

Chapter 3

Decimal Numbers

A dot or tiny point placed between two digits of a number is called the **decimal point**. We used the decimal point to separate paise from rupees. When a number contains a decimal point in it, it is called the **decimal** or **the decimal fraction**. Here, the decimal point is used to show a fraction. Thus, a decimal point separates the fraction from a whole number.

Place Value of Decimals: Consider the number 443.186. It is a decimal fraction or simply the decimal. It has two parts. The number formed by the digits on the left of the decimal point, (i.e. 443) is its integral part whereas the number formed by the digits on the right of the decimal point is its decimal part.

6724 → The place value of 6 is 6000; 2562 → The place value of 6 is 600;

5348 → The place value of 4 is 40 and 9275 → The place value of 4 is 4.

From the above discussion, we observe that when the digit 4 moves one place to the right, its value becomes one-tenth $\left(\frac{1}{10}\right)$ of its previous value, when it moves two places to the right, its value becomes one-hundredth $\left(\frac{1}{100}\right)$ of its previous value and so on.

If we wish to continue moving towards right, we shall have to extend the place-value chart beyond ones place by opening the places for tenths, hundredths, thousandths and so on.

Thus, the place value table takes the following shape :

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

If we have to represent the number $47 + \frac{5}{10} + \frac{3}{100}$ in the place value chart, then 4 goes to tens place, 7 goes to ones place, 5 goes to tenths place and 3 goes to hundredths place as indicated below :

Tens	Ones	Tenths	Hundredths
4	7	5	3

The number shown in the chart is written as 47.53 and is called a decimal fraction or simply decimal. It is read as thirty-seven point five two. Here the point (.) is called the decimal point, and it separates whole number and fractional parts.

Similarly, the number $426 + \frac{3}{10} + \frac{8}{100} + \frac{7}{1000}$ is written as 426.387 and read as four hundred twenty-six point three eight seven.

It can also be read as four hundred twenty-six and three hundred eight-seven hundredths.

Now, study the following table :

Number	Read as
18 . 4	Eighteen point four
33 . 11	Thirty-three point one one
0 . 83	Zero point eight three
128 . 01	One hundred twenty-eight point zero one

A decimal may contain a whole number part and a decimal part as shown below:

In 22.74, the whole number part is 22 and the decimal part is 74.

In 5.702, the whole number part is 5 and the decimal part is 702.

In 0.85, the whole number part is 0 and the decimal part is 85.

In 42.0, the whole number part is 42 and the decimal part is 0.

The decimals consisting of only one part, i.e., either decimal part or whole number part can be written by making use of zero in whole or decimal part as shown below:

37 can be written as 37.0.

.9 can be written as 0.9.

.406 can be written as 0.406 etc.

DECIMAL PLACES

The number of digits contained in the decimal part of a decimal gives the number of its decimal places.

For example, 5.64 has two decimal places and 46.175 has three decimal places.

Example 1 : Arrange the following decimals in the place value chart :

14.65, 8.07, 71.857

Solution : The given decimals can be arranged in the place value chart as shown below :

S. No.	Tens 10	Ones 1	Tenths $\frac{1}{10}$	Hundredths $\frac{1}{100}$	Thousandths $\frac{1}{1000}$
14.65	1	4	6	5	
8.07		8	0	7	
71.857	7	1	8	5	7

Example 2 : Write the following decimals in words :

- (a) 37.4 (b) 59.73 (c) 208.506

Solution : (a) 37.4 \longrightarrow Thirty-seven and four tenths

(b) 59.73 \longrightarrow Fifty-nine and seventy-three hundredths

(c) 208.506 \longrightarrow Two hundred eight and five hundred six thousandths.

Example 3 : Write each of the following as a decimal :

- (a) Seventeen point five three
 (b) Eighty-one and six hundredth
 (c) Two hundred four point zero six nine

Solution : (a) Seventeen point five three = 17.53

(b) Eighty-one and six hundredths = $81 + \frac{0}{10} + \frac{6}{100} = 81.06$

(c) Two hundred four point zero six nine = 204.069.

