1}{100} = 0.01$. It is read as 1 per cent.

In the same way, 50% means 50 out of hundred or fifty hundredth. That is $50\% = \frac{50}{100}$

80% means 80 out of hundred or eighty hundredth. That is $80\% = \frac{80}{100}$

20% means 20 out of hundred or twenty hundredth. That is $20\% = \frac{20}{100}$

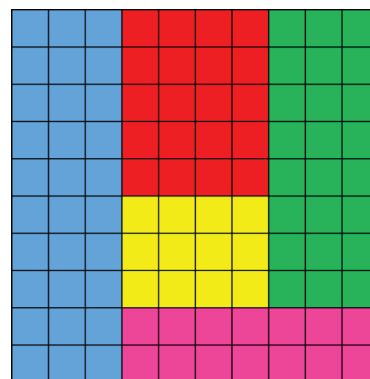
To understand this let us do the following activity.



Activity

Take a 10×10 square grid to recall the previous knowledge on fraction. The grid is shaded using 5 different colours. The particulars related to blue colour shaded portion shown in the grid is given in the table below. Observe the grid and complete the table.

Colour	Number of Squares	Fraction	Percentage
Blue	30	$\frac{30}{100}$	30%
Red			
Yellow			
Green			
Pink			



From this we can understand that *percentage can be written as a fraction with denominator hundred.*



Try these

Find the percentage of children whose scores fall in different categories given in table below.

Category	Number of students	Fraction	Percentage
Below 60	25		
60 – 80	23		
81 – 90	42		
91 – 99	9		
Centum	1		
Total	100		

In all these examples, the total number of items add upto 100. Can we calculate those percentage of items if the total number do not add upto 100? Yes. We can find the percentage of items. In such cases we need to convert the given fractions to their equivalent fraction with denominator 100.

For example consider a 5×10 square grid.

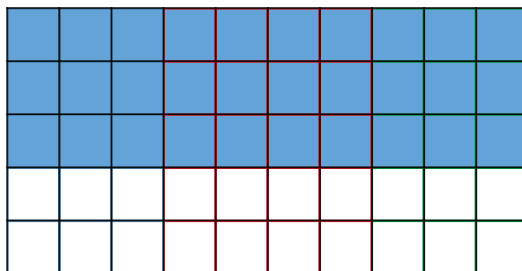


Fig 2.1

In the Fig 2.1, the blue shaded portion of the grid represents the fraction $\frac{30}{50}$. Which is equal to $\frac{60}{100}$ or 0.60 or 0.6 or 60%.



Try these

There are 50 students in class VII of a school. The number of students involved in these activities are :

Scout – 7 Red Ribbon Club – 6 Junior Red Cross – 9 Green Force – 3

Sports – 14 Cultural activity – 11

Find the percentage of students who involved in various activities.

2.1.1 Converting Fraction to Percentage

All numbers which are represented using numerator and denominator are fractions. They can have any number as a denominator. If the denominator of the fraction is hundred then it can be very easily expressed as a percentage. Let us try to convert different fraction to percentage.

Example 2.1 Write $\frac{1}{5}$ as per cent.

Solution

$$\text{We have } \frac{1}{5} = \frac{1}{5} \times \frac{100}{100} = \frac{1}{5} \times 100\% = \frac{100}{5}\% = 20\%.$$

Example 2.2 Convert $\frac{7}{4}$ to per cent.

Solution

$$\text{We have } \frac{7}{4} = \frac{7}{4} \times \frac{100}{100} = \frac{7}{4} \times 100\% = \frac{700}{4}\% = 175\%.$$

Example 2.3 Out of 20 beads, 5 beads are red. What is the percentage of red.

Solution

$$\text{We have } \frac{5}{20} = \frac{5}{20} \times \frac{100}{100} = \frac{5}{20} \times 100\% = \frac{500}{20}\% = 25\%.$$



Example 2.4 Convert the fraction $\frac{23}{30}$ as per cent.

Solution

$$\text{We have } \frac{23}{30} = \frac{23}{30} \times \frac{100}{100} = \frac{23}{30} \times 100\% = 76\frac{2}{3}\%$$

From these examples we see that the percentage of proper fractions are less than 100 and that of improper fractions are more than 100.



Try these

Convert the fractions as percentage.

- (i) $\frac{1}{20}$ (ii) $\frac{13}{25}$ (iii) $\frac{45}{50}$ (iv) $\frac{18}{5}$ (v) $\frac{27}{10}$ (vi) $\frac{72}{90}$

2.1.2 Converting percentage as fraction

A percentage is a number or ratio expressed as a fraction of 100. Here, let us try to convert different percentage to fraction.

Example 2.5 Write the following percentage into fraction.

- (i) 60% (ii) 125% (iii) $\frac{3}{5}\%$ (iv) $\frac{15}{10}\%$ (v) $28\frac{1}{3}\%$

Solution

$$(i) \quad 60\% = \frac{60}{100} = \frac{6}{10} = \frac{3}{5}$$

$$(iv) \quad \frac{15}{10}\% = \frac{15}{100} = \frac{3}{20}$$

$$(ii) \quad 125\% = \frac{125}{100} = \frac{5}{4}$$

$$(v) \quad 28\frac{1}{3}\% = \frac{28\frac{1}{3}}{100} = \frac{85}{300} = \frac{28\frac{1}{3}}{100} = \frac{85}{300} = \frac{17}{60}$$

$$(iii) \quad \frac{3}{5}\% = \frac{\frac{3}{5}}{100} = \frac{3}{500}$$



Try these

Convert the following percentage as fractions.

