



$5(x - y)$

$\sqrt{64}$



$1\frac{7}{10}$

$(-1)^1$



15

Decimal Numbers

By studying this lesson you will be able to,

- multiply a whole number by a decimal number,
- multiply a decimal number by a decimal number,
- divide a whole number by a decimal number, and
- divide a decimal number by a decimal number.

15.1 Decimal numbers

In Grades 6 and 7 you learnt how to represent a given fraction as a decimal number and a given decimal number as a fraction.

You also learnt that it is easy to represent a fraction as a decimal number when the denominator of the given fraction can be expressed as a power of 10 such as 10, 100, 1000, ... etc.

- Let us consider how a fraction with denominator equal to 10 is written as a decimal number.

$$\frac{1}{10} = 0.1, \quad \frac{9}{10} = 0.9, \quad \frac{17}{10} = 1.7$$

- Let us now recall how some fractions with denominators which are not powers of 10 were represented as decimal numbers by using equivalent fractions.

- Let us write $\frac{3}{25}$ as a decimal number.

Since $100 \div 25 = 4$,

$$\frac{3}{25} = \frac{3 \times 4}{25 \times 4} = \frac{12}{100} = 0.12$$

- Let us write the improper fraction $\frac{17}{4}$ as a decimal number.

$$\frac{17}{4} = \frac{17 \times 25}{4 \times 25} = \frac{425}{100} = 4.25$$

- Let us write $\frac{77}{125}$ as a decimal number.

Since $1000 \div 125 = 8$,

$$\frac{77}{125} = \frac{77 \times 8}{125 \times 8} = \frac{616}{1000} = 0.616$$

- Let us write the mixed number $6\frac{33}{40}$ as a decimal number.

$$\begin{aligned} 6\frac{33}{40} &= 6 + \frac{33}{40} = 6 + \frac{33 \times 25}{40 \times 25} \\ &= 6 + \frac{825}{1000} \\ &= 6 + 0.825 \\ &= 6.825 \end{aligned}$$



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Accordingly, if a number which is a power of 10, such as 10, 100, 1000, is divisible by the denominator of a fraction, then that fraction can easily be written as a decimal number.

You have learnt how to multiply a decimal number by a whole number and how to divide a decimal number by a whole number.

- When multiplying a number which is in decimal form by a number which is a power of 10, the number of places the decimal point in the decimal number is shifted to the right (by adding zeros if necessary), is equal to the number of zeros in the power of ten by which it is multiplied.

Examples: (i) $3.211 \times 10 = 32.11$ (ii) $2.31 \times 100 = 231$ (iii) $1.11 \times 1000 = 1110$

- When dividing a number which is in decimal form by a number which is a power of 10, the number of places the decimal point in the decimal number is shifted to the left (by adding zeros if necessary) is equal to the number of zeros in the power of ten by which it is divided.

Examples: (i) $22.31 \div 10 = 2.231$ (ii) $0.4 \div 100 = 0.004$ (iii) $32 \div 1000 = 0.032$

Do the following review exercise to recall the above facts about decimal numbers that you learnt in Grades 6 and 7.

Review Exercise

- (1) Represent each of the following proper fractions as a decimal number.

(i) $\frac{3}{10}$

(ii) $\frac{97}{100}$

(iii) $\frac{1}{1000}$

(iv) $\frac{7}{8}$

- (2) Write each of the following decimal numbers as a fraction, and express it in its simplest form.

(i) 0.7

(ii) 0.25

(iii) 8.16

(iv) 0.025

- (3) Represent each of the following improper fractions and mixed numbers as a decimal number.

(i) $\frac{17}{10}$

(ii) $\frac{308}{25}$

(iii) $3\frac{9}{10}$

(iv) $14\frac{9}{100}$

- (4) Find the value of each of the following.

(a) (i) 3.87×10

(ii) 4.08×100

(iii) 0.0456×1000

(iv) 4.09×10^2

(v) 9.45×10^3

(vi) 18.342×10^2

(vii) 3.27×3

(viii) 0.65×11

(ix) 15.08×13



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(b) (i) $58 \div 10$

(ii) $34 \div 100$

(iii) $148 \div 1000$

(iv) $7.29 \div 10^2$

(v) $35 \div 10^3$

(vi) $1.785 \div 10^2$

(vii) $78.3 \div 3$

(viii) $0.684 \div 4$

(ix) $30.84 \div 12$

15.2 Multiplying a whole number by a decimal number

Let us now study how to multiply a whole number by a decimal number. This is similar to multiplying a decimal number by a whole number. We can also convert the decimal number into a fraction and then perform the multiplication.