Example 4 : Express the following as a decimal :

- (a) $8 + \frac{6}{10} + \frac{1}{100}$ (b) $32 + \frac{5}{10} + \frac{4}{100}$ (c) $64 + \frac{9}{100} + \frac{5}{1000}$

Solution : (a) $8 + \frac{6}{10} + \frac{1}{100} = 8.61$

(b) $32 + \frac{5}{10} + \frac{4}{100} = 32.54$

(c) $64 + \frac{8}{100} + \frac{5}{1000} = 64 + \frac{0}{10} + \frac{9}{100} + \frac{5}{1000} = 64.095.$



Testing Time 3.1

1. Write the decimals shown in the table:

	Hundreds 100	Tens 10	Ones 1	Tenths $\frac{1}{10}$	Hundredths $\frac{1}{100}$	Thousandths $\frac{1}{1000}$
(a)		1	2	6	3	
(b)		5	7	4	8	
(c)	1	3	0	0	5	4
(d)	6	0	3	5	0	6

2. Write each of the following decimals in words:

(a) 2.7

(b) 16.3

(c) 29.46

(d) 251.83

(e) 0.69

(f) 7.352

(g) 73.104

(h) 0.835

3. Write each of the following as decimals:

(a) $14 + \frac{6}{10} + \frac{3}{100}$

(b) $56 + \frac{8}{100}$

(c) $73 + \frac{2}{10} + \frac{9}{100} + \frac{5}{1000}$

(d) $62 + \frac{5}{10} + \frac{7}{1000}$

(e) $\frac{8}{10} + \frac{3}{100}$

(f) $777 + \frac{8}{10} + \frac{8}{1000}$

4. Write each of the following as a decimal:

(a) Twenty point five one

(b) Thirty-six and four tenths

(c) Nineteen and nineteen hundredths

(d) Three hundred nine and seven hundredths

(e) Seven thousandths

(f) Ninety and one hundredths

(g) Two hundred and three thousandths

(h) Thirty-eight and four thousandths

(i) Zero point seven four one

LIKE DECIMALS

Decimals having the same number of decimal places are called like decimals.

For example, 7.32, 0.65, 47.04, 18.91 etc. are like decimals, each having two decimal places.

UNLIKE DECIMALS

Decimals having different number of decimal places are called unlike decimals.

For example, 8.31, 0.5, 3.562 etc. are unlike decimals.

Remember

The addition of zeros to the extreme right of a decimal part does not change the value of the decimal number, i.e., $3.8 = 3.80 = 3.8000$ etc.

Such decimals are called equivalent but unlike decimals. Thus, without changing the value of a decimal number, the number of decimal places can be increased simply by adding required number of zeros to extreme right of its decimal part.

CONVERSION OF UNLIKE DECIMALS INTO LIKE DECIMALS

Study the following example.

Example 5 : Express 4.3, 16.82, 0.192, 132.08 as a set of like decimals.

Solution : Here, the decimal number having highest decimal places is 0.192. It has 3 decimal places. Therefore, we have to convert other decimals into their equivalent decimals which have three decimal places, i.e.,

$$4.3 = 4.300, 16.82 = 16.820, 132.08 = 132.080$$

Thus, 4.300, 16.820, 0.192 and 132.080 is a set of like decimals.

Example 6 : Arrange the digits of 274.906 in the place value chart and write the place value of each digit. Also, write 274.906 in the expanded form.

Solution : The digits of 274.906 can be arranged in the place value chart as shown below:

Hundreds	Tens	Ones	Dec. point	Tenths	Hundredths	Thousandths
2	7	4	.	9	0	6

In 274.906, we have:

$$\text{Place value of 2} = 2 \text{ hundreds} = 2 \times 100 = 200$$

$$\text{Place value of 7} = 7 \text{ tens} = 7 \times 10 = 70$$

$$\text{Place value of 4} = 4 \text{ ones} = 4 \times 1 = 4$$

$$\text{Place value of 9} = 9 \text{ tenths} = 9 \times \frac{1}{10} = \frac{9}{10}$$

$$\text{Place value of 0} = 0 \text{ hundredths} = 0 \times \frac{1}{100} = 0$$

$$\text{Place value of 6} = 6 \text{ thousandths} = 6 \times \frac{1}{1000} = \frac{6}{1000}$$

In expanded form, we may write

$$274.906 = 2 \text{ hundreds} + 7 \text{ tens} + 4 \text{ ones} + 9 \text{ tenths} + 0 \text{ hundredths} + 6 \text{ thousandths}$$

$$\begin{aligned}
 &= 200 + 70 + 4 + \frac{9}{10} + \frac{0}{100} + \frac{6}{1000} \\
 &= 200 + 70 + 4 + \frac{9}{10} + \frac{6}{1000}.
 \end{aligned}$$

COMPARISON OF DECIMALS

To compare two decimals we take the following steps:

- Step1.** Convert the given decimals into like decimals.
- Step2.** First compare the whole number parts.
- Step3.** If they are the same, compare the tenths digits.
- Step4.** If they are the same, compare the hundredths digits and so on.

Example 7 : Compare 18.37 and 31.24.

Solution : Given decimals are 18.37 and 31.24.

Let us compare their whole number parts.

