3

DECIMALS

3.1 INTRODUCTION

In Class VI, we have learnt about decimal numbers, representation of decimal numbers on the number line, their comparison, addition and subtraction. In this chapter, we will learn about multiplication and division of decimal numbers. Let us first recall various concepts which we have learnt in the earlier class.

3.2 RECAPITULATION

DECIMALS We have learnt in the previous class that the decimals are an extension of our number system. We have also learnt that decimals can be considered as fractions whose denominators are 10, 100, 1000 etc. We may say that the numbers expressed in decimal forms are called decimals. For example, 17.235, 0.149, 125.005, 2534.0 etc are decimal numbers or decimals.

Clearly, each decimal number or decimal has two parts, namely

(i) whole-number part, (ii) decimal part.

Also, these parts are separated by a dot (·), called the decimal point.

In the decimal number 27.54, whole number part is 27 and decimal part is 54.

DECIMAL PLACES *The number of digits contained in the decimal part of a decimal number is known as the number of decimal places.*

For example, 3.75 has two decimal places and 85.325 has three decimal places.

LIKE AND UNLIKE DECIMALS *Decimals having the same number of places are called like decimals i.e. decimals having the same number of digits on the right of the decimal point are known as like decimals. Otherwise, the decimals are unlike decimals.*

For example, 5.25, 15.04, 273.89 are like decimals and 9.5, 18.235, 20.0254 etc are unlike decimals.

It is to note that by annexing zeros on the right side of the extreme right digit of the decimal part of a number does not alter the value of the number. So, unlike decimals can always be converted into like decimals by annexing required number of zeros on the right side of the extreme right digit in the decimal part.

For example, 7.4, 15.35, 49.105 are unlike decimals. These decimals can be re-written as 7.400, 15.350, 49.105. Now, these are like decimals.

3.2.1 COMPARING DECIMALS

In order to compare decimal numbers, we may follow the following steps:

STEP I *Obtain the decimal numbers*

STEP II *Compare the whole parts of the numbers. The number with greater whole part will be greater. If the whole parts are equal, go to next step.*

STEP III *Compare the extreme left digits of the decimal parts of two numbers. The number with greater extreme left digit will be greater. If the extreme left digits of decimal parts are equal, then compare the next digits and so on.*

ILLUSTRATION 1 Which is greater of 48.23 and 39.35?

Solution The given decimals have distinct whole number parts, so we compare whole number parts only.

In 48.23, the whole number part is 48.

In 39.35, the whole number part is 39.

$\because \quad 48 > 39$

$\therefore \quad 48.23 > 39.35.$

ILLUSTRATION 2 Write the following decimals in ascending order:

5.64, 2.54, 3.05, 0.259 and 8.32

Solution Converting the given decimals into like decimals, we get

5.640, 2.540, 3.050, 0.259 and 8.320

Clearly, $0.259 < 2.540 < 3.050 < 5.640 < 8.320$

Hence, the given decimals in the ascending order are:

0.259, 2.54, 3.05, 5.64 and 8.32

A decimal can always be converted into a fraction by using the following steps:

STEP I *Obtain the decimal.*

STEP II *Take the numerator as the number obtained by removing the decimal point from the given decimal.*

STEP III *Take the denominator as the number obtained by inserting as many zeros with 1 (e.g. 10, 100 or 1000 etc.) as there are number of places in the decimal part.*

ILLUSTRATION 3 Express the following decimals as fractions in lowest form:

(i) 0.05 (ii) 3.75 (iii) 0.004 (iv) 5.066

Solution We have,

(i) $0.05 = \frac{05}{100} = \frac{5}{100} = \frac{1}{20}$ (ii) $3.75 = \frac{375}{100} = \frac{15}{4}$

(iii) $0.004 = \frac{4}{1000} = \frac{1}{250}$ (iv) $5.066 = \frac{5066}{1000} = \frac{2533}{500}$

In the beginning of this section, we have mentioned that decimals are fractions with denominators 10, 100, 1000 etc. In order to convert other fractions into decimals, we follow the following steps:

STEP I *Obtain the fraction and convert it into an equivalent fraction with denominator 10 or 100 or 1000 if it is not so.*

STEP II *Write its numerator and mark decimal point after one place or two places or three places from right towards left if the denominator is 10 or 100 or 1000 respectively. If the numerator is short of digits, insert zeros at the left of the numerator.*

ILLUSTRATION 4 Express the following fractions as decimals:

(i) $\frac{2}{10}$ (ii) $\frac{1359}{1000}$ (iii) $7\frac{1}{2}$ (iv) $9\frac{1}{4}$ (v) $12\frac{1}{8}$

Solution Using the above method, we have

(i) $\frac{2}{10} = 0.2$ (ii) $\frac{1359}{1000} = 1.359$

(iii) We have,

$$7\frac{1}{2} = 7 + \frac{1}{2} = 7 + \frac{5\times1}{5\times2} = 7 + \frac{5}{10} = 7 + 0.5 = 7.5$$

(iv) We have,

$$9\frac{1}{4} = 9 + \frac{1}{4} = 9 + \frac{25\times1}{25\times4} = 9 + \frac{25}{100} = 9 + 0.25 = 9.25$$

(iv) We have,

$$12\frac{1}{8} = 12 + \frac{1}{8} = 12 + \frac{125\times1}{125\times8} = 12 + \frac{125}{1000} = 12 + 0.125 = 12.125$$

3.2.2 ADDITION AND SUBTRACTION OF DECIMALS

In order to add or subtract decimals, we may use the following steps:

STEP I *Convert the given decimals to like decimals.*

STEP II *Write the decimals in columns with their decimal points directly below each other so that tenths come under tenths, hundredths come under hundredths and so on.*

STEP III *Add or subtract as we add or subtract whole numbers.*

STEP IV *Place the decimal point, in the answer, directly below the other decimal points.*

ILLUSTRATION 1 Add: 15.44, 7.524 and 25

Solution Converting the given decimals to like decimals, we have 15.440, 7.524 and 25.000.