- Let us find the value of 7×0.8

Let us write the decimal number as a fraction with denominator a power of 10 and then multiply.

$$0.8 = \frac{8}{10}$$

$$\therefore 7 \times 0.8 = 7 \times \frac{8}{10} = \frac{7 \times 8}{10}$$

$$= \frac{56}{10} = 5.6$$

That is, to obtain the value of 7×0.8 , the value of 7×8 needs to be divided by 10.

$$\therefore 7 \times 0.8 = \frac{56}{10} = 5.6$$

- Let us find the value of 8×1.2

Method I

$$8 \times 1.2 = 8 \times \frac{12}{10} = \frac{8 \times 12}{10}$$

$$= \frac{96}{10}$$

$$= 9.6$$

Since $1.2 \times 10 = 12$, to obtain the value of 8×1.2 , the value that is obtained for 8×12 , by not considering the decimal place in 1.2, should be divided by 10.

That is, $8 \times 1.2 = 9.6$

Method II

Let us first multiply the numbers without considering the decimal places.

$$8 \times 12 = 96$$

Since there is one decimal place in 1.2, place the decimal point in the answer such that it too has one decimal place.

That is, $8 \times 1.2 = 1.2 \times 8 = 9.6$

**Example 1**

Find the value of 8×8.73 .

Method I

$$8 \times 8.73 = 8 \times \frac{873}{100} = \frac{8 \times 873}{100} = \frac{6984}{100} = 69.84$$

That is, to find the value of 8.73×8 , the value of 873×8 , must be divided by 100.

Method II

Let us multiply the two numbers without considering the decimal places.

$$\begin{array}{r} 873 \\ \times 8 \\ \hline 6984 \end{array}$$

Since 8.73 has two decimal places, the decimal point needs to be placed in the answer such that it too has two decimal places.

$$\therefore 8 \times 8.73 = 69.84$$

Example 2

(1) $7 \times 233 = 1631$. Find the value of each of the following multiplications.

(i) 7×23.3

(ii) 7×2.33

(iii) 7×0.233

(i) $7 \times 233 = 1631$

Since $23.3 \times 10 = 233$,

$$\begin{aligned} 7 \times 23.3 &= 1631 \div 10 \\ &= 163.1 \end{aligned}$$

(ii) $7 \times 233 = 1631$

Since $2.33 \times 100 = 233$,

$$\begin{aligned} 7 \times 2.33 &= 1631 \div 100 \\ &= 16.31 \end{aligned}$$

(iii) $7 \times 233 = 1631$

Since $0.233 \times 1000 = 233$,

$$\begin{aligned} 7 \times 0.233 &= 1631 \div 1000 \\ &= 1.631 \end{aligned}$$

Exercise 15.1

(1) Find the value of each of the following.

(i) 5×8.03

(ii) 12×19.4

(iii) 30×10.53

(iv) 4×3.197

(v) 15×1.91

(vi) 32×24.64



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(2) Find the value of 678×4 , and hence write down the value of each of the following multiplications.

(i) 4×67.8

(ii) 4×6.78

(iii) 4×0.678

(3) Find the area of a rectangular vegetable plot of length 34 m and breadth 12.8 m.

15.3 Multiplying a decimal number by a decimal number

The length and breadth of a rectangular shaped bed sheet are 2.7 m and 0.9 m respectively. Find the area of the bed sheet.

Length of the rectangular shaped bed sheet = 2.7 m

Breadth of the rectangular shaped bed sheet = 0.9 m

$$\begin{aligned}\therefore \text{Area of the rectangular shaped bed sheet} &= 2.7 \text{ m} \times 0.9 \text{ m} \\ &= 2.7 \times 0.9 \text{ m}^2\end{aligned}$$



Now let us consider how to find the value of 2.7×0.9 .