- (i) 50% (ii) 75% (iii) 250%
 (iv) $30\frac{1}{5}\%$ (v) $\frac{7}{20}\%$ (vi) 90%

Example 2.6 In a survey one out of five people said they preferred a particular brand of soap. Convert it into percentage?

Solution

$$\text{Fraction} = \frac{1}{5}$$

$$\text{Percentage} = \frac{1}{5} \times 100\% = 20\%$$

Example 2.7 75 students from a Government High school appeared for S.S.L.C. examination. 72 of them are declared passed in the examination. Find the percentage of students passed.

Solution

$$\begin{aligned} \text{Total number of students} &= 75 \\ \text{Number of students declared passed} &= 72 \\ \text{Percentage} &= \frac{72}{75} \times 100\% \\ &= \frac{24}{25} \times 100\% \\ &= 24 \times 4\% \\ &= 96\%. \end{aligned}$$

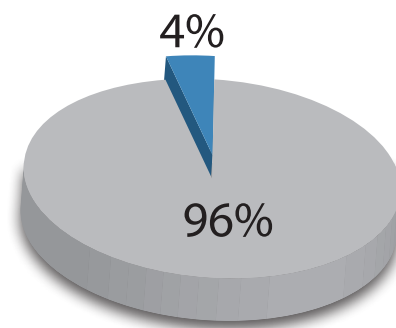


Fig 2.2

Note

All the parts of the whole when added together gives the whole or 100%. So out of 2 parts if we are given 1 part we can definitely find the other part. That is in the above example, if 96% of the students has passed means, 96 out of 100 has passed and the remaining (100-96)% 4% have failed.

Example 2.8 In a class of 50 students if 28 are girls and 22 are boys then express boys and girls in percentage.

Solution

Let us find the percentage of boys and girls. It is given in the form of table below.

	Number of students	Fraction	Make denominator as 100	Percentage
Girls	28	$\frac{28}{50}$	$\frac{28}{50} \times \frac{100}{100} = \frac{56}{100}$	56%
Boys	22	$\frac{22}{50}$	$\frac{22}{50} \times \frac{100}{100} = \frac{44}{100}$	44%
Total	50			100%

To find the percentage of boys and girls we can also use unitary method or multiply both numerator and denominator by a same number which makes denominator 100.

Example 2.9 There are 560 students in a school. Out of 560 students, 320 are boys. Find the percentage of girls in that school.

Solution

$$\begin{aligned} \text{Total number of students} &= 560 \\ \text{Number of boys} &= 320 \\ \text{Number of girls} &= 560 - 320 = 240 \end{aligned}$$

$$\begin{aligned} \text{Percentage} &= \frac{240}{560} \times 100\% = \frac{24}{56} \times 100\% \\ &= \frac{3}{7} \times 100\% = \frac{300}{7}\% \\ &= 42.86\% \end{aligned}$$

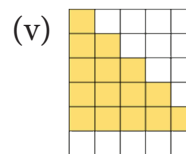
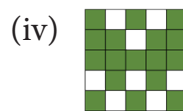
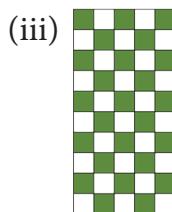
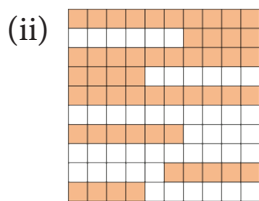
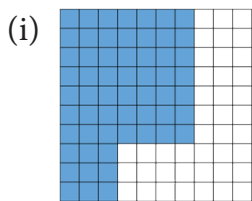


Think

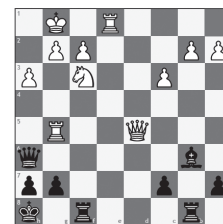
1. What is the difference between 0.01 and 1%
2. In a readymade shop there will be a board showing upto 50% off. Most of the people will realize that everything is half of its original price, Is that true?

Exercise 2.1

1. In each of the following grid, find the number of coloured squares and express it as a fraction, decimal and percentage.



2. A picture of chess board is given. (i) Find the percentage of the white coloured squares. (ii) Find the percentage of grey coloured squares. (iii) Find the percentage of the squares that have the pieces and (iv) The squares that do not have the pieces.



3. A picture of dart board is given. Find the percentage of white coloured portion and black coloured portion.
4. Write each of the following fraction as percentage.

