Fractions and Decimals

Multiplication of Fractions with Whole Numbers

Sometimes, we are required to add a fraction repeatedly. Let us consider one such situation. Suppose Mohit's school is located at a distance of $\frac{3}{4}$ km from his house. Now, how do we find the total distance that Mohit travels from his home to school and back?

Here, we know that Mohit's school is located at a distance of $\frac{3}{4}$ km from his house. He travels the same distance while going to school and while returning home every day.

Thus, total distance that Mohit travels every day = $\left(\frac{3}{4}+\frac{3}{4}\right)$ km

We could have also written this as $\left(2\times\frac{3}{4}\right)$ km.

Here, instead of multiplying the fraction with 2, we could have easily added it twice. However, what would have happened if we were to find the total distance traveled by Mohit to his school and back in 20 days? Then it would not be possible to add the fraction so many times. It would be easier if we multiplied the fraction with 40.

To multiply a fraction with a whole number, the whole number is multiplied with the numerator of the fraction, keeping the denominator same.

Thus, if *a* is a whole number and $\frac{b}{c}$ is a fraction, then $a\times\frac{b}{c}=\frac{a\times b}{c}$.

For example,

$$2\times\frac{1}{4}=\frac{2\times1}{4}=\frac{2}{4}=\frac{1}{2}$$

$$3\times\frac{7}{4}=\frac{3\times7}{4}=\frac{21}{4}$$

$$\frac{3}{5}\times8=\frac{3\times8}{5}=\frac{24}{5}\text{ etc.}$$

In the example that we were discussing in the beginning, we can multiply the fraction $\frac{3}{4}$ with 40 as

$$\frac{3}{4}\times 40=\frac{3\times 40}{4}=3\times 10=30$$

Thus, Mohit would travel 30 km to his school and back in 20 days.

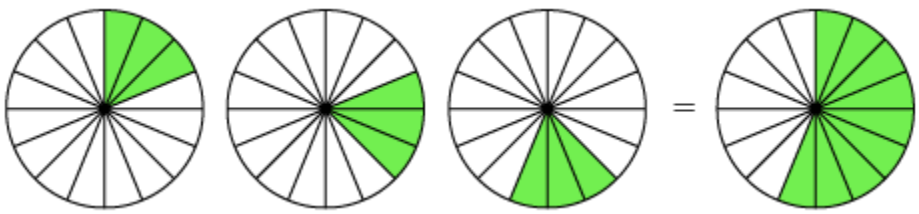
Now, suppose we want to **multiply a whole number with a mixed fraction**, say for example, we want to find the value of the expression $3\times 2\frac{4}{5}$.

To multiply a mixed fraction with a whole number, convert the mixed fraction into an improper fraction and then carry out the multiplication operation.

$$\therefore 3\times 2\frac{4}{5}=3\times\frac{14}{5}=\frac{3\times 14}{5}=\frac{42}{5}$$

We can also represent the **multiplication of fractions with whole numbers with the help of figures.** Let us see how.

Which expression does the following set of figures represent?

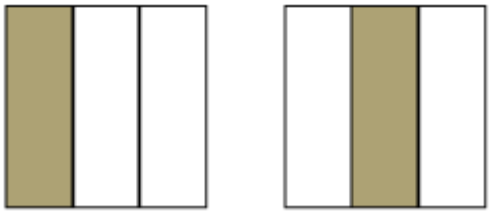


The figures represent the equation $\frac{3}{16}+\frac{3}{16}+\frac{3}{16}=\frac{9}{16}$. We can also say that it represents the equation $3\times\frac{3}{16}=\frac{9}{16}$.

Note that we can also use the operator "of" instead of the multiplication sign "×".

The shaded portion of the following figure represents $\frac{1}{3}$ of the whole, i.e., $\frac{1}{3}$ of 1.

Similarly, in the following figure, the shaded portions represent $\frac{1}{3}$ of 2 wholes, i.e., $\frac{1}{3}$ of 2.



We can combine these two figures to obtain the following figure:

This figure represents the fraction $\frac{2}{3}$.

$\therefore \frac{1}{3}$ of $2 = \frac{2}{3}$

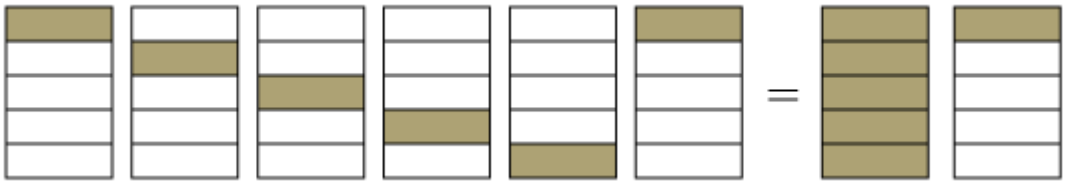
However, when we combined the two figures to obtain the final figure, the expression was $\frac{1}{3} \times 2 = \frac{2}{3}$.

Thus, the expressions $\frac{1}{3} \times 2$ and $\frac{1}{3}$ of 2 are the same.

Let us now find the value of the expression $\frac{1}{5}$ of 6.

$$\frac{1}{5} \text{ of } 6 = \frac{1}{5} \times 6 = \frac{6}{5} = 1\frac{1}{5}$$

This can also be represented as



Let us now see some more examples to understand the concept more clearly.

