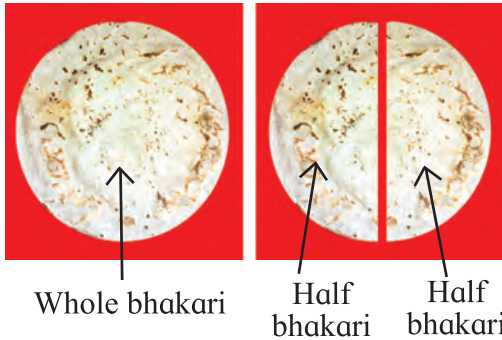


## 10. Fractions



**The meaning of fractions. Reading and writing fractions :**

### ◆ Half

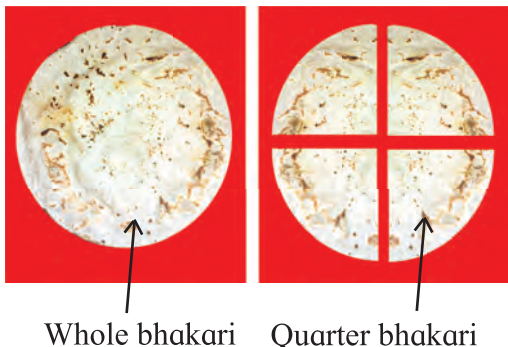


One bhakari has to be divided equally between two people. When it is divided into two equal parts, each of the parts is one half of the whole bhakari.

When any object is divided into two equal parts, then each of the parts is one half of that object. One half of the whole is shown by the fraction  $\frac{1}{2}$ .



### ◆ Quarters



One bhakari has to be divided equally between four people. When it is divided into four equal parts, and one part is given to each person, each share is a quarter of the whole bhakari.

When any object is divided into four equal parts, each of those parts is a quarter of the whole.



One quarter is shown by the fraction  $\frac{1}{4}$ .

Numbers such as  $\frac{1}{2}$ ,  $\frac{1}{4}$  are called fractions. In a fraction, the number written above the line is the numerator and the number written below the line is the denominator. In the fraction  $\frac{1}{2}$ , the numerator is 1 and the denominator is 2.

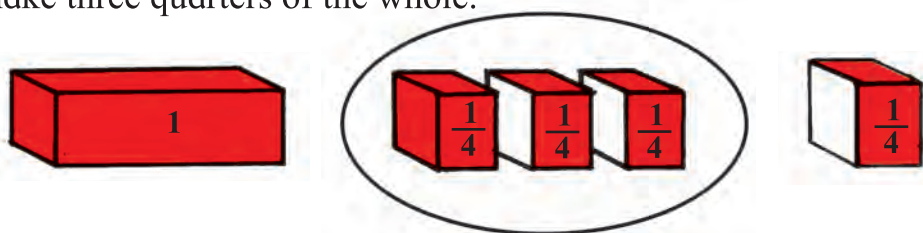
$\frac{1}{2}$  is read as 'one half' or 'one upon two.'

$\frac{1}{4}$  is read as 'one fourth' or 'one quarter' or 'one upon four'.

### ◆ Three quarters



Three children bought a cake and asked their grandfather to divide it equally among the four of them including himself. Grandfather divided the cake into four equal pieces. Each piece is one quarter of the cake. Grandfather gave Raju, Rani and Pinky one quarter each and kept the last quarter for himself. Grandfather gave his two granddaughters, quarter + quarter, that is, half of the cake. He gave his three grandchildren quarter + quarter + quarter, three quarters of the cake. One half and one quarter also make three quarters of the whole.



When an object is divided into 4 equal parts, 3 of its parts taken together are called three quarters. This is shown by the fraction  $\frac{3}{4}$ .  
 $\frac{3}{4}$  is read as 'three fourths' or 'three upon four.'

### Some more fractions



Here, a circular disc is divided into 5 equal parts and 3 of its parts are coloured. The coloured part of the disc is shown as  $\frac{3}{5}$ .

$$\frac{1}{5} + \frac{1}{5} + \frac{1}{5} \text{ together make } \frac{3}{5}. \text{ That is, } \frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{3}{5}$$

When an object is divided into 5 equal parts and three of them are taken, that part is shown as  $\frac{3}{5}$ . Here, the denominator 5 shows how many equal parts are made of the whole, and the numerator 3 shows how many of those are taken.

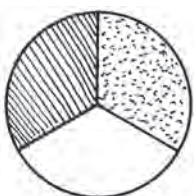


This strip has been divided into 7 equal parts and 2 parts are coloured, which means  $\frac{2}{7}$  of the strip is coloured. Here, the number 7 gives the total number of equal parts made, and 2 gives the number of parts taken. In the fraction  $\frac{2}{7}$ , 2 is the numerator and 7 is the denominator.