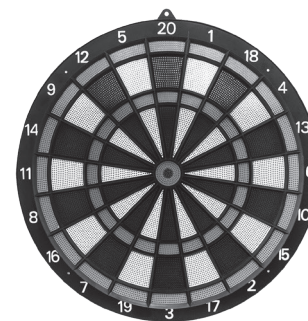
(i) $\frac{36}{50}$

(ii) $\frac{81}{30}$

(iii) $\frac{42}{56}$

(iv) $2\frac{1}{4}$

(v) $1\frac{3}{5}$



5. Anbu scored 436 marks out of 500 in his exams. What was the percentage he scored?

6. Write each of the following percentage as fraction.

(i) 21%

(ii) 93.1%

(iii) 151%

(iv) 65%

(v) 0.64%

7. Iniyam bought 5 dozen eggs. Out of that 5 dozen eggs, 10 eggs are rotten. Express the number of good eggs as percentage.
8. In an election, Candidate X secured 48% of votes. What fraction will represent his votes?
9. Ranjith's total income was ₹7,500. He saved 25% of his total income. Find the amount saved by him.

Objective type Questions

10. Thendral saved one fourth of her salary. Her savings percentage is
(i) $\frac{3}{4}$ % (ii) $\frac{1}{4}$ % (iii) 25% (iv) 1%
11. Kavin scored 15 out of 25 in a test. The percentage of his marks is
(i) 60% (ii) 15% (iii) 25% (iv) 15/25
12. 0.07% is
(i) $\frac{7}{10}$ (ii) $\frac{7}{100}$ (iii) $\frac{7}{1000}$ (iv) $\frac{7}{10,000}$

2.1.3 Converting Decimals to Percentage

We have seen how to convert fractions into per cent. Let us now learn how to convert decimals into per cent.

Example 2.10 Convert the given decimals to percentage.

- (i) 0.85 (ii) 0.05 (iii) 0.3 (iv) 0.025 (v) 2.25

Solution:

- (i) $0.85 = 0.85 \times 100\% = \frac{85}{100} \times 100\% = 85\%$
- (ii) $0.05 = \frac{5}{100} \times 100\% = 5\%$
- (iii) $0.3 = \frac{3}{10} \times 100\% = 30\%$
- (iv) $0.025 = \frac{25}{1000} \times 100\% = \frac{25}{10}\% = \frac{5}{2}\%$ or 2.5%
- (v) $2.25 = \frac{225}{100} \times 100\% = 225\%$



Try these

Convert these decimals to percentage.

- (i) 0.25 (ii) 0.07 (iii) 0.8 (iv) 0.375 (v) 3.75

2.1.4 Converting Percentages to Decimals

We have seen conversion of decimals to percentage. We can also do the reverse process, that is when the percentage is given we can convert them to decimals.

Example 2.11 Convert the given percentage to decimals.

- (i) 58% (ii) 8% (iii) 30% (iv) 120% (v) 1.25%

Solution:

- (i) $58\% = \frac{58}{100} = 0.58$
- (ii) $8\% = \frac{8}{100} = 0.08$
- (iii) $30\% = \frac{30}{100} = 0.3$
- (iv) $120\% = \frac{120}{100} = 1.2$

$$(v) \quad 1.25\% = \frac{1.25}{100} = 0.0125$$

From the above examples we see that to convert percentage to decimals we first convert it into fraction and get the solution.



Try these

Write these percentage as decimals.

- (i) 3% (ii) 25% (iii) 80% (iv) 67% (v) 17.5% (vi) 135% (vii) 0.5%

Example 2.12 Malar bought 1.75 m of fabric from a roll of 25 m. Express the fabric bought in terms of percentage?

Solution

$$\begin{aligned} \text{Total length of the fabric} &= 25 \text{ m} \\ \text{Length of the fabric bought} &= 1.75 \text{ m} \\ \text{Percentage of the fabric bought} &= \frac{1.75}{25} \times \frac{100}{100} = \frac{175}{25 \times 100} = \frac{7}{100} = 7\% \end{aligned}$$

Area as Percentage

Percentages also help us to estimate the area.

Example 2.13 How many per cent in the Fig. 2.3 is shaded as blue?

Solution

$$\text{The fraction in the Fig. 2.3, that is shaded} = \frac{2}{4} = \frac{1}{2}.$$

That is half of the Fig. 2.3 is shaded blue.

$$\text{So, the percentage of shaded portion} = \frac{1}{2} \times 100\% = 50\%$$

Thus, 50% of the Fig. 2.3 is shaded.

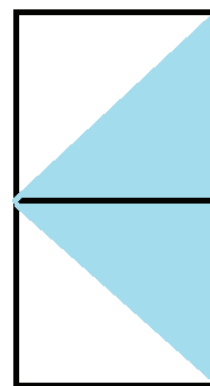


Fig. 2.3

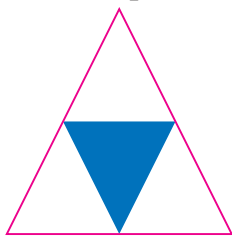
Exercise 2.2

- Write each of the following percentage as decimal.

(i) 21% (ii) 93.1% (iii) 151% (iv) 65% (v) 0.64%.
- Convert each of the following decimal as percentage

(i) 0.282 (ii) 1.51 (iii) 1.09 (iv) 0.71 (v) 0.858
- In an examination a student scored 75% of marks. Represent the given percentage in decimal form?
- In a village 70.5% people are literate. Express it as a decimal.
- Scoring rate of a batsman is 86%. Write his strike rate as decimal.
- The height of a flag pole in a school is 6.75m. Express it as percentage.