Example 1:

Find the value of the following expressions:

(i) $\mathbf{\frac{9}{7} \times 15}$

(ii) $\mathbf{2\frac{2}{3} \times 5}$

(iii) $\mathbf{\frac{7}{2} \text{ of } 12}$

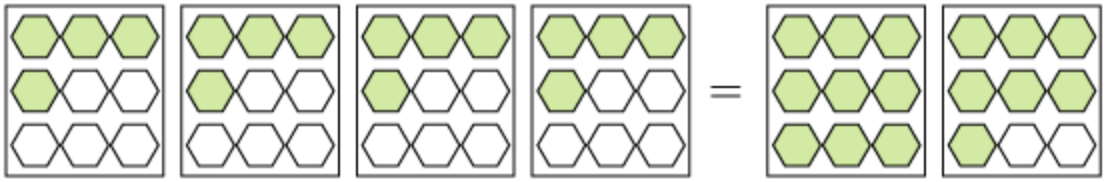
Solution:

(i) $\frac{9}{7} \times 15 = \frac{9 \times 15}{7} = \frac{135}{7}$

(ii) $2\frac{2}{3} \times 5 = \frac{8}{3} \times 5 = \frac{8 \times 5}{3} = \frac{40}{3}$

(iii) $\frac{7}{2} \text{ of } 12 = \frac{7}{2} \times 12 = \frac{7 \times 12}{2} = \frac{84}{2} = 42$

Example 2:



Which of the following expressions is represented by the figure drawn above?

(i) $3 \times \frac{4}{9} = 1\frac{1}{3}$

(ii) $4 \times \frac{5}{9} = 1\frac{8}{9}$

(iii) $4 \times \frac{4}{9} = 1\frac{7}{9}$

(iv) $5 \times \frac{5}{9} = 1\frac{7}{9}$

Solution:

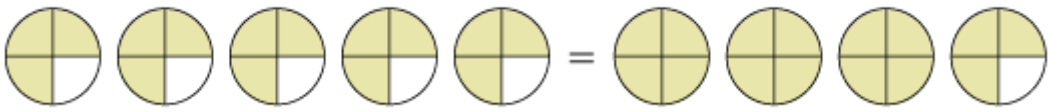
Expression (iii), i.e., $4 \times \frac{4}{9} = 1\frac{7}{9}$, is represented by the given figure.

Example 3:

Represent $5 \times \frac{3}{4} = 3\frac{3}{4}$ **pictorially.**

Solution:

The expression $5 \times \frac{3}{4} = 3\frac{3}{4}$ can be represented pictorially as follows:



Example 4:

Isha scored 450 marks in 5 subjects. In mathematics, she scored $\frac{1}{5}$ of the total marks scored. Find the sum of the marks scored by her in the other subjects.

Solution:

We are given that Isha scored $\frac{1}{5}$ of the total marks scored in mathematics.

∴ Her marks in other subjects = $\left(1-\frac{1}{5}\right)$ of the total marks scored

= $\frac{4}{5}$ of the total marks scored

$=\frac{4}{5}\times 450$

$=\frac{4\times 450}{5}$

= 4 × 90

= 360

Example 5:

Soma bought $3\frac{1}{4}$ kg of mangoes, Bala bought $4\frac{1}{2}$ kg of mangoes, Sunila bought $2\frac{3}{4}$ kg of mangoes. If the cost of 1 kg of mangoes is Rs 60 then find the total cost of mangoes bought by them.

Solution:
Total quantities of mangoes bought by three persons

$$= 3\frac{1}{4} + 4\frac{1}{2} + 2\frac{3}{4}$$
$$= \frac{13}{4} + \frac{9}{2} + \frac{11}{4}$$
$$= \frac{13+18+11}{4}$$
$$= \frac{42}{4}$$
$$= \frac{21}{2} \text{ kg}$$

Cost of 1 kg of mangoes = Rs 60

∴ Total cost of mangoes bought by all three persons

$$= \frac{21}{2} \times \text{Rs } 60$$
$$= 21 \times \text{Rs } 30$$
$$= \text{Rs } 630$$

Multiplication of Fractions with Fractions

We have learnt how to multiply integers or decimals. But we have another form of numbers whose multiplication we have to learn. Those types of numbers are fractions.

Let us go through the given video to understand how to multiply two fractions.

There are several more properties in multiplication of fractions which we require to keep in mind while carrying out the multiplication.

These points are summed up below.

Points to remember

(i) ***The value of the product of two proper fractions is always less than the value of each of the fraction that is being multiplied.***

For example,

$$\frac{2}{3} \times \frac{4}{7} = \frac{2 \times 4}{3 \times 7} = \frac{8}{21}$$

We know that $\frac{2}{3} = \frac{2 \times 7}{3 \times 7} = \frac{14}{21}$

Since $\frac{8}{21} < \frac{14}{21}$

Therefore, $\frac{8}{21} < \frac{2}{3}$

Again, $\frac{4}{7} = \frac{4 \times 3}{7 \times 3} = \frac{12}{21}$

Since $\frac{8}{21} < \frac{12}{21}$

Therefore, $\frac{8}{21} < \frac{4}{7}$

(ii) ***The value of the product of two improper fractions is always greater than the value of each of the fraction that is being multiplied.***

For example,

$\frac{7}{4} \times \frac{6}{5} = \frac{7 \times 6}{4 \times 5} = \frac{42}{20}$

We know that $\frac{7}{4} = \frac{7 \times 5}{4 \times 5} = \frac{35}{20}$

Since $\frac{42}{20} > \frac{35}{20}$

Therefore, $\frac{42}{20} > \frac{7}{4}$

Again, $\frac{6}{5} = \frac{6 \times 4}{5 \times 4} = \frac{24}{20}$

Since $\frac{42}{20} > \frac{24}{20}$

Therefore, $\frac{42}{20} > \frac{6}{5}$

Let us now solve some examples.

