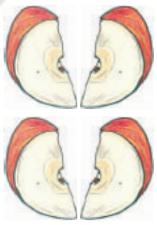
CHAPTER - 7

Fractions and Decimals

7.1 Introduction

Ramu bought an apple and want to share it equally with his friend. This means that the apple has to be divided into two equal pieces. Ramu will take one piece and his friend the other.

Reshma asks that if there were four friends then what will Ramu do? Ramu further divided his half apple into two equal parts and asked Reshma what fraction of the whole apple was that piece. He also did the same with the other half.



Reshma said that these four equal parts together make one whole. So each equal part is one-fourth of one whole apple.

Therefore we can say that when something is divided into two equal parts each part represents one half of the whole. (See the figure given below)

One Whole part **Cut along the dotted line**

7.2 A Fraction

A fraction means a part of a group or of a whole.

$\frac{5}{12}$ is a fraction. We read it as 'five-twelfths'.

What does '12' stand for? It is the number of equal parts into which the whole has been divided. What does '5' stand for? It is the number of equal parts which have been taken out or selected.

Here 5 is called the numerator and 12 is called the denominator.

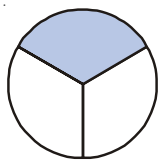
What is the numerator of $\frac{3}{7}$ and the denominator of $\frac{4}{15}$.

Try These

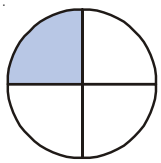
1. How will you represent the following pictorially:

(i) $\frac{3}{4}$ (ii) $\frac{2}{8}$ (iii) $\frac{1}{3}$ (iv) $\frac{5}{8}$

2. Write the fraction representing the shaded portion.



(i)



(ii)

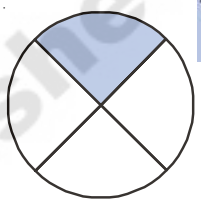
(iii)

These fraction are less than one and are parts of a whole. These are called **proper fraction** In proper fractions, always numerator is less than denominator**.**

Do This

1. Write 5 proper fractions and draw them pictorially.

2. Rani says that shaded portion in given figure represents $\frac{1}{4}$.



Do you agree with her? Give reason to support your answer.?

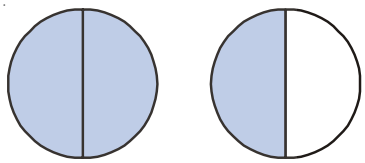
7.2.1 Improper Fractions

Consider fractional numbers that are more then one. There are called improper fractions. For example $\frac{3}{2}, \frac{5}{2}, \frac{7}{3}, \frac{8}{2}$ etc. Check whether the denominator is greater than numerator?

Write 5 more improper fractional numbers.

How do we represent these improper fractions pictorically? Let us consider an example.

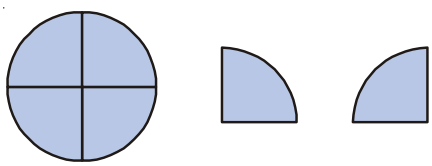
Each circle represents a whole. We have 2 wholes out of which three equal parts are shaded. There are 3 parts and each whole is divided in to two parts. Therefore this is a representation of $\frac{3}{2}$. We notice that for representing an improper fraction we need to have more than one whole.

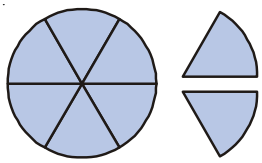


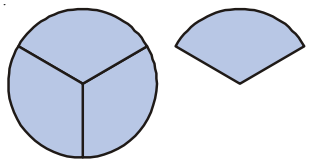
Do This

1. Write improper fractions represented by the following pictures.

(i)



(ii) 

(iii) 

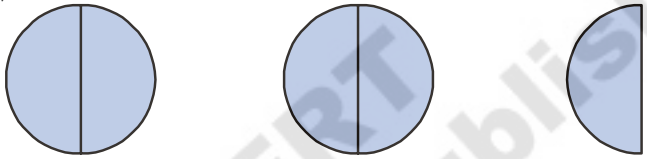
2. Represent the following fractions pictorially:

$\frac{7}{4}, \frac{5}{3}, \frac{7}{6}$

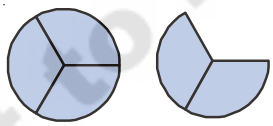
7.2.2 Mixed Fractions

Value of improper fractions are greater than one. For example $\frac{5}{2}$ has 5 halves.

We represent this as:



This has 2 complete wholes and a half, i.e., $2+\frac{1}{2}$ and we write it as $2\frac{1}{2}$. Here, we say that $2\frac{1}{2}$ is in the form of a mixed fraction.Similarly $\frac{5}{3}$ has one complete wholes and two thirds besides. It can be represented as $1\frac{2}{3}$.

 and its equal to $1+\frac{2}{3}=1\frac{2}{3}=\frac{5}{3}$

Each improper fraction can be represented as mixed fraction.

Do This

Write the following as mixed fractions.

$\frac{7}{2}, \frac{8}{5}, \frac{9}{4}, \frac{13}{5}, \frac{17}{3}$

7.3 Numerator and Denominator

We can see from above that any two whole numbers written in the form $\frac{1}{2}, \frac{1}{3}, \frac{5}{4}, \frac{3}{4}, \frac{2}{3}$ represent fractional numbers. In this the only condition is that the denominator can not be equal to 0.