Now,

$$\begin{array}{r} 15.440 \\ +\ 7.524 \\ +\ 25.000 \\ \hline 47.964 \end{array}$$

ILLUSTRATION 2 Aakash bought vegetables weighing 10 kg. Out of this 3 kg 500 g is onion, 2 kg 75 g is tomato and the rest is potato. What is the weight of potato?

Solution We have,

Weight of onion = 3 kg 500 g = 3.500 kg

Weight of tomato = 2 kg 75 g = 2.075 kg

$\therefore$ Total weight of onion and tomato is :

$$\begin{array}{r} 3.500 \text{ kg} \\ +\ 2.075 \text{ kg} \\ \hline 5.575 \text{ kg} \end{array}$$

Total weight of vegetables = 10 kg

Weight of potato is = 10 kg – 5.575 kg = 4.425 kg

$$\begin{array}{r} 10.000 \\ -\ 5.575 \\ \hline 4.425 \end{array}$$

ILLUSTRATION 3 Simplify : 36.54 – 15.79 + 85.2 – 57.615

Solution We have,

$36.65 - 15.79 + 85.2 - 57.615$

$= 36.650 - 15.790 + 85.200 - 57.615$ [Converting the given decimals into like decimals]

$= (36.650 + 85.200) - (15.790 + 57.615)$

$= 121.850 - 73.405$

$= 48.445$

$$\begin{array}{r} 36.650 \\ +\ 85.200 \\ \hline 121.850 \end{array} \qquad \begin{array}{r} 15.790 \\ +\ 57.615 \\ \hline 73.405 \end{array} \qquad \begin{array}{r} 121.850 \\ -\ 73.405 \\ \hline 48.445 \end{array}$$

EXERCISE 3.1

1. Write each of the following as decimals:

   (i) $\frac{8}{100}$ (ii) $20 + \frac{9}{10} + \frac{4}{100}$ (iii) $23 + \frac{2}{10} + \frac{6}{1000}$

2. Convert each of the following into fractions in the lowest form:

   (i) 0.04 (ii) 2.34 (iii) 0.342 (iv) 17.38

3. Express the following fractions as decimals:

   (i) $\frac{23}{10}$ (ii) $25\frac{1}{8}$ (iii) $39\frac{7}{35}$ (iv) $15\frac{1}{25}$

4. Add the following:

   (i) 41.8, 39.24, 5.01 and 62.6 (ii) 18.03, 146.3, 0.829 and 5.324

5. Find the value of:

   (i) 9.756 – 6.28 (ii) 48.1 – 0.37 (iii) 108.032 – 86.8 (iv) 100 – 26.32

6. Take out 3.547 from 7.2

7. What is to be added to 36.85 to get 59.41?

8. What is to be subtracted from 17.1 to get 2.051?

9. By how much should 34.79 be increased to get 70.15?

10. By how much should 59.71 be decreased to get 34.58?

ANSWERS

1. (i) 0.08 (ii) 20.94 (iii) 23.206

2. (i) $\frac{1}{25}$ (ii) $\frac{117}{50}$ (iii) $\frac{171}{500}$ (iv) $\frac{869}{50}$

3. (i) 2.3 (ii) 25.125 (iii) 39.2 (iv) 15.04

4. (i) 148.65 (ii) 170.483

5. (i) 3.476 (ii) 47.73 (iii) 21.232 (iv) 73.68

6. 3.653 7. 22.56 8. 15.049 9. 35.36 10. 25.13

3.3 MULTIPLICATION OF DECIMALS

In our day-to-day life, we come across many situations where we need to know the multiplication of decimals. For example, if Shikha purchased 2.75 kg potatos at the rate of ₹ 7.50 per kg, then how much money she has to pay? Clearly, money to be paid would be ₹ 7.50 × 2.75. Here, she has to know the multiplication of decimals to know the amount to be paid. In fact, there are many situations where we use the multiplication of decimals.

3.3.1 MULTIPLICATION OF A DECIMAL BY 10, 100, 1000 etc.

We follow the following rules to multiply a decimal by 10, 100, 1000 etc.