Example 1:

Find the value of the following expressions.

(i) $\frac{2}{3}\times\frac{6}{5}$ **(ii)** $\frac{7}{4}\times 2\frac{4}{5}$

(iii) $3\frac{5}{9}\times 7\frac{1}{2}$ **(iv)** $5\frac{3}{8}\times\frac{2}{5}$

Solution:

(i) $\frac{2}{3}\times\frac{6}{5}=\frac{2\times 6}{3\times 5}$

$=\frac{12}{15}$

$=\frac{4}{5}$

(ii) $\frac{7}{4}\times 2\frac{4}{5}=\frac{7}{4}\times\frac{14}{5}$

$=\frac{7\times 14}{4\times 5}$

$=\frac{98}{20}$

$=\frac{49}{10}$

(iii) $3\frac{5}{9}\times 7\frac{1}{2}=\frac{32}{9}\times\frac{15}{2}$

$=\frac{32\times 15}{9\times 2}$

$=\frac{480}{18}$

$=\frac{80}{3}$

(iv) $5\frac{3}{8}\times\frac{2}{5}=\frac{43}{8}\times\frac{2}{5}$

$=\frac{43\times 2}{8\times 5}$

$=\frac{86}{40}$

$=\frac{43}{20}$

Example 2:

Simon can eat $\frac{3}{4}$ of an apple in 1 minute. How many apples can she eat in $2\frac{2}{3}$ minutes?

Solution:

Apples that Simon can eat in 1 minute = $\frac{3}{4}$ apple

Apples that she can eat in $2\frac{2}{3}$ minutes $=\frac{3}{4}\times 2\frac{2}{3}$

$=\frac{3}{4}\times\frac{8}{3}$

$=\frac{3\times 8}{4\times 3}$

$=\frac{24}{12}$

$= 2$ apples

Thus, Simon can eat 2 apples in $2\frac{2}{3}$ minutes.

Example 3:

The length of a rectangular park is $24\frac{3}{5}$ m. Find the width of the park, if its width is $\frac{1}{3}$ of the length.

Solution:

It is given that length of the park = $24\frac{3}{5}\text{m}$

$$=\frac{123}{5}\text{m}$$

Therefore, width of the park $=\frac{1}{3}\times\frac{123}{5}$

$$=\frac{1\times123}{3\times5}$$
$$=\frac{123}{15}$$
$$=\frac{41}{5}$$
$$=8+\frac{1}{5}$$
$$=8\frac{1}{5}\text{ m}$$

Thus, the width of the park is $8\frac{1}{5}$ m.

Example 4:

Deepa bought $8\frac{3}{4}\text{ m}$ long ribbon. She had given $\frac{2}{5}$ of the ribbon to her sister Tanu. Find the length of the remaining ribbon.

Solution:

Original length of the ribbon = $8\frac{3}{4}\text{ m}=\frac{35}{4}\text{ m}$

$\frac{2}{5}$ of the ribbon was given to her sister Tanu.

∴ Length of the ribbon given to Tanu = $\frac{2}{5} \times \frac{35}{4} = \frac{7}{2}$ m

Thus, length of the remaining ribbon = $\frac{35}{4} - \frac{7}{2} = \frac{35-14}{4} = \frac{21}{4} = 5\frac{1}{4}$ m

Division of Fractions by Whole Numbers or Fractions

To divide a fraction by a whole number or by a fraction, we use the concept of reciprocal. Let us go through the video to understand the concept of reciprocal and relate it to the division of fractions by whole numbers or by fractions.

Let us see some more examples.

$$\frac{3}{5} \div \frac{1}{4} = \frac{3}{5} \times \frac{4}{1} = \frac{3 \times 4}{5 \times 1} = \frac{12}{5}$$
$$\frac{9}{7} \div \frac{3}{2} = \frac{9}{7} \times \frac{2}{3} = \frac{9 \times 2}{7 \times 3} = \frac{18}{21} = \frac{6}{7}$$

Let us solve some more examples to understand this concept better.

Example 1:

Evaluate the following.

$$\textbf{(i)}\ 3\frac{4}{7} \div 9 \qquad \textbf{(ii)}\ 4\frac{7}{9} \div 3\frac{1}{2}$$

Solution:

(i) $3\frac{4}{7} \div 9 = \frac{25}{7} \div 9$

$$= \frac{25}{7} \times \frac{1}{9}$$
$$= \frac{25 \times 1}{7 \times 9}$$
$$= \frac{25}{63}$$

(ii) $4\frac{7}{9} \div 3\frac{1}{2} = \frac{43}{9} \div \frac{7}{2}$

$$= \frac{43}{9} \times \frac{2}{7}$$
$$= \frac{43 \times 2}{9 \times 7}$$
$$= \frac{86}{63}$$
$$= \frac{(1 \times 63) + 23}{63}$$
$$= 1 + \frac{23}{63}$$
$$= 1\frac{23}{63}$$

Example 2:

Fill the boxes in the following expressions.

$$\textbf{(i)}\ \frac{2}{5} \times \frac{3}{7} = \frac{2}{5} \div \square$$
$$\textbf{(ii)}\ 2\frac{3}{5} \times 1\frac{2}{3} = 2\frac{3}{5} \div \square$$

Solution:

$$\textbf{(i)}\ \frac{2}{5} \times \frac{3}{7} = \frac{2}{5} \div \boxed{\frac{7}{3}}$$

$$\textbf{(ii)}\ 1\frac{2}{3} = \frac{(1 \times 3) + 2}{3} = \frac{5}{3}$$

Its reciprocal is $\frac{3}{5}$.