Try These

1. Write the numerator and denominators of the following fractional numbers:

$\frac{1}{3}, \frac{2}{5}, \frac{7}{2}, \frac{19}{3}, \frac{7}{29}, \frac{11}{13}, \frac{1}{7}, \frac{8}{3}$

2. Sort the following fractions into the category of proper and improper fractions. Also write improper fractions as mixed fractions:

$\frac{1}{3}, \frac{2}{7}, \frac{8}{3}, \frac{3}{5}, \frac{5}{3}, \frac{1}{9}, \frac{9}{5}, \frac{8}{7}$

7.4 Fractional Numbers on the Number Line

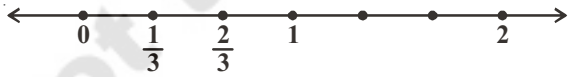
We can show fractional numbers on the number line also.

Let us draw a number line and mark $\frac{1}{2}$ on it.

We know that $\frac{1}{2}$ is greater than 0 and less than 1, so it should lie between 0 and 1.

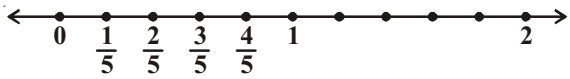
[Divided the gap between 0 and 1 into 2 equal parts and show one parts as $\frac{1}{2}$]

Similarly $\frac{1}{3}$ and $\frac{2}{3}$ can be shown as below:



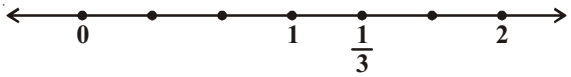
[One unit has to divide into 3 equal parts]

$\frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}$ can be shown as follows:



[The gap between line divided into 5 equal parts]

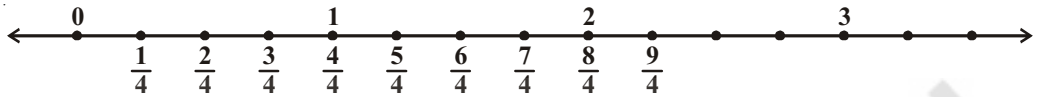
How do we show $\frac{4}{3}$ on the number line? $\frac{4}{3}$ has four one thirds. It is more than one. To represent $\frac{4}{3}$ we need one more one third after 1.



$\frac{4}{3} = \frac{3}{3} + \frac{1}{3} = 1 + \frac{1}{3}$

After 1 unit divide the gap between 1 and 2 into 3 equal parts.

If we consider $\frac{9}{4}$ then this number has 9 one fourths. This number would therefore be marked as shown



This number is thus after 2 on the number line and is written as $2\frac{1}{4}$.

Do This

1. Show the following on number lines:

   (i) $\frac{7}{6}$ (ii) $\frac{5}{2}$ (iii) $\frac{7}{5}$ (iv) $\frac{9}{6}$

2. Consider these numbers. Which of these would lie on the number line:

   (i) before 1 (ii) between 1 and 2

   $\frac{17}{8}, \frac{11}{4}, \frac{1}{3}, \frac{7}{9}, \frac{7}{5}, \frac{6}{11}, \frac{9}{2}, \frac{9}{5}$

Exercise - 7.1

1. Out of these which are proper fractional numbers?

   (i) $\frac{3}{2}$ (ii) $\frac{2}{5}$ (iii) $\frac{1}{7}$ (iv) $\frac{8}{3}$

2. Which of these are improper fractional numbers?

   (i) $\frac{2}{7}$ (ii) $\frac{7}{11}$ (iii) $\frac{9}{11}$ (iv) $\frac{13}{2}$ (v) $\frac{7}{3}$

   Write where each of the above improper fractional numbers would lie on the number line?

3. Pick out the mixed fractions from these:

   (i) $\frac{3}{5}$ (ii) $1\frac{2}{7}$ (iii) $\frac{7}{2}$ (iv) $2\frac{3}{5}$

4. Convert the following improper fractions into mixed fractions:

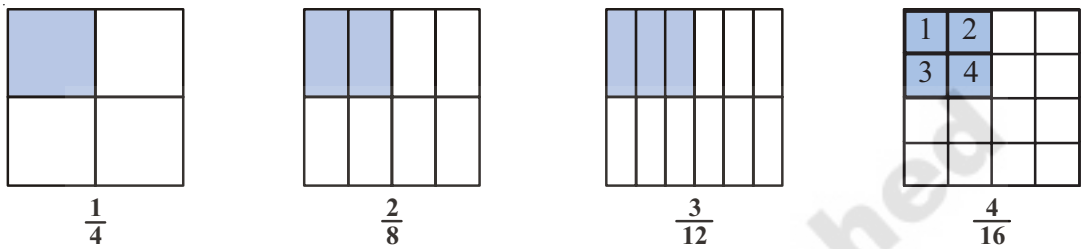
   (i) $\frac{7}{3}$ (ii) $\frac{11}{2}$ (iii) $\frac{9}{4}$ (iv) $\frac{27}{4}$

5. Convert the following mixed fractions into improper fractions.

(i) $1\frac{2}{7}$ (ii) $3\frac{2}{8}$ (iii) $10\frac{2}{9}$ (iv) $8\frac{7}{9}$

7.5 Equivalent Fractions

Consider the following four fractions and their representations.



$\frac{1}{4}$ $\frac{2}{8}$ $\frac{3}{12}$ $\frac{4}{16}$

If we look at these closely we find that the numerator and denominator of $\frac{2}{8}$ are twice the numerator and denominator of $\frac{1}{4}$. Similarly $\frac{3}{12}$ has the numerator and denominator multiplied by 3 each.

We see $\frac{1}{4} = \frac{2}{8} = \frac{3}{12} = \frac{4}{16}$.

All these fractions are equivalent to $\frac{1}{4}$.

We can say that the equivalent fractions arise when we multiply both the numerator and the denominator by the same number.

