FRACTIONS AND DECIMALS

Concepts Covered

- Fractions, Addition of fractions, Subtraction of fractions, Multiplication of fractions, Division of fractions, Decimal numbers, Addition of decimal numbers, Subtraction of decimal numbers, Multiplication of decimal numbers, Division of decimal numbers

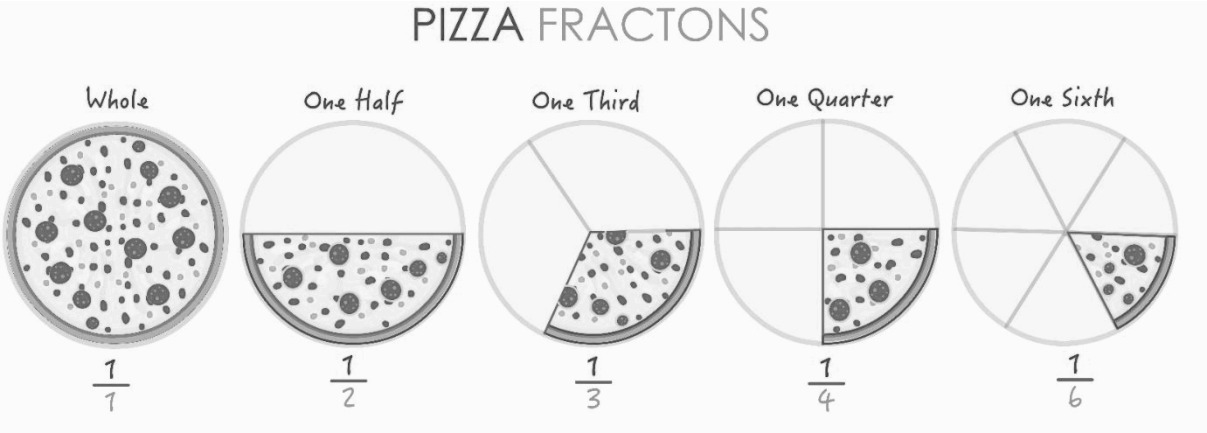
Fractions

A fraction is a number which can be written in the form $\frac{a}{b}$, where both a and b are natural numbers and the number ' a ' is called numerator and ' b ' is called the denominator of the fraction, $\frac{a}{b}, b \neq 0$.

For Example: $\frac{2}{5}, \frac{1}{3}, \frac{0}{5}, \frac{7}{15}$ are fractions

Pictorial Form

A fraction represents a part of a whole, where the denominator of the fraction represents the number equal parts in which the whole is divided, and the numerator shows the number of equal parts taken.



Types of Fractions

The different types of fractions are:

(1) Proper Fraction: A fraction that represents a part of whole is a proper fraction. 1/2, 3/4, 5/6, 0/7 are some examples of proper fractions.
In a proper fraction, numerator is less than the denominator. The whole number 0 can be expressed as a proper fraction.

(2) Improper Fraction: A fraction that represents a combination of a whole and a part of the whole is an improper fraction. 5/3, 8/5, 20/9, and 10/10 are some examples of improper fractions. In an improper fraction, the numerator is greater than or equal to its denominator. All natural numbers can be expressed as improper fractions.

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(3) Mixed Fraction: When an improper fraction is written as an integer followed by a proper fraction, it is a mixed fraction.

For Example: (i) $1\frac{2}{3}$: Here, 1 is a whole and $\frac{2}{3}$ is a part.

(ii) $2\frac{2}{9}$: Here, 2 is a whole and $\frac{2}{9}$ is a part.

Note: Only improper fractions can be converted into mixed fractions.

(4) Like Fractions: The fractions with the same denominator are called like fractions.

For Example: $\frac{7}{12}, \frac{5}{12}, \frac{11}{12}$, …., etc. are like fractions.

(5) Unlike Fractions: The fractions with different denominators are called unlike fractions.

For Example: $\frac{2}{3}, \frac{4}{5}, \frac{11}{13}, \frac{7}{8}$, …., etc. are unlike fractions.

Conversion of Fractions

(1) Conversion of Unlike Fractions to Like Fractions

To convert the unlike fractions to like fractions follow the below steps:

Step-1: Find the LCM of the denominators of the given fractions.

Step-2: Find the quotient by dividing the LCM by the denominator of the given fractions.

Step-3: Multiply the numerator by the corresponding quotient.

Example:

Convert $\frac{4}{9}$ and $\frac{5}{6}$ to like fractions.