Rule I *On multiplying a decimal by 10, the decimal point is shifted to the right by one place.*

Rule II *On multiplying a decimal by 100, the decimal point is shifted to the right by two places.*

Rule III *On multiplying a decimal by 1000, the decimal point is shifted to the right by three places, and so on.*

ILLUSTRATION Find the following products:

(i) 27.05×10 (ii) 429.7×100 (iii) 31.09×1000

Solution We have,

(i) $27.05 \times 10 = 270.5$ [Shifting the decimal point by one place to the right]

(ii) $429.7 \times 100 = 429.70 \times 100$ [$\because 429.7 = 429.70$]

$= 42970$ [Shifting the decimal point by two places to the right]

(iii) $31.09 \times 1000 = 31.090 \times 1000$ [$\because 31.09 = 31.090$]

$= 31090$ [Shifting the decimal point by three places to the right]

3.3.2 MULTIPLICATION OF A DECIMAL BY A WHOLE NUMBER

In order to multiply a decimal by a whole number, we follow the following steps:

STEP I *Multiply the decimal without the decimal point by the given whole number.*

STEP II *Mark the decimal point in the product to have as many places of decimal as are there in the given decimal.*

ILLUSTRATION Find each of the following products:

(i) 3.25×12 (ii) 0.524×15 (iii) 0.0275×17

Solution (i) We have,

$325 \times 12 = 3900$

$\therefore \quad 3.25 \times 12 = 39.00$

$$\begin{array}{r} 325 \\ \times 12 \\ \hline 650 \\ +3250 \\ \hline 3900 \end{array}$$

(ii) We have,

$524 \times 15 = 7860$

$\therefore \quad 0.524 \times 15 = 7.860$

$$\begin{array}{r} 524 \\ \times 15 \\ \hline 2620 \\ +5240 \\ \hline 7860 \end{array}$$

(iii) We have,

$275 \times 17 = 4675$

$\therefore \quad 0.0275 \times 17 = 0.4675$

$$\begin{array}{r} 275 \\ \times 17 \\ \hline 1925 \\ +2750 \\ \hline 4675 \end{array}$$

3.3.3 MULTIPLICATION OF A DECIMAL BY ANOTHER DECIMAL

In order to multiply a decimal by another decimal, we follow the following steps.

STEP I *Multiply the two decimals without decimal point just like whole numbers.*

STEP II *Insert the decimal point in the product by counting as many places from the right to left as the sum of the number of decimal places of the given decimals.*

ILLUSTRATION 1 Find the product of 9.2 and 6.07.

Solution We have,

$$\begin{array}{r} 92 \\ \times 607 \\ \hline 644 \\ 000 \\ +55200 \\ \hline 55844 \end{array}$$

$\therefore \quad 92 \times 607 = 55844$

Since the sum of the decimal places in the given decimals is $1 + 2 = 3$.

So, the product must contain 3 places of decimals.

Hence, $9.2 \times 6.07 = 55.844$

ILLUSTRATION 2 Multiply 0.0345 by 0.0237

Solution We have,

$$\begin{array}{r} 345 \\ \times 237 \\ \hline 2415 \\ 10350 \\ +69000 \\ \hline 81765 \end{array}$$

$\therefore \quad 345 \times 237 = 81765$

We observe that the sum of the decimals in the given decimals is $4 + 4 = 8$

So, the product must contain 8 places of decimals.

Hence, $0.0345 \times 0.0237 = 0.00081765$

ILLUSTRATIVE EXAMPLES

Example 1 Find the value of :

(i) 3.45×10 (ii) 0.25×10000 (iii) 1000×5.29

(iv) 10000×0.01

Solution (i) We have,

$3.45 \times 10 = 34.5$ [Shifting the decimal point by one place to the right]

(ii) We have,

0.25×10000

$= 0.2500 \times 10000$ [$\because 0.25 = 0.2500$]

$= 2500$ [By shifting the decimal point by four places to the right]

(iii) We have,

$5.29 = 5.290$

$\therefore \quad 1000 \times 5.29 = 1000 \times 5.290$

$\Rightarrow \quad 1000 \times 5.29 = 5290$ [By Shifting the decimal point by three places to the right]

(iv) We have,

$0.01 = 0.0100$

$\therefore \quad 10000 \times 0.01 = 10000 \times 0.0100$

$= 100$ [By shifting the decimal point by four places to the right]

Example 2 Multiply 7.43 by 14.1

Solution In order to find 7.43 × 14.1, we first multiply 743 by 141.

$$\begin{array}{r} 743 \\ \times 141 \\ \hline 743 \\ 29720 \\ +74300 \\ \hline 104763 \end{array}$$

$\therefore \quad 743 \times 141 = 104763$

Sum of decimal places in the given decimals = 2 + 1 = 3. So, we mark the decimal point by counting 3 places from right to left.

Hence, 7.43 × 14.1 = 104.763

Example 3 Find the product 0.008 × 0.74

Solution In order to find the product, we first multiply 8 by 74.

We have, $8 \times 74 = 592$

Now, 0.008 has 3 decimal places and 0.74 has two decimal places.
The sum of the decimal places = 3 + 2 = 5
So, the product must contain 5 places of decimals.
Hence, 0.008 × 0.74 = 0.00592

Example 4 Find the area of a rectangle whose length is 5.7 cm and breadth is 3.5 cm.

Solution We have,

Length of the rectangle = 5.7 cm, Breadth of the rectangle = 3.5 cm

$\therefore$ Area of the rectangle = Length × Breadth

$= 5.7 \times 3.5\,cm^2$

$= 19.95\,cm^2$

$$\begin{array}{r} 57 \\ \times 35 \\ \hline 285 \\ +1710 \\ \hline 1995 \end{array}$$

Hence, area of the rectangle is 19.95 cm^2.