Therefore, $2\frac{3}{5} \times 1\frac{2}{3} = 2\frac{3}{5} \div \boxed{\frac{3}{5}}$

Example 3:

Mohit has $3\frac{1}{5}$ pizzas with him. How many people are required to eat this amount of pizza, if each person eats a portion equal to $\frac{2}{5}$ of the pizza?

Solution:

Amount of pizza which Mohit has = $3\frac{1}{5}$

Portion of pizza which each person will eat = $\frac{2}{5}$

Therefore, number of people required = $3\frac{1}{5} \div \frac{2}{5}$

$$= \frac{16}{5} \div \frac{2}{5}$$
$$= \frac{16}{5} \times \frac{5}{2}$$
$$= \frac{16 \times 5}{5 \times 2}$$
$$= \frac{80}{10}$$
$$= 8$$

Thus, the number of people required is 8.

Example 4:

A car travels $244\frac{1}{2}$ km in 6 hours. Find the speed of the car.

Solution:

Distance travelled by the car = $244\frac{1}{2}$ km

$$= \frac{489}{2} \text{ km}$$

Time taken to travel the distance = 6 h

Therefore, speed of the car $= \text{Distance} \div \text{time}$

$= \left(\frac{489}{2} \div 6 \right)$ km/h

$= \frac{489}{2} \times \frac{1}{6}$

$= \frac{489 \times 1}{2 \times 6}$

$= \frac{489}{12}$

$= \frac{163}{4}$

$= \frac{(40 \times 4) + 3}{4}$

$= 40 + \frac{3}{4}$

$= 40\frac{3}{4}$ km/h

Thus, the speed of the car is $40\frac{3}{4}$ km/h.

Example 5:

A bag contains $8\frac{1}{2}$ kg of salt. In how many packets can it be filled if each packet can hold $\frac{1}{4}$ kg?

Answer:

Quantity of salt contained in the bag = $8\frac{1}{2} = \frac{17}{2}$ kg

Quantity of salt a packet can hold = $\frac{1}{4}$ kg

So, number of packets that can be filled by salt = $\frac{17}{2} \div \frac{1}{4} = \frac{17}{2} \times 4 = 17 \times 2 = 34$

Division of Whole Numbers by Fractions

We know how to divide fractions by whole numbers and fractions by fractions.

But what if we have to divide a whole number by a fraction? How will we perform such a division?

The division of a whole number by a fraction can also be performed in a similar way as the division of a fraction by a whole number or as the division of a fraction by another fraction.

In this case also, we convert the division operation into multiplication operation using the following rule.

"**To divide a whole number by a fraction, we replace the divisor by the reciprocal of the divisor and the division operation by multiplication operation".**

For example,

$$2 \div \frac{1}{2}$$

Here, first we replace the fraction by its reciprocal which is 2 and the division sign by multiplication.

Hence, the expression becomes

$$= 2 \times 2$$

Now, we can simply perform multiplication to obtain the required result

$$= 4$$

Thus, $2 \div \frac{1}{2} = 4$

In this way, we can divide a given whole number by a fraction. Let us now solve some more examples.

Example 1:

Find the value of the following expressions.

(i) $5 \div \frac{4}{7}$ **(ii)** $19 \div 2\frac{6}{15}$

Solution:

(i) $5 \div 475 \div 47$

$$= 5 \times \frac{7}{4}$$
$$= \frac{5 \times 7}{4}$$
$$= \frac{35}{4}$$

(ii) $19 \div 2\frac{6}{15}$

$$= 19 \div \frac{(2 \times 15) + 6}{15}$$
$$= 19 \div \frac{36}{15}$$
$$= 19 \times \frac{15}{36}$$

$$= \frac{19 \times 15}{36}$$
$$= \frac{285}{36}$$
$$= \frac{285 \div 3}{36 \div 3}$$
$$= \frac{95}{12}$$
$$= \frac{(7 \times 12) + 11}{12}$$
$$= 7\frac{11}{12}$$

Example 2:

Fill in the blanks in the following expressions.

(1) $\mathbf{9 \div \frac{19}{30} = 9 \times \square}$

(2) $\mathbf{50 \div \square = 50 \times 2\frac{25}{16}}$

Solution:

(1) $9 \div \frac{19}{30} = 9 \times \boxed{\frac{30}{19}}$

(2) $2\frac{25}{16} = \frac{(16 \times 2) + 25}{16} = \frac{57}{16}$

And the reciprocal of $\frac{57}{16}$ is $\frac{16}{57}$.

Thus, $50 \div \boxed{\frac{16}{57}} = 50 \times 2\frac{25}{16}$

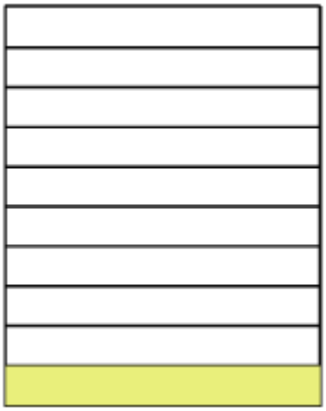
Multiplication of Decimals

Multiplication of decimal numbers is closely related to multiplication of fractions. Therefore, let us take a real-life situation and learn about multiplying two decimal numbers through this example.