Clearly, $18 < 31$.

$\therefore 18.37 < 31.24$.

Example 8 : Compare 27.407 and 27.409.

Solution : Given decimals are 27.407 and 27.409.

Here, both the decimals have equal whole number parts namely, 27.

So, we compare their decimal parts.

Their tenths and hundredths digits are same.

Let us compare their thousandths digits.

Clearly, 7 thousandths $<$ 9 thousandths.

$\therefore 27.407 < 27.409$.

Example 9 : Arrange the following decimal fractions in ascending order :

2.03, 3.15, 0.25, 0.9

Solution : The smallest fraction is 0.25. The next fraction greater than 0.25 is 0.9. The other fractions in ascending order are 2.03 and 3.15.

Hence, the given decimal fractions in ascending order are:

0.25, 0.9, 2.03, 3.15.

Alternative Method

On converting the given fractions to like decimals, we get

2.03, 3.15, 0.25, 0.90

After arranging 203, 315, 25 and 90 in ascending order, we get

25, 90, 203, 315

∴ Fractions when arranged in ascending order are: 0.25, 0.9, 2.03, 3.15.

Example 10 : Arrange the following decimal fractions in descending order :

6.5, 0.49, 3.612, 0.6.

Solution : On converting the decimal fractions into like decimals, we get

6.500, 0.490, 3.612, 0.600

Now, arranging 6500, 490, 3612 and 600 in descending order, we get

6500, 3612, 600, 490

The decimal fractions when arranged in descending order are:

6.5, 3.612, 0.6, 0.49.



Testing Time 3.2

1. Convert each of the following groups of unlike decimals into like decimals :

(a) 18.6, 9.52

(b) 24.2, 0.64

(c) 21.5, 122, 83.42

(d) 0.5, 0.896, 9.12

2. Write the following in short form :

(a) $0.4 + 0.07$

(b) $26 + 0.5 + 0.09 + 0.008$

(c) $300 + 7 + \frac{2}{100} + \frac{8}{1000}$

(d) $700 + 50 + 8 + \frac{3}{10} + \frac{6}{100} + \frac{9}{1000}$

3. Fill in the boxes with correct numeral :

(a) $4.72 = 4 + \frac{7}{\square} + \frac{2}{100}$

(b) $18.63 = 10 + \square + \frac{6}{10} + \frac{\square}{100}$

(c) $25.08 = \square + 5 + \frac{8}{\square}$

(d) $203.952 = \square + 3 + \frac{\square}{10} + \frac{5}{\square} + \frac{\square}{1000}$

4. Fill in the boxes with the symbol > or < :

(a) $4.053 \square 3.925$

(b) $5.28 \square 5.293$

(c) $3.6 \square 0.702$

(d) $0.086 \square 1.02$

(e) $2.215 \square 8.606$

(f) $0.418 \square 0.417$

5. Arrange the following decimals in ascending order:

- (a) 4.9, 2.08, 1.87, 3, 5.2
- (b) 0.17, 9.2, 7.025, 2.9, 6.23
- (c) 6.307, 15.21, 0.985, 0.97, 6.4, 5.92
- (d) 0.7, 1.32, 8.006, 5.621, 0.73, 6.02

6. Arrange the following decimals in descending order:

- (a) 5.7, 0.49, 12.6, 10.52, 5.9
- (b) 11.85, 13.62, 9.106, 0.857, 6.008
- (c) 7.7, 0.77, 77.7, 7.07, 7.007
- (d) 13.6, 63.1, 13.16, 13.163, 12.98

CONVERSION OF A DECIMAL FRACTION INTO A COMMON FRACTION

Study the following:

(a) $0.2 = \frac{2}{10}$

(b) $0.15 = \frac{1}{10} + \frac{5}{100} = \frac{1 \times 10 + 5}{100} = \frac{15}{100}$

(c) $5.07 = 5 + \frac{7}{100} = \frac{5 \times 100 + 7}{100} = \frac{507}{100}$

(d) $4.612 = 4 + \frac{6}{10} + \frac{1}{100} + \frac{2}{1000} = \frac{4 \times 1000 + 6 \times 100 + 1 \times 10 + 2}{1000} = \frac{4612}{1000}$

What do you conclude?

We conclude that to convert a decimal fraction into a common fraction, we remove the decimal point from the given fraction and the number thus obtained becomes the numerator of the common fraction. The denominator is formed by putting 1 and the number of zeros at the right of 1 equal to the number of digits at the right of the decimal point in the given decimal fraction.

Example 11 : Convert 0.4, 0.05 and 0.632 into common fractions in the lowest terms.