Example 5 A two wheeler covers a distance of 55.4 km in one litre of petrol. How much distance will it cover in 7.5 litres of petrol?

Solution We have,

Distance covered in one litre of petrol = 55.4 km

$\therefore$ Distance covered in 7.5 litres of petrol

$= (55.4 \times 7.5)$ km $= 415.50$ km

$$\begin{array}{r} 554 \\ \times 75 \\ \hline 2770 \\ +38780 \\ \hline 41550 \end{array}$$

Example 6 If 1 kg of pure milk contains 0.245 kg of fat. How much fat is there is 14.4 kg of milk?

Solution We have,

Quantity of fat in 1 kg of milk = 0.245 kg

$\therefore$ Quantity of fat in 14.4 kg of milk

$= (0.245 \times 14.4)$ kg $= 3.528$ kg

$$\begin{array}{r} 245 \\ \times 144 \\ \hline 980 \\ 9800 \\ +24500 \\ \hline 35280 \end{array}$$

EXERCISE 3.2

1. Find the product:
   (i) 4.74 × 10 (ii) 0.45 × 10 (iii) 0.0215 × 10 (iv) 0.0054 × 10
2. Find the product:
   (i) 35.853 × 100 (ii) 42.5 × 100 (iii) 12.075 × 100 (iv) 100 × 0.005
3. Find the product:
   (i) 2.506 × 1000 (ii) 20.708 × 1000 (iii) 0.0529 × 1000 (iv) 1000 × 0.1
4. Find the product:
   (i) 3.4 × 17 (ii) 0.745 × 12 (iii) 28.73 × 47 (iv) 0.0415 × 59
5. Find:
   (i) 1.07 × 0.02 (ii) 211.9 × 1.13 (iii) 10.05 × 1.05 (iv) 13.01 × 5.01

6. Find the area of a rectangle whose length is 5.5 m and breadth is 3.4 m.
7. If the cost of a book is ₹ 25.75, find the cost of 24 such books.
8. A car covers a distance of 14.75 km in one litre of petrol. How much distance will it cover in 15.5 litres of petrol?
9. One kg of rice costs ₹ 42.65. What will be the cost of 18.25 kg of rice?
10. One metre of cloth costs ₹ 152.50. What is the cost of 10.75 metres of cloth?

ANSWERS

1.	(i) 47.4	(ii) 4.5	(iii) 0.215	(iv) 0.054
2.	(i) 3585.3	(ii) 4250	(iii) 1207.50	(iv) 0.5
3.	(i) 2506	(ii) 20708	(iii) 52.9	(iv) 100
4.	(i) 57.8	(ii) 8.94	(iii) 1350.31	(iv) 2.4485
5.	(i) 0.0214	(ii) 239.447	(iii) 10.5525	(iv) 65.1801
6.	18.7 m^2	7. ₹ 618	8. 228.625 km	
9.	₹ 778.3625	10. ₹ 1639.375		

3.4 DIVISION OF DECIMALS

In our day-to-day, life we come across many situations where we need to know the division of decimals. Suppose we are given the area of a rectangle as 58.75 cm^2 and width as 5.45 cm and we are required to find the length. Clearly, length $= \frac{58.75}{5.45}$. Here, we need division of decimals. Similarly, there are many other situations in our day-to-day life where we need division of decimals.

3.4.1 DIVIDING A DECIMAL BY 10, 100, 1000 etc.

In order to divide a decimal by 10, 100, 1000 etc., we follow the following rules:

Rule I *When a decimal is divided by 10, the decimal point is shifted to the left by one place.*

Rule II *When a decimal is divided by 100, the decimal point is shifted to the left by two places.*

Rule III *When a decimal is divided by 1000, the decimal point is shifted to the left by three places.*

ILLUSTRATION Divide:

(i) 12.75 by 10 (ii) 127.5 by 100 (iii) 1275.7 by 1000
(iv) 0.58 by 10 (v) 3.52 by 100 (vi) 6.25 by 1000

Solution We have,

(i) $12.75 \div 10 = \frac{12.75}{10} = 1.275$ [Shifting decimal point to the left by 1 place]

(ii) $127.5 \div 100 = \frac{127.5}{100} = 1.275$ [Shifting decimal point to the left by 2 places]

(iii) $1275.7 \div 1000 = \frac{1275.7}{1000} = 1.2757$ [Shifting decimal point to the left by 3 places]

(iv) $0.58 \div 10 = \frac{0.58}{10} = 0.058$ [Shifting decimal point to the left by 1 place]

(v) $3.52 \div 100 = \frac{3.52}{100} = 0.0352$ [Shifting decimal point to the left by 2 places]

(vi) $6.25 \div 1000 = \frac{6.25}{1000} = 0.00625$ [Shifting decimal point to the left by 3 places]

3.4.2 DIVIDING A DECIMAL BY A WHOLE NUMBER

In order to divide a decimal by a whole number, we follow the following steps:

STEP I *Check the whole number part of the dividend.*

STEP II *If the whole number part of the dividend is less than the divisor, then place a 0 in the ones place in the quotient. Otherwise, go to step III.*

STEP III *Divide the whole number part of the dividend.*

STEP IV *Place the decimal point to the right of ones place in the quotient obtained in step I.*

STEP V *Divide the decimal part of the dividend by the divisor. If the digits of the dividend are exhausted, then place zeros to the right of dividend and remainder each time and continue the process.*

Following examples will illustrate the procedure.