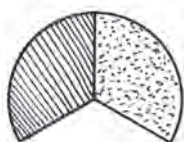
You can work out the meanings of fractions such as  $\frac{8}{11}$  or  $\frac{7}{13}$  just like the fractions  $\frac{3}{4}$ ,  $\frac{3}{5}$  and  $\frac{2}{7}$ .

## Different meanings of fractions

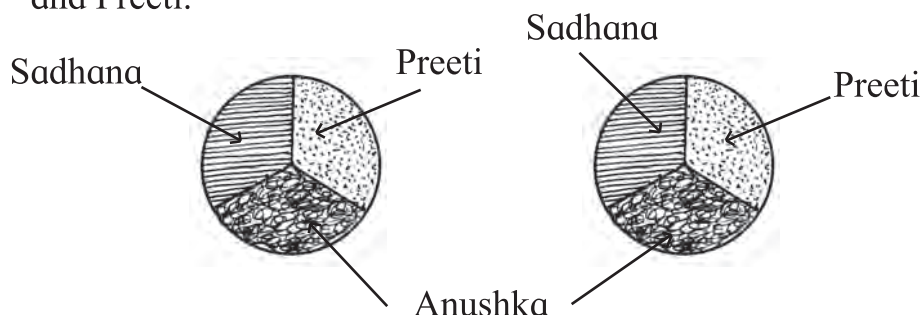
Amita was given two parts out of three equal parts of a bhakari.



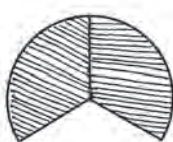
This means Amita was given  $\frac{2}{3}$  of one bhakari.



Two bhakarīs of the same size as Amita's have to be divided equally between three girls, Sadhana, Anushka and Preeti.

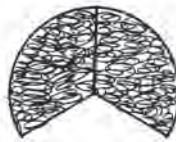


The two bhakarīs were divided into three equal parts each. One part of each bhakari was given to Sadhana, Anushka and Preeti.



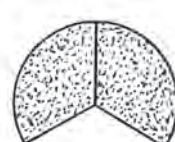
Sadhana's share :

$$\frac{1}{3} + \frac{1}{3}$$



Anushka's share :

$$\frac{1}{3} + \frac{1}{3}$$



Preeti's share :

$$\frac{1}{3} + \frac{1}{3}$$

Each girl was given a  $\frac{1}{3}$  part twice.

That is, each got  $\frac{1}{3} + \frac{1}{3}$ .

However, Amita's share and that of each of the other three girls is the same.

Hence, we can see that  $\frac{2}{3} = \frac{1}{3} + \frac{1}{3}$

Note that when two bhakarīs are divided between three girls, each girl gets  $\frac{2}{3}$  bhakarīs.

It means that  $\frac{2}{3}$  can be explained in three different ways.

- ◆ 2 parts out of 3 equal parts of an object.
- ◆  $\frac{1}{3}$  twice; which means  $\frac{1}{3} + \frac{1}{3}$ ; which also means  $2 \times \frac{1}{3}$ ; or two times  $\frac{1}{3}$ .
- ◆ Equal division of two objects between three people.

## Exercise

1. Complete the following table.

| Fractions     | Addition                                                | Multiplication         | How many times        |
|---------------|---------------------------------------------------------|------------------------|-----------------------|
| $\frac{4}{5}$ | $\frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5}$ | $\frac{1}{5} \times 4$ | 4 times $\frac{1}{5}$ |
| $\frac{3}{4}$ |                                                         |                        |                       |
| $\frac{3}{7}$ |                                                         |                        |                       |
| $\frac{5}{6}$ |                                                         |                        |                       |

2. Write the shaded and unshaded parts of the shapes below as fractions and in words.

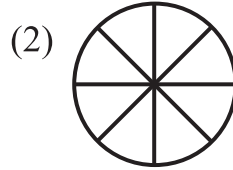
| Shape                                                                               | Shaded fraction | Read as          | Unshaded fraction | Read as         |
|-------------------------------------------------------------------------------------|-----------------|------------------|-------------------|-----------------|
|  | $\frac{3}{8}$   | Three upon eight | $\frac{5}{8}$     | Five upon eight |
|  |                 |                  |                   |                 |
|  |                 |                  |                   |                 |
|  |                 |                  |                   |                 |
|  |                 |                  |                   |                 |

 **Remember :** In the first shape given above, the shaded part is  $\frac{3}{8}$  and the unshaded part is  $\frac{5}{8}$ . Both together form  $\frac{8}{8}$  or the whole shape. The same thing can also be seen in the other shapes.