Solution : $0.4 = \frac{4}{10} = \frac{2}{5}$

$$0.05 = \frac{5}{100} = \frac{1}{20}$$

$$0.632 = \frac{632}{1000} = \frac{79}{125}$$

Example 12 : Convert the following into common fractions in the lowest terms :

(a) 7.5

(b) 8.56

(c) 6.435

Solution : (a) $7.5 = \frac{75}{10} = \frac{15}{2} = 7\frac{1}{2}$
 (b) $8.56 = \frac{856}{100} = \frac{214}{25} = 8\frac{14}{25}$
 (c) $6.435 = \frac{6435}{1000} = \frac{1287}{200} = 6\frac{87}{200}$.

CONVERSION OF A COMMON FRACTION INTO A DECIMAL

In previous class, we have learnt how to convert a common fraction into an equivalent common fraction. We shall apply the same rule to convert a given common fraction into an equivalent common fraction whose denominator is 10 or a multiple of 10.

Study these examples:

(a) $\frac{1}{5} = \frac{1 \times 2}{5 \times 2} = \frac{2}{10} = 0.2$

(b) $\frac{1}{4} = \frac{1 \times 25}{4 \times 25} = \frac{25}{100} = 0.25$

(c) $\frac{5}{8} = \frac{5 \times 125}{8 \times 125} = \frac{625}{1000} = 0.625$.

What do you observe from the above examples?

We observe that to change a common fraction into a decimal fraction, first we change the given common fraction into an equivalent common fraction whose denominator is 10 or 100 or 1000 etc. After that we change it into a decimal fraction.

We can also adopt the following division method to change a common fraction into a decimal fraction.

$$\begin{array}{r} 0.2 \\ 5 \overline{) 1.0} \\ \underline{- 10} \\ 0 \end{array}$$

$$\begin{array}{r} 0.25 \\ 4 \overline{) 1.00} \\ \underline{- 8} \\ 20 \\ \underline{- 20} \\ 0 \end{array}$$

$$\begin{array}{r} 0.625 \\ 8 \overline{) 5.000} \\ \underline{- 48} \\ 20 \\ \underline{- 16} \\ 40 \\ \underline{- 40} \\ 0 \end{array}$$

$\therefore \frac{1}{5} = 0.2$

$\frac{1}{4} = 0.25$

$\frac{5}{8} = 0.625$.

While adopting division method, we take the following steps:

Step 1. We divide the numerator by the denominator.

Step 2. When we have finished the division and a non-zero remainder is left, we insert a decimal point in the dividend and the quotient and put a zero on the right of the decimal point in the dividend and the remainder. We divide again.

Step 3. We continue the division process just like whole numbers till we get a zero remainder.

Note: Conversion of some fractions like $\frac{2}{3}$, $\frac{3}{7}$, $\frac{5}{9}$ etc. for which the process of division never ends will be dealt in the higher classes.

Example 13: Convert $6\frac{1}{4}$ into decimal.

Solution : $6\frac{1}{4} = \frac{25}{4} = 6.25$

Another Method:

$$\begin{aligned} 6\frac{1}{4} &= 6 + \frac{1}{4} \\ &= 6 + \frac{1 \times 25}{4 \times 25} \\ &= 6 + \frac{25}{100} \\ &= 6 + 0.25 = 6.25. \end{aligned}$$

$$\begin{array}{r} 6.25 \\ 4 \overline{) 25.00} \\ \underline{-24} \\ 10 \\ \underline{-8} \\ 20 \\ \underline{-20} \\ 0 \end{array}$$



Testing Time 3.3

1. Convert the following decimals into common fractions in the lowest terms:

- (a) 0.2 (b) 0.72 (c) 5.02 (d) 0.05 (e) 0.007 (f) 82.07
 (g) 6.23 (h) 18.24 (i) 15.635 (j) 34.275 (k) 60.855 (l) 0.222

2. Convert these fractions into decimals:

- (a) $\frac{12}{5}$ (b) $\frac{13}{4}$ (c) $\frac{7}{20}$ (d) $\frac{33}{100}$
 (e) $\frac{49}{1000}$ (f) $19\frac{7}{25}$ (g) $21\frac{9}{16}$ (h) $26\frac{3}{40}$
 (i) $\frac{245}{100}$ (j) $\frac{700}{125}$ (k) $6\frac{7}{200}$ (l) $5\frac{13}{1000}$

USE OF DECIMAL NOTATION IN THE MEASURE OF LENGTH, MASS AND CAPACITY

Length

We know that $1 \text{ m} = 100 \text{ cm}$

$$\therefore 1 \text{ cm} = \frac{1}{100} \text{ m} = 0.01 \text{ m}$$

Similarly, $2 \text{ cm} = \frac{2}{100} \text{ m} = 0.02 \text{ m}$

$$10 \text{ cm} = \frac{10}{100} \text{ m} = 0.1 \text{ m}$$

$$25 \text{ cm} = \frac{25}{100} \text{ m} = 0.25 \text{ m}$$

- ✖ 6 m 27 cm can be written as 6.27 m and 13 m 46 cm as 13.46 m.

