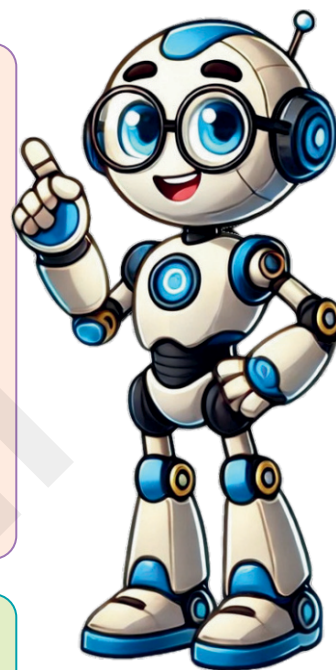# 6 Decimals

We'll cover the following key points:

→ What are Decimals?

→ Converting a Decimal into a Fraction

→ Like and Unlike Decimals

→ Comparing decimals

→ Addition and Subtraction of Decimals

→ Multiplication of Decimals

→ Multiplication of a decimal by another decimal

→ To Find the Product of a Decimal by a Decimal

→ Division of Decimals

→ Division of a decimal by 10, 100, 1000, ...

→ Division of a decimal by Another Decimal

Do you Remember fundamental concept in previous class.

In class 4th we learnt

→ What are Decimals

→ Comparison of Decimals

→ Addition of Decimals

→ Subtraction of Decimals

EeeBee

Still curious? Talk to me by scanning the QR code.

Learning Outcomes

By the end of this chapter, students will be able to:

- Understand the concept of decimals as an extension of the number system.
- Read and write decimal numbers up to two or more decimal places.
- Compare and order decimal numbers using place value.
- Convert decimals into fractions and vice versa.
- Perform operations (addition, subtraction, multiplication, and division) on decimal numbers.
- Represent decimal numbers on a number line.
- Apply decimals to solve real-life problems, such as those involving money, measurements, and weights.
- Round decimal numbers to the nearest whole number, tenth, or hundredth.

Warm Up

Copy the given decimal numbers vertically and add:
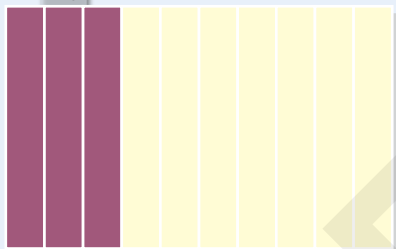
1. 0.7 + 0.37 + 0.09 + 0.63

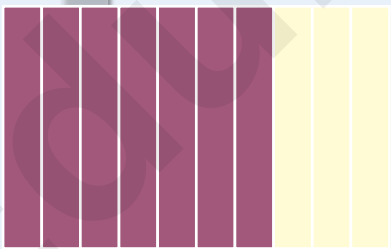2. 1.53 + 1.25 + 1.06 + 1.20

3. 9.1 + 11.11 + 777.777

4. 0.485 + 0.623 + 0.184 + 0.667
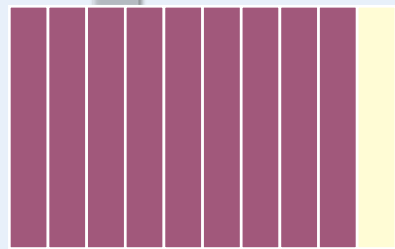
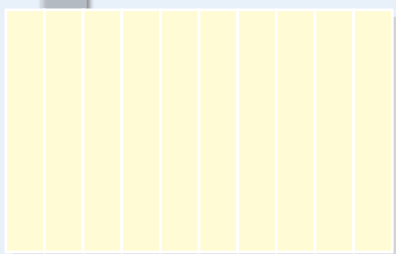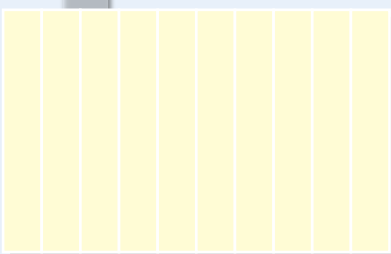**Write the decimals for the coloured part:**
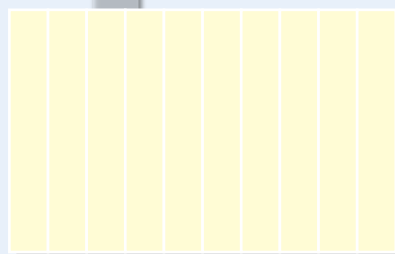
1.

2.

3.

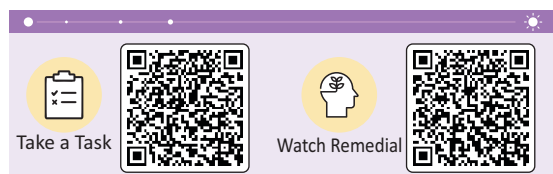**Colour to show the given decimals:**

1. six tenths

2. 0.8

3. five tenths

What are Decimals?

Fractions with denominators 10, 100, 1000, ... are called decimal fractions.

Thus, $\frac{4}{10}$, $\frac{58}{100}$, $\frac{312}{1000}$ are all decimal fractions. They are written as 0.4, 0.58 and 0.312 respectively by using a point (.) called the **decimal point**.

A decimal consists of two parts: a **whole number** part and a **decimal number** part. Both the parts are separated by a dot (.), called decimal point.

Look at the following **Place Value Chart**.