Solution: First take the L.C.M for the denominators

L.C.M of 9 and 6=18

$\frac{4}{9} \times \frac{2}{2} = \frac{8}{18}$

$\frac{5}{6} \times \frac{3}{3} = \frac{15}{18}$

$\frac{8}{18}$ and $\frac{15}{18}$ have same denominators; hence they are like fractions.

(2) Conversion of an Improper Fraction to a Mixed Fraction

To convert an Improper Fraction to a Mixed Fraction can follow these steps:

Step-1: Divide the numerator of the fraction by the denominator of the fraction and note down the quotient and remainder.

Step-2: Write down the quotient as the whole number part of the fraction.

Step-3: The denominator remains the same as the denominator of the improper fraction.

Step-4: Write down any remainder as the numerator.

Step-5: Write the mixed fraction as Quotient $\frac{\text{Remainder}}{\text{Denominator}}$.

Example:

Express the following improper fraction as a mixed fraction: $\frac{15}{7}$

Solution: If we divide 15 by 7 , we get 2 as the quotient and 1 as the remainder.

So, $\frac{15}{7}$ can be written as $2\frac{1}{7}$.

$\Rightarrow \frac{15}{7} = 2\frac{1}{7}$

(3) Conversion of a Mixed Fraction to an Improper Fraction

To convert a mixed fraction to an improper fraction, follow these steps:

Step-1: Multiply the denominator of the fractional part by the whole number part.

Step-2: Add the numerator with the product.

Step-3: This sum becomes the numerator of the improper fraction. The denominator of the mixed fraction remains the same as the denominator of the improper fraction.

Step-4: Hence, the improper fraction is given by:

Improper fraction= $\frac{(\text{whole number} \times \text{Denominator}) + \text{Numerator}}{\text{Denominator}}$

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Example:

Convert the mixed fraction $12\frac{1}{8}$ to an improper fraction.

Solution: Use the formula, Improper fraction= $\frac{(\text{whole number}\times\text{Denominator})+\text{Numerator}}{\text{Denominator}}$

So, we have, $12\frac{1}{8}=\frac{(12\times8)+1}{8}=\frac{97}{8}$

So, $12\frac{1}{8}$ can be written as $\frac{97}{8}$ in improper fraction.

$\Rightarrow 12\frac{1}{8}=\frac{97}{8}$

Comparison of Fractions

Example:

Compare $\frac{2}{5}$ and $\frac{3}{7}$.

Solution: L.C.M of denominators (5,7) = 35

$\frac{2}{5}$ can be written as $\frac{2\times7}{5\times7}=\frac{14}{35}$

$\frac{3}{7}$ can be written as $\frac{3\times5}{7\times5}=\frac{15}{35}$

$\frac{15}{35}>\frac{14}{35}\Rightarrow\frac{3}{7}>\frac{2}{5}$

Example:

Ramesh solved $\frac{2}{7}$ part of an exercise while Seema solved $\frac{4}{5}$ of it. Who solved less of the exercise?

Solution: In order to find who solved less part of the exercise, let us compare $\frac{2}{7}$ and $\frac{4}{5}$.

Converting them to like fractions we have, $\frac{2}{7}=\frac{10}{35},\frac{4}{5}=\frac{28}{35}$. Since 10 < 28

So, $\frac{10}{35}<\frac{28}{35}$.

Thus, $\frac{2}{7}<\frac{4}{5}$. Ramesh solved less part of the exercise.

Addition of Fractions

Fraction and an Integer:

The integer is expressed as a fraction with the same denominator as the given fraction and the numerators are added.

For Example:

(i) $\frac{5}{8}+1=\frac{5}{8}+\frac{8}{8}\Rightarrow\frac{13}{8}$

(ii) $\frac{5}{8}+0=\frac{5}{8}+\frac{0}{8}\Rightarrow\frac{5}{8}$

(iii) $\frac{5}{8}+(-2)=\frac{5}{8}+\frac{-16}{8}\Rightarrow\frac{-11}{8}$

Two or More Fractions:

All the fractions in the expression are expressed with a common denominator and the numerators are add ed.

For Example: (i) $\frac{2}{3}+\frac{3}{4}=\frac{2(4)}{3(4)}+\frac{3(3)}{4(3)}=\frac{8}{12}+\frac{9}{12}=\frac{17}{12}$

(ii) $\frac{5}{6}+\frac{7}{9}-\frac{1}{2}=\frac{15}{18}+\frac{14}{18}-\frac{9}{18}=\frac{20}{18}=\frac{10}{9}$

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Example:

(i) Solve $\frac{7}{10}+\frac{2}{5}+\frac{3}{2}$

Solution: For addition of two unlike fractions, first, change them to like fractions.