We know that

$$1 \text{ cm} = 10 \text{ mm}$$

$$\therefore 1 \text{ mm} = \frac{1}{10} \text{ cm} = 0.1 \text{ cm.}$$

Similarly, $3 \text{ mm} = \frac{3}{10} \text{ cm} = 0.3 \text{ cm.}$

and $8 \text{ mm} = \frac{8}{10} \text{ cm} = 0.8 \text{ cm.}$

- ✖ 6 cm 5 mm can be written as 6.5 cm and 3 cm 5 mm as 3.5 mm .

The higher unit of length is kilometre.

We know that

$$1 \text{ km} = 1000 \text{ m}$$

$$\therefore 1 \text{ m} = \frac{1}{1000} \text{ km} = 0.001 \text{ km}$$

$$4 \text{ m} = \frac{4}{1000} \text{ km} = 0.004 \text{ km}$$

$$70 \text{ m} = \frac{70}{1000} \text{ km} = 0.07 \text{ km}$$

$$600 \text{ m} = \frac{600}{1000} \text{ km} = 0.6 \text{ km}$$

and $286 \text{ m} = \frac{286}{1000} \text{ km} = 0.286 \text{ km}$

- ✖ 4 km 320 m can be written as 4.320 km or 4.32 km and 18 km 465 m as 18.465 km.

Mass

We know that, $1 \text{ kg} = 1000 \text{ g}$

$$\therefore 1 \text{ g} = \frac{1}{1000} \text{ kg} = 0.001 \text{ kg}$$

$$\text{Similarly, } 5 \text{ g} = \frac{5}{1000} \text{ kg} = 0.005 \text{ kg}$$

$$40 \text{ g} = \frac{40}{1000} \text{ kg} = 0.04 \text{ kg}$$

$$328 \text{ g} = \frac{328}{1000} \text{ kg} = 0.328 \text{ kg}$$

7 kg 325 g can be written as 7.325 kg and 14 kg 35 g as 14.035 kg.

Capacity

We know that, $1 \text{ l} = 1000 \text{ ml}$

$$\therefore 1 \text{ ml} = \frac{1}{1000} \text{ l} = 0.001 \text{ l}$$

$$5 \text{ ml} = \frac{5}{1000} \text{ l} = 0.005 \text{ l}$$

$$60 \text{ ml} = \frac{60}{1000} \text{ l} = 0.06 \text{ l}$$

$$\text{and } 325 \text{ ml} = \frac{325}{1000} \text{ l} = 0.325 \text{ l}$$

8 l 925 ml can be written as 8.925 l, 6 l 420 ml as 6.42 l and 13 l 68 ml as 13.068 l.



Testing Time 3.4

1. Express each of the following using decimal point :

- | | | | |
|-----------------|-----------------|----------------|----------------|
| (a) 38 m 42 cm | (b) 81 m 25 cm | (c) 44 m 7 cm | (d) 6 cm 8 mm |
| (e) 13 cm 6 mm | (f) 15 km 726 m | (g) 52 km 87 m | (h) 86 km 2 m |
| (i) 23 kg 425 g | (j) 47 kg 80 g | (k) 63 kg 8 g | (l) 7 l 375 ml |
| (m) 38 l 450 ml | (n) 52 l 7 ml | | |

2. Rewrite each of the following without decimal point :

- | | | | | |
|-------------|--------------|--------------|---------------|---------------|
| (a) 8.27 m | (b) 14.08 m | (c) 25.6 m | (d) 45.376 km | (e) 13.648 kg |
| (f) 46.5 kg | (g) 16.365 l | (h) 63.008 l | (i) 72.05 l | (j) 60.086 l |

ADDITION AND SUBTRACTION OF DECIMALS

Addition and subtraction of decimals is as simple as addition and subtraction of whole numbers. The only difference is that we ensure aligning of the decimal points of the given numbers before their addition and subtraction. For this we keep the decimal point in the same column.

Before adding and subtracting the decimals, we convert them into like decimals if they are not.

Study the following examples to make the concept more clear.

Example 14: Add 35.6, 0.59 and 52.406.