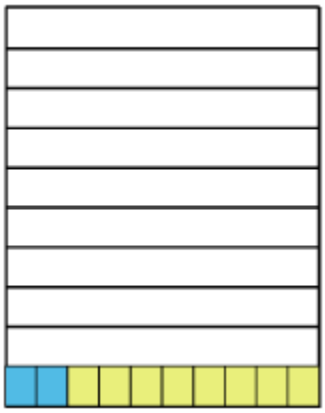
We can represent this multiplication pictorially as well. Let us see how this can be done.

The decimal 0.1 or $\frac{1}{10}$ represents 1 part of 10 equal parts.

This can be shown as in the following figure.



Now, $\frac{2}{10} \times \frac{1}{10}$ means $\frac{2}{10}$ of $\frac{1}{10}$ i.e., divide the shaded portion of the above figure into 10 equal parts and take 2 parts out of these 10 parts. These two parts represent $\frac{2}{10}$ of $\frac{1}{10}$.



In the above figure, the blue shaded part represents $\frac{2}{10}$ of $\frac{1}{10}$ i.e., $\frac{2}{10} \times \frac{1}{10}$ or 0.2 × 0.1.

Let us now look at some more examples.

Let us find the value of

(a) 0.4 × 0.6

(b) 2 × 0.14

(c) 0.43 × 0.23

Now, $0.4 \times 0.6 = \frac{4}{10} \times \frac{6}{10} = \frac{4 \times 6}{10 \times 10} = \frac{24}{100} = 0.24$

$2 \times 0.14 = 2 \times \frac{14}{100} = \frac{2 \times 14}{100} = \frac{28}{100} = 0.28$

$0.43 \times 0.23 = \frac{43}{100} \times \frac{23}{100} = \frac{43 \times 23}{100 \times 100} = \frac{989}{10000} = 0.0989$

In the above examples, we can see that

"The number of digits to the right of the decimal point of the product is equal to the sum of the number of digits on the right of the decimal point on each of the numbers being multiplied".

Using this fact, we can multiply the decimals without converting them into fractions.

Let us look at the first example.

To perform the multiplication 0.4 × 0.6, we will first find the product of 4 and 6 and then put the decimal at the required position.

Thus, 4 × 6 = 24

Now we have to insert the decimal.

In this case, the number of digits on the right of decimal point in 0.4 and 0.6 are 1 and 1 respectively.

Now, 1 + 1 = 2, therefore, we insert the decimal before two digits starting from left.

Therefore, we obtain

0.6 × 0.4 = 0.24

Let us now look at some more examples.

Example 1:

Evaluate the following expressions.

1. **4 × 2.05 × 0.05**
2. **256.15 × 0.1**

Solution:

(i) $$4\times 2.05\times 0.05 = 4\times\frac{205}{100}\times\frac{5}{100}$$
$$=\frac{4\times 205\times 5}{100\times 100}$$
$$=\frac{4100}{10000}$$
$$=\frac{41}{100}$$
$$=0.41$$

(ii) $256.15 \times 0.1 = \frac{25615}{100} \times \frac{1}{10}$

$= \frac{25615 \times 1}{100 \times 10}$

$= \frac{25615}{1000}$

$= 25.615$

Example 2:

Evaluate 0.4 × 0.7 and represent the multiplication pictorially.

Solution:

$0.4 \times 0.7 = \frac{4}{10} \times \frac{7}{10}$

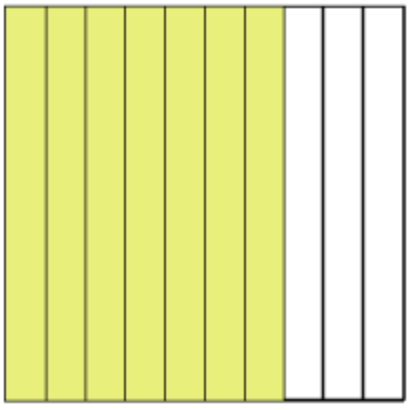
$= \frac{4 \times 7}{10 \times 10}$

$= \frac{28}{100}$

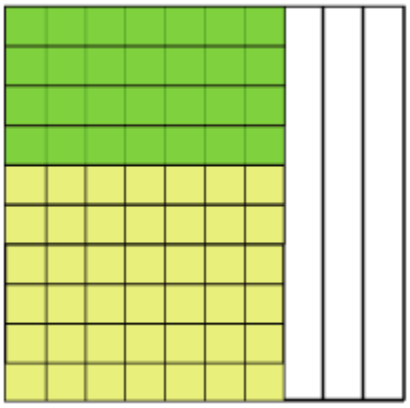
$= 0.28$

Pictorial representation -

$0.7 = \frac{7}{10}$ means 7 parts of 10 equal parts as shown below.



$0.4 \times 0.7 = \frac{4}{10} \times \frac{7}{10}$ means $\frac{4}{10}$ of $\frac{7}{10}$. To represent $\frac{4}{10}$ of $\frac{7}{10}$, we have to take 4 parts out of 10 equal parts of $\frac{7}{10}$.