Method I

Let us write each decimal number as a fraction.

$$2.7 = \frac{27}{10} \text{ and } 0.9 = \frac{9}{10}.$$

$$\begin{aligned}\therefore 2.7 \times 0.9 &= \frac{27}{10} \times \frac{9}{10} \\ &= \frac{27 \times 9}{100} \\ &= \frac{243}{100} \\ &= 2.43\end{aligned}$$

That is, to find the value of 2.7×0.9 , the value of 27×9 must be divided by 100.

Method II

$$\begin{array}{cc} 2.7 \times 0.9 \\ \uparrow \quad \uparrow \\ \text{multiplicand} \quad \text{multiplier}\end{array}$$

There are two decimal places in these two decimal numbers (multiplicand and multiplier).

Let us multiply the two decimal numbers without considering their decimal places.

$$27 \times 9 = 243$$

When 243 is written by considering the two decimal places, we obtain 2.43.

That is, $2.7 \times 0.9 = 2.43$

Therefore, the area of the bed sheet is 2.43 m^2 .

$$\begin{array}{r} 27 \\ \times 9 \\ \hline 243 \end{array}$$

**Example 1**

Find the value of 30.8×0.07

Method I

$$30.8 = \frac{308}{10} \text{ and } 0.07 = \frac{7}{100}$$

$$\therefore 30.8 \times 0.07 = \frac{308}{10} \times \frac{7}{100} = \frac{2156}{1000} = 2.156$$

Method II

$$\begin{array}{r} 308 \\ \times 7 \\ \hline 2156 \end{array}$$

The total number of decimal places in 30.8 (multiplicand) and 0.07 (multiplier) is 3. Therefore let us place the decimal point in the answer so that it has 3 decimal places.

$$\therefore 30.8 \times 0.07 = 2.156$$

Example 2

$172 \times 26 = 4472$. Write the value of each of the following accordingly.

(i) 1.72×2.6 (ii) 17.2×2.6 (iii) 0.172×0.026

$$(i) \ 1.72 \times 2.6 = \frac{172 \times 26}{100 \times 10} = \frac{4472}{1000} = 4.472$$

$$(ii) \ 17.2 \times 2.6 = \frac{172 \times 26}{100} = \frac{4472}{100} = 44.72$$

$$(iii) \ 0.172 \times 0.026 = \frac{172 \times 26}{1000 \times 1000} = \frac{4472}{1\ 000\ 000} = 0.004472$$

Exercise 15.2

(1) Find the value of each of the following.

(i) 0.7×0.6

(ii) 1.2×0.8

(iii) 4.2×2.8

(iv) 1.26×0.9

(v) 1.31×0.91

(vi) 2.78×1.87

(vii) 62.32×3.48

(viii) 59.08×1.42

(ix) $(0.4)^2$

(x) $(0.06)^2$

(xi) $0.3 \times 0.5 \times 0.9$

(xii) $4 + 0.3 \times 0.2$

(xiii) $0.09 - 0.09 \times 0.03$

(xiv) $(1 - 0.7)^2$



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- (2) The price of 1 kg of potatoes is Rs.76.50. How much does it cost Achala to buy 2.5 kg of potatoes?



- (3) The side length of a square shaped stamp is 2.7 cm. Find the area of the stamp.
- (4) $273 \times 31 = 8463$. Find the value of each of the following multiplications accordingly.

(i) 27.3×3.1

(ii) 2.73×3.1

(iii) 0.31×2.73

(iv) 3.1×0.273

(v) 0.031×2.73

(vi) 0.031×27.3

- (5) The mass of a brick is approximately 2.3 kg. To construct a wall, 2500 such bricks are required.

(i) Estimate the total mass of the bricks.

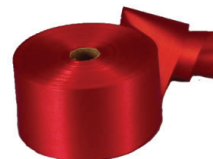
(ii) A lorry can transport a mass of up to 2 metric tons per trip. Estimate how many such lorries are required to transport these 2500 bricks.



15. 4 Dividing a whole number by a decimal number

Jayamini requires several pieces of ribbon of length 0.8 m each to decorate a classroom. She has a roll of ribbon of length 48 m.

Let us find how many pieces of ribbon of length 0.8 m can be cut from this roll of ribbon.



To obtain the answer, 48 m needs to be divided by 0.8 m.

Method I

$$48 \div 0.8 = 48 \div \frac{8}{10}$$

Since the reciprocal of $\frac{8}{10}$ is $\frac{10}{8}$

$$\begin{aligned} \therefore 48 \div 0.8 &= 48 \times \frac{10}{8} \\ &= \frac{480}{8} = 60 \end{aligned}$$

Let us find the value of $48 \div 0.8$ without considering the decimal place in 0.8.