Ten Thousands	Thousands	Hundreds	Tens	Ones		Tenths	Hundredths	Thousandths
10000	1000	100	10	1	Decimal point (.)	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
Whole Number (Whole Number Part)						Fractional Part (Decimal Part)		

The place value chart contains places for the digits of whole numbers and such fractions whose denominators are 10, 100, 1000,....... etc.

To separate whole numbers from fractional numbers, a small dot (.) i.e. **decimal point** is put between the **ones place** and the **tenths place**.

It can be observed from the place value chart that each place just right to a given place is one-tenth of value of the given place.

Or

Each place just left to a given place is 10 times the value of the given place. Thus, we have the following :

1 ones	= 10 tenths		10 tenths	= 1 ones
1 tenths	= 10 hundredths	Or	10 hundredths	= 1 tenths
1 hundredths	= 10 thousandths		10 thousandths	= 1 hundredths

Example 1 :   Write 489.256 in expanded form.

Solution : Arrange the given number in the **Place Value chart**

Places	Thousands	Hundreds	Tens	Ones	Decimal point	Tenths	Hundredths	Thousandths
Value of Place	1000	100	10	1	(.)	$\dfrac{1}{10}$	$\dfrac{1}{100}$	$\dfrac{1}{1000}$
Digits		4	8	9	(.)	2	56	
Place value of the digits		4×100 $= 400$	8×10 $= 80$	9×1 $= 9$	(.)	$2 \times \dfrac{1}{10}$ $= \dfrac{2}{10}$	$5 \times \dfrac{1}{100}$ $= \dfrac{5}{100}$	$6 \times \dfrac{1}{1000}$ $= \dfrac{6}{1000}$

Thus, the expanded form of 489.256 is given by

$$489.256 = 400 + 80 + 9 + \frac{2}{10} + \frac{5}{100} + \frac{6}{1000}$$

Or

489.256 = **4 hundreds + 8 tens + 9 ones + 2 tenths + 5 hundredths + 6 thousandths**

Example 2 : Write 87 hundredths as a sum of hundredths and tenths.

Solution : 87 hundredths = 80 hundredths + 7 hundredths

= **8 tenths + 7 hundredths**

Example 3 : Write the decimal number corresponding to the following :

5 hundreds + 8 tens + 4 ones + 2 tenths + 9 hundredths

Solutions : 5 hundreds + 8 tens + 4 ones + 2 tenths + 9 hundredths

$$= (5 \times 100) + (8 \times 10) + (4 \times 1) + \left(2 \times \frac{1}{10} \right) + \left(9 \times \frac{1}{100} \right)$$

$$= 500 + 80 + 4 + \frac{2}{10} + \frac{9}{100} = 584 + \frac{2}{10} + \frac{9}{100} = 584 + \frac{29}{100} = \textbf{584.29}$$

Example 4: Convert 23.45 into a fraction.

Solution : $23.45 = \dfrac{23}{1} + \dfrac{4}{10} + \dfrac{5}{100}$

$$= \frac{(23 \times 100) + (4 \times 10) + (5 \times 1)}{100} \quad \text{[LCM of 10 and 100 is 100.]}$$

$$=$$

$$\frac{2300 + 40 + 5}{100} = \frac{2345}{100}$$

Converting a Decimal into a Fraction

Follow the steps given below for converting a decimal number into a fractional number :

Working Rules

1. Write the decimal without the decimal point as the numerators of the fractions.
2. Write the denominator of the fraction by putting 1 and the number of zeroes at its right equal to the number of digits to the right of decimal point in the given number.
3. Simplify the fraction and write the fraction in its possible lowest form.

Example 5: Convert the following decimal numbers into lowest form of fractions :

(I) 39.230   (ii) 245.25   (iii) 924.275

Solution :   **First Method**

(i) $39.230 = \dfrac{39230}{1000} = \dfrac{3923}{100} = 39\dfrac{23}{100}$ [Cancelling by 10]

(ii) $245.25 = \dfrac{24525}{100}^{981}_{4} = \dfrac{981}{4} = 245\dfrac{1}{4}$ [Cancelling by 25]

(iii) $924.275 = \dfrac{924275}{1000}^{36971}_{40} = \dfrac{36971}{40} = 924\dfrac{11}{40}$ [Cancelling by 25]

Second Method

(I) $39.230 = 39 + \dfrac{230}{1000} = 39 + \dfrac{23}{100} = 39\dfrac{23}{100}$

(ii) $245.25 = 245 + \dfrac{25}{100}^{1}_{4} = 245 + \dfrac{1}{4} = 245\dfrac{1}{4}$

(iii) $924.275 = 924 + \dfrac{275}{1000}^{11}_{40} = 924 + \dfrac{11}{40} = 924\dfrac{11}{40}$

Exercise 6.1

Knowledge Application

1. Write the expanded form :

(a) 28.093   (b) 2.667   (c) 125.93

(d) 98.373   (e) 916.616   (f) 118.36

2. **Write decimal for each of the following :**

   (a) 5 ones + 6 tenths + 2 hundredths + 1 thousandths

   (b) 2 hundreds + 3 ones + 4 tenths + 2 thousandths

   (c) 3 hundreds + 2 tens + 4 ones + 2 thousandths

   (d) 2 hundreds + 5 tens + 9 hundredths + 3 thousandths

   (e) 6 tens + 4 ones + 5 tenths + 7 thousandths

3. **Convert the following as fraction in the lowest term or as mixed numbers:**

   (a) 13.72   (b) 94.07   (c) 3.125   (d) 17.250

   (e) 42.100   (f) 32.04   (g) 210.200   (h) 6.0005
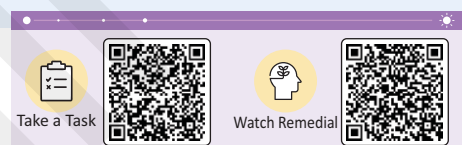
Like and Unlike Decimals

