Chapter 8

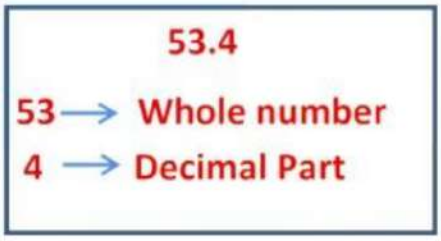
Decimals

Introduction to Decimals

The numbers expressed in decimal forms are called decimals.

Decimals have a decimal part and a whole number part. The point is used to separate these parts.

The number on the left side of decimal is the whole number part and the number formed by the digits at the right side of the decimal is called decimal part.



Place Values of Decimals

The place value chart of decimal numbers

Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
100	10	1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$

Tenths

Tenths
10 mm = 1 cm

Therefore, 1 mm = $\frac{1}{10}$ cm or one-tenth cm = 0.1 cm

Now, length of Ravi's pencil = 8 cm 5mm

$= 8\frac{5}{10}$ cm i.e. 8 cm and 5 tenths of a cm

= 8.5 cm

The length of Raju's pencil = 9 cm 3 mm

$= 9\frac{3}{10}$ cm i.e. 9 cm and 3 tenths of a cm

= 9.3 cm

Place Values of Decimals

The place value chart of decimal numbers of tenth decimal numbers.

Hundreds	Tens	Ones	Tenths
100	10	1	$\frac{1}{10}$

Example: Write the following in the decimal form

Hundreds	Tens	Ones	Tenths
2	3	1	4

Write the following numbers in the place value table:
(a) 30.5
(b) 5.2

Hundreds	Tens	Ones	Tenths
0	3	0	5
0	0	5	2

Fraction as decimals

We have already seen how a fraction with denominator 10 can be represented using decimals.

Example: Find the decimal representation of:

(a) $\frac{11}{5}$

(b) $\frac{1}{2}$

(a) Here, the denominator is 5. For writing in decimal notation, the the denominator should be 10.

We know that,

$$\frac{11}{5} = \frac{11 * 2}{5 * 2} = \frac{22}{10} = 2 + \frac{2}{10} = 2.2$$

(b) Here, the denominator is 2. For writing in decimal notation, the the denominator should be 10.

So,

$$\frac{1}{2} = \frac{1 * 5}{2 * 5} = \frac{5}{10} = 0 + \frac{5}{10} = 0.5$$

Hundredths

100 cm = 1 m

Therefore, 1 cm = $\frac{1}{100}$ m or one-hundredth m = 0.01 cm

Now, length of Ravi's cloth = 8 m 49 cm

= 8 $\frac{49}{100}$ m i.e. 8 m and 49 hundredths of a m

= 8.49 m

The length of Raju's cloth = 9 m 3 cm

$= 9\frac{3}{100}$ **m i.e. 9 cm and 3 hundredths of a m**

= 9.03 m

Place Values of Decimals

The place value chart of decimal numbers of tenth decimal numbers.

Hundreds	Tens	Ones	Ones	Hundredths
100	10	1	$\frac{1}{10}$	$\frac{1}{100}$

Example: Write the following in the decimal form

Hundreds	Tens	Ones	Ones	Hundredths
2	3	1	4	5

Sol.

Decimal number = 231.45

Write the following numbers in the place value table:
(a) 20.05
(b) 4.12

Hundreds	Tens	Ones	Ones	Hundredths
0	2	0	0	5
0	0	4	1	2

Fraction as decimals

We have already seen how a fraction with denominator 10 can berepresented using decimals.

Example: Find decimal representation of:

(a) $\frac{11}{25}$

(b) $\frac{5}{4}$

(a) Here, the denominator is 25.

For writing in decimal notation, the denominator should be 100.
We know that

$$\frac{11}{25} = \frac{11 * 4}{25 * 4} = \frac{44}{100} = 0 + \frac{44}{100} = 0.44$$

(b) Here, the denominator is 4.
For writing in decimal notation, the denominator should be 100.
So,

$$\frac{5}{4} = \frac{5 * 25}{4 * 25} = \frac{125}{100} = 1 + \frac{125}{100} = 1.25$$

Comparing Decimals

Consider the decimals, 28.43 and 28.67.

If we have to compare the given decimals, we follow the following steps.

1) We first compare the whole-number part (starting from the leftmost digit)

In the given decimals, 28.43 and 28.67 we see that the digits, 2 and 8 to the left of the decimal point are the same in both the decimals.

2) If the whole number parts are equal, then we compare the digits on the right of the decimal point starting from the tenths place.

Digits at tenths place of the decimals, 28.43 and 28.67 are 4 and 6 respectively.

Now, $6 > 4$

Therefore $28.67 > 28.43$

Example: Which is greater?

i) 0.5 or 0.05 ii) 1.37 or 1.49 iii) 0.8 or 0.88

i) 0.5 or 0.05

We compare the whole number parts (digit to the left of the decimal point) of the decimals, 0.5 and 0.05. Clearly, it is the same in both the decimals.

Next, we compare the digits at the tenths place of 0.5 and 0.05.

Now, $5 > 0$.

Therefore, $0.5 > 0.05$.

ii) 1.47 or 1.49

Comparing the whole number parts of the decimals, 1.47 and 1.49 (digit to the left of the decimal point) we see that it is the same in both the numbers.

Next, we compare the tenths digits of the decimals, 1.47 and 1.49.

Clearly, the tenths digit is also the same in both the numbers.

We compare the hundredths digit of the decimals, 1.47 and 1.49.

Now, $9 > 7$. So, $1.49 > 1.47$

iii) 0.8 or 0.88

As the number of digits to the right of the decimals is not the same, so we add a 0 to the right of 0.8.