The equivalent fractions of $\frac{1}{3}$ are $\frac{2}{6}, \frac{3}{9}, \frac{4}{12}, \frac{5}{15}$ ..... etc.

7.6 Lowest form of a Fraction

Out of the equivalent fractions $\frac{1}{3}, \frac{2}{6}, \frac{3}{9}, \frac{4}{12}$, ... etc. $\frac{1}{3}$ is the standard form. It is the standard form as the numerator and denominator are in lowest terms and do not have any common factors.

For example $\frac{2}{3}, \frac{7}{3}, \frac{17}{7}, \frac{1}{5}, \frac{3}{11}$ are all standard forms.

However, $\frac{5}{10}, \frac{2}{4}, \frac{16}{36}, \frac{3}{9}$ etc. are not in their standard forms.

Try These

1. Write 5 fractional numbers that are in the standard form.
2. Write 5 fractional numbers that are not in standard form.
3. Convert the following fractions into their standard form.

(i) $\frac{7}{28}$ (ii) $\frac{15}{90}$ (iii) $\frac{11}{33}$ (iv) $\frac{39}{13}$

7.7 Like and Unlike Fractions

In a mathematics exam, Ramu got 5 marks out of 25. We write it as $\frac{5}{25}$. Raju got $\frac{10}{25}$ and Ravi got $\frac{21}{25}$.

It is clear that Ravi got the highest marks of three. It is easy to see that the numerator of that fractions is the highest and the all have the same denominator.

The fractional numbers that have the same denominators are called **like fractions**. As we see, these can be compared easily. Fractions where the denominators are not the same are **unlike fractions**. Example $\frac{1}{3}$ and $\frac{1}{7}$ are unlike fractions. $\frac{2}{4}$ and $\frac{6}{12}$ are also unlike fractions.

While, $\frac{2}{4}$ and $\frac{6}{12}$ are equivalent fractions but they are unlike fractions.

Exercise - 7.2

1. Which group of fractions are like fractions among the following?

(i) $\frac{2}{7}, \frac{3}{7}, \frac{4}{7}$ (ii) $\frac{1}{9}, \frac{2}{9}, \frac{4}{9}$ (iii) $\frac{3}{7}, \frac{4}{9}, \frac{7}{11}$

2. Write five groups of like fractions.
3. From each of these identify like fractional numbers:

(i) $\frac{2}{3}, \frac{5}{3}, \frac{1}{3}, \frac{4}{6}$ (ii) $\frac{1}{7}, \frac{3}{5}, \frac{2}{5}, \frac{1}{9}$ (iii) $\frac{7}{8}, \frac{8}{7}, \frac{2}{8}, \frac{7}{5}$

Think, Discuss and Write

Rafi says "There can be no equivalent fractions that are also like fractions."
Do you agree with him? Explain your answer and justity.

7.8 Ascending and Descending Order Fractions

Whenever we have a set of numbers we compare them. Some are bigger than the others, some are smaller. We can see taht 7 is smaller than 19 and bigger than 3. We also know that 3 is bigger than -5. Can we make such comparisons in fractional numbers so easily. Let us consider these through a few examples.

In a school test Suresh got $\frac{7}{10}$, Seetha got $\frac{9}{10}$, Rakesh got $\frac{5}{10}$. We know that Seetha got the most marks and that $\frac{9}{10}$ is bigger than $\frac{7}{10}$. $\frac{9}{10}$ represents 9 parts taken out of 10 equal parts. That is more than 7 parts out of 10 equal parts. It is easy to see this as the denominators are equal. For example out of $\frac{3}{2}$ and $\frac{1}{2}$, it is $\frac{3}{2}$ that is bigger. If we want to show the fractions $\frac{7}{10}, \frac{9}{10}, \frac{5}{10}$ in ascending order we show them as $\frac{5}{10}, \frac{7}{10}, \frac{9}{10}$. Can you show them in descending order ?

Do This

Identify the biggest and the smallest in these group of fractional numbers

(i) $\frac{1}{7}, \frac{3}{7}, \frac{2}{7}, \frac{5}{7}$ (ii) $\frac{1}{9}, \frac{13}{9}, \frac{11}{9}, \frac{5}{9}$

(iii) $\frac{1}{3}, \frac{5}{3}, \frac{17}{3}, \frac{9}{3}$

7.8.1 Comparing Unlike Fractions

Let us now compare $\frac{2}{3}$ and $\frac{3}{5}$? Which of these is bigger?

We cannot now tell just by looking at the numbers. There are 2 parts in the first and 3 parts in the second. These sets of parts are equal among themselves but the sizes of these equal parts are different. To compare such unlike fractions we have to convert them to equivalent like fractions.

So we convert both $\frac{2}{3}$ and $\frac{3}{5}$ in the following way.

$$\frac{2}{3} = \frac{2}{3} \times \frac{5}{5} = \frac{10}{15}$$

$$\frac{3}{5} = \frac{3}{5} \times \frac{3}{3} = \frac{9}{15}$$

therefore, $\frac{9}{15} < \frac{10}{15}$ and thus $\frac{3}{5} < \frac{2}{3}$

Consider another example. Which is bigger out of $\frac{7}{9}$, $\frac{3}{11}$?

Converting them into equivalent like fractions.

$\frac{7}{9}\times\frac{11}{11}=\frac{77}{99}$; $\frac{3}{11}\times\frac{9}{9}=\frac{27}{99}$

$\frac{77}{99}$ is big one. So, $\frac{7}{9}$ is big one. $\frac{7}{9}>\frac{3}{11}$.

In all these we have tried to make the denominators of both the fractions same. Once the denominators are the same the size of the parts is the same. We can then compare the number of parts and see which fractional number has more equal parts to find the bigger fraction.