LCM of $10,5,2 = 10$

Now, let us change each of the given fraction into an equivalent fraction having 10 as the denominator.

$= \frac{7}{10}\times\frac{1}{1}=\frac{7}{10}$

$= \frac{2}{5}\times\frac{2}{2}=\frac{4}{10}$

$= \frac{3}{2}\times\frac{5}{5}=\frac{15}{10}$

Now, $= \left(\frac{7}{10}\right)+\left(\frac{4}{10}\right)+\left(\frac{15}{10}\right)=\left[\frac{7+4+15}{10}\right]=\left(\frac{26}{10}\right)=\left(\frac{13}{5}\right)=2\frac{3}{5}$

(ii) Solve $2\frac{2}{3}+3\frac{1}{2}$

Solution:

First, convert the mixed fractions into improper fractions,

$2\frac{2}{3}=\frac{8}{3};\ 3\frac{1}{2}=\frac{7}{2}$

For addition of two unlike fractions, change them to like fractions.

LCM of $3, 2 = 6$

Now, let us change each of the given fraction into an equivalent fraction having 6 as the denominator.

$\frac{8}{3}\times\frac{2}{2}=\frac{16}{6};\ \frac{7}{2}\times\frac{3}{3}=\frac{21}{6}$

$=\frac{16}{6}+\frac{21}{6}$

$=\frac{16+21}{6}=\frac{37}{6}=6\frac{1}{6}$

Example:

Sameera purchased $3\frac{1}{2}$ kg apples and $4\frac{3}{4}$ kg oranges. What is the total weight of the fruits purchased by her?

Solution: The total weight of the fruits $=\left(3\frac{1}{2}+4\frac{3}{4}\right)\text{kg}$

$=\left(\frac{7}{2}+\frac{19}{4}\right)\text{kg}=\left(\frac{14}{4}+\frac{19}{4}\right)\text{kg}$

$=\frac{33}{4}\ \text{kg}=8\frac{1}{4}\ \text{kg}$

Subtraction of Fractions

Fraction and an Integer:

The integer is expressed as a fraction with the same denominator as the given fraction and the numerators are subtracted.

For Example: (i) $1-\frac{5}{8}=\frac{8}{8}-\frac{5}{8}\Rightarrow\frac{3}{8}$

(iii) $\frac{5}{8}-(-2)=\frac{5}{8}-\frac{-16}{8}\Rightarrow\frac{21}{8}$

Two or More Fractions:

All the fractions in the expression are expressed with a common denominator and the numerators are subtracted.

For Example: (i) $\frac{2}{3}-\frac{3}{4}=\frac{2(4)}{3(4)}-\frac{3(3)}{4(3)}=\frac{8}{12}-\frac{9}{12}=\frac{-1}{12}$

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(ii) $\frac{5}{6}-\frac{7}{9}=\frac{15}{18}-\frac{14}{18}=\frac{1}{18}=\frac{1}{18}$

Example:

Subtract $8\frac{5}{6}$ from $15\frac{3}{4}$.

Solution: Given: $15\frac{3}{4}-8\frac{5}{6}$

Now, convert mixed fractions into improper fractions.

$15\frac{3}{4}-8\frac{5}{6}=\frac{63}{4}-\frac{53}{6}$

Now, find the LCM of 4 and 6 and make the denominators equal.

Thus, LCM of 4 and 6 is 12

$\frac{63}{4}-\frac{53}{6}=\frac{63x3}{4x3}-\frac{53x2}{6x2}$

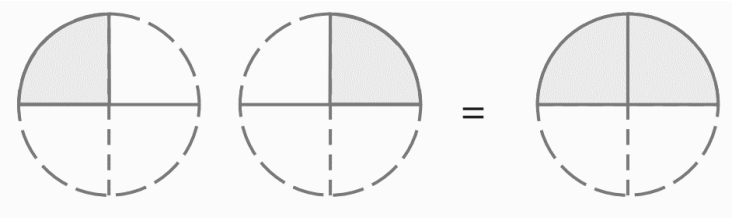
$=\frac{189}{12}-\frac{106}{12}=\frac{83}{12}$

Multiplication of Fractions

Multiplication of a Fraction by a Whole Number

- To multiply a whole number with a proper or an improper fraction, we multiply the whole number with the numerator of the fraction, keeping the denominator same.
- To multiply a mixed fraction to a whole number, we convert the mixed fraction to an improper fraction and then multiply.