7. The weights of two chemical substances are 20.34 g and 18.78 g. Write the difference in percentage.
8. Find the percentage of shaded region in the following figure.



Objective type Questions

9. Decimal value of 142.5% is
 (i) 1.425 (ii) 0.1425 (iii) 142.5 (iv) 14.25
10. The percentage of 0.005 is
 (i) 0.005% (ii) 5% (iii) 0.5% (iv) 0.05%
11. The percentage of 4.7 is
 (i) 0.47% (ii) 4.7% (iii) 47% (iv) 470%

2.2 Percentage in Real Life

We have seen how percentage are used in comparison of quantities. We also learnt to convert fractions and decimals to percentage and vice-versa.

Now we shall see some situations that use percentage in real life such as 5% of income is allotted for saving; 20% of children's picture book is coloured green; a book distributor gets 10% of profit on every book sold by him. What can we conclude from these situations.

Percentage as a value

Example 2.14 There are 50 students in a class. If 14% are absent on a particular day, find the number of students present in the class.

Solution

$$\begin{aligned} \text{Number of students absent on a particular day} &= 14 \% \text{ of } 50 \\ &= \frac{14}{100} \times 50 = 7 \end{aligned}$$

Therefore, the number of students present = $50 - 7 = 43$ students.

Example 2.15 Kuralmathi bought a raincoat and saved ₹ 25 with discount of 20%. What was the original price of the raincoat?

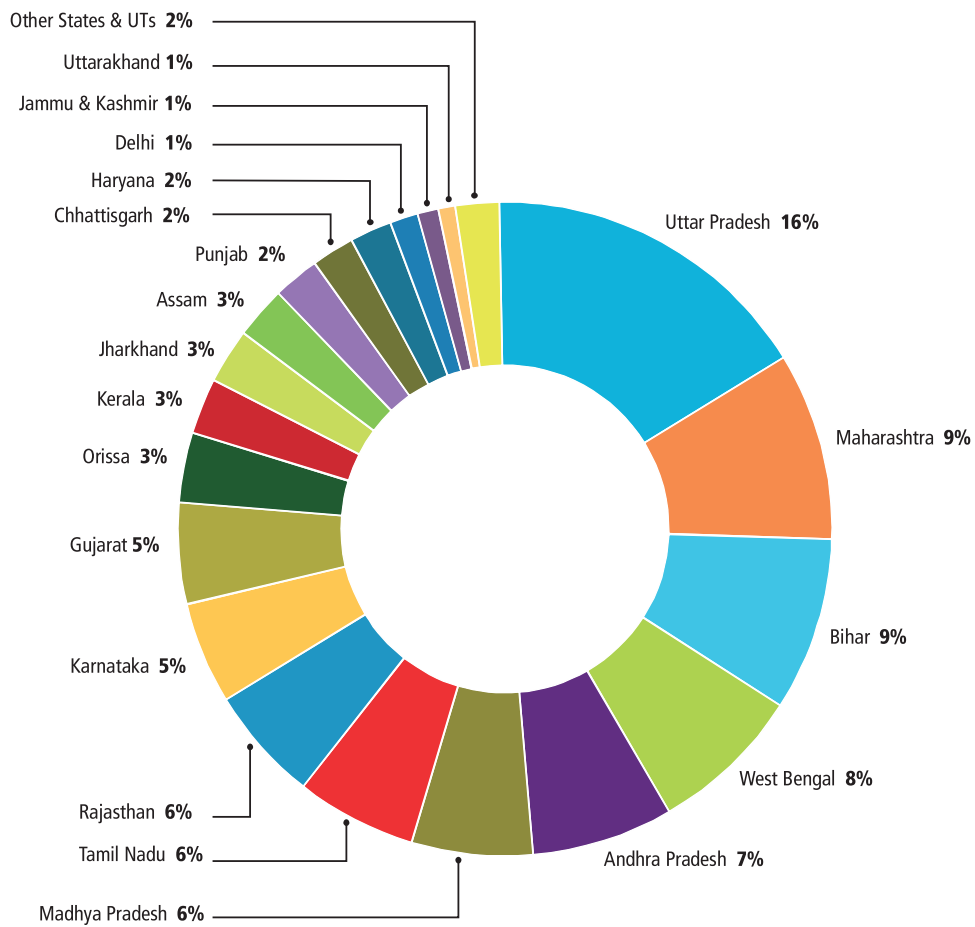
Solution

$$\begin{aligned} \text{Let the price of the raincoat (in ₹) be } P. \text{ So } 20\% \text{ of } P &= 25 \\ \frac{20}{100} \times P &= 25 \\ P &= \frac{25 \times 100}{20} = 125 \end{aligned}$$