Do This

Which of these is the smaller fraction?

(i) $\frac{2}{5}$, $\frac{3}{7}$ (ii) $\frac{7}{8}$, $\frac{5}{4}$ (iii) $\frac{3}{11}$, $\frac{1}{2}$ (iv) $\frac{5}{6}$, $\frac{2}{3}$

7.8.2 Ascending and Descending Order

We know that when we write numbers in a form that increase from the left to the right then they are in the ascending order.

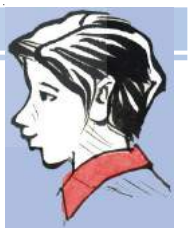
For example 1, 3, 7, 8, 12 are in ascending order:

Similarly,

$\frac{2}{5}$, $\frac{3}{5}$, $\frac{7}{5}$, $\frac{16}{5}$ are also in ascending order. Here $\frac{2}{5}<\frac{3}{5}<\frac{7}{5}<\frac{16}{5}$

And $\frac{1}{7}$, $\frac{1}{6}$, $\frac{1}{5}$, $\frac{1}{4}$ are also in ascending order.

Do This



Write the following fractional number in ascending order:

(i) $\frac{1}{7}$, $\frac{13}{7}$, $\frac{11}{7}$, $\frac{5}{7}$, $\frac{15}{7}$ (ii) $\frac{2}{3}$, $\frac{5}{6}$, $\frac{3}{9}$, $\frac{24}{18}$

(iii) $\frac{2}{3}$, $\frac{1}{2}$, $\frac{5}{6}$, $\frac{7}{12}$ (iv) $\frac{1}{5}$, $\frac{1}{2}$, $\frac{1}{8}$, $\frac{1}{3}$, $\frac{1}{12}$

When we write numbers in the manner that they decrease from left to right then they are said to be in descending order.

For example 100, 85, 83, 74, 61 are in descending order.

Similarly $\frac{11}{2}, \quad \frac{7}{2}, \quad \frac{5}{2}, \quad \frac{3}{2}, \quad \frac{1}{2}$ are in descending order $\frac{1}{4}, \quad \frac{1}{5}, \quad \frac{1}{6}, \quad \frac{1}{7}$ are also in descending order. Can you say why? Discuss with your friends.

Do This

Write the following in descending order:

(i) $\frac{1}{9}, \quad \frac{13}{9}, \quad \frac{11}{9}, \quad \frac{15}{9}, \quad \frac{3}{9}$

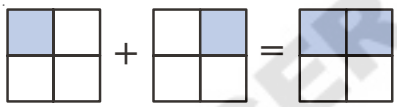
(ii) $\frac{1}{6}, \quad \frac{2}{3}, \quad \frac{3}{9}, \quad \frac{5}{6}$

(iii) $\frac{1}{5}, \quad \frac{9}{5}, \quad \frac{3}{5}, \quad \frac{6}{5}$

(iv) $\frac{1}{4}, \quad \frac{1}{2}, \quad \frac{1}{8}, \quad \frac{3}{4}$

7.9 Addition of Fractions:

Add the following

1.  $= \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$

2.  $= \frac{1}{2} + \frac{1}{2} = \frac{2}{2} = 1$

Do This

Simplify the following

i. $\frac{1}{4}+\frac{5}{4}$ ii. $\frac{1}{3}+\frac{2}{3}$ iii. $\frac{1}{7}+\frac{2}{7}+\frac{3}{7}$ iv. $\frac{13}{6}+\frac{5}{6}$

7.9.1 Adding unlike fractions

Look at the following

$\frac{1}{2} + \frac{1}{3} = ?$

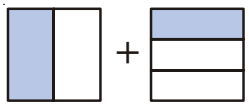
We can not add the numerators here. Why not? So what do we do.

To add such fractions we convert them into equivalent fractions with the same denominators.

$\frac{1}{2}=\frac{1}{2}\times\frac{3}{3}=\frac{3}{6}$; $\frac{1}{3}=\frac{1}{3}\times\frac{2}{2}=\frac{2}{6}$

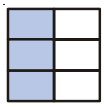
So, $\frac{1}{2}+\frac{1}{3}=\frac{3}{6}+\frac{2}{6}=\frac{5}{6}$

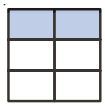
Let us see how this works pictorially.

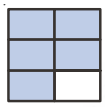
$\frac{1}{2}+\frac{1}{3}$ 

The parts in the two pictures are not equal. In order to add we need equal parts.

We divide the first into three more horizontal parts.

We get $\frac{3}{6}$ 

and for the second picture similarly we get $\frac{2}{6}$. 

No we can add both and get sum as $\frac{5}{6}$ 

Consider $\frac{1}{6}+\frac{5}{3}$

We write $\frac{5}{3}=\frac{10}{6}$

Thus $\frac{1}{6}+\frac{5}{3}=\frac{1}{6}+\frac{10}{6}=\frac{11}{6}$

Do This

Add the following fractional numbers:

(i) $\frac{1}{2}+\frac{1}{5}$ (ii) $\frac{1}{2}+\frac{3}{2}+\frac{7}{2}$ (iii) $\frac{1}{3}+\frac{2}{6}+\frac{5}{6}$ (iv) $\frac{1}{3}+\frac{7}{5}$

7.9.2 Addition of mixed fractions

How do we add $2\frac{1}{3}$ and $1\frac{2}{3}$?

One way is to convert them into improper fractions $\frac{7}{3}$ and $\frac{5}{3}$ and add. We can also add them in the following way $2\frac{1}{3}+1\frac{2}{3}=2+1+\frac{1}{3}+\frac{2}{3}$

We have added the whole number part and the fractional part separately. Then we add the the two and get $3+\frac{3}{3}=3+1=4$.