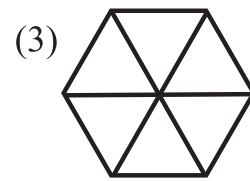
3. Write the given fraction in the blue box and colour an equal part in the given shape.



Two thirds



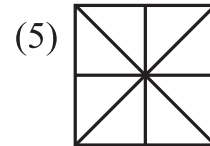
Four upon eight



Five sixths



Two upon seven



Seven upon eight

4. Write the numerator and denominator of each of the following fractions.

$$\frac{3}{7}, \frac{8}{11}, \frac{4}{5}, \frac{7}{13}, \frac{2}{9}, \frac{5}{8}$$

### Mixed fractions

- ◆ 3 guavas have to be shared equally between 2 people. We can do this in two ways.

Method 1



Divide each guava equally into two.  
Give each person 1 part, that is,  $\frac{1}{2}$ , of each guava.

In this way, each person gets three halves.

Therefore, each person will have  $\frac{1}{2} \times 3 = \frac{3}{2}$  guavas.

Method 2



First, give each person 1 whole guava.  
Then divide the remaining guava into two equal parts. Give each person one part of the third guava, that is,  $\frac{1}{2}$  guava.

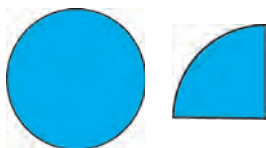
Each person gets 1 whole and  $\frac{1}{2}$  guava.  
Each has  $1 + \frac{1}{2}$  guava.

$1 + \frac{1}{2}$  is written as  $1\frac{1}{2}$ .

This shows that  $\frac{3}{2} = 1\frac{1}{2}$ .

A fraction like  $1\frac{1}{2}$  is called a mixed fraction.

### One and a quarter, two and a quarter, three and a quarter

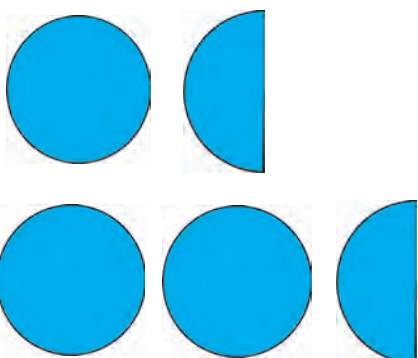


One whole and one quarter makes  $1 + \frac{1}{4}$ . This is written in short as  $1\frac{1}{4}$  and is read as 'one and a quarter'.

Three wholes and one quarter make  $3 + \frac{1}{4}$ . This is written in short as  $3\frac{1}{4}$  and read as 'three and a quarter'.

In the same way,  $2\frac{1}{4}$  is read as 'two and a quarter' and  $4\frac{1}{4}$  is read as 'four and a quarter'.

### One and a half, two and a half, three and a half



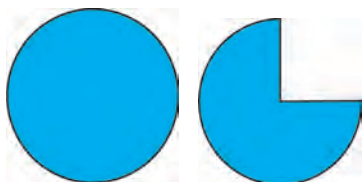
One whole and one half make  $1\frac{1}{2}$ .

$1\frac{1}{2}$  is read as 'one and a half'.

Two wholes and one half is written as  $2\frac{1}{2}$  and read as 'two and a half'.

In the same way,  $3\frac{1}{2}$  is read as 'three and a half' and  $4\frac{1}{2}$  is read as 'four and a half'.

### One and three quarters, two and three quarters, three and three quarters,...



One whole and three quarters is written as  $1\frac{3}{4}$  and read as 'one and three quarters'.

In the same way,  $2\frac{3}{4}$  is read as 'two and three quarters' and  $4\frac{3}{4}$  is read as 'four and three quarters'.

#### Exercise

1. Read the following fractions and write them in words.

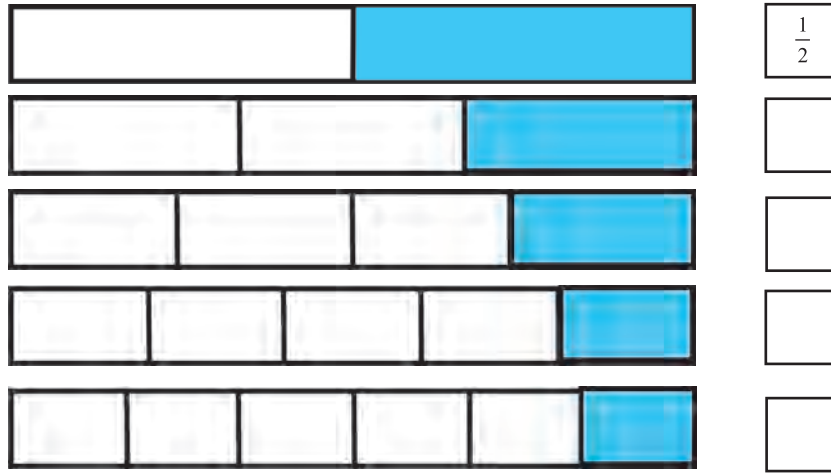
$$2\frac{3}{4}, \quad 3\frac{1}{4}, \quad 11\frac{1}{2}, \quad 5\frac{3}{4}, \quad 9\frac{1}{2}, \quad 8\frac{1}{4}$$