The green shaded part of the above figure represents $\frac{4}{10}$ of $\frac{7}{10}$ i.e., $\frac{4}{10} \times \frac{7}{10}$ or 0.4 × 0.7.

Example 3:
A metro train takes 2.25 minutes to travel from one station to the next station and it stops for half a minute at every station. If the total number of stations in the whole journey of the train is 32 then find the time taken by the train to reach its destination station.

Solution:
Time taken by the train to reach second station = 2.25 minutes
Stoppage time of the train on second station = 0.5 minute
∴ Total time taken by the train to pass through second station = (2.25 + 0.5) minutes = 2.75 minutes

In the same manner, the train will pass through 31 stations.

∴ Total time taken by the train to pass through 31st station = (2.75 × 31**)** minutes = 85.25 minutes

Time taken by the train from 31st station to 32nd station = 2.25 minutes
∴ Total time taken by the train to reach its destination station i.e., 32nd station = (85.25 + 2.25) minutes = 87.50 minutes

Multiplication of Decimals with 10, 100 and 1000

Let us start with an example.

Suppose Honey went to a shop to buy 10 toffees. The cost of one toffee is Rs 0.50. So, she started calculating the money which she would require to give to the shopkeeper.

She did the calculation as follows.

Cost of 1 toffee = Rs 0.50 = Rs $\frac{50}{100}$

$\therefore$ Cost of 10 toffees = $\text{Rs } 0.5 \times 10 = \text{Rs } \left(\frac{50}{100} \times 10\right) = \text{Rs } \frac{500}{100}$

= Rs 5

Thus, she requires Rs 5 to buy 10 toffees.

When she returned home, she saw that her friend Reema was waiting for her. She told her about the toffees she had bought. Then Reema told her that she can calculate the cost of 100 toffees within seconds.

She then told her that the money required for 100 toffees is Rs 50.

Honey calculated it and was amazed that this was correct and asked Reema how she could do this.

Then Reema told her that whenever we have to multiply a number by any multiple of 10, then in the answer, the digits remain the same and the decimal is shifted to right by as many places as there are zeros after one in the multiple of 10.

The multiplication of a decimal number with a multiple of 10 can be summarised as follows.

"When a decimal number is multiplied by 10, 100, or any other multiple of 10, then the digits in the product are the same as in the decimal number but the decimal point in the product is shifted to the right by as many places as there are zeroes after one".

For example,

17.8562 × 10 = 178.562

17.8562 × 100 = 1785.62

17.8562 × 1000 = 17856.2

The given video will help you understand this better.

Now, let us solve some more examples.

Example 1:

Evaluate the following.

1. **0.007 × 10000**
2. **785.5478 × 100**
3. **0.8996 × 1000**

Solution:

1) Here, the decimal is shifted 4 places to the right as there are 4 zeroes after 1
$0.007 \times 10000 = 70$

2) $785.5478 \times 100 = 78554.78$

3) $0.8996 \times 1000 = 899.6$

Example 2:

The cost of 1 kg of apples is Rs 26.5. What will be the cost of 10 kg of apples?

Solution:

Cost of 1 kg of apples = Rs 26.5

Cost of 10 kg apples = Rs (26.5 × 10)

= Rs 265

Division of Decimals by 10, 100 and 1000

Let us start with an example.

Rahul fills the tank of his bike with 10 L of petrol. He covered a distance of 125.3 km with this petrol. Can you find the distance covered by Rahul in 1 L of petrol?

We can find the distance covered by Rahul by unitary method.

Distance covered in 10 L of petrol = 125.3 km

Distance covered in 1 L of petrol = $\frac{125.3}{10}$ km

To find the distance covered in 1 L of petrol, we have to divide 125.3 by 10. We can divide it by long division method as follows.

$$
\begin{array}{r}
12.53 \\
10\overline{)\,125.3} \\
-10 \\
\hline
25 \\
-20 \\
\hline
53 \\
-50 \\
\hline
30 \\
-30 \\
\hline
0 \\
\hline
\end{array}
$$

The long division method is very lengthy and time consuming. We can divide a number by the multiples of 10 within seconds. Now, let us know the method to divide a number by any multiple of 10 without carrying out the long division method.

"When a decimal number is divided by 10, 100, 1000 etc., the digits remain the same, and only the decimal is shifted to the left by as many places as there are zeroes in the divisor".

In the above example, the number of zeroes in the divisor is 1. Therefore, we shift the decimal point one place to the left. Thus, we obtain

$\therefore \frac{125.3}{10} = 12.53$

Using this rule, we obtained the same answer as we obtained from the long division method.

Now, look at some more examples.

$2468.3 \div 10 = 246.83$

2468.3 ÷ 100 = 24.683

2468.3 ÷ 1000 = 2.4683

It can be clearly noted that the number of places by which the decimal is shifted to the left is equal to the number of zeroes in the divisor.

$2468.3 \div 10 = 2468.3 = 246.83$
$2468.3 \div 100 = 2468.3 = 24.683$
$2468.3 \div 1000 = 2468.3 = 2.4683$

Look at the given video to understand the concept explained above.

Let us see some more examples to understand the concept better.

Example 1:

Evaluate

(i) 6407 ÷ 1000

(ii) 25.32 ÷ 10000

Solution:

(i) $6407 \div 1000 = \frac{6407}{1000} = 6.407$

(ii) $25.32 \div 10000 = \frac{25.32}{10000} = 0.002532$

Example 2:

Fill in the blanks to make the following statements correct.