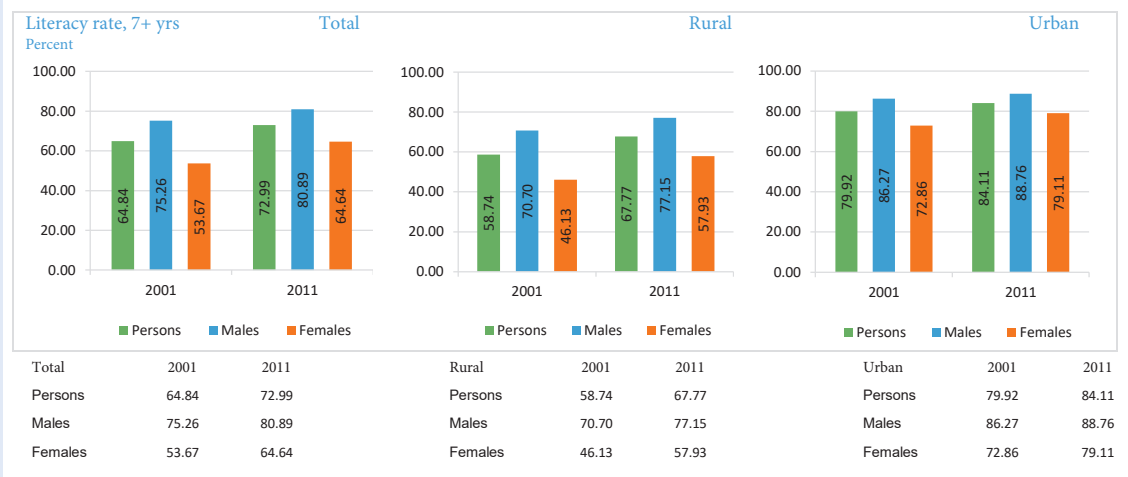
Therefore, the original price of the raincoat is ₹ 125.



Population share of States and Union Territories, India: 2011



India



http://censusindia.gov.in/2011-prov-results/data_files/india/

Example 2.16 An alloy contains 26 % of copper. What quantity of alloy is required to get 260 g of copper ?

Solution:

Let the quantity of alloy required be Q g

Then 26 % of Q = 260 g

$$\frac{26}{100} \times Q = 260 \text{ g}$$
$$Q = \frac{260 \times 100}{26} \text{ g}$$

$$Q = \frac{26000}{26} \text{ g}$$

$$Q = 1000 \text{ g}$$

Therefore, the required quantity of alloy is 1000 g.

Ratios as percentage

Sometimes ingredients used to prepare food can be represented in the form of ratio. Let us see some examples.

Example 2.17 Kuzhal's mother makes dosa by mixing the batter made from 1 portion of Urad dhal with 4 portions of rice. Represent each of the ingredients used in the batter as percentage.

Solution

Representing ingredients used in the batter as ratio, we get, rice : urad dhall = 4 : 1

Now, the total number of parts is $4 + 1 = 5$.

That is, $\frac{4}{5}$ portion of rice is mixed with $\frac{1}{5}$ portion of urad dhall.

Thus, the percentage of rice would be $\frac{4}{5} \times 100\% = \frac{400}{5}\% = 80\%$

The percentage of urad dhall would be $\frac{1}{5} \times 100\% = \frac{100}{5}\% = 20\%$

Example 2.18 A family cleans a house for pongal celebration by dividing the work in the ratio 1:2:3. Express each portion of work as percentage.

Solution

The total number of parts of the work is $1 + 2 + 3 = 6$

That is, the work is divided into 3 portions as $\frac{1}{6}$, $\frac{2}{6}$ and $\frac{3}{6}$.

Thus, the percentage of $\frac{1}{6}$ portion of work would be $\frac{1}{6} \times 100\% = \frac{100}{6}\% = 16\frac{2}{3}\%$

Similarly, the percentage of $\frac{2}{6}$ portion of work would be $\frac{2}{6} \times 100\% = \frac{200}{6}\% = 33\frac{1}{3}\%$

Similarly, the percentage of $\frac{3}{6}$ portion of work would be $\frac{3}{6} \times 100\% = \frac{300}{6}\% = 50\%$

Increase or decrease as Percentage

There are situations where we need to know the increase or decrease of a certain quantity as percentage. Let us see few examples.

Example 2.19 During Aadi sale the price of shirt decreased from ₹ 90 to ₹ 50. What is the percentage of decrease.

Solution

Original price = the price of the shirt before Aadi month

Amount of change = the decrease in the price = $90 - 50 = ₹ 40$

$$\begin{aligned} \text{Therefore, the percentage of decrease} &= \frac{\text{Amount of change}}{\text{Original amount}} \times 100 \\ &= \frac{40}{90} \times 100 = \frac{400}{9} \\ &= 44\frac{4}{9}\% \end{aligned}$$

Example 2.20 The number of literate persons in a city increased from 5 lakhs to 8 lakhs in 5 years. What is the percentage of increase?

Solution

Original amount = the number of literate persons initially = 5 lakhs

Amount of change = increase in the number of literate persons = $8 - 5 = 3$ lakhs

$$\begin{aligned} \text{Therefore, the percentage of increase} &= \frac{\text{Amount of change}}{\text{Original amount}} \times 100 \\ &= \frac{3}{5} \times 100 = 60\% \end{aligned}$$



Try these

Level of water in a tank is increased from 35 litres to 50 litres in 2 minutes, what is the percentage of increase?