2. Read each of the following and write the fractions.

- Four and three quarters
- Ten and a half
- Fourteen and three quarters
- Seven and one quarter
- Eighteen and a half
- Nine and one quarter
- Seven and a half

## Comparing fractions

In the picture given below, each of the strips of equal length has some shaded part. Write the fraction shown by the shaded part of each strip in the box next to it.



Now look at the pictures and the fractions written in the boxes and answer the following questions.

(1) Which is the smaller fraction,  $\frac{1}{2}$  or  $\frac{1}{3}$  ?

(2) Which is the smaller fraction,  $\frac{1}{5}$  or  $\frac{1}{6}$  ?

(3) Which is the bigger fraction,  $\frac{1}{3}$  or  $\frac{1}{5}$  ?

(4) Write  $<$  or  $>$  in the boxes given below.

$\frac{1}{3}$    $\frac{1}{2}$  ;  $\frac{1}{3}$    $\frac{1}{4}$  ;  $\frac{1}{5}$    $\frac{1}{3}$  ;  $\frac{1}{2}$    $\frac{1}{3}$    $\frac{1}{4}$    $\frac{1}{5}$    $\frac{1}{6}$

(5) As the denominator of the fractions with numerator 1 keeps increasing, what happens to the value of the fraction?

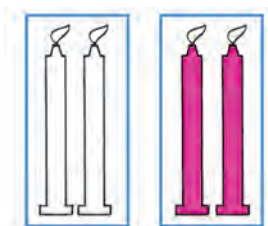
(6) Which is the smaller fraction,  $\frac{1}{6}$  or  $\frac{1}{9}$  ? Why ?

(7) Fill in the boxes below with the proper sign from  $=$ ,  $<$  or  $>$ .

$\frac{1}{8}$    $\frac{1}{10}$  ,  $\frac{1}{5}$    $\frac{1}{3}$  ,  $\frac{1}{4}$    $\frac{1}{2}$  ,  $\frac{1}{3}$    $\frac{1}{3}$   
 $\frac{1}{15}$    $\frac{1}{20}$  ,  $\frac{1}{20}$    $\frac{1}{15}$  ,  $\frac{1}{200}$    $\frac{1}{100}$

(8) You have a fruit. Using that fruit, how will you explain to your friend that  $\frac{1}{4} < \frac{1}{2}$  ?

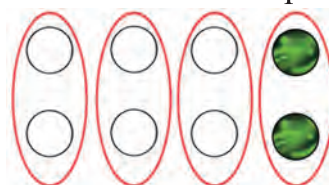
## Fractions related to sets



- ◆ In this picture, there is a set of four candles. It has been divided into two equal parts and 1 part has been coloured.

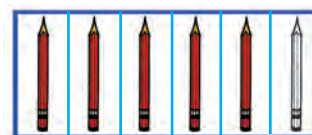
That is  $\frac{1}{2}$  a part has been coloured.  $\frac{1}{2}$  of 4 is 2.

- ◆ This is a set of 8 marbles. It has been divided into 4 equal parts. One of the parts is coloured. That is, a  $\frac{1}{4}$  part has been coloured. This means  $\frac{1}{4}$  of 8 is 2.



- ◆ This is a set of 12 balls which has been divided into 4 equal parts. Three parts are coloured. It means that a  $\frac{3}{4}$  part is coloured.  $\frac{3}{4}$  of 12 is 9.

- ◆ This is a set of 6 pencils which has been divided into 6 equal parts. Each part has only one pencil. 5 parts are shaded showing that  $\frac{5}{6}$  of 6 is 5.



### Exercise

Circle a portion of the set equal to the given fraction.

| Fraction      | Set |
|---------------|-----|
| $\frac{1}{2}$ |     |
| $\frac{2}{3}$ |     |
| $\frac{3}{4}$ |     |
| $\frac{2}{4}$ |     |
| $\frac{1}{5}$ |     |
| $\frac{3}{5}$ |     |