We will now add $2\frac{1}{8}, 3\frac{1}{6}$ in both ways.

1st Method : $2\frac{1}{8}+3\frac{1}{6} = 2+3+\frac{1}{8}+\frac{1}{6}$

$= 5+\frac{1\times 6}{8\times 6}+\frac{1\times 8}{6\times 8}$

$= 5+\frac{6}{48}+\frac{8}{48}$

$= 5+\frac{14}{48} = 5+\frac{7}{24} = 5\frac{7}{24}$

2st Method : Changing both into improper fractions we have $\frac{17}{8}+\frac{19}{6}$

Change into equivalent like fractions $\frac{17}{8} = \frac{17}{8}\times\frac{6}{6} = \frac{102}{48}$

$\frac{19}{6} = \frac{19}{6}\times\frac{8}{8} = \frac{152}{48}$

$\therefore \frac{102}{48}+\frac{152}{48} = \frac{254}{48} = \frac{127}{24} = 5\frac{7}{24}$

7.10 Subtraction

Subtract $\frac{3}{7}$ from $\frac{4}{7}$. Here the numbers have the same denominator so they are like fractions. We take 3 one sevenths from 4 one sevenths and are left with 1 one seventh.

$\therefore \frac{4}{7}-\frac{3}{7} = \frac{4-3}{7} = \frac{1}{7}$

Now take an example where fractional numbers have different denominators.

Subtract $\frac{2}{9}$ from $\frac{3}{10}$

$\frac{3}{10}-\frac{2}{9}$.

We can not do the same process as we did above.

We make them equivalent like fractions and write

$$\frac{3}{10}=\frac{3\times9}{10\times9}=\frac{27}{90};\quad \frac{2}{9}=\frac{2\times10}{9\times10}=\frac{20}{90}$$

We get $\frac{27}{90}-\frac{20}{90}=\frac{27-20}{90}=\frac{7}{90}$

Do This

1. Add the following fractions.

   (i) $\frac{2}{5}+\frac{3}{5}$ (ii) $\frac{7}{10}+\frac{2}{10}$ (iii) $\frac{3}{4}+\frac{2}{6}$

2. Subtract the following.

   (i) $\frac{2}{7}$ from $\frac{3}{5}$ (ii) $\frac{1}{9}$ from $\frac{2}{5}$

Exercise - 7.3

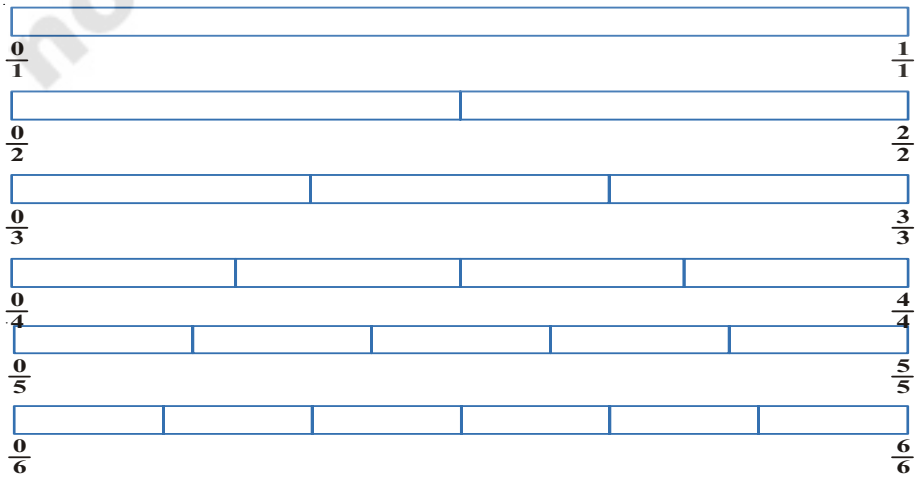
1. Write shaded portion as fraction. Arrange them in ascending or descending order using sign '<', '=', '>' between the fractions:

   (i) 

   (ii) 

2. Show $\frac{2}{6}$, $\frac{4}{6}$, $\frac{8}{6}$, $\frac{5}{6}$ and $\frac{6}{6}$ on the number line. Also arrange them in ascending order.

3. Look at the figures and write '<' or '>', '=' between the given pairs of fractions:



(i) $\frac{1}{6} \square \frac{1}{3}$ (ii) $\frac{3}{4} \square \frac{2}{6}$ (iii) $\frac{2}{3} \square \frac{2}{4}$

(iv) $\frac{6}{6} \square \frac{3}{3}$ (v) $\frac{5}{6} \square \frac{5}{5}$

Make five more such problems and ask your friends to solve them.

4. Fill with the appropriate sign. ('<', '=', '>')

(i) $\frac{1}{2} \square \frac{1}{5}$ (ii) $\frac{2}{4} \square \frac{3}{6}$ (iii) $\frac{3}{5} \square \frac{2}{3}$

(iv) $\frac{3}{4} \square \frac{2}{8}$ (v) $\frac{3}{5} \square \frac{6}{5}$ (vi) $\frac{7}{9} \square \frac{3}{9}$

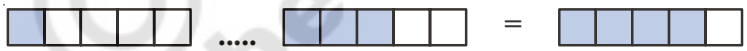
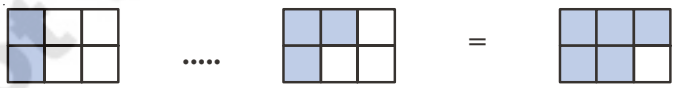
5. Answer the following. Also write how you solved them.:

(i) Is $\frac{5}{9}$ equal to $\frac{4}{5}$? (ii) Is $\frac{9}{16}$ equal to $\frac{5}{9}$?