We know that fractions having the same denominators are called like fractions and fractions having different denominators are called unlike fractions. Similarly, the decimals having the same number of decimal places are called like decimals (such as 22.8, 5.5, 222.8 are like decimals) and the decimals having different number of decimal places are called unlike decimals (such as 42.3, 8.54, 422.488 are unlike decimals).

Example 6:   Write 'like decimals' or 'unlike decimals' for each of the following:

   (I)   22.32 and 256.76   (ii)   289.2 and 31.12

   (iii)   1.634 and 6.183

Solution :   (I)   22.32 and 256.76

Same number of decimal places

22.32   256.76
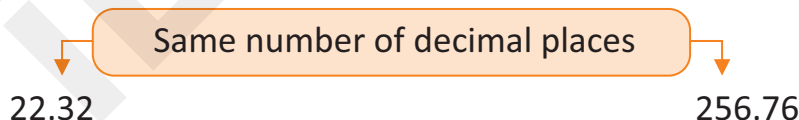
Since both the decimals have same (i.e. equal) number of decimal places, they are like decimals.

   (ii)   289.2 and 31.12

Different number of decimal places

289.2   31.12

One decimal place   Two decimal places
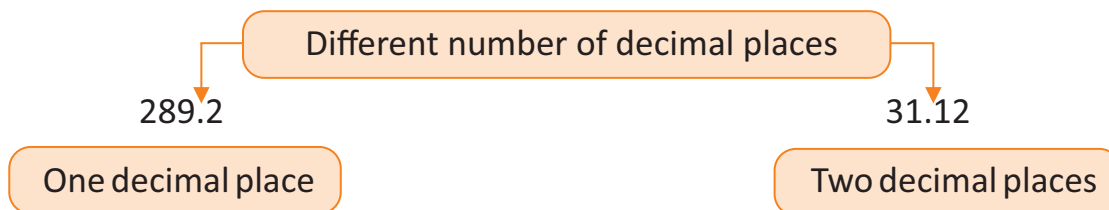
Since, there are different number of decimal places, the given decimals are unlike

decimals.

   (iii) 1.634 and 6.183

Since both the decimal numbers have same number of decimal places i.e. 3, they are **like decimals**.

While grouping the decimals into 'like decimals' and 'unlike decimals', only the digits or places in the decimal part of the decimals are considered. The number of digits or places in the whole number part of the decimals are not considered.

Conversion of unlike decimals into like decimals

We know that the addition of zeroes to extreme right of a decimal part does not change the value of the decimal number

i.e.   9.3 = 9.30 = 9.300 = 9.3000

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

Read the following unlike decimals and their respective like decimals:

	Unlike decimal	Like decimal
(I)	8.7, 4.25	8.70, 4.25
(ii)	5.34, 3.754	5.340, 3.754
(iii)	8.7, 2.45	8.70, 2.45
(iv)	3.7, 8.751	3.700, 8.751
(v)	2.753, 4.2, 1.25	2.753, 4.200, 1.250

Example 7: Convert the following unlike decimals into like decimals:

2.5, 54.29 and 7.251

Solution: Here, the decimal number having highest decimal places is 7.251. It has 3 decimal places. Therefore, we have to convert other two given decimals into their equivalent decimal which have three decimal places.

i.e.   2.5 = 2.500

54.29 = 54.290

Thus, 8.300, 54.290 and 7.251 are the required like decimals

Comparing decimals

In comparison of decimal numbers, first we compare the whole number parts of the decimal numbers. If the whole number parts are equal, then we compare the extreme left digits of the decimal parts of the decimal numbers. If they are equal, then we compare the next digits and so on.

Example 8 :   Write the greater decimals in the following:

    (I) 21.23 and 24.78   (ii) 71.25 and 71.56

    (iii) 761.32 and 761.35

Solution: (I) 21.23 and 24.78

    First, we compare the whole number parts of the decimals 21.23 and 24.78 i.e. 21 and 24.

    Since, 24 > 21, therefore, 24.78 > 21.23.

    (ii) 71.25 and 71.56

    Here, the whole number part in each decimal is equal i.e. 71.

    So, we compare the decimal parts i.e. .25 and .56.

    Since, 5 > 2 i.e. 56 > 25, hence 71.56 > 71.25.

    (iii) 761.32 and 761.35

    Here, whole number parts are equal. So, we compare the decimal parts. .32 and .35.

    Here, the extreme left digit of the decimal part is equal i.e. 3.

    Now, compare the next digit to the extreme left of the decimals.

    Since, 5 > 2, i.e. 35 > 32, hence 761.35 > 761.32.

Example 9 :   Arrange the following decimals in descending order :

        1.5, 3.3, 6.0, 6.7, 6.8, 3.5, 28.1

Solution :   On comparing the whole number parts, we find that 28.1 has the greatest whole number part and 1.5 has the smallest whole number part. Comparing 6.0, 6.7 and 6.8, we get 6.8 > 6.7 > 6.0

    Also, comparing 3.3 and 3.5, we get 3.5 > 3.3.