(i) $\mathbf{36.7 \div \square = 3.67}$

(ii) $\mathbf{19.95 \div 1000 = \square}$

Solution:

(i) $36.7 \div \boxed{10} = 3.67$

Because, $36.7 \div 10 = \frac{36.7}{10}$

$= 3.67$

(ii) $19.95 \div 1000 = \boxed{0.01995}$

Because, $19.95 \div 1000 = \frac{19.95}{1000}$

$= 0.01995$

Example 3:

Sumit bought 10 chocolates for Rs 127.5. What was the cost of one chocolate?

Solution:

Cost of 10 chocolates = Rs 127.5

$\therefore$ Cost of 1 chocolate = Rs $\left(\frac{127.5}{10}\right)$

= Rs 12.75

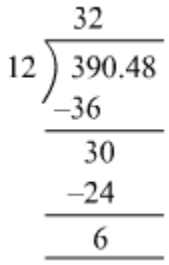
Division of Decimals by Whole Numbers

How does one divide a whole number by another whole number? Now, that's easy. But how does one divide a decimal number by a whole number? Confused? Hey! So is Ritika. What, you don't know Ritika? Not to worry. Watch the video and all your confusions will be cleared.

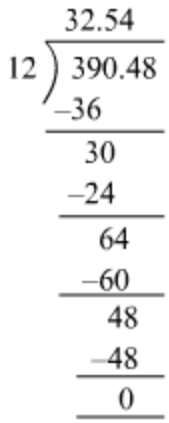
In the video, we solved the division by making the denominator and numerator whole numbers, but we can follow the long division method also to solve such division problems.

This is similar to dividing whole number by whole number. The only difference is that when we consider the digit after decimal to divide, we need to mark decimal in the quotient.

Let us divide 390.48 by 12.



It can be seen that we obtained 6 as the remainder after dividing whole part i.e., 390 by 12. Now, we have to divide the decimal or fractional part i.e., 48. On dividing the fractional part, we will get fractional part in the quotient as well. So, we mark decimal after 2 in the quotient and proceed further.



The remainder is 0, so the division finishes here.

Thus, 390.48 ÷ 12 = 32.54

Let us now solve some more examples to understand the concept of division of a decimal number by a whole number better.

Example 1:

Evaluate the following expressions using long division method.

1. **105.84 ÷ 7**
2. **0.03 ÷ 12**
3. **5861.52 ÷ 18**
4. **1545.3 ÷ 15**

Solution:

i.

$$
\begin{array}{r}
15.12 \\
7\overline{)105.84} \\
-7 \\
\hline
35 \\
-35 \\
\hline
8 \\
-7 \\
\hline
14 \\
-14 \\
\hline
0
\end{array}
$$

∴ 105.84 ÷ 7 = 15.12

ii.

For convenience, let us write 0.03 as 0.0300.

$$
\begin{array}{r}
0.0025 \\
12\overline{)0.0300} \\
-24 \\
\hline
60 \\
-60 \\
\hline
0
\end{array}
$$

∴ 0.03 ÷ 12 = 0.0025

iii.

$$
\begin{array}{r}
325.64 \\
18\overline{)5861.52} \\
-54 \\
\hline
46 \\
-36 \\
\hline
101 \\
-90 \\
\hline
115 \\
-108 \\
\hline
72 \\
-72 \\
\hline
0
\end{array}
$$

∴ 5861.52 ÷ 18 = 325.64

iv.

For convenience, let us write 1545.3 as 1545.30.

$$
\begin{array}{r}
103.02 \\
15\overline{)\,1545.30} \\
-15 \\
\hline
45 \\
-45 \\
\hline
30 \\
-30 \\
\hline
0
\end{array}
$$

∴ 1545.3 ÷ 15 = 103.02

Example 2:

Evaluate the following expressions without using long division method.

1. **13.5 ÷ 9**
2. **0.0075 ÷ 15**
3. **126.45 ÷ 5**

Solution:

1. 13.5 ÷ 9 = $\frac{135}{10} \div 9$

$$= \frac{135}{10} \times \frac{1}{9}$$
$$= \frac{135 \times 1}{10 \times 9}$$
$$= \frac{1}{10} \times \frac{135}{9}$$
$$= \frac{1}{10} \times 15$$
$$= \frac{15}{10}$$
$$= 1.5$$

2. 0.0075 ÷ 15 = $\frac{75}{10000} \div 15$

$$= \frac{75}{10000} \times \frac{1}{15}$$
$$= \frac{75 \times 1}{10000 \times 15}$$
$$= \frac{1}{10000} \times \frac{75}{15}$$
$$= \frac{1}{10000} \times 5$$
$$= \frac{5}{10000}$$
$$= 0.0005$$

3. 126.45 ÷ 5 = $126.45 \times \frac{1}{5}$

$$= \frac{12645}{100} \times \frac{1}{5}$$
$$= \frac{12645 \times 1}{100 \times 5}$$
$$= \frac{1}{100} \times \frac{12645}{5}$$
$$= \frac{1}{100} \times 2529$$
$$= \frac{2529}{100}$$
$$= 25.29$$

Example 2:

A bus was going on a journey. The bus travelled 35.7 km in the first hour, 29.4 km in the second hour, and 33 km in the third hour. What is the average distance travelled by the bus in an hour?