Therefore, the two decimals are 0.80 and 0.88.

We see that the whole number parts of the decimals, 0.80 and 0.88 are the same.

On comparing the tenths digits of the decimals, 0.80 and 0.88 we see that they are also the same.

Next, we compare the hundredths digit of the decimals, 0.80 and 0.88.

Now, $8 > 0$. So, $0.88 > 0.80$

Using Decimals

- Money

We know that 100 paise = 1 Rupee

1 paisa = $\frac{1}{100}$ Rs

- Length

Various length measurements are done with the help of decimals.
1 cm = 10 mm

Thus, 1 mm = $\frac{1}{10}$ cm

1 m = 100 cm

Thus, 1 cm = $\frac{1}{100}$ m and so on.....

- Weight

Various length measurements are done with the help of decimals.

1 kg = 1000 g

Thus, 1 g = $\frac{1}{1000}$ kg

1 mg = 10 cg

Thus, 1 cg = $\frac{1}{10}$ mg and so on.....

Example:

i) Express 5 rupees and 65 paise as rupees.

We know that,

1 paisa = $\frac{1}{100}$ Rs

65 paisa $= \frac{65}{100}$ Rs $= 0.65$ Rs

5 rupees and 65 paise $= 5 + 0.65$ Rs $= 5.65$ Rs

ii) Express 5 m and 60 cm as m.

We know that,

1 cm $= \frac{1}{100}$ m

60 cm $=$ m $= \frac{60}{100}$ 0.60 m

5 m and 60 cm $= 5 + 0.60$ m $= 5.60$ m

iii) Express 7 kg and 68 gms as kg.

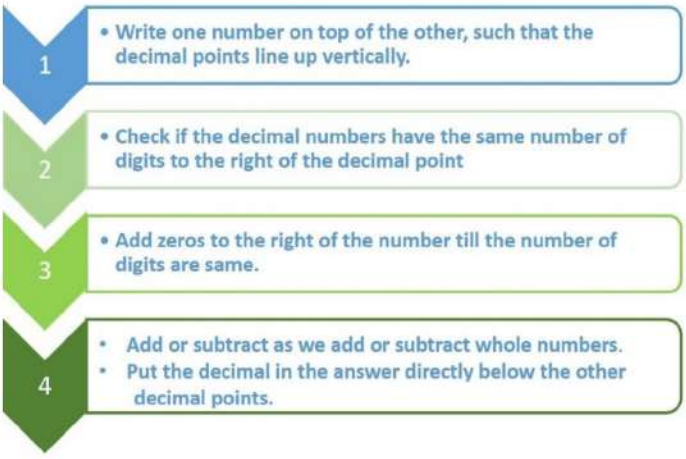
We know that,

1 gm $= \frac{1}{1000}$ kg

68 gms $= \frac{68}{1000}$ kg $= 0.068$ kg

7 kg and 68 gms $= 7+0.068$

Addition and Subtraction of Decimals



Add: 0.19 + 2.3

Decimal numbers, 0.19 and 2.3 have two digits and one digit respectively to the right of the decimal point. So, we add a zero to the right of 2.3.

$$\begin{array}{r} 0.19 \\ +\ 2.30 \\ \hline 2.49 \end{array}$$

9 + 0 = 9

1 + 3 = 4

0 + 2 = 2

Subtract: 39.87 – 21.98

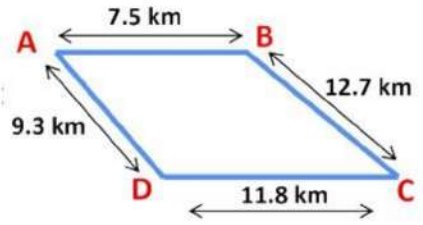
Decimal numbers 39.87 and 21.98 have the same number of zeros after the decimal point.

$$\begin{array}{r} {\scriptstyle 8\ 171} \\ 39.87 \\ -\ 21.98 \\ \hline 17.89 \end{array}$$

Digit at the hundredths place of the top number is smaller than that of the bottom number.
Digit at tenths place of the top number is also smaller than that of the bottom number (8<9).
So, we borrow from ones digit in order to do the subtraction.
17 – 8 = 9
17 – 9 = 8
8 – 1 = 7
3 – 2 = 1

Example: Dinesh went from place A to place B and from there to place C. A is 7.5 km from B and B is 12.7 km from C. Ayub went from place A to place D

and from there to place C. D is 9.3 km from A and C is 11.8 km from D. Who traveled more and by how much?



Distance traveled by Dinesh

= Distance from A to B + Distance from B to C

=7.5 km + 12.7 km

$$\begin{array}{r} {\scriptstyle 1} \\ 7.5 \\ {\scriptstyle 1} \\ +\,12.7 \\ \hline 20.2 \end{array}$$

5 + 7 = 12

1 + 7 + 2 = 10

1 + 1 = 2

Distance traveled by Dinesh = 20.2 km

Distance traveled by Ayub

=Distance from A to D + Distance from D to C

= 9.3 km + 11.8 km

$$\begin{array}{r} {\scriptstyle 1} \\ 9.3 \\ {\scriptstyle 1} \\ +\,11.8 \\ \hline 21.1 \end{array}$$

3 + 8 = 11

1 + 9 + 1 = 11

1 + 1 = 2

Distance traveled by Ayub = 21.1 km

We see that the distance traveled by Ayub is more than the distance traveled by Dinesh.

Difference = 21.1 km – 20.2 km

$$\begin{array}{r} {\scriptstyle 0\ 1} \\ 2\not{1}.1 \\ -\ 20.2 \\ \hline 00.9 \end{array}$$

11 - 2 = 9

0 – 0 = 0

2 – 2 = 0