    Thus, the required descending order is: **28.1, 6.8, 6.7, 6.0, 3.5, 3.3, 1.5**

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

   (a)   5.7, 7.81

   (b)   4.001, 4.01, 4.1

   (c)   22.03, 220.3

   (d)   5.2, 0.22, 0.202, 0.2020

2. **Fill in the boxes using > , < or = to make the statements true :**

   (a)   87.6 ☐ 6.4

   (b)   6.85 ☐ 8.94

   (c)   18.01 ☐ 30.1

   (d)   6.99 ☐ 6.997

   (e)   25.29 ☐ 39.45

   (f)   21.27 ☐ 21.270

3. **Rewrite the following groups of decimals in ascending order.**

   (a)   0.342, 0.324, 0.243, 0.234, 0.432, 0.423

   (b)   8.77, 8.07, 8.707, 80.7, 787.0, 707.8

   (c)   444.4, 44.44, 4.444, 4444, 40.44, 0.4444

   (d)   5434, 0.05434, 0.5434, 5.434, 54.34, 543.4

4. **Rewrite the following groups of decimals in descending order.**
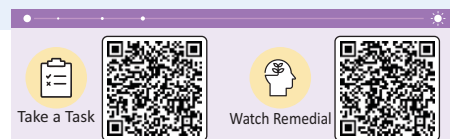
   (a)   6.789,   67.89,   69.76,   6.987,   698.7,   68.99

   (b)   56.783,   5.7836,   578.63,   56.938,   57.93,   598.36

   (c)   97.335,   79.533,   87.235,   78.459,   88.923,   99.202

   (d)   536.7,   53.67,   5.367,   59.03,   51.995,   59.02

Addition and Subtraction of Decimals

Take a Task   Watch Remedial

For adding or subtracting the decimal numbers, we arrange the numbers one below the other such that the decimal points in numbers are in vertical line.

While arranging the digits of the decimal numbers, they must be put at the proper places. All vacant places should be filled in with zeroes.

Example 10 :   Add 65.251, 32.72, 4.9 and 22.64.

Solution :   Arrange the decimals in columns so that the decimal points are in one vertical line. The missing places in the decimal are filled in with zeroes.

$$6\ 5\ .\ 2\ 5\ 1$$

$$\left.\begin{array}{r} 3\,2\,.\,7\,2\,0 \\ +\,0\,4\,.\,9\,0\,0 \\ +\,2\,2\,.\,6\,4\,0 \end{array}\right\} \leftarrow \text{Addends}$$

$$\overline{1\,2\,5\,.\,5\,1\,1} \leftarrow \text{Sum}$$

Thus, $65.251 + 32.72 + 4.9 + 22.64 = 125.511$.

Example 11 : Subtract 61.689 from 89.02.

Solution : Arrange the given decimal numbers in columns.

Fill in the vacant places by zeroes and subtract.

$$\begin{array}{r} \boxed{8}\qquad\boxed{9}\,\boxed{11}\,\boxed{10} \\ \cancel{8}\,9\,.\,\cancel{0}\,\cancel{2}\,\cancel{0} \leftarrow \text{Minuend} \\ -\,6\,1\,.\,6\,8\,9 \leftarrow \text{Subtrahend} \\ \hline 2\,7\,.\,3\,3\,1 \end{array}$$

Thus, $89.02 - 61.689 = \mathbf{27.331.}$

Exercise 6.2

1. Fill in the boxes :

(a) $0.4 + 4.0$ = ☐   (b) $7.1 + 0.08$ = ☐

(c) $6.12 + 0.001$ = ☐   (d) $50.01 + 5.001$ = ☐

(e) $4.01 + 0.14$ = ☐   (f) $43.209 + 21.003$ = ☐

2. Arrange in columns and add :

(a) 8.9, 0.1, 52.7, 58.0   (b) 0.789, 4.125, 3.75, 0.325

(c) 1.13, 7.03, 8.23, 1.30   (d) 1.573, 8.4, 19.538, 0.32

(e) 5.8, 22.7, 0.9, 3.5   (f) 6.02, 99.34, 3.00, 222.07

3. Subtract each of the following from 18 :

(a) 11.013   (b) 5.002   (c) 9.044   (d) 7.303

4. Subtract :

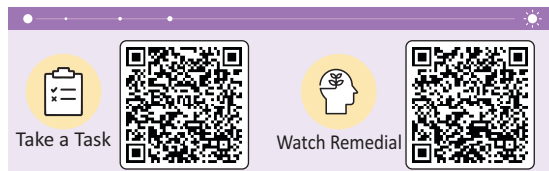(a) 65.005 from 99.449   (b) 64.444 from 98.649

(c) 7.005 from 9.105   (d) 8.105 from 16.104

(e) 6.912 from 11.012   (f) 2.009 from 3.018

Multiplication of Decimals

Multiplication of a decimal by a whole number

Working Rules

To multiply a decimal number by a whole -number,

(i) multiply the two numbers in the same way as we multiply whole numbers.

(ii) place the decimal point in such a way that there are as many decimal places in the product as in the multiplicand.

Example 12: Multiply 41.23 by 213.