Solution:

Distance covered in the 1st hour = 35.7 km

Distance covered in the 2nd hour = 29.4 km

And, distance covered in the 3rd hour = 33 km

Therefore, average distance covered by the bus in an hour = $\frac{35.7 + 29.4 + 33}{3}$ km

$$= \frac{98.1}{3} \text{ km}$$

= 32.7 km

Example 3:
Akbar purchases a cake weighing 12.356 kg in his birthday party and he distributes the cake equally among 36 guests. Find the weight of each piece of cake.

Solution:
Total weight of the cake = 12.356 kg
Total number of the guests = 36

Weight of each piece of the cake

= 12.35636= 0.343 kg= 12.35636= 0.343 kg

Example 4:
If an amount of Rs 1259.28 is distributed equally among 12 persons, find the amount received by each person.

Solution:
Total amount = Rs 1259.28
Total number of the person = 12
Amount received by each person

$$= \text{Rs}\left(\frac{1259.28}{12}\right)$$

$$= \text{Rs } 104.94$$

Division of Decimals by Decimals

To divide a decimal number by another decimal number, we should follow the rule "First, both the divisor and dividend are changed into fractional forms and then the dividend is multiplied with the reciprocal of the divisor".

We can follow the long division method also to solve such division problems.

First, we make divisor a whole number and then proceed in the same way as division of decimal by whole number.

Let us divide 650.112 by 1.6.

It can be seen that:

$$\frac{650.112}{1.6} = \frac{650.112 \times 10}{1.6 \times 10} = \frac{6501.12}{16}$$

Since the value of 650.112 ÷ 1.6 is equal to the value of 6501.12 ÷ 16, let us solve the second expression.

$$
\begin{array}{r}
406.32 \\
16\overline{)6501.12} \\
-64 \\
\hline
101 \\
-96 \\
\hline
51 \\
-48 \\
\hline
32 \\
-32 \\
\hline
0 \\
\hline
\end{array}
$$

The remainder is 0, so the division finishes here.

$\therefore 6501.12 \div 16 = 406.32$

$\therefore 650.112 \div 1.6 = 406.32$

Let us now go through some more examples to understand the method better.

Example 1:

Evaluate the following.

(1) 28.819 ÷ 0.23

(2) 299.91 ÷ 2.6

Solution:

(1)

It can be seen that:

$$\frac{28.819}{0.23} = \frac{28.819 \times 100}{0.23 \times 100} = \frac{2881.9}{23}$$

Since the value of 28.819 ÷ 0.23 is equal to the value of 2881.9 ÷ 23, let us solve the second expression.

$$
\begin{array}{r}
125.3 \\
23\overline{)2881.9} \\
-23 \\
\hline
58 \\
-46 \\
\hline
121 \\
-115 \\
\hline
69 \\
-69 \\
\hline
0 \\
\hline
\end{array}
$$

The remainder is 0, so the division finishes here.

∴ 2881.9 ÷ 23 = 125.3

∴ 28.819 ÷ 0.23 = 125.3

(2)

It can be seen that:

$$\frac{299.91}{2.6} = \frac{299.91 \times 10}{2.6 \times 10} = \frac{2999.1}{26}$$

Since the value of 299.91 ÷ 2.6 is equal to the value of 2999.1 ÷ 26, let us solve the second expression.

$$
\begin{array}{r}
115.35 \\
26\overline{)2999.10} \\
-26 \\
\hline
39 \\
-26 \\
\hline
139 \\
-130 \\
\hline
91 \\
-78 \\
\hline
130 \\
-130 \\
\hline
0 \\
\hline
\end{array}
$$

The remainder is 0, so the division finishes here.

∴ 2999.1 ÷ 26 = 115.35

∴ 299.91 ÷ 2.6 = 115.35

Example 2:

Evaluate the following.

(1) 1.25 ÷ 0.05

(2) 0.032 ÷ 0.8

Solution:

$$\textbf{(1)}\ 1.25 \div 0.05 = \frac{125}{100} \div \frac{5}{100}$$
$$= \frac{125}{100} \times \frac{100}{5}$$
$$= \frac{125}{5}$$
$$= 25$$

$$\textbf{(2)}\ 0.032 \div 0.8 = \frac{32}{1000} \div \frac{8}{10}$$
$$= \frac{32}{1000} \times \frac{10}{8}$$
$$= \frac{32}{100} \times \frac{1}{8}$$
$$= \frac{32 \times 1}{100 \times 8}$$
$$= \frac{4}{100}$$
$$= 0.04$$

Example 3:

Rohit has a pencil of length 5.4 cm and Mohit has a pencil of length 10.8 cm. How many times is Mohit's pencil longer than Rohit's pencil?

Solution:

It is given that, length of Rohit's pencil = 5.4 cm

Length of Mohit's pencil = 10.8 cm

Therefore, Mohit's pencil is longer than Rohit's pencil by $\frac{10.8}{5.4}$ times.

$$\frac{10.8}{5.4} = 10.8 \div 5.4 = \frac{108}{10} \div \frac{54}{10} = \frac{108}{10} \times \frac{10}{54} = \frac{108}{54} = 2$$

Thus, Mohit's pencil is 2 times longer than Rohit's pencil.

Example 4:
Raju earns Rs 587.25 by selling mangoes at the rate of Rs 40.50. Find the total weight of the mangoes sold by Raju.

Solution:
Total amount earned by Raju = Rs 587.25
Rate = Rs 40.50
The weight of mangoes

$$= \frac{587.25}{40.50}$$
$$= 14.50 \text{ kg}$$