Solution : Converting the given decimals into like decimals, they become 35.600, 0.590 and 52.406

Now, writing them columnwise and adding, we get

$$\begin{array}{r} 35.600 \\ + 0.590 \\ + 52.406 \\ \hline 88.596 \end{array}$$

Thus, $35.6 + 0.59 + 52.406 = 88.596$.

Note : It is important to note that the carried digit from tenths place may go beyond the decimal point to reach ones place.

Example 15: Find the sum of 8.4, 0.249 and 15.

Solution :

$$\begin{array}{r} 8.400 \\ + 0.249 \\ + 15.000 \\ \hline 23.649 \end{array}$$

Thus, $8.4 + 0.249 + 15 = 23.649$.

Example 16: Solve: $37.21 + 8.035 + 15.647$.

Solution :

$$\begin{array}{r} 37.210 \\ + 8.035 \\ + 15.674 \\ \hline 60.919 \end{array}$$

Thus, the sum of the given decimal number is 60.919.

Example 17: Subtract 4.21 from 15.65.

Solution : 4.21 and 15.68 are like fractions.

Writing them columnwise and subtracting, we get

$$\begin{array}{r} 15.68 \\ - 4.21 \\ \hline 11.47 \end{array}$$

Thus, $15.68 - 4.21 = 11.47$.

Thus, the required difference is 11.47.

Example 18: Subtract 8.324 from 20.

Solution :

$$\begin{array}{r} 20.000 \\ - 8.324 \\ \hline 11.676 \end{array}$$

Thus, $20.000 - 8.324 = 11.676$.

Example 19: Find the difference between 16.38 and 27.2.

Solution : Since $27.2 > 16.38$, we subtract 16.38 from 27.2.

$$\begin{array}{r} 27.20 \\ - 16.38 \\ \hline 10.82 \end{array}$$

Thus, the required difference is 10.82.

WORD PROBLEMS ON DECIMALS

Let us study following examples.

Example 20: Subtract the sum of 13.26 and 24.75 from 52.63.

Solution : First of all we find the sum of 13.26 and 24.75.

$$\begin{array}{r} 13.26 \\ + 24.75 \\ \hline 38.01 \end{array}$$

Now, we subtract 38.01 from 52.63.

$$\begin{array}{r} 52.63 \\ - 38.01 \\ \hline 14.62 \end{array}$$

Hence, the required decimal is 14.62.

Example 21 : Add the difference of 42.08 and 36.52 to 9.74.

Solution : First we subtract 36.52 from 42.08.

$$\begin{array}{r} 42.08 \\ - 36.52 \\ \hline 5.56 \end{array}$$

Now, we add 9.74 to 5.56.

$$\begin{array}{r} 5.56 \\ + 9.74 \\ \hline 15.30 \end{array}$$

Hence, the required decimal is 15.30.



Testing Time 3.5

1. Find the sum :

(a)
$$\begin{array}{r} 2.056 \\ + 13.8 \\ + 9.43 \\ \hline \hline \end{array}$$

(b)
$$\begin{array}{r} 73.46 \\ + 0.82 \\ + 26.047 \\ \hline \hline \end{array}$$

(c)
$$\begin{array}{r} 42.05 \\ + 20.007 \\ + 84.39 \\ \hline \hline \end{array}$$

(d)
$$\begin{array}{r} 68.392 \\ + 4.80 \\ + 102.068 \\ \hline \hline \end{array}$$

(e)
$$\begin{array}{r} 127.046 \\ + 16.795 \\ \hline \hline \end{array}$$

(f)
$$\begin{array}{r} 24.926 \\ + 3.80 \\ + 138.549 \\ \hline \hline \end{array}$$

2. Arrange in columns and add :

(a) 6.28, 3.52 and 3.27

(b) 0.47, 0.6 and 46.3

(c) 23.65, 24 and 29.08

(d) 42.67, 7.263 and 20

3. Solve :

- (a) $8.3 + 0.54 + 20.03$ (b) $70.25 + 9.005 + 2.7$ (c) $27.076 + 0.77 + 0.004$
(d) $150.63 + 25.2 + 41$ (e) $27 + 0.512 + 18.6$ (f) $0.75 + 10.325 + 48$

4. Subtract :

- (a) 18.23 from 30.64 (b) 6.051 from 9.238 (c) 0.23 from 0.57
(d) 0.715 from 1.402 (e) 5.87 from 14.2 (f) 109.54 from 250

5. Find the difference:

- (a) $7.63 - 2.41$ (b) $18.627 - 15.908$ (c) $25.06 - 2.87$
(d) $0.96 - 0.58$ (e) $13.6 - 5.37$ (f) $15 - 6.925$

6. Subtract the sum of 49.15 and 26.73 from 85.68.

7. Subtract the sum of 29.17 and 34.586 from 70.

8. Add the difference of 62.04 and 28.205 to 18.6.

MULTIPLICATION OF DECIMALS

MULTIPLICATION OF A DECIMAL BY A WHOLE NUMBER

To multiply a decimal by a whole number we take the following steps:

Step 1 : Multiply the decimal without the decimal point by the whole number.