(iii). Is $\frac{4}{5}$ equal to $\frac{16}{20}$? (iv) Is $\frac{1}{15}$ equal to $\frac{4}{30}$?

6. Varshith read 25 pages of a story book containing 100 pages. Lalitha read $\frac{2}{5}$ of the same story book. Who read less? Give reason.

7. Write these fractions appropriately as additions or subtractions:

(i)  (ii)  (iii) 

8. Simplify

(i) $\frac{1}{18} + \frac{1}{18}$ (ii) $\frac{8}{15} + \frac{3}{15}$ (iii) $\frac{7}{7} - \frac{5}{7}$

(iv) $\frac{1}{22} + \frac{21}{22}$ (v) $\frac{12}{15} - \frac{7}{15}$ (vi) $\frac{5}{8} + \frac{3}{8}$

(vii) $1 - \frac{2}{3}$ (viii) $\frac{1}{4} + \frac{0}{4}$ (ix) $3 - \frac{12}{5}$

9. Fill in the missing fractions:

(i) $\frac{7}{10} - \square = \frac{3}{10}$ (ii) $\square - \frac{3}{21} = \frac{5}{21}$

(iii) $\square - \frac{3}{3} = \frac{3}{6}$ (iv) $\square + \frac{5}{27} = \frac{12}{27}$

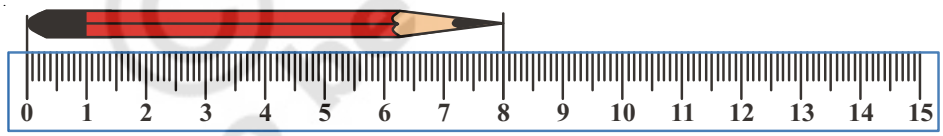
10. Narendra painted $\frac{2}{3}$ area of the wall in his room. His brother Ritesh helped and painted $\frac{1}{3}$ area of the wall. How much did they paint together?

11. Neha was given $\frac{5}{7}$ of a basket of bananas. What fraction of bananas was left in the basket?

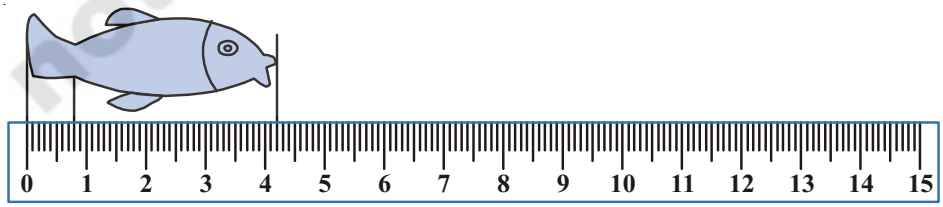
12. A piece of rod $\frac{7}{8}$ metre long is broke into two pieces. One piece was $\frac{1}{4}$ metre long. How long is the other piece?

13. Renu takes $2\frac{1}{5}$ minutes to walk around the school ground. Snigdha takes $\frac{7}{4}$ minutes to do the same. Who takes less time and by what fraction?

7.11 Decimals



What is the length of this pencil? ..... centimeter.



The length of this fish is more than 4 cm. But it is less than 5 cm. How will you find the length of this fish?

To do this we divide the space between 4 and 5 into 10 equal parts.

Now can you measure the length of this fish? The length is ..... cm and ..... small part. We call this small part as millimeter. That means this fish is 4 cm and 2 mm in length. Each of the 10 equal parts is one milli meter. In using the scale we use equal divisions and count the smaller parts.

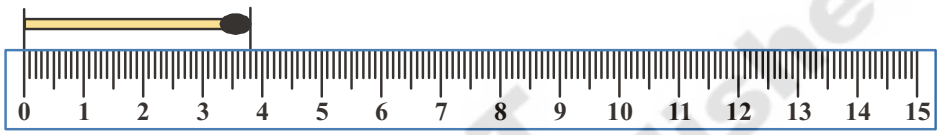
In the above examples, the length is.

4 and $\frac{2}{10}$ part = $4\frac{2}{10}$ cm

What is the length of the tail of the fish? See the picture of fish from the above.

You find it is less than 1 cm and is equal to 8 parts out of the 10 equal parts.

Thus it is $\frac{1}{10} + \frac{1}{10} + \frac{1}{10} + \frac{1}{10} + \frac{1}{10} + \frac{1}{10} + \frac{1}{10} + \frac{1}{10} = \frac{8}{10}\ cm$



Look at the match stick. Measure the length of the match stick and write it in centimeters and its tenth parts.

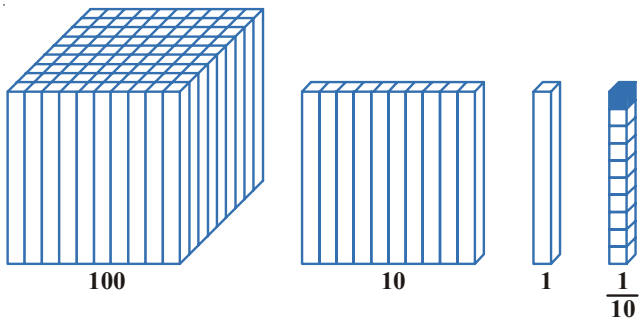
1 part of each cm = 1 mm = $\frac{1}{10}\ cm$ = 1 cm

7.11.1 Place Value in Decimal Number

If we read a three digit number then we can find the number by deciding the place value of the digits. Lets take 3 digits as an example: 1, 2, 5.