ILLUSTRATIVE EXAMPLES

Example 1 Divide 93.45 by 15

Solution We have,

$$
\begin{array}{r|l}
15 & 93.45 \;(6.23 \\
 & -90 \\
\hline
 & 34 \\
 & -30 \\
\hline
 & 45 \\
 & -45 \\
\hline
 & 0 \\
\hline
\end{array}
$$

$\therefore \quad 93.45 \div 15 = 6.23$

Example 2 Divide 8.28 by 12

Solution We have,

$$
\begin{array}{r|l}
12 & 8.28 \;(0.69 \\
 & 0 \\
\hline
 & 82 \\
 & -72 \\
\hline
 & 108 \\
 & -108 \\
\hline
 & 0 \\
\hline
\end{array}
$$

$\therefore \quad 8.28 \div 12 = 0.69$

Example 3 Divide 0.6204 by 5

Solution We have,

$$
\begin{array}{r|l}
5 & 0.62040 \,(0.12408 \\
 & 0 \\
\hline
 & 6 \\
 & -5 \\
\hline
 & 12 \\
 & -10 \\
\hline
 & 20 \\
 & -20 \\
\hline
 & 40 \\
 & -40 \\
\hline
 & 0 \\
\hline
\end{array}
$$

Thus, $0.6204 \div 5 = 0.12408$

Example 4 Divide 28.82 by 20

Solution We have,

$$\frac{28.82}{20} = \frac{28.82}{2 \times 10} = \frac{28.82}{2} \times \frac{1}{10} = \frac{14.41}{10} = 1.441$$

Hence, $28.82 \div 20 = 1.441$

Example 5 Divide 48.08 by 400.

Solution We have,

$$\frac{48.08}{400} = \frac{48.08}{4} \times \frac{1}{100} = \frac{12.02}{100} = 0.1202$$

Thus, $48.08 \div 400 = 0.1202$

Example 6 Divide 163.44 by 24

Solution We have,

$$
\begin{array}{r|l}
24 & 163.44 \,(6.81 \\
 & -144 \\
\hline
 & 194 \\
 & -192 \\
\hline
 & 24 \\
 & -24 \\
\hline
 & 0 \\
\hline
\end{array}
$$

Hence, $163.44 \div 24 = 6.81$

3.4.3 DIVIDING A DECIMAL BY A DECIMAL

In order to divide a decimal by another decimal, we follow the following steps:

STEP I *Multiple the dividend and divisor by 10 or 100 or 1000 etc to convert the divisor into a whole number.*

STEP II *Divide the new dividend by the whole number obtained in step I.*

Following examples will illustrate the above procedure.

ILLUSTRATIVE EXAMPLES

Example 1 Divide 3.28 by 0.4

Solution We have,

$$\frac{3.28}{0.4} = \frac{3.28 \times 10}{0.4 \times 10} = \frac{32.8}{4}$$

$\therefore \quad 3.28 \div 0.4 = 8.2$

$$\begin{array}{r|l} 4 & 32.8 \,(8.2 \\ & -32 \\ \hline & 8 \\ & -8 \\ \hline & 0 \\ \hline \end{array}$$

Example 2 Divide 42.8 by 0.02

Solution We have,

$$\frac{42.8}{0.02} = \frac{42.8 \times 100}{0.02 \times 100} = \frac{4280}{2} = 2140$$

Hence, $42.8 \div 0.02 = 2140$

Example 3 Divide 0.00942 by 0.312

Solution We have,

$$\frac{0.00942}{0.314} = \frac{0.00942 \times 1000}{0.314 \times 1000} = \frac{9.42}{314}$$

Hence, $0.00942 \div 0.314 = 0.03$

$$\begin{array}{r|l} 314 & 9.42 \,(0.03 \\ & 0 \\ \hline & 942 \\ & -942 \\ \hline & 0 \\ \hline \end{array}$$

Example 4 Divide 0.0216 by 0.6

Solution We have,

$$\frac{0.0216}{0.6} = \frac{0.0216 \times 10}{0.6 \times 10} = \frac{0.216}{6}$$

$$\begin{array}{r|l} 6 & 0.216 \,(0.036 \\ & 0 \\ \hline & 21 \\ & -18 \\ \hline & 36 \\ & -36 \\ \hline & 0 \\ \hline \end{array}$$

Hence, $0.0216 \div 0.6 = 0.036$

Example 5 Divide 0.0024 by 0.04

Solution We have,

$$\frac{0.0024}{0.04} = \frac{0.0024 \times 100}{0.04 \times 100} = \frac{0.24}{4}$$

$$\begin{array}{r} 4\overline{)\,0.24\,}(0.06 \\ 0 \\ \hline 24 \\ -24 \\ \hline 0 \\ \hline \end{array}$$