Step 2 : Place the decimal point so as to obtain as many decimal places in the product as there are in the decimal number.

Let us understand it through following examples: **A D E M Y**

Example 22 : Multiply 4.92 by 8.

Solution : First, we multiply 492 by 8.

$$\begin{array}{r} 492 \\ \times 8 \\ \hline 3936 \end{array}$$

The given decimal number has 2 decimal places.

So, the product will have 2 decimal places.

Thus, $4.92 \times 8 = 39.36$.

Example 23 : Multiply 9.253 by 17.

Solution : First, we multiply 9253 by 17.



Testing Time 3.6

1. Find :

- (a) 2.5×4 (b) 9.27×5 (c) 14.316×9 (d) 65.176×14
 (e) 312.05×21 (f) 65.24×153 (g) 0.085×25 (h) 0.246×6
 (i) 16.175×37 (j) 73.09×125 (k) 34.420×218 (l) 126.007×84

2. Find the following products:

- (a) 2.4×10 (b) 42.53×10 (c) 0.316×10 (d) 152.383×10
 (e) 9.4×100 (f) 31.84×100 (g) 0.38×100 (h) 9.206×100
 (i) 15.06×1000 (j) 37.425×1000 (k) 0.62×1000 (l) 0.027×1000

MULTIPLICATION OF TWO DECIMALS

Look at the following products:

(a) $0.14 \times 0.5 = \frac{14}{100} \times \frac{5}{10} = \frac{70}{1000} = 0.07$

Thus, $0.14 \times 0.5 = 0.07$

(b) $0.27 \times 0.4 = \frac{27}{100} \times \frac{4}{10} = \frac{27 \times 4}{100 \times 10} = \frac{108}{1000} = 0.108$

Thus, $0.27 \times 0.4 = 0.108$.

(c) $3.26 \times 2.15 = \frac{326}{100} \times \frac{215}{100} = \frac{326 \times 215}{100 \times 100} = \frac{70090}{10000} = 7.009$

Thus, $3.26 \times 2.15 = 7.009$.

Now, study the table given below carefully:

Example	Number of decimal places in		
	Multiplicand	Multiplier	Product
(a) $1.6 \times 0.52 = 0.832$	2	1	$2 + 1 = 3$
(b) $2.35 \times 1.25 = 2.9375$	2	2	$2 + 2 = 4$

From the above table, we observe that in each of the examples, the product contains as many decimal places as these are in the multiplicand and multiplier together.

Thus, to multiply two decimals we take the following steps :

Step 1 : Multiply the multiplicand by the multiplier just like whole numbers.

Step 2 : In the product, place the decimal point so that the number of decimal places in the product is equal to the sum of the decimal places in the multiplier and multiplicand.

$$\begin{array}{r} 9253 \\ \times 17 \\ \hline 64771 \\ 92530 \\ \hline 157301 \end{array}$$

The given decimal number has 3 decimal places.
So, the product will have 3 decimal places.
Thus, $9.253 \times 17 = 157.301$.

MULTIPLICATION OF DECIMALS BY 10, 100, 1000 etc.

Study the following examples:

Example 24: Multiply :

(a) 8.147×10 (b) 8.147×100 (c) 8.147×1000

Solution : (a) $8147 \times 10 = 81470$
Hence, $8.147 \times 10 = 81.470 = 81.47$
(b) $8147 \times 100 = 814700$
Hence, $8.147 \times 100 = 814.700 = 814.7$
(c) $8147 \times 1000 = 8147000$
Hence, $8.147 \times 1000 = 8147.000 = 8147$.

What do you conclude from the above examples?

We conclude that

- ✖ To multiply a decimal by 10, we simply shift the decimal point one place to the right
- ✖ To multiply a decimal by 100, we simply shift the decimal point two places to the right.
- ✖ To multiply a decimal by 1000, we simply shift the decimal point three places to the right.

Remember: Any number of zeros after the last significant (non-zero) digit in the decimal part of a given number does not change the value of the number.

For example, $4.900 = 4.90 = 4.9$
and $0.6 = 0.60 = 0.600$ etc.

But in 5.006, the first 0 is at the tenths place and second 0 is at hundredths place. Here after two 0s, there is a significant digit 6. So, these 0s are meaningful.

The following examples will make the concept more clear.