Profit or Loss as a Percentage

We have learnt already profit and loss of items. Now we will see how a profit or loss can be converted to percentage. That is, to find the profit % or loss %, we will see some examples.

Example 2.21 A shopkeeper bought a chair for ₹ 325 and sold it for ₹ 350. Find the profit percentage.

Solution

$$\text{Profit per cent} = \frac{\text{Profit}}{\text{C.P}} \times 100$$

$$= \frac{25}{325} \times 100 = \frac{100}{13} = 7 \frac{9}{13} \%.$$

Example 2.22 A T-shirt bought for ₹ 110 is sold at ₹ 90. Find the loss percentage.

Solution

Cost price of T-shirt is ₹ 110 and Selling price is ₹ 90. So, the loss is ₹ 20

$$\text{Hence, for ₹ 100 the loss is } \frac{20}{110} \times 100 = \frac{200}{11} = 18 \frac{2}{11} \% .$$

Example 2.23 An item was sold at ₹ 200 at a loss of 4 %. What is its cost price.

Solution

To find the cost price,

$$\text{Loss per cent} = \frac{\text{Loss}}{\text{C.P}} \times 100$$

$$4\% = \frac{\text{Loss}}{\text{C.P}} \times 100$$

$$4\% = \frac{\text{Loss}}{200} \times 100$$

$$\text{Loss} = 8$$

$$\text{C.P} = \text{S.P} + \text{Loss}$$

$$= 200 + 8$$

$$= 208$$

Hence the cost price of the item is ₹ 208.

The world's population is growing by 1.10 % per year.
50.4 % of the world's population is male and 49.6 % is female.



Exercise 2.3

- 14 out of the 70 magazines at the bookstore are comedy magazines. What percentage of the magazines at the bookstore are comedy magazines?
- A tank can hold 50 litres of water. At present, it is only 30 % full. How many litres of water will fill the tank, so that it is 50 % full?
- Karun bought a pair of shoes at a sale of 25%. If the amount he paid was ₹ 1000, then find the marked price.
- An agent of an insurance company gets a commission of 5% on the basic premium he collects. What will be the commission earned by him if he collects ₹ 4800?
- A biology class examined some flowers in a local Grass land. Out of the 40 flowers they saw, 30 were perennials. What percentage of the flowers were perennials?



6. Ismail ordered a collection of beads. He received 50 beads in all. Out of that 15 beads were brown. Find the percentage of brown beads?
7. Ramu scored 20 out of 25 marks in English, 30 out of 40 marks in Science and 68 out of 80 marks in mathematics. In which subject his percentage of marks is best?
8. Peter requires 50% to pass. If he gets 280 marks and falls short by 20 marks, what would have been the maximum marks of the exam?
9. Kayal scored 225 marks out of 500 in revision test 1 and 265 out of 500 marks in revision test 2. Find the percentage of increase in her score.
10. Roja earned ₹ 18,000 per month. She utilized her salary in the ratio 2:1:3 for education, savings and other expenses respectively. Express her usage of income in percentage.

2.3 Simple Interest

Selvam said that her sister took a loan from the bank to do her higher studies. The loan money that she borrowed from the bank is known as Sum or Principal. The borrower takes some time period to return the money to the bank. To use the money during a particular period of time, the borrower has to pay an additional amount to the bank. This is known as Interest. So to repay the money borrowed, the borrower has to add the principal and the interest.

That is, Amount = Principal + Interest

Interest is generally given in per cent for a period of 1 year per annum. Suppose the bank gives an amount of ₹ 100 at an interest rate of ₹ 8, it is written as 8% per year or per annum or in short 8% p.a. (per annum).

It means on every ₹ 100 borrowed, ₹ 8 is the required interest, to be paid for every one year. To understand this let us consider an example.

Selvam takes a loan of ₹ 10000 at 15% per year as rate of interest. Let us find the interest he has to pay at the end of 1 year.

Sum borrowed = ₹ 10000

Rate of interest = 15 % per year

This means if ₹ 100 is borrowed he has to pay ₹ 15 as interest.

So, for the borrowed amount of ₹ 10000, the interest for one year would be

$$\frac{15}{100} \times 10000 = ₹ 1500$$

So at the end of 1 year, he has to give an amount of = 10000 + 1500 = ₹ 11500.

Now we can write a general relation to find interest for one year. Take P as the principal or sum and r % as Rate per cent per annum. On every ₹ 100 borrowed the interest paid is ₹ r . Therefore, on ₹ P borrowed the interest paid for 1 year would be $\frac{P \times r}{100}$. If the amount



is borrowed for more than 1 year then the interest is calculated for the total period during which the money is kept. This way of calculating interest for the total time period for the same Principal is known as simple interest.

We know that on a Principal of ₹ P at r % rate of interest per year, the interest paid for 1 year is $\frac{P \times r}{100}$. Hence the interest 'I' paid for ' n ' years would be $\frac{P \times n \times r}{100}$ or $\frac{Pnr}{100}$.

The amount we have to pay at the end of ' n ' years is $A = P + I$.