Observe the pictures given below :



Each shaded part is $\frac{1}{4}$ of the circle and together it will represent $\frac{1}{4}+\frac{1}{4}=2\times\frac{1}{4}$.

On combining the above two shaded parts, it represents $\frac{2}{4}$ part of a circle.

Example:

In a class, there are 60 students. One-third of them are girls. How many girls are there in the class?

Solution: It is given that $\frac{1}{3}$ of the total students are girls.

$\therefore$ The number of girls $=\frac{1}{3}$ of $60=\frac{1}{3}(60)=20$

We observe that multiplication is also used as an operator 'of'.

$\frac{1}{4}$ of $20=\frac{1}{4}(20)=5$

$\frac{1}{5}$ of $80=\frac{1}{5}(80)=16$

Multiplication of a Fraction by a Fractional number

To multiply two fractions, we multiply the numerators to get the numerator of the product and multiply the denominators to get the denominator of the product.

$\frac{a}{b}\cdot\frac{c}{d}=\frac{a\cdot c}{b\cdot d}$

For Example: $\frac{2}{3}\cdot\frac{5}{7}=\frac{2\cdot5}{3\cdot7}=\frac{10}{21}$

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Example:

Suppose your father has brought a big bar of chocolate. He divided it into two equal pieces and gave one piece to you.
You wanted to share it with two of your friends. You divided your piece of chocolate into three equal pieces. How much did each of you get?
Solution:

You have $\frac{1}{2}$ of a chocolate bar. You made 3 pieces of it where each piece is $\frac{1}{3}$rd of the half.

$\frac{1}{3} \times \left(\frac{1}{2}\right) = \frac{1}{6}$

Each of the three got $\frac{1}{6}$ th of the chocolate bar.

Hence, we observe that the product of two fractions $= \frac{\text{The product of their numerators}}{\text{The product of their denominators}}$.

Multiplication of a Fraction by a Mixed Fractional number

For multiplying a fractional number by a mixed fraction, first convert the mixed fraction into an improper fraction and then solve it.

For Example: $4 \times 3\frac{2}{5} = 4 \times \frac{17}{5} = \frac{68}{5}$

Example:

Sushant reads $\frac{1}{3}$ part of a book in 1 hour. How much part of the book will he read in $2\frac{1}{5}$ hours?
Solution:

The part of the book read by Sushant in 1 hour $= \frac{1}{3}$.

So, the part of the book read by him in $2\frac{1}{5}$ hours $= 2\frac{1}{5} \times \frac{1}{3}$

$= \frac{11}{5} \times \frac{1}{3} = \frac{11 \times 1}{5 \times 3} = \frac{11}{15}$

Following observations can also be made while multiplying fractions:

(i) Changing the order of fractional numbers does not change the product.

For Example: $\frac{3}{4}\left(\frac{1}{2}\right) = \frac{3}{8}$

Also, $\frac{1}{2}\left(\frac{3}{4}\right) = \frac{3}{8}$

(ii) The product of two proper fractions is less than one.

For Example: $\frac{1}{2}\left(\frac{1}{3}\right) = \frac{1}{6} < 1$ and $\frac{2}{3}\left(\frac{3}{4}\right) = \frac{1}{2} < 1$ $\left(\because \frac{1}{2}\left(\frac{1}{3}\right) \text{ can be written as } \frac{1}{2} \times \frac{1}{3}\right)$

(iii) The product of two proper fractions is less than each of the two fractions.

For Example: $\frac{3}{4}\left(\frac{1}{2}\right) = \frac{3}{8}$ and we note that $\frac{3}{8} < \frac{3}{4}$ and $\frac{3}{8} < \frac{1}{2}$.

$\frac{1}{2}\left(\frac{1}{3}\right) = \frac{1}{6} \Rightarrow \frac{1}{6}$ is less than $\frac{1}{2}$ as well as $\frac{1}{3}$.

(iv) The product of two improper fractions is more than one.

For Example: $\frac{3}{2}\left(\frac{5}{4}\right) = \frac{15}{8} > 1$

$\frac{5}{4}\left(\frac{7}{6}\right) = \frac{35}{24} > 1$

(v) The product of two improper fractions is greater than each of the fractions.

For Example: $\frac{5}{2}\left(\frac{7}{3}\right) = \frac{35}{6}$ and we note that $\frac{35}{6} > \frac{5}{2}$ also $\frac{35}{6} > \frac{7}{3}$.

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(vi) When a proper fraction and an improper fraction are multiplied, the product obtained is greater than the proper fraction but less than the improper fraction.