Solution : First multiply 4123 by 213.

$$
\begin{array}{r}
4\ 1\ 2\ 3 \\
\times\ 2\ 1\ 3 \\
\hline
1\ 2\ 3\ 6\ 9 \quad\leftarrow\ 4123 \times 3 \\
4\ 1\ 2\ 3\ 0 \quad\leftarrow\ 4123 \times 10 \\
+\ 8\ 2\ 4\ 6\ 0\ 0 \quad\leftarrow\ 4123 \times 200 \\
\hline
8\ 7\ 8\ 1\ 9\ 9 \quad\leftarrow\ 4123 \times 213 \\
\end{array}
$$

Since, $\quad 4123 \quad \times \quad 213 \quad = \quad 878199$

Thus, $\quad 41.23 \quad \times \quad 213 \quad = \quad 8781.99$

$\qquad$ Two decimal places.

Multiplication of a Decimal By 10, 100, 1000, ...

Consider the following examples and study the change in the position of the decimal point.

Example 13: Multiply

(I) 6.47 by 10 $\qquad$ (ii) 86. 152 by 10

Solution : (I) $6.47 \times 10 = 64.7$ $\qquad$ (ii) $86.152 \times 10 = 861.520 \text{ or } 861.52$

We find that in multiplying a decimal by 10, we simply shift the decimal point by one place to the right.

Similarly in multiplying a decimal by 100, we simply have to shift the decimal point by two places to

the right and to multiply a decimal by 1000 we shift the decimal point by three places to the right.

Working Rules

To multiply a decimal by 10, 100, 1000 .... etc.

(i) Shift the decimal point to the right as many places as many there are zeroes in the multiplier.

(ii) If there are not sufficient number of places while shifting the decimal point to the right, zeroes may be written at the right end to fill in the gap.

Example 14 : Multiply 6.573 by 1000.

Solution : There are three decimal places in 6.573. Since we are multiplying by 1000, we shift the decimal point by three places to the right. But there are three places in the decimal part. So,

Thus, $6.573 \times 1000 = 6575$

Example 15 : Multiply 823.75 by 10000.

Solution : Since there are two decimal places in 823.75. Since we are multiplying by 10000, we shift the decimal point by four places to the right. But there are only two places in the decimal part. So, we write two zeroes on the extreme right of the number and put the decimal point to the right of the zeroes.

Thus, $823.75 \times 10000 = 8237500$.

Exercise 6.4

Knowledge Application

1. **Fill in the blanks by writing products :**

(a) 7.9×10 = _____ (b) 14.37×10 = _____

(c) 9.15×100 = _____ (d) 8.54×100 = _____

(e) 43.435×100 = _____ (f) 57.125×100 = _____

(g) 86.2745×1000 = _____ (h) 3.789×1000 = _____

2. **Multiply :**

(a) 3.4 by 3 (b) 3.04 by 9 (c) 3.004 by 7 (d) 0.34 by 4

(e) 9.43 by 8 (f) 5.081 by 9 (g) 9.453 by 8 (h) 0.459 by 7

3. Multiply :

(a) 925.32×245 (b) 5.8045×147 (c) 323.4×178 (d) 624.16×77

(e) 675.08×54 (f) 385.34×13 (g) 923.8×67 (h) 2.335×28

Multiplication of a decimal by another decimal

Study the following products:

(I) $0.8 \times 0.7 = \dfrac{8}{10} \times \dfrac{7}{10} = \dfrac{8 \times 7}{10 \times 10} = \dfrac{56}{100} = 0.56$

    Thus, $0.8 \times 0.7 = 0.56$

(ii) $0.25 \times 0.3 = \dfrac{25}{100} \times \dfrac{3}{10} = \dfrac{25 \times 3}{100 \times 10} = \dfrac{75}{1000} = 0.075$

    Thus, $0.25 \times 0.3 = 0.075$.

(iii) $3.45 \times 1.23 = \dfrac{345}{100} \times \dfrac{123}{100} = \dfrac{345 \times 123}{10000} = \dfrac{42435}{10000} = 4.2435$

Thus, $3.45 \times 1.23 = 4.2435$.

Now, observe the following table carefully :

Example	Number of decimal places in		
	Multiplicand	**Multiplier**	**Product**
(I) $0.8 \times 0.7 = 0.56$	1	1	$1 + 1 = 2$
(ii) $0.25 \times 0.3 = 0.075$	2	1	$2 + 1 = 3$
(iii) $3.45 \times 1.23 = 4.2435$	2	2	$2 + 2 = 4$

We conclude that in each of the examples given in the table, the product has as many decimal places as there are in the multiplicand and multiplier put together or combined.

Now, follow the steps of multiplication given below :

To Find the Product of a Decimal by a Decimal

Working Rules

1. Perform the multiplications as we are multiplying two whole numbers (without considering the position of decimal points).

2. Place the decimal point in the product so that the number of decimal places in the product is equal to the sum of the number of decimal places in the multiplicand and multiplier.

Example 16 : Find the product of :

(I) 14.25 and 3.2   (ii) 2.224 and 2.5

Solution :   (I) 14.25 and 3.2

First, multiply 1425 by 32.

$$
\begin{array}{r}
1\ 4\ 2\ 5 \\
\times\ 3\ 2 \\
\hline
2\ 8\ 5\ 0 \\
+\ 4\ 2\ 7\ 5\ 0 \\
\hline
4\ 5\ 6\ 0\ 0 \\
\hline
\end{array}
$$

← 1425 × 2

← 1425 × 30

← 1425 × 3 2

Number of decimal places in 14.25 (multiplicand) = 2.