Example 2.24 Find the simple interest on ₹ 25,000 at 8% per annum for 3 years?

Solution

Here, the Principal (P) = ₹ 25,000

Rate of interest (r) = 8% per annum

Time (n) = 3 years

$$\begin{aligned} \text{Simple Interest (I)} &= \frac{Pnr}{100} \\ &= \frac{25000 \times 3 \times 8}{100} = 6000 \end{aligned}$$

Hence, Simple Interest (I) is ₹ 6,000.



Try these

1. Arjun borrowed a sum of ₹ 5,000 from a bank at 5% per annum. Find the interest and amount to be paid at the end of three year.
2. Shanti borrowed ₹ 6,000 from a Bank for 7 years at 12% per annum. What amount will clear off her debt?

Example 2.25 Kumaravel has paid simple interest on a certain sum for 2 years at 10% per annum is ₹ 750. Find the sum.

Solution

Given the rate of interest (r) = 10% per annum

Time (n) = 2 years

$$\begin{aligned} \text{We know that Simple Interest (I)} &= \frac{Pnr}{100} \\ 750 &= \frac{P \times 2 \times 10}{100} \\ \text{Therefore, Principal (P)} &= \frac{750 \times 100}{2 \times 10} = 3750 \end{aligned}$$

Therefore, Kumaravel has borrowed a sum of ₹ 3,750.

Example 2.26 In what time will ₹ 5,600 amount to ₹ 6,720 at 6% per annum?

Solution:

$$\text{Principal (P)} = ₹ 5,600$$

$$\text{Rate (r)} = 6\% \text{ per annum}$$

$$\text{Amount} = ₹ 6,720$$

$$\text{Amount} = \text{principal} + \text{interest}$$

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

$$= 6720 - 5600 = 1120$$

$$\text{We know that Simple Interest (I)} = \frac{Pnr}{100}$$

$$1120 = \frac{6720 \times 6 \times n}{100}$$

$$\text{Therefore, } n = \frac{1120 \times 100}{5600 \times 6} = 3\frac{1}{3} \text{ years.}$$

Example 2.27 Sathish kumar borrowed ₹ 52,000 from a money lender at a particular rate of simple interest. After 4 years, he paid ₹ 79,040 to settle his debt. At what rate of interest he borrowed the money?

Solution

$$\text{Principal (P)} = ₹ 52,000$$

$$\text{Time (n)} = 4 \text{ years}$$

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

$$= 79,040 - 52,000 = 27,040$$

$$\text{We find the Simple Interest (I)} = \frac{Pnr}{100}$$

$$\text{Therefore, } 27040 = \frac{52000 \times r \times 4}{100}$$

$$\text{Rate of interest he borrowed (r)} = \frac{27040 \times 100}{52000 \times 4} = 13\% .$$

Example 2.28 A sum of ₹ 46,000 was lent out at simple interest and at the end of 1 year and 9 months, the total amount was ₹ 52,440. Find the rate of interest per year.

Solution

$$A = P + I$$

$$I = A - P$$

$$= 52440 - 46000$$

$$= ₹ 6,440$$

$$r = ?$$

$$\begin{aligned} \text{1 Year and 9 months} &= 1\frac{9}{12} \\ &= 1\frac{3}{4} \\ &= \frac{7}{4} \end{aligned}$$



we know that, $I = \frac{Pnr}{100}$

$$\begin{aligned} \text{Therefore, } 6440 &= \frac{46000 \times r \times \frac{7}{4}}{100} \\ 6440 &= 46000 \times r \times \frac{7}{4} \times \frac{1}{100} \\ r &= \frac{6440 \times 4 \times 100}{46000 \times 7} \\ &= 8\%. \end{aligned}$$

Example 2.29 A principal becomes ₹10,050 at the rate of 10% in 5 years. Find the principal.

Solution

$A = ₹10,050$

$n = 5 \text{ years}$

$r = 10\%$

$P = ?$

For calculating principal with the given data, we proceed as follows.
We know that,

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

$$A = P + I$$

$$A = P + \frac{Pnr}{100}$$

$$A = P \left(1 + \frac{nr}{100} \right)$$

$$\text{Therefore, } 10,050 = P \left(1 + \frac{10 \times 5}{100} \right)$$

$$= P \left(1 + \frac{50}{100} \right)$$

$$= P \left(\frac{150}{100} \right)$$

$$= P \left(\frac{3}{2} \right)$$

$$\text{Therefore, } P = 10,050 \times \frac{2}{3} = 3350$$

Hence, Principal = ₹3,350.



Think

In simple interest, a sum of money doubles itself in 10 years. In how many years it will get triple itself.

Exercise 2.4

1. Find the simple interest on ₹ 35,000 at 9% per annum for 2 years?
2. Aravind borrowed a sum of ₹ 8,000 from Akash at 7% per annum. Find the interest and amount to be paid at the end of two years.
3. Sheela has paid simple interest on a certain sum for 4 years at 9.5% per annum is ₹ 21,280. Find the sum.
4. Basha borrowed ₹ 8,500 from a bank at a particular rate of simple interest. After 3 years, he paid ₹ 11,050 to settle his debt. At what rate of interest he borrowed the money?
5. In What time will ₹ 16,500 amount to ₹ 22,935 at 13% per annum?
6. In what time will ₹ 17800 amount to ₹ 19936 at 6% per annum?
7. A sum of ₹ 48,000 was lent out at simple interest and at the end of 2 years and 3 months the total amount was ₹ 55,560. Find the rate of interest per year.
8. A principal becomes ₹ 17,000 at the rate of 12% in 3 years. Find the principal.