For Example: (i) $\frac{1}{2}\left(\frac{5}{4}\right) = \frac{5}{8}$. We see that $\frac{1}{2} < \frac{5}{8} < \frac{5}{4}$.

(ii) $\frac{2}{3}\left(\frac{7}{5}\right) = \frac{14}{15}$. We see that $\frac{2}{3} < \frac{14}{15} < \frac{7}{5}$.

Multiplicative Inverse of a Fraction:

The multiplicative inverse of $\frac{1}{2}$ is 2 and that of $\frac{1}{3}$ is 3

Multiplicative inverse of a number is also known as its reciprocal.

The product of a number and its reciprocal is one.

For Example: $4\left(\frac{1}{4}\right) = 1$.

As the multiplicative inverse of $\frac{a}{b}$ is $\frac{b}{a}$, and that of $\frac{b}{a}$ is $\frac{a}{b}$, i.e., when the product of two non-zero numbers is one, then each of them is the reciprocal of the other.

Division of Fractions

(i) Division of Whole Number by a Fraction

Suppose you have ₹4. You have to give half of a rupee each to some children. Can you guess the number of children the rupee can be given to?

₹$4 \div$ ₹$\frac{1}{2}$ or $4 \div \frac{1}{2}$ gives you the answer.

We observe that there are two half parts in one, four half parts in two, six half parts in three, and eight half parts in 4.

Therefore, $4 \div \frac{1}{2} = 8$. We can also write the above as: $4 \div \frac{1}{2}$ as $4\left(\frac{2}{1}\right) = 8$

Therefore, we find that the division sign is replaced by a multiplication sign and the fraction $\frac{a}{b}$ is replaced by the fraction $\frac{b}{a}$

For Example: (i) $6 \div \frac{1}{3} = 6\left(\frac{3}{1}\right) = 18$

(ii) $12 \div \frac{3}{4} = 12\left(\frac{4}{3}\right) = 16$

(ii) Division of a Fraction by a Whole Number

We multiply the fraction by the multiplicative inverse of the whole number.

For Example: $\frac{1}{2} \div 3$ can be written as $\frac{1}{2} \div \frac{3}{1} = \frac{1}{2}\left(\frac{1}{3}\right) = \frac{1}{6}$

(iii) Division of a fraction by Another Fraction

We multiply the first fraction by the multiplicative inverse of the second.

For Example: (i) $\frac{2}{9} \div \frac{3}{4} = \frac{2}{9}\left(\frac{4}{3}\right) = \frac{8}{27}$

(ii) $\frac{5}{6} \div \frac{7}{9} = \frac{5}{6}\left(\frac{9}{7}\right) = \frac{45}{42} = \frac{15}{14}$

Example:

The area of a rectangle is $50\frac{1}{2}$ sq. cm. If its breadth is $2\frac{1}{4}$ cm, find its length.

Solution:

Area of rectangle = length × breadth

$$50\frac{1}{2} = \text{length} \times 2\frac{1}{4} \Rightarrow \frac{101}{2} = \text{length} \times \frac{9}{4}$$

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$\frac{101}{2} \div \frac{9}{4} =$ length

$\left(\frac{101}{2} \times \frac{4}{9}\right) =$ length

Length $= \frac{101 \times 2}{9}$ cm $= \frac{202}{9} = 22\frac{4}{9}$ cm

Hence, length of rectangle $= 22\frac{4}{9}$ cm.

Check your Concept

(1) A rectangular sheet of paper is $12\frac{1}{2}$ cm long and $10\frac{2}{3}$ cm wide. Find its perimeter.

(2) Michael finished colouring a picture in $\frac{7}{12}$ hours. Vaibhav finished colouring the same picture in $\frac{3}{4}$ hours. Who worked longer ? By how much ?

(3) Find the product

(i) $\frac{5}{8} \times \frac{3}{7}$ (ii) $\frac{6}{14} \times \frac{7}{9}$ (iii) $2\frac{4}{7} \times 2\frac{3}{4} \times 1\frac{2}{5}$

(4) In a cinema hall's parking, 90 cars can be parked at a time. During a night show, $\frac{5}{9}$ of the parking lot was full. How many cars were there at that time ?

(5) A car runs 16 km using 1 litre of petrol. How much distance will it cover using $2\frac{3}{4}$ litres of petrol ?

(6) The area of a rectangle is $50\frac{1}{2}$ sq. cm. If its breadth is $2\frac{1}{4}$ cm, find its length.