In the number 512 if 5 takes the place of the hundreds then it has the value 500. That is why 512 is five hundred and twelve. In the number 152 the numeral 5 is in tens place so it has the place value of fifty.

In 125 we have 5 in the place of units. That is why the number is one hundred twenty and five or one hundred and twenty five. If we move to the right of hundreds we have tens and if we move to the right side of tens it is units. In other words while shifting towards right the value of place becomes $\frac{1}{10}$ of its value.



The picture above shows how as we move right the value becomes $\frac{1}{10}$th of the value on the left. The first figure, We start 100 with a cube for 100 made up of 100 cuboidal rods. If we divide it into 10 equal parts then you will get a cuboid made up of 10 rods

When we further divide a ten in to 10 equal parts we get 1 cuboidal rod. This means that 10^{th} part of a $hundred^{th}$ is tens and 10^{th} part of tens is a unit.

Now, if we move more towards right then what will happen?

You must remember that in above diagram of measuring fish example we measured length less than 1 cm. We divided 1 cm. into 10 small equal parts. Each part is called of 1 mm. That is each part is $\frac{1}{10}$ cm. When we write mm in cm then we write it on the right hand side of the decimal point. The value of the first digit on the right hand side of the decimal point is $\frac{1}{10}$

$$100 \rightarrow \frac{100}{10} = 10 \rightarrow \frac{10}{10} = 1 \rightarrow \frac{1}{10}$$

If we have five 10^{th} parts we have $\frac{5}{10}$ and write 0.5. This means 5 parts out of the 10 of a whole i.e., $\frac{5}{10} = 0.5$

TRY THESE

(i) Write fractions for the following decimal and also find how many tenth parts are there in each:

0.4 , 0.2 , .8 , 1.6 , 5.4 , 555.3 , 0.9

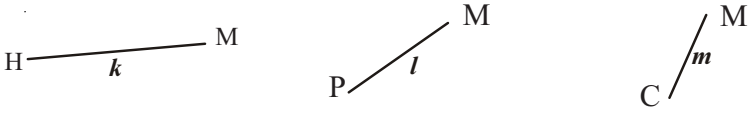
(ii) Complete the following table.

Tens (10)	Ones (1)	One-Tenths (1/10)	Decimal number
3	5	7	
6	9	4	
7	6	3	

(iii) Complete the following table.

Decimal Number	Whole number part	Decimal part	Value of the Decimal part	Write in words
8.5				
14.7				
23.0				
5.4				

(iv) Measure the length of these line segments and fill it in the table given below.



What you measured	*cm* and *mm*	Length measurement in *cm*	Length measurement in decimal
$\overline{HM}$			
$\overline{PM}$			
$\overline{CM}$			
Your rubber			
Piece of a chalk			
Your fore finger			

If part of 100 is to be shown then we have to write the number after two places to the right side of the decimal like $\frac{5}{100} = \cdot 05$ that is, if we move one place towards right from $\frac{1}{10}$ then the value is $\frac{1}{100}$.

1 m. has 100 cm in it. If we have to write 5 cm in meter then we write ·05 m If we have to write 25 cm. or hundredth part is to be written then it is 0·25

that is $\frac{20}{100} + \frac{5}{100} = \frac{25}{100} = 0.25$

Write fractions for the following decimal and find how many hundredth parts are there in it:

0.35, 0.08, 6.70, 23.53, 756.01

Similarly we know 100 paise = 1 Rupee, so how much is 10 paise of a rupee and how much is 1 paise of rupee?

How much is 475 paise? It is 400 + 75 paise or $4 + \frac{75}{100}$ rupee or 4.75 rupee. Also written as 4 rupees 75 paise (or) ₹ 4.75

Similarly rupees 5 and 30 paisa will be written as $5\frac{30}{100}$ rupees which ₹ 5.30

Do This

Fill in the blanks:

(i) 325 paisa = ... rupees ..... paisa = ₹.....

(ii) 570 paisa = ... rupees ..... paisa = ₹.....

(iii) 2050 paisa = ... rupees ..... paisa = ₹ .....

Exercise - 7.4

1. Fill in the blanks

   (i) The fractional form of 0.8 is _____

   (ii) The whole number part of 15.9 is _____

   (iii) The digit in the tenths place of 171.9 is _____

   (iv) The place value of 8 in 9.8 is _____

   (v) The point between the whole number part and the decimal part of the decimal number is called _____

2. Write the decimal for each of the following

   (i) One hundred twenty five and four tenths

   (ii) Twenty and two tenths

   (iii) Eight and Six tenths

3. Write the following fractions in the decimal form using the decimal point.

   (i) 16/100 (ii) 278/1000 (iii) 6/100

   (iv) 369/100 (v) 16/1000 (vi) 345/10

4. Write the place value of each underlined digit.

   (i) 3$\underline{4}$.26 (ii) 8.8$\underline{8}$ (iii) 0.$\underline{9}$1

   (iv) 0.$\underline{5}$0 (v) 3.0$\underline{3}$ (vi) 6.$\underline{7}$4

5. Find which is greater?

   (i) 0.2 or 0.4 (ii) 70.08 or 70.7

   (iii) 6.6 or 6.58 (iv) 7.4 or 7.35 (v) 0.76 or 0.8

6. Rewrite in ascending order

   (i) 0.04, 1.04, 0.14, 1.14 (ii). 9.09, 0.99, 1.1 , 7

7. Rewrite in descending order

   (i) 8.6, 8.59, 8.09, 8.8 (ii) 6.8, 8.66, 8.06, 8.68

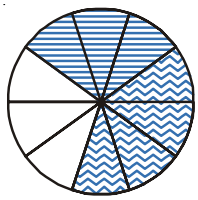
7.12 Addition and Subtractions of Decimal Fractions

Add 0.3 and 0.4

Take a circle and divide it into 10 equal parts.