Number of decimal places in 3.2 (multiplier) = 1.

Sum of decimal places = 2 + 1 = 3.

Thus, the product will contain 3 decimal places.

Since 1425 × 32 = 45600, therefore 14.25 × 3.2 = 45.600 = 45.6.

(ii) 2.224 and 2.5

First, multiply 2224 by 25.

$$
\begin{array}{r}
2\ 2\ 2\ 4 \\
\times\ 2\ 5 \\
\hline
1\ 1\ 1\ 2\ 0 \\
+\ 4\ 4\ 4\ 8\ 0 \\
\hline
5\ 5\ 6\ 0\ 0 \\
\hline
\end{array}
$$

← 2224 × 5

← 2224 × 20

> **Note**
>
> Zero at the end of a decimal part does not have any value.

Since, there are 3 + 1 i.e. 4 decimal places in the multiplicand and the multiplier together, therefore the product will contain 4 decimal places.

Since 2224 × 25 = 55600

∴ 2.225 × 2.5 = 5.5600 = 5.56

1.   Find the product:

(a) 76.2×0.23

(b) 0.662×0.24

(c) 56.2×2.3

(d) 5.62×0.35

(e) 3.62×230

(f) 0.962×0.023

2.   If $2234 \times 32 = 71488$, fill in the boxes :

(a) 223.4×3.2 $=$

(b) 22.34×3.2 $=$

(c) 2.234×3.2 $=$

(d) 0.2234×3.2 $=$

(e) 223.4×0.32 $=$

(f) 22.34×0.32 $=$

3.   Multiply :

(a) 98.03 by 2.24

(b) 5.067 by 0.091

(c) 59.23 by 3.23

(d) 371.9 by 0.978

Division of Decimals

Division of a decimal by a whole number

Consider $0.75 \div 3$.

We can divide it in the following two different ways:

(I) $0.75 \div 3 = \dfrac{75}{100} \div 3 = \dfrac{75}{100} \times \dfrac{1}{3} = \dfrac{25}{100} = 0.25$

$$
\begin{array}{r}
0.25 \\
3\overline{)0.75} \\
-0 \\
\hline
7 \\
-6 \\
\hline
15 \\
-15 \\
\hline
0
\end{array}
$$

Thus, $0.75 \div 3 = 0.25$.

Follow the Steps given below to divide a decimal by a whole number :

Working Rules

1.   Carry on the division in the same way as in the case of whole numbers (ignoring the decimal point).

2.   Put the decimal point in the quotient just above the decimal point in the dividend.

3.   If the last remainder is other than zero, write as many zeroes in the right of the dividend as necessary to make the remainder zero.

Example 17 : Divide 825.75 by 25.

Solution : First, we divide 82575 by 25 (ignoring the position of decimal point). Then, place the decimal point just above the decimal point in the dividend.

```
              3 3 . 0 3
    2 5 ) 8 2 5 . 7 5
          − 7 5 ↓
            0 7 5
          − 0 7 5  ↓
                0 7 │
              − 0 0 ↓
                    7 5
                  − 7 5
                      0
```

Thus, 825.75 ÷ 25 = 33.03.

Example 18 : Divide 4.53 by 8.

Solution :

```
          0 . 5 6 6 2 5
    8 ) 4 . 5 3 0 0 0   ← Add zeroes
      − 4 . 0
          5 3
        − 4 8
            5 0
          − 4 8
              2 0
            − 1 6
                4 0
              − 4 0
                  0
```

Add as many zeroes to the extreme right of the dividend as are necessary so that the dividend is exactly divided by the divisor.

Thus, 4.53 ÷ 8 = 0.56625.

Division of a decimal by 10, 100, 1000, ...
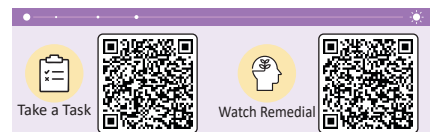
Study the following examples to learn how to divide decimals by 10, 100, 1000 etc.

Example 19 : Find the quotient of 83.7 ÷ 10.

Solution : $83.7 \div 10 = \dfrac{837}{10} \div 10 = \dfrac{837}{10} \times \dfrac{1}{10} = \dfrac{837}{100} = 8.37$

Hence, the required quotient is 8.37.

We observe that the decimal point is shifted to the left by one place as divisor has one zero.

Example 20 : Divide 934.5 by 100.

Solution : $934.5 \div 100 = \dfrac{9345}{10} \div 100 = \dfrac{9345}{10} \times \dfrac{1}{100} = \dfrac{9345}{1000} = 9.345$

We observe that the decimal point is shift to the left by two places as divisor has two zeros.

Rule :

1. To divide a decimal by 10, 100, 1000..... etc., shift the decimal point to the left as many places as there are zeroes in the divisor.

2. While shifting the decimal point, if there are not enough number of decimal places, put zeroes to the left to get the required number of decimal places.

Example 21: Divide 86.48 by 20.

Solution : We can divide 86.48 by 20 by two different methods :

```
           4 . 3 2 4
    2 0 ) 8 6 . 4 8 0        → Adding 0 to the dividend
        − 8 0
          0 6   4
          − 6   0
                4 8
              − 4 0
                  8 0
                − 8 0
                    0
```

Thus, 86.48 ÷ 20 = 4.324.