Example 25 : Multiply 27.3 by 0.46.

Solution : First we multiply 273 by 46.

$$\begin{array}{r}
 273 \\
 \times 46 \\
 \hline
 1638 \\
 10920 \\
 \hline
 12558
 \end{array}$$

Sum of decimal places in given decimals = 1 + 2 = 3.

So, we put the decimal point in the product so as to have 3 decimal places from the right.

Thus, $27.3 \times 0.46 = 12.558$.

Example 26: Multiply 9.738 by 6.3.

Solution : First we multiply 9738 by 63.

$$\begin{array}{r}
 9738 \\
 \times 63 \\
 \hline
 29214 \\
 584280 \\
 \hline
 613494
 \end{array}$$

Sum of decimal places in the given decimals = 3 + 1 = 4.

So, we put the decimal point in the product so as to have 4 decimal places from the right.

Thus, $9.738 \times 6.3 = 61.3494$.



Testing Time 3.7

1. Find the product:

(a) 9.45

(b) 13.526

(c) 7.058

(d) 0.409

$\times 7.3$

$\times 2.7$

$\times 3.6$

$\times 0.8$

2. Find the value of:

(a) 2.3×3.5

(b) 13.6×8.1

(c) 7.5×0.3

(d) 16.3×0.7

(e) 44.5×2.5

(f) 23.81×0.6

(g) 32.07×0.2

(h) 0.8×0.4

(i) 0.43×0.5

(j) 0.036×0.3

(k) 7.008×3.5

(l) 0.007×9.23

(m) 0.089×2.5

3. Match the following columns and write the correct statements in your notebook:

Column I	Column II
I. 0.3×1	(a) 0.084
II. 0.5×8	(b) 0.063
III. 0.12×7	(c) 0.3
IV. 0.21×0.3	(d) 0.84
V. 0.6×0.14	(e) 0.375
VI. 0.75×0.5	(f) 4

DIVISION OF DECIMALS

DIVISION OF A DECIMAL BY A WHOLE NUMBER

To divide a decimal by a whole number we take the following steps.

Step 1 : Perform the division by considering the dividend a whole number.

Step 2 : When the division of whole number part of the dividend is complete, put the decimal point in the quotient and proceed with division as in case of whole numbers.

Let us understand it through the following examples:

Example 27: Divide 25.2 by 6.

Solution :

$$\begin{array}{r}
 4.2 \\
 6 \overline{) 25.2} \\
 \underline{-24} \\
 12 \\
 \underline{-12} \\
 0
 \end{array}$$

Thus, $25.2 \div 6 = 4.2$.

Example 28: Divide 7.164 by 9.

Solution :

$$\begin{array}{r}
 0.796 \\
 9 \overline{) 7.164} \\
 \underline{-0} \\
 71 \\
 \underline{-63} \\
 86 \\
 \underline{-81} \\
 54 \\
 \underline{-54} \\
 0
 \end{array}$$

Thus, $7.164 \div 9 = 0.796$.

What do you conclude from this example?

We conclude that when the whole number part of dividend is less than the divisor, we first place a 0 in the ones place in the quotient followed by a decimal point. Then we divide as usual by forming greater number with the digits of the dividend.

Example 29: Divide 174.36 by 8.

Solution :

$$\begin{array}{r}
 21.795 \\
 8 \overline{) 174.360} \\
 \underline{-16} \\
 14 \\
 \underline{-8} \\
 63 \\
 \underline{-56} \\
 76 \\
 \underline{-72} \\
 40 \\
 \underline{-40} \\
 0
 \end{array}$$

Don't forget to add as many zeros to the extreme right of the decimal fraction divided as are necessary so that the dividend is exactly divided by the divisor.

Thus, $174.36 \div 8 = 21.795$.



Testing Time 3.8

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Divide :

- | | | |
|------------------|------------------|-----------------|
| 1. 18.4 by 4 | 2. 23.5 by 5 | 3. 46.2 by 7 |
| 4. 8.1 by 9 | 5. 82.5 by 15 | 6. 96.42 by 12 |
| 7. 87.21 by 18 | 8. 46.312 by 14 | 9. 7.728 by 14 |
| 10. 124.05 by 15 | 11. 725.34 by 21 | 12. 9.62 by 32 |
| 13. 287.32 by 16 | 14. 39.818 by 43 | 15. 59.62 by 25 |
| 16. 0.767 by 13 | 17. 5.1 by 4 | |

DIVISION OF A DECIMAL BY 10, 100, 1000 etc.

Study the following examples.

Example 30: Find the quotient:

- (a) $63.5 \div 10$ (b) $84.7 \div 100$ (c) $105.36 \div 1000$