Since 0.8 has one decimal place, the answer which is obtained for $48 \div 8$ must be multiplied by 10.

$$48 \div 8 = 6$$

$$\therefore 48 \div 0.8 = 60.$$

Therefore 60 pieces of ribbon can be cut.

**Method II**

Multiply both the dividend and the divisor by a power of 10 and convert the divisor into a whole number. Then perform the division in the usual manner.

$$48 \div 0.8 = \frac{48}{0.8} = \frac{48 \times 10}{0.8 \times 10} = \frac{480}{8} = 60$$

Example 1

Divide 63 by 1.2.

Method I

$$\begin{aligned} 63 \div 1.2 &= 63 \div \frac{12}{10} \\ &= 63 \times \frac{10}{12} \quad (\text{since the reciprocal of } \frac{12}{10} \text{ is } \frac{10}{12}) \\ &= \frac{63}{12} \times 10 \\ &= \frac{630}{12} = 52.5 \end{aligned}$$

$$\begin{array}{r} 52.5 \\ 12 \overline{) 630.0} \\ \underline{60} \\ 30 \\ \underline{24} \\ 60 \\ \underline{60} \\ 00 \end{array}$$

Let us divide 63 by 12 without considering the decimal places.

Since there is one decimal place in 1.2, the answer that is obtained when 63 is divided by 12 must be multiplied by 10.

$$\begin{aligned} 63 \div 1.2 &= 5.25 \times 10 \\ &= 52.5 \end{aligned}$$

$$\begin{array}{r} 5.25 \\ 12 \overline{) 63.00} \\ \underline{60} \\ 30 \\ \underline{24} \\ 60 \\ \underline{60} \\ 00 \end{array}$$

Method II

$$\begin{aligned} \frac{63}{1.2} &= \frac{63 \times 10}{1.2 \times 10} = \frac{630}{12} \\ &= 52.5 \end{aligned}$$

$$\begin{array}{r} 52.5 \\ 12 \overline{) 630.0} \\ \underline{60} \\ 30 \\ \underline{24} \\ 60 \\ \underline{60} \\ 00 \end{array}$$



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**Example 2**

$87 \div 12 = 7.25$. Find the value of each of the following divisions accordingly.

(i) $87 \div 1.2$

(ii) $87 \div 0.12$



(i) $87 \div 12 = 7.25$

$$\begin{aligned} 87 \div 1.2 &= 7.25 \times 10 \\ &= 72.5 \end{aligned}$$

$$\begin{aligned} \text{(ii) } 87 \div 0.12 &= \frac{87}{0.12} \\ &= \frac{87 \times 100}{0.12 \times 100} \\ &= \frac{8700}{12} \\ &= \frac{87}{12} \times 100 \\ &= 7.25 \times 100 \\ &= 725 \end{aligned}$$

Exercise 15.3

(1) Find the value of each of the following.

(i) $7 \div 0.28$

(ii) $11 \div 0.44$

(iii) $82 \div 3.28$

(iv) $12 \div 0.48$

(v) $475 \div 2.5$

(vi) $97 \div 2.5$

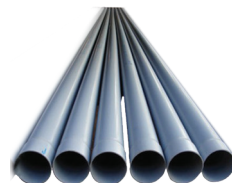
(2) $198 \div 11 = 18$. Find the value of each of the following divisions accordingly.

(i) $198 \div 1.1$

(ii) $198 \div 0.11$

(iii) $1980 \div 0.011$

(3) How many pipes of length 2.4 m each are required to construct a pipeline of length 720 m?



(4) A motor car travelled 150.78 km in 4 hours. Find the distance it travelled in an hour by assuming that it travelled an equal distance each hour.





15.5 Dividing a decimal number by another decimal number

Let us divide 3.72 by 1.2.