ANSWER KEY

(1) $46\frac{1}{3}$ cm **(2)** Vaibhav, $\frac{1}{6}$Hr **(3)** (i) $\frac{15}{56}$ (ii) $\frac{1}{3}$ (iii) $9\frac{9}{10}$

(4) 50 cars **(5)** 44 km **(6)** $22\frac{4}{9}$ cm

Decimal Numbers

The word 'decimal' means related to ten. A fraction in which the denominator is 10, 100, 1000, … (i.e., a power of 10) is called a decimal fraction. When the denominator is represented by placing a point in the numerator, the expression is called a decimal.

The part right side of the decimal point is called the decimal part of the number as it represents a part of 1. The part left to the decimal point is called an integral part of the number.

0.5, 0.25, 0.03, and 3.5 are some examples of decimal numbers.

A fraction in which the denominator is 10, 100, 1000, … (i.e., a power of 10) is called a **decimal fraction**. When the denominator is represented by placing a point in the numerator, the expression is called a **decimal**.

The place value of the first digit after the decimal point is $\frac{1}{10}$ tenths and that of the second digit is $\frac{1}{100}$ hundredths and so on.

For Example: 254.36 can be written in the expanded form as

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$2(100) + 5(10) + 4(1) + 3\left(\frac{1}{10}\right) + 6\left(\frac{1}{100}\right)$.
In the number 254.36,
2 is in the 100 's place,
5 is in the 10 's place,
4 is in the units place,
3 is in the $\frac{1}{10}$ th place and 6 is in the $\frac{1}{100}$ th place.
The number 254.36 is read as two hundred and fifty-four point three, six.
All the digits after the decimal point are read as one digit at a time.
Similarly, $48.352 = 4(10) + 8(1) + 3\left(\frac{1}{10}\right) + 5\left(\frac{1}{100}\right) + 2\left(\frac{1}{1000}\right)$.
This is read as forty-eight point three, five, two.

Conversion of a Decimal Number into a Fraction

Step 1: Write the decimal number without the decimal point as the numerator of the fraction.
Step 2: Write 1 followed by as many zeroes as there are decimal places in the given decimal, as the denominator of the fraction.
Step 3: Simplify the fraction, if possible.

Example:

Convert decimal 0.75 into a fraction.
Solution: 0.75 = $\frac{75}{100}$ = $\frac{3}{4}$

Example:

Convert decimal 12.35 into a fraction.
Solution: 12.35 = 12 + 0.35 = 12 + $\frac{35}{100}$ = 12 + $\frac{7}{20}$ = 12$\frac{7}{20}$

Conversion of a Fraction into a Decimal Number

Type 1: When the denominator of a fraction is 10 or powers of 10.

Example:

Convert fraction $\frac{2125}{1000}$ into a decimal.
Solution: We have $\frac{2125}{1000}$ = $\frac{2000+125}{1000}$ = 2 + $\frac{125}{100}$ = 2 + 0.125 = 2.125

Type 2: Fraction whose denominator are not 10 or powers of 10.
Note: Convert the denominator to 10, 100 or 1000.

Example:

Convert fraction $\frac{4}{5}$ into a decimal.
Solution: $\frac{4}{5} = \frac{4x2}{5x2} = \frac{8}{10} = 0.8$

Example:

Convert fraction $\frac{11}{20}$ into a decimal.
Solution: $\frac{11}{20} = \frac{11x5}{20x5} = \frac{55}{100} = 0.55$

Example:

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Convert fraction $\frac{13}{25}$ into a decimal.

Solution: $\frac{13}{25} = \frac{13x4}{25x4} = \frac{52}{100} = 0.52$

Addition and Subtractions of Decimals

Decimal numbers are added in the following way:

Example:

(i) The sum of 25.36 and 34.52 can be written as:

Solution:

$$\begin{array}{r} 25.36 \\ +\ 34.52 \\ \hline 59.88 \end{array}$$

(ii) The sum of 123.56 and 38.23 can be written as:

Solution:

$$\begin{array}{r} 38.23 \\ \hline 161.79 \end{array}$$

Note:
When we add two decimal numbers or subtract one decimal number from the other, we have to ensure that the digit in the unit's place of the second number is written exactly below the digit in the unit's place of the first number.

Same is the case with digits in the 100 's place, 1000 's place, $\frac{1}{10}$ th place, $\frac{1}{100}$ th place, and so on.