Objective type Questions.

9. The interest for a principle of ₹ 4,500 which gives an amount of ₹ 5,000 at end of certain period is
(i) ₹ 500 (ii) ₹ 200 (iii) 20% (iv) 15%
10. Which among the following is the simple interest for the principle of ₹ 1,000 for one year at the rate of 10% interest per annum?
(i) ₹ 200 (ii) ₹ 10 (iii) ₹ 100 (iv) ₹ 1,000
11. Which among the following rate of interest yields an interest of ₹ 200 for the principle of ₹ 2,000 for one year.
(i) 10% (ii) 20% (iii) 5% (iv) 15%

Exercise 2.5

Miscellaneous Practice problems



1. When Mathi was buying her flat she had to put down a deposit of $\frac{1}{10}$ of the value of the flat. What percentage was this?
2. Yazhini scored 15 out of 25 in a test. Express the marks scored by her in percentage.
3. Out of total 120 teachers of a school 70 were male. Express the number of male teachers as percentage.
4. A cricket team won 70 matches during a year and lost 28 matches and no results for two matches. Find the percentage of matches they won.
5. There are 500 students in a rural school. If 370 of them can swim, what percentage of them can swim and what percentage cannot?



6. The ratio of Saral's income to her savings is 4 : 1. What is the percentage of money saved by her?
7. A salesman is on a commission rate of 5%. How much commission does he make on sales worth ₹ 1,500?
8. In the year 2015 ticket to the world cup cricket match was ₹ 1,500. This year the price has been increased by 18%. What is the price of a ticket this year?
9. 2 is what percentage of 50?
10. What percentage of 8 is 64?
11. Stephen invested ₹ 10,000 in a savings bank account that earned 2% simple interest. Find the interest earned if the amount was kept in the bank for 4 years.
12. Riya bought ₹ 15,000 from a bank to buy a car at 10% simple interest. If she paid ₹ 9,000 as interest while clearing the loan, find the time for which the loan was given.
13. In how much time will the simple interest on ₹ 3,000 at the rate of 8% per annum be the same as simple interest on ₹ 4,000 at 12% per annum for 4 years?



Challenge Problems

14. A man travelled 80 km by car and 320 km by train to reach his destination. Find what percent of total journey did he travel by car and what per cent by train?
15. Lalitha took a math test and got 35 correct and 10 incorrect answers. What was the percentage of correct answers?
16. Kumaran worked 7 months out of the year. What percentage of the year did he work?
17. The population of a village is 8000. Out of these, 80% are literate and of these literate people, 40% are women. Find the percentage of literate women to the total population?
18. A student earned a grade of 80% on a math test that had 20 problems. How many problems on this test did the student answer correctly?
19. A metal bar weighs 8.5 kg. 85% of the bar is silver. How many kilograms of silver are in the bar?
20. Concession card holders pay ₹ 120 for a train ticket. Full fare is ₹ 230. What is the percentage of discount for concession card holders?
21. A tank can hold 200 litres of water. At present, it is only 40 % full. How many litres of water to fill in the tank, so that it is 75 % full?
22. Which is greater $16\frac{2}{3}$ or $\frac{2}{5}$ or 0.17?
23. The value of a machine depreciates at 10% per year. If the present value is ₹ 1,62,000, what is the worth of the machine after two years.
24. In simple interest, a sum of money amounts to ₹ 6,200 in 2 years and ₹ 6,800 in 3 years. Find the principal and rate of interest.

25. A sum of ₹ 46,900 was lent out at simple interest and at the end of 2 years, the total amount was ₹ 53,466. Find the rate of interest per year.
26. Arun lent ₹ 5,000 to Balaji for 2 years and ₹ 3,000 to Charles for 4 years on simple interest at the same rate of interest and received ₹ 2,200 in all from both of them as interest. Find the rate of interest per year.
27. If a principal is getting doubled after 4 years, then calculate the rate of interest.
(Hint : Let $P = ₹ 100$).

Summary

- Percentage is a fraction with denominator hundred
- To convert a fraction as percentage, multiply the numerator and denominator of the fraction by 100.
- To convert a percentage as fraction, write it as fraction with denominator 100.
- To convert decimals into percentage, multiply the given decimals by 100%
- Principal is the money borrowed or lent.
- Interest is the additional money given by the borrower to use the principal for a certain period of time
- Rate of interest is the percentage of the principal paid every year.
- Time is the period for which the money is borrowed or lent.
- Amount is the total money returned by the borrower to the lender after a certain period of time. It is found by using $\text{Amount} = \text{Principal} + \text{Interest}$.
- Simple interest can be calculated by using $\frac{P \times n \times r}{100}$, where P – Principal, r – Rate of Interest, n – Time.