Method I

$$\begin{aligned}
 3.72 \div 1.2 &= \frac{372}{100} \div \frac{12}{10} \\
 &= \frac{372}{100} \times \frac{10}{12} \quad \text{(since the reciprocal of } \frac{12}{10} \text{ is } \frac{10}{12} \text{)} \\
 &= \frac{372}{10 \times 12} = \frac{37.2}{12} \\
 &= 3.1
 \end{aligned}$$

Method II

Multiply the dividend and the divisor by a power of 10 and convert the divisor into a whole number. Then carry out the division in the usual way.

$$\frac{3.72}{1.2} = \frac{3.72 \times 10}{1.2 \times 10} = \frac{37.2}{12} = 3.1$$

$$\begin{array}{r}
 3.1 \\
 12 \overline{) 37.2} \\
 \underline{36} \\
 12 \\
 \underline{12} \\
 00
 \end{array}$$

Example 1

Divide 0.648 by 5.4.

Method I

$$\begin{aligned}
 0.648 \div 5.4 &= \frac{648}{1000} \div \frac{54}{10} \\
 &= \frac{648}{1000} \times \frac{10}{54} \quad \text{(the reciprocal of } \frac{54}{10} \text{ is } \frac{10}{54} \text{)} \\
 &= \frac{648}{100} \times \frac{1}{54} \\
 &= \frac{6.48}{54} \\
 &= 0.12
 \end{aligned}$$

$$\begin{array}{r}
 0.12 \\
 54 \overline{) 648} \\
 \underline{54} \\
 108 \\
 \underline{108} \\
 000
 \end{array}$$

Method II

$$\frac{0.648}{5.4} = \frac{0.648 \times 10}{5.4 \times 10} = \frac{6.48}{54}$$

$$\therefore 0.648 \div 5.4 = 0.12$$

$$\begin{array}{r}
 0.12 \\
 54 \overline{) 6.48} \\
 \underline{54} \\
 108 \\
 \underline{108} \\
 000
 \end{array}$$



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**Exercise 15.4**

(1) Find the value of each of the following.

(i) $0.8 \div 1.6$

(ii) $16.8 \div 0.07$

(iii) $194.3 \div 6.7$

(iv) $1.943 \div 0.67$

(v) $19.43 \div 6.7$

(vi) $0.1943 \div 6.7$

(vii) $1.943 \div 0.067$

(viii) $19.43 \div 670$

(2) (i) Find the value of $336 \div 12$.

(ii) Find the value of each of the following divisions, based on the value of $336 \div 12$.

(a) $3.36 \div 0.12$

(b) $33.6 \div 1.2$

(3) (i) Find the value of $3638 \div 17$.

(ii) Find the value of each of the following divisions based on the value of $3638 \div 17$.

(a) $36.38 \div 1.7$

(b) $363.8 \div 0.17$

(4) The price of a book is Rs. 47.25. How many books can be bought for Rs. 425.25?



(5) The area of a rectangular shaped plot of land is 2718.75 m^2 . The breadth of the plot is 12.5 m. Find its length.

Miscellaneous Exercise

(1) Simplify the following.

(i) 7.18×100

(ii) 9.03×4

(iii) 10.9×7

(iv) 19.2×12

(v) 31.4×15

(vi) 3.07×33

(2) Simplify the following.

(i) 10×8.79

(ii) 100×0.92

(iii) 14×0.21

(iv) 27×0.6

(v) 1.005×40

(vi) 30×4.2

(3) $28 \times 43 = 1204$. Write the value of each of the following multiplications accordingly.

(i) 2.8×43

(ii) 4.3×28

(iii) 0.43×28

(iv) 0.28×43

(v) 0.028×43

(vi) 0.043×28



(4) $188 \div 32 = 5.875$. Write the value of each of the following divisions accordingly.

(i) $18.8 \div 3.2$

(ii) $18.8 \div 0.32$

(iii) $1.88 \div 0.32$

(iv) $0.188 \div 3.2$

(v) $0.188 \div 0.32$

(vi) $1.88 \div 0.032$

(5) Find the value of each of the following.

(i) $5.2 \div 0.4$

(ii) $0.75 \div 0.5$

(iii) $0.075 \div 2.5$

(iv) $3.74 \div 1.1$

(v) $0.195 \div 1.5$

(6) The area of a rectangular sheet is 87.6 cm^2 . If its breadth is 1.2 cm , find its length.

Summary



When dividing a decimal number by a decimal number, multiply the dividend and the divisor by a power of 10 and convert the divisor into a whole number. Then carry out the division in the usual manner.



When multiplying a whole number by a decimal number, write the decimal number as a fraction with a power of ten as its denominator and then do the multiplication.