Example:

Subtract 35.006 from 123.41

Solution:

$$\begin{array}{r} 123.410 \\ -\ 35.006 \\ \hline 88.404 \end{array}$$

Multiplication of Decimals Number

Shreyansh purchased 2.5 kg sugar at the rate of Rs. 22.50 per kg. How much money should he pay? Certainly, it would be Rs. (2.5 × 22.50). Both 2.5 and 22.50 are decimal numbers. So, we have come across a situation where we need to know how to multiply two decimals. There are three cases of multiplication of decimals which are:

(i) Multiplication of a Decimal by Multiples of 10.

Method: On multiplying a decimal number by 10, 100, 1000, … the decimal point is shifted to the right by one, two, three, … places respectively.

Example:

$673.234 \times 10 = 6732.34$
$673.234 \times 100 = 67323.4$
$673.234 \times 1000 = 673234.0$

(ii) Multiplication of a Decimal by a Whole Number

Method: Multiply the whole number by decimal (without the decimal point).
Mark the decimal point in the product from the right side to have as many decimals as there are in the given decimal.

Example:

12 × 3.82

Solution : First find the product of 12 and 382

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(Ignoring decimal) 382 × 12

$$\begin{array}{r} 382 \\ \times 12 \\ \hline 764 \\ 382\times \\ \hline 4584 \\ \hline \end{array}$$

Mark the decimal point in the product after as many places (from the right) as the decimal places in decimal number.
So, 12 × 3.82 = 45.84.

(iii) Multiplication of a Decimal by Decimal Method:
(1) Multiply the decimal numbers as you would multiply ordinary number (ignoring decimal points).
(2) Mark the decimal point in the product after as many places (from the right) as the sum of the decimal places in each number.

Example:

82.53 × 7.4
Solution : First find the product of 8253 and 74 (ignoring decimal point) 8253×74

$$\begin{array}{r} 8253 \\ \times 74 \\ \hline 33012 \\ 57771\times \\ \hline 610722 \\ \hline \end{array}$$

As the sum of decimals places in both numbers is 3, we will add decimals point in the final product after 3 places from the right .
82.53 × 7.4 = 610.722

Example:

2.325 × 25
Solution :

$$\begin{array}{r} 2325 \\ \times 25 \\ \hline 11625 \\ 46500 \\ \hline 58125 \\ \hline \end{array}$$

So, $2.325 \times 25 = 58.125$

Example:

Multiply 6.7 × 4.25 × 12.3
Solution : 6.7 × 4.25 × 12.3 = (6.7 × 4.25) × 12.3
= 28.475 × 12.3 = 350.2425

$$\begin{array}{r} 67 \\ \times 425 \\ \hline 335 \\ +1340 \\ +26800 \\ \hline 28475 \\ \hline \end{array} \qquad \begin{array}{r} 28475 \\ \times \quad 123 \\ \hline 85425 \\ +569500 \\ +2847500 \\ \hline 3502425 \\ \hline \end{array}$$

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Example:

Find the area of a rectangle whose length is 5.7 cm and breadth is 3 cm.
Solution : Length of rectangle = 5.7 cm
Breadth of rectangle = 3 cm
Area of rectangle = length × breadth
= (5.7 × 3) cm^2 = 17.1 cm^2

Example:

A two-wheeler covers a distance of 55.3 km in one litre of petrol. How much distance will it cover in 10 litres of petrol ?
Solution : Distance covered in one litre petrol = 55.3 km
Distance covered in 10 litres of petrol
= 55.3 × 10 km
= 553.0 km = 553 km

Divisions of Decimals Number

(i) Dividing a Decimal by Multiples of 10.
Method: On dividing a number by $10, 100, 1000$, ... the digits of the number and the quotient are the same, but the decimal point in the quotient shifts to left by one, two, three, ... places, respectively

Example:

$3.27 \div 10 = 0.327$
$3.27 \div 100 = 0.0327$
$3.27 \div 1000 = 0.00327$

(ii) Dividing a Decimal by a Whole Number
Method:
(i) Divide the dividend considering it as a whole number.
(ii) When the division of the whole-number part of the dividend is complete, mark the decimal point in the quotient and proceed with the division as in case of whole number.

Example:

Solve 149.236 ÷ 8
Solution:

```
      18.6545
8) 149.236
     8
    ----
     69
    -64
    ----
      52
     -48
    ----
       43
      -40
    ----
       36
      -32
    ----
       40
      -40
    ----
        0
```

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(iii) Dividing a Decimal by a Decimal
Method:
(i) Convert the divisor into a whole number by multiplying it by 10, 100, 1000, … etc, depending upon the number of decimal places in it.
Also, multiply the dividend by the same multiplier.
(ii) Divide the new dividend by the whole number obtained above.