Hence, $0.0024 \div 0.04 = 0.06$

Example 6 Divide 6.9168 by 52.4

Solution We have,

$$\frac{6.9168}{52.4} = \frac{6.9168 \times 10}{52.4 \times 10} = \frac{69.168}{524}$$

$$\begin{array}{r} 524\overline{)\,69.168\,}(0.132 \\ -0 \\ \hline 691 \\ -524 \\ \hline 1676 \\ -1572 \\ \hline 1048 \\ -1048 \\ \hline 0 \\ \hline \end{array}$$

Hence, $6.9168 \div 52.4 = 0.132$

Example 7 Divide 1391 by 1.3

Solution We have,

$$\frac{1391}{1.3} = \frac{1391 \times 10}{1.3 \times 10} = \frac{13910}{13}$$

$$\begin{array}{r} 13\overline{)\,13910\,}(1070 \\ -13 \\ \hline 91 \\ -91 \\ \hline 0 \\ \hline \end{array}$$

$\therefore \quad 1391 \div 1.3 = 1070$

Example 8 Divide 42 by 16

Solution We have,

$$
\begin{array}{r|l}
16 & 2.625 \\
\hline
 & 42.000 \quad \leftarrow \text{Annexing three zeros} \\
 & -32 \\
\hline
 & 100 \\
 & -\ 96 \\
\hline
 & 40 \\
 & -32 \\
\hline
 & 80 \\
 & -80 \\
\hline
 & 0 \\
\hline
\end{array}
$$

Hence, $42 \div 16 = 2.625$

Example 9 Divide (i) 3 by 8 (ii) 3 by 80

Solution (i) We have,

$$
\begin{array}{r|l}
8 & 0.375 \\
\hline
 & 3.000 \quad \leftarrow \text{three zeros annexed} \\
 & 0 \\
\hline
 & 30 \\
 & -24 \\
\hline
 & 60 \\
 & -56 \\
\hline
 & 40 \\
 & -40 \\
\hline
 & 0 \\
\hline
\end{array}
$$

Hence, $3 \div 8 = 0.375$

(ii) We have,

$$
\begin{array}{r|l}
80 & 0.0375 \\
\hline
 & 3.0000 \quad \leftarrow \text{Four zeros annexed} \\
 & 0 \\
\hline
 & 30 \\
 & -00 \\
\hline
 & 300 \\
 & -240 \\
\hline
 & 600 \\
 & -560 \\
\hline
 & 400 \\
 & -400 \\
\hline
 & 0 \\
\hline
\end{array}
$$

Hence, $3 \div 80 = 0.0375$

Example 10 The cost of 24 pens is ₹ 2986.80. Find the cost of one pen.

Solution We have,

Cost of 24 pens = ₹2986.80

$\therefore$ Cost of 1 pen $= ₹\left(\frac{2986.80}{24}\right) = ₹\,124.45$

$$
\begin{array}{r|l}
24 & 2986.80 \,(124.45 \\
 & -24 \\
\hline
 & 58 \\
 & -48 \\
\hline
 & 106 \\
 & -96 \\
\hline
 & 108 \\
 & -96 \\
\hline
 & 120 \\
 & 120 \\
\hline
 & 0 \\
\hline
\end{array}
$$

Hence, the cost of one pen is ₹ 124.45

Example 11 A car covers a distance of 89.1 km in 2.2 hours. What is the average distance covered by the car in 1 hour?

Solution We have,

Distance covered by the car in 2.2 hours = 89.1 km

$\therefore$ Distance covered by the car in 1 hour

$$= \frac{89.1}{2.2}\text{ km}$$

$$= \frac{89.1 \times 10}{2.2 \times 10} = \frac{891}{22}\text{km} = 40.5\text{ km}$$

$$
\begin{array}{r|l}
22 & 891.0 \,(40.5 \\
 & 88 \\
\hline
 & 11 \\
 & 00 \\
\hline
 & 110 \\
 & 110 \\
\hline
 & 0 \\
\hline
\end{array}
$$

Hence, the car covers 40.5 km in 1 hour.

Example 12 Mrs Jain bought 14.5 litres of refined oil for ₹ 1194.80. Find its cost per litre.

Solution We have,

Cost of 14.5 litres of refined oil = ₹ 1194.80

$\therefore$ Cost of 1 litre of refined oil $= ₹\left(\frac{1194.80}{14.5}\right)$

$= ₹\left(\frac{1194.80 \times 10}{14.5 \times 10}\right)$

$= ₹\left(\frac{11948}{145}\right) = 82.40$

$$\begin{array}{r|l} 145 & 11948.00 \,(82.40 \\ & -1160 \\ \hline & 348 \\ & -290 \\ \hline & 580 \\ & -580 \\ \hline & 00 \\ & -00 \\ \hline & 0 \end{array}$$

Hence, the cost of 1 litre of refined oil is Rs 82.40

Example 13 The product of two decimals is 1.8576. If one of the decimals is 0.54, find the other.