Shade 3 equal parts to represent 0.3

Shaded 4 equal parts in a different way to represent 0.4



Now count the total number of shaded tenths in the circle.

	Ones		Tenths
	0	.	3
+	0	.	4
	0	.	7

Therefore 0.3 + 0.4 = 0.7

Thus, we can add decimal in such a manner that tenth part will add to tenth part of the second number. Similarly the hundredth parts would be added together.

Can you now add 0.63 and 0.54?

	Ones		Tenths	Hundredths
	0	.	6	3
+	0	.	5	4
	1	.	1	7

Thus 0.63 + 0.54 = 1.17

Do This

Find:

(i) 0.39 + 0.26 (ii) 0.8 + 0.07

(iii) 1.45 + 1.90 (iv) 3.44 + 1.58

Example-1. Add 3.64 + 5.4

***Method-(i)*:** 3.64 + 5.4 The first is two decimal place fraction and the second is a one decimal place fraction

= 364/100 + 54/10 Express them in the fractional form

= 364/100 + 540/100 Make 100 the denominator of the second fraction.

= 904/100 Add the numerators after making the denominators equal.

= 9.04 Write the answer using the decimal point.

***Method-(ii)*:** 3.64 + 5.4

	Units		Tenths	Hundredths
	3	.	6	4
+	5	.	4	
	9	.	0	4

3.64 As the first fraction has two decimal

\+ 5.40 places, convert 5.4 into a two decimal

9.04 place fraction and add.

Example-2. Salma is practising for her school sports day. She runs 3·27 km. in the morning and 2·8 km. in the evening. How much does she run in all?

Solution: 3.27 + 2.8 = ?

Run in the morning	=	3.27 km
Run in the evening	=	2.80 km
Total distance run	=	**6.07** km

Example-3. Subtract 1·23 from 2·85

Solution: This can be shown by the table

	Ones		Tenths	Hundredths
	2	.	8	5
-	1	.	2	3
	1	.	6	2

Thus 2·85 - 1·23 = 1·62

Therefore, we can say that, subtraction of decimals can be done by subtracting hundredths from hundredths, tenths from tenths, ones from ones and so on. Just as we added in addition.

Sometimes while subtracting decimals, we may also need to regroup.

Example-3. Subtract 2·89 from 4·5

Solution:

	Ones		Tenths	Hundredths
	4	.	5	0
-	2	.	8	9
	1	.	6	1

Therefore 4.5 – 2.89 = 1.61

EXERCISE - 7.5

1. Sonu went to a shop. He wanted to buy a chiki and a toffee. One chiki costs ₹0·75 and a toffee costs ₹ 0·50. If he buys one each of them how much he has to pay to the shop keeper. Sonu's mother gave him ₹ 2. He gave it to shopkeeper and bought items of ₹1.25. How much he will get in return? Suppose if his mother gave her ₹ 5 then how much will the shopkeeper return?

2. Add the following decimal fractions:

   (i) 25.11 + 3.80 (ii) 14.01 + 1.1 + 1.98

   (iii) 9.85 + 0.61 (iv) 2.3 + 18.94

   (v) 2.57 + 3.75

3. Abhishek travelled 5 km. 28 m. by bus, 2 km. 265 m. by car and the rest 1 km. 30 m. by walk. How much distance did he travel in all?

4. Mrs.Vykuntam bought 6.25 m of dress material for her older daughter and 5.75 m for the younger one. How much dress material did she buy for her daughters.

WHAT HAVE WE DISCUSSED?

1. i. A fraction is a number representing a part of a whole. The whole may be a single object or a group of objects.
   ii. When expressing a situation of counting parts to write a fraction, it must be ensured that all parts are equal.
2. In $\frac{5}{7}$, 5 is called the numerator and 7 is called the denominator.
3. Fractions can be shown on a number line. Every fraction has a point associated with it on the number line.
4. In a proper fraction, the numerator is less than the denominator. The fractions, where the numerator is greater than the denominator are called improper fractions. An improper fraction can be written as a combination of a whole and a part and such fractions are called mixed fractions.
5. Each proper or improper fraction has many equivalent fractions. To find an equivalent fraction of a given fraction, we may multiply or divide both the numerator and the denominator of the given fraction by the same number.
6. A fraction is said to be in the standard (or lowest) form if its numerator and the denominator have no common factor except 1.
7. To understand the parts of one whole (i.e. a unit) we represent a unit by a cuboidal bar. One cuboidal bar divided into 10 equal parts means each part is $\frac{1}{10}$ (one-tenth) of a unit. It can be written as 0.1 in decimal notation. The dot represents the decimal point and it comes between the units place and the tenths place.
8. Every fraction with denominator 10 and its multiple can be written in decimal notation and vice-versa.
9. One block divided into 100 equal parts means each part is $\frac{1}{100}$ (one-hundredth) of a unit. It can be written as 0.01 in decimal notation.
10. In the place value table, as we go from left to the right, the multiplying factor becomes $\frac{1}{10}$ of the previous factor.

    The place value table can be further extended from hundredths to $\frac{1}{10}$ of hundredths i.e. thousandths $\frac{1}{1000}$, which is written as 0.001 in decimal notation.
11. All decimals can also be represented on a number line.
12. Any two decimal numbers can be compared among themselves. The comparison can start with the whole part. If the whole parts are equal then the tenth parts can be compared and so on.
13. Decimals are used in many ways in our lives. For example, in representing units of money, length and weight.