📖 Exercise 6.6   Knowledge Application

1. **Find the quotient :**

   (a) $7.488 \div 24$ (b) $61.92 \div 12$ (c) $41.28 \div 12$

   (d) $3.366 \div 11$ (e) $3.042 \div 13$ (f) $345.2 \div 8$

   (g) $78.89 \div 23$ (h) $758.16 \div 18$ (I) $3.23 \div 5$

2. **Write 'True' or 'False' for each of the following:**

   (a) $6881 \div 1000 = 688.1$_____   (b) $78.18 \div 100 = 7818$_____

   (c) $281.8 \div 10 = 28.18$_____   (d) $3.818 \div 1000 = 3818$_____

(e) $.2881 \div 10 = 0.02881$_____ (f) $.02881 \div 100 = 2.881$_____

3. Fill in the boxes :

(a) $887.790 \div 100$ = [ ] (b) $454.200 \div 1000$ = [ ]

(c) $385.116 \div 100$ = [ ] (d) $3.256 \div 100$ = [ ]

(e) $57.355 \div 100$ = [ ] (f) $98.282 \div 100$ = [ ]

(g) $223.456 \div 1000$ = [ ] (h) $925.654 \div 1000$ = [ ]

4. Find the quotient :

(a) $28.23 \div 30$ (b) $65.56 \div 40$ (c) $28.48 \div 200$

(d) $24.24 \div 30$ (e) $8.08 \div 80$ (f) $255.55 \div 200$

Division of a decimal by Another Decimal

Follow the steps given below to divide a decimal by another decimal:

1. Leave aside the decimal points in dividend and divisor, and consider them as whole numbers.

2. Divide them as whole numbers.

   For example : In $9.912 \div 4.2$, take $9912 \div 42$.

3. The quotient we get, put decimal point after as many number of places as the difference between the numbers of decimal places in dividend and divisor.

$$
\begin{array}{r}
2\ 3\ 6 \\
4\ 2\ )\overline{\ 9\ 9\ 1\ 2} \\
-\ 8\ 4\ \ \ \ \\
\overline{\ \ \ 1\ 5\ 1} \\
-\ 1\ 2\ 6 \\
\overline{\ \ \ 2\ 5\ 2} \\
-\ 2\ 5\ 2 \\
\overline{\ \ \ \ \ \ 0}
\end{array}
$$

   For example : $9.912 \div 4.2$

   Number of decimal places in dividend = 3.

   Number of decimal places in divisor = 1.

   Difference between the decimal places = 3 − 1 = 2.
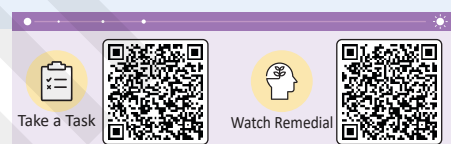
   So, the quotient will be 2.36.

4. If the number of decimal places in dividend is less than that in divisor, then put as many zeroes to the right of the quotient as is the difference between decimal places.

   For example : Consider $737.5 \div 1.25$.

   The no. of decimal places in the divisor = 2.

   The no. of decimal places in the dividend = 1.

   Difference between the no. of decimal places = 2 − 1 = 1.

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Also, $7375 \div 125 = 59$

Thus, $737.5 \div 1.25 = 590$

5. If the number of decimal places in dividend and divisor are the same, the quotient will be a whole number.

For example : Consider $9.25 \div 0.25$.

We find that $925 \div 25 = 37$.

As both the dividend and the divisor have two decimal Places, $9.25 \div 0.25 = 37$.

```
         3 7
   2 5 ) 9 2 5
       − 7 5
         1 7 5
       − 1 7 5
               0
```

Example 23 :   Divide the following:

    (I) $5.778 \div 0.0018$ (ii) $3.195 \div .213$

Solution:

(I) $5.778 \div 0.0018$

```
           3 2 1
   1 8 ) 5 7 7 8
       − 5 4
           3 7
         − 3 6
             1 8
           − 1 8
               0
```

The no. of decimal places in dividend =3, in divisor = 4. The divisor has one more decimal place than the dividend.
∴ $5.778 \div 0.0018 = 3210$

(ii) $3.195 \div .213$

```
             1 5
   2 1 3 ) 3 1 9 5
         − 2 1 3
           1 0 6 5
         − 1 0 6 5
                 0
```

The no. of decimal places in dividend = 3, in divisor =3.
∴ $3.195 \div 0.213 = 15$

Exercise 6.7

1. **Find the quotient :**

(a) $40.713 \div 3.31$ (b) $5.2 \div 1.25$ (c) $84.826 \div 58.1$

(d) $22.512 \div 4.02$ (e) $1.088 \div 0.32$ (f) $25.925 \div 0.425$

2. **Find the quotient :**

(a) $9009 \div 0.13$ (b) $120 \div 0.12$ (c) $672 \div 0.025$

Word Problems

Example 24 : The weight of Tapan is $\frac{2}{3}$ of the weight of Ranjan. The weight of Ashok is $\frac{3}{4}$ of the weight of Tapan. If the weight of Ranjan is 24.6 kg, find the weight of Tapan and Ashok.

Also, find the total weight of Tapan, Ranjan and Ashok.