Solution We have,

Product of the given decimals = 1.8576

One decimal = 0.54

$\therefore$ The other decimal $= \frac{1.8576}{0.54}$

$= \left(\frac{1.8576 \times 100}{0.54 \times 100}\right) = \frac{185.76}{54} = 3.44$

Hence, the other decimal = 3.44

EXERCISE 3.3

1. Divide:
   (i) 142.45 by 10 (ii) 54.25 by 10 (iii) 3.45 by 10
   (iv) 0.57 by 10 (v) 0.043 by 10 (vi) 0.004 by 10
2. Divide:
   (i) 459.5 by 100 (ii) 74.3 by 100 (iii) 5.8 by 100
   (iv) 0.7 by 100 (v) 0.48 by 100 (vi) 0.03 by 100
3. Divide:
   (i) 235.41 by 1000 (ii) 29.5 by 1000 (iii) 3.8 by 1000
   (iv) 0.7 by 1000
4. Divide:
   (i) 0.45 by 9 (ii) 217.44 by 18 (iii) 319.2 by 2.28
   (iv) 40.32 by 9.6 (v) 0.765 by 0.9 (vi) 0.768 by 1.6
5. Divide:
   (i) 16.64 by 20 (ii) 0.192 by 12 (iii) 163.44 by 24
   (iv) 403.2 by 96 (v) 16.344 by 12 (vi) 31.92 by 228
6. Divide:
   (i) 15.68 by 20 (ii) 164.6 by 200 (iii) 403.80 by 30

7. Divide:
   (i) 76 by 0.019 (ii) 88 by 0.08 (iii) 148 by 0.074
   (iv) 7 by 0.014
8. Divide:
   (i) 20 by 50 (ii) 8 by 100 (iii) 72 by 576
   (iv) 144 by 15
9. A vehicle covers a distance of 43.2 km in 2.4 litres of petrol. How much distance will it travel in 1 litre of petrol?
10. The total weight of some bags of wheat is 1743 kg. If each bag weights 49.8 kg, how many bags are there?
11. Shikha cuts 50 m of cloth into pieces of 1.25 m each. How many pieces does she get?
12. Each side of a rectangular polygon is 2.5 cm in length. The perimeter of the polygon is 12.5 cm. How many sides does the polygon have?
13. The product of two decimals is 42.987. If one of them is 12.46, find the other.
14. The weight of 34 bags of sugar is 3483.3 kg. If all bags weigh equally, find the weight of each bag.
15. How many buckets of equal capacity can be filled from 586.5 litres of water, if each bucket has capacity of 8.5 litres?

ANSWERS

1. (i) 14.245 (ii) 5.425 (iii) 0.345 (iv) 0.057
   (v) 0.0043 (vi) 0.0004
2. (i) 4.595 (ii) 0.743 (iii) 0.058 (iv) 0.007
   (v) 0.0048 (vi) 0.0003
3. (i) 0.23541 (ii) 0.0295 (iii) 0.0038 (iv) 0.0007
4. (i) 0.05 (ii) 12.08 (iii) 140 (iv) 4.2
   (v) 0.85 (vi) 0.48
5. (i) 0.832 (ii) 0.016 (iii) 6.81 (iv) 4.2
   (v) 1.362 (vi) 0.14
6. (i) 0.784 (ii) 0.823 (iii) 13.46
7. (i) 4000 (ii) 1100 (iii) 2000 (iv) 500
8. (i) 0.4 (ii) 0.08 (iii) 0.125 (iv) 9.6
9. 18 km
10. 35
11. 40
12. 5
13. 3.45
14. 102.45 kg
15. 69

OBJECTIVE TYPE QUESTIONS

Mark the correct alternative in each of the following:

1. When 0.48 is written in the simplest form of its terms, the sum of its numerator and denominator is
   (a) 148 (b) 74 (c) 37 (d) 147
2. The improper fraction $2\frac{1}{25}$ in decimal form is
   (a) 2.4 (b) 2.04 (c) 2.004 (d) None of these
3. $4 + 4.4 + 44.4 + 4.04 + 444 =$
   (a) 500.84 (b) 577.2 (c) 495.22 (d) 472.88

4. 1.04 as an mixed fraction is

(a) $1\frac{1}{5}$ (b) $1\frac{2}{5}$ (c) $1\frac{1}{25}$ (d) $1\frac{2}{25}$

5. If $24.125 = 24 + \frac{A}{10} + \frac{B}{100} + \frac{C}{1000}$, then $A + B + C =$

(a) 3 (b) 6 (c) 13 (d) 8

6. $0.002 \times 0.5 =$

(a) 0.0001 (b) 0.001 (c) 0.01 (d) 1

7. $3 \times 0.3 \times 0.03 \times 0.003 \times 30 =$

(a) 0.0000243 (b) 0.000243 (c) 0.00243 (d) 0.0243

8. $0.012 \times 0.15 =$

(a) 0.8 (b) 0.08 (c) 0.008 (d) 0.0018

9. $75.57 \div 0.01 =$

(a) 7557 (b) 0.7557 (c) 755.7 (d) 7.557

10. What should be subtracted from 0.1 to get 0.06?

(a) 0.4 (b) 0.04 (c) 0.004 (d) None of these

11. What should be added to 5.09 to get 5.5?

(a) 0.41 (b) 0.59 (c) 0.49 (d) 0.95

12. $0.3 \times 0.3 \times 0.3 =$

(a) 2.7 (b) 0.27 (c) 0.027 (d) None of these

13. $0.25 \times 0.8 =$

(a) 0.02 (b) 0.2 (c) 0.002 (d) 2

14. 5 kg 5 g written in decimal notation is

(a) 5.5 (b) 5.05 (c) 5.005 (d) 5.0005

15. $0.012 \div 1.5 = ?$

(a) 0.8 (b) 0.08 (c) 0.008 (d) None of these

16. $0.02 \times 0.05 =$

(a) 0.1 (b) 0.01 (c) 0.001 (d) 0.0001

17. 5 km 5 m = ?