Solution : Weight of Ashok = $\frac{2}{3}$ of the weight of Ranjan = $\frac{2}{3}$ of 24.6 kg

$$= \frac{2 \times 24.6}{3} = \frac{49.2}{3} kg = 16.4 kg$$

Weight of Ashok = $\frac{3}{4}$ of the weight of Tapan = $\frac{3}{4}$ of 16.4 kg

$$= \frac{3 \times 16.4}{4} = \frac{49.2}{4} kg = 12.3 kg$$

Total weight of Tapan, Ranjan and Ashok

$$= 16.4 kg + 24.6 kg + 12.3 kg = 53.3 kg$$

Example 25 : The product of two decimals is 7.74

If one of them is 4.3, find the other decimal.

Solution : The product of two decimals = 7.74.

One decimal = 4.3

Other decimal = $\frac{7.74}{4.3} = 1.8$

Thus, required decimal will be 1.8.

```
          1 8
    4 3 ) 7 7 4
        − 4 3
          3 4 4
        − 3 4 4
              0
```

Exercise 6.8

Knowledge Application

Solve the following questions.

1. A man earns ₹10278 in a year. find his monthly income.

2. If the cost of 8.5 metres cloth is ₹178.50, what is the cost of one metre of that cloth ? Also, find the cost of 5.5 metres of this cloth.

3. 40.5 m cloth is required to make 18 shirts. How much cloth will be required to make

   (i) 1 shirt ?   (ii) 8 shirts ?   (iii)   10 shirts ?

4. Find the perimeter of the square whose side is 9.5 m.

5. Prem bought 28.5 kg ghee for ₹2992.50. Find the price of ghee per kg.

6. If a shopkeeper has 1864.5 kg of wheat in 33 bags, how much wheat is there in each bag ?

7. A batsman scored 388 runs in 5 innings. Find his average score per inning.

8. 1 metre of suiting cloth costs ₹50.75. What will be the cost of 25 m of the suiting cloth?

9. I bought 18 kg of desi ghee for ₹1989. Find the price of one kg ghee.

10. Yogesh earns ₹42534 in a year. If he earns the same amount every month, find his monthly income.

Think Tank

1. **Tick (✓) the correct answer.**

   (a) Which of the following is the greatest number?

   (i) 4.835 ☐   (ii) 3.79 ☐   (iii) 2.792 ☐   (iv) 1.825 ☐

   (b) What is the decimal fraction of $\frac{17}{20}$?

   (i) 0.95 ☐   (ii) 0.85 ☐   (iii) 0.50 ☐   (iv) 0.75 ☐

   (c) $4 \div 2 \times 5 =$ _____ .

   (i) 18 ☐   (ii) 15 ☐   (iii) 10 ☐   (iv) 20 ☐

2. **Fill in the blanks:**

   (a) $9.54 \times 10 =$ _____ .   (b) $4.05 \times 100 =$ _____ .

   (c) $0.87 \times 1000 =$ _____ .   (d) $3.058 \times 10000 =$ _____ .

   (e) $100 \times 1.56 =$ _____ .   (f) $93.539 \times 1000 =$ _____ .

   (g) 48.305×10 _____ .   (h) $0.0075 \times 1000 =$ _____ .

   (i) $793.08 \times 1000 =$ _____ .   (i) $.03355 \times 100 =$ _____ .

3. **Match these number pair to make 5:**

Column "A"	Column "B"
(a) 2.7	(I) 0.03
(b) 4.97	(ii) 1.854
(c) 3.75	(iii) 3.889
(d) 3.146	(iv) 2.3
(e) 1.111	(v) 1.25

Puzzle

To solve this puzzle each row and column must add up to 3.25.

0.7		1.06
		0.64
	1.3	

$\Rightarrow$ 3.25

Mental Math

1. How many zeros are there in the denominator? Write in the ◯.

   (a) $\dfrac{4}{10}$ ◯   (b) $\dfrac{8}{100}$ ◯   (c) $\dfrac{11}{1000}$ ◯   (d) $\dfrac{328}{10}$ ◯   (e) $\dfrac{15}{1000}$ ◯

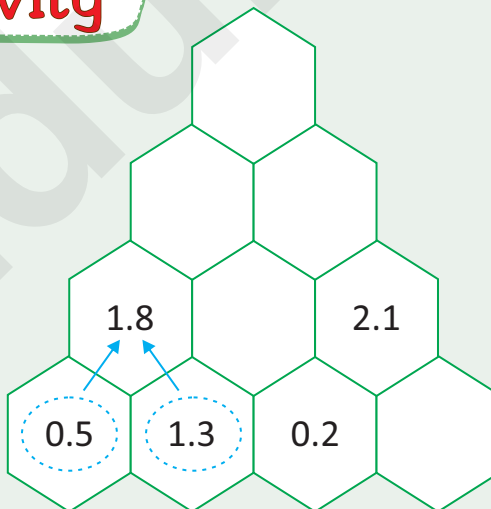2. How many decimal places are there? Write in the ◯.

   (a) 7.9 ◯   (b) 8.97 ◯   (c) 1.342 ◯   (d) 0.02 ◯   (e) 5.624 ◯

Fun Time Activity

To solve the puzzle, each number must be equal to the sum of two number below:

1.8   2.1

0.5   1.3   0.2

HOTS

1. Reema bought 5.5 kg of wheat and 10.75 kg of sugar and 15.25 kg of rice. Find the total weight of the items she purchases? _____ .

2. Monu has ₹20. He bought one pen for ₹9.75 and one pencil for ₹2.50. How much rupees (₹) does he have now? _____ .