(a) 5.5 km (b) 5.05 km (c) 5.005 km (d) 5.0005 km

18. The value of $2.2 \times 0.2 \times 0.001$ is

(a) 4.2 (b) 0.00044 (c) 4.4 (d) None of these

19. If $14 \times 4 = 56$, then $0.014 \times 4 =$

(a) 0.56 (b) 5.6 (c) 0.056 (d) None of these

20. 8 ml is equal to

(a) 0.8 l (b) 0.08 l (c) 0.008 l (d) None of these

ANSWERS

1. (c) 2. (b) 3. (a) 4. (c) 5. (d) 6. (b) 7. (c)
8. (d) 9. (a) 10. (b) 11. (a) 12. (c) 13. (b) 14. (c)
15. (c) 16. (c) 17. (c) 18. (b) 19. (c) 20. (c)

THINGS TO REMEMBERS

1. *Decimals are an extension of our number system.*
2. *Decimals are fractions whose denominators are 10, 100, 1000 etc.*
3. *A decimal has two parts, namely, the whole number part and decimal part.*
4. *The number of digits contained in the decimal part of a decimal number is known as the number of decimal places.*
5. *Decimals having the same number of places are called like decimals, otherwise they are known as unlike decimals.*
6. *We have, 0.1 = 0.10 = 0.100 etc, 0.5 = 0.50 = 0.500 etc and so on. That is by annexing zeros on the right side of the extreme right digit of the decimal part of a number does not alter the value of the number.*
7. *Unlike decimals may be converted into like decimals by annexing the requisite number of zeros on the right side of the extreme right digit in the decimal part.*
8. *Decimal numbers may be compared by using the following steps.*

   Step I Obtain the decimal numbers

   Step II Compare the whole parts of the numbers. The number with greater whole part will be greater. If the whole parts are equal, go to next step.

   Step III Compare the extreme left digits of the decimal parts of two numbers. The number with greater extreme left digit will be greater. If the extreme left digits of decimal parts are equal, then compare the next digits and so on.

9. *A decimal can be converted into a fraction by using the following steps:*

   Step I Obtain the decimal.

   Step II Take the numerator as the number obtained by removing the decimal point from the given decimal.

   Step III Take the denominator as the number obtained by inserting as many zeros with 1 (e.g. 10, 100 or 1000 etc.) as there are number of places in the decimal part.

10. *Fractions can be converted into decimals by using the following steps:*

    Step I Obtain the fraction and convert it into an equivalent fraction with denominator 10 or 100 or 1000 if it is not so.

    Step II Write its numerator and mark decimal point after one place or two places or three places from right towards left if the denominator is 10 or 100 or 1000 respectively. If the numerator is short of digits, insert zeros at the left of the numerator.

11. *Decimals can be added or subtracted by using the following steps:*

    Step I Convert the given decimals to like decimals.

    Step II Write the decimals in columns with their decimal points directly below each other so that tenths come under tenths, hundredths come and hundredths and so on.

    Step III Add or subtract as we add or subtract whole numbers.

    Step IV Place the decimal point, in the answer, directly below the other decimal points.

12. *In order to multiply a decimal by 10, 100, 1000 etc., we use the following rules:*

    Rule I On multiplying a decimal by 10, the decimal point is shifted to the right by one place.

    Rule II On multiplying a decimal by 100, the decimal point is shifted to the right by two places.

    Rule III On multiplying a decimal by 1000, the decimal point is shifted to the right by three places, and so on.

13. *A decimal can be multiplied by a whole number by using following steps:*

    Step I Multiply the decimal without the decimal point by the given whole number.

    Step II Mark the decimal point in the product to have as many places of decimal as are there in the given decimal.

14. *To multiply a decimal by another decimal, we follow following steps:*

    Step I Multiply the two decimals without decimal point just like whole numbers.

    Step II Insert the decimal point in the product by counting as many places from the right to left as the sum of the number of decimal places of the given decimals.

15. *A decimal can be divided by 10, 100, 1000 ect by using the following rules:*

    Rule I When a decimal is divided by 10, the decimal point is shifted to the left by one place.

    Rule II When a decimal is divided by 100, the decimal point is shifted to the left by two places.

    Rule III When a decimal is divided by 1000, the decimal point is shifted to the left by three places.

16. *A decimal can be divided by a whole number by using the following steps:*

    Step I Check the whole number part of the dividend.

    Step II If the whole number part of the dividend is less than the divisor, then place a 0 in the ones place in the quotient. Otherwise, go to step III.

    Step III Divide the whole number part of the dividend.

    Step IV Place the decimal point to the right of ones place in the quotient obtained in step I.

    Step V Divide the decimal part of the dividend by the divisor. If the digits of the dividend are exhausted, then place zeros to the right of dividend and remainder each time and continue the process.

17. *A decimal can be divided by a decimal by using the following steps:*

    Step I Multiple the dividend and divisor by 10 or 100 or 1000 etc. to convert the divisor into a whole number.