Example:

Solve 22.08 ÷ 1.5
Solution : $= \frac{22.08}{1.5} = \frac{22.08 \times 10}{10 \times 15} = \frac{220.8}{15}$

```
        14.72
15 ) 220.8
     -15
     ----
       70
      -60
     ----
      108
     -105
     ----
        30
       -30
     ----
         0
```

(1) Evaluate: (i) 3.21 + 2.34 (ii) 0.0345 + 6.124 (iii) 6.9 + 32.26

(2) Evaluate the following: (i) 4.12 – 2.22 (ii) 62.7 – 60.74

(3) Multiply: (i) 1.6 by 0.3 (ii) 8.03 by 2.9 (iii) 0.657 by 27

(4) Divide: (i) 15.225 by 0.35 (ii) 50.76 ÷ 9.4

Answer Key

(1) (i) 5.55 (ii) 6.1585 (iii) 39.16 **(2)** (i) 1.90 (ii) 1.96

(3) (i) 0.48 (ii) 23.287 (iii) 17.739 **(4)** (i) 43.5 (ii) 5.4

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Solved Examples

(1) Convert each of the following into like decimals :
(i) 6.5, 16.03, 0.274, 119.4
(ii) 3.5, 0.67, 15.6, 4
Solution : Converting the given decimals into like decimals, we have:
(i) 6.500, 16.030, 0.274 and 119.400
(ii) 3.50, 0.67, 15.60 and 4.00

(2) Which of the following is greater: 3.406 or 3.46?
Solution : Converting the decimals into like decimals, we get 3.406 and 3.460.
Comparing the whole number parts, 3 = 3
Comparing the tenth digit, 4 = 4
Comparing the hundredths digit, 6 > 0
Thus, 3.406 < 3.46.

(3) Arrange the following decimals in an ascending order : 0.5, 5.5, 5.05, 0.05, 5.55.
Solution : Converting the given decimals into liked decimals, we get :
0.50, 5.50, 5.05, 0.05, 5.55
Clearly, 0.05 < 0.50 < 5.05 < 5.50 < 5.55
Hence, the given decimals arranged in the ascending order are 0.05, 0.5, 5.05, 5.5 and 5.55.

(4) Arrange the following decimals in a descending order : 7.4, 8.34, 74.4, 7.44, 0.74
Solution : Converting the given decimals into like decimals,
7.40, 8.34, 74.40, 7.44, 0.74
Clearly, 74.40 > 8.34 > 7.44 > 7.40 > 0.74
Hence, the given decimals in descending order are 74.4, 8.34, 7.44, 7.4 and 0.74.

(5) Express 45 mm in cm, m, and km.
Solution : 45mm = $\frac{45}{10}$ cm
$= 4.5$ cm
= 4.5 cm = $\frac{4.5}{100}$ m
$= 0.045$ m
= 0.045m = $\frac{0.045}{1000}$ km
= 0.000045 km
∴ 45 mm = 4.5 cm = 0.045m = 0.000045 km

(6) Find the reciprocal of $\frac{2}{5} \times \frac{4}{9}$.
Solution : We have,
$$\frac{2}{5} \times \frac{4}{9} = \frac{2 \times 4}{5 \times 9} = \frac{8}{45}$$
$$\therefore \text{The reciprocal of } \frac{2}{5} \times \frac{4}{9} \Rightarrow \left(\text{Reciprocal of} \frac{8}{45}\right) \Rightarrow \frac{45}{8}$$

(7) Write four rational numbers between $\frac{1}{3}$ and $\frac{1}{2}$.
Solution : The two numbers are $\frac{1}{3}$ and $\frac{1}{2}$.
Make the denominators same for the given rational number $\frac{1}{3} \times \frac{2}{2} = \frac{2}{6}$, $\frac{1}{2} \times \frac{3}{3} = \frac{3}{6}$
The mean of $\frac{1}{3}$ and $\frac{1}{2} = \frac{\frac{2}{6} + \frac{3}{6}}{2} = \frac{5}{12}$

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$\therefore \frac{2}{6} < \frac{5}{12} < \frac{3}{6}$

The mean of $\frac{2}{6}$ and $\frac{5}{12} = \frac{\frac{2}{6}+\frac{5}{12}}{2} = \frac{4+5}{24} = \frac{9}{24}$

The mean of $\frac{5}{12}$ and $\frac{3}{6} = \frac{\frac{5}{12}+\frac{3}{6}}{2} = \frac{5+6}{24} = \frac{11}{24}$

The mean of $\frac{5}{12}$ and $\frac{11}{24} = \frac{\frac{5}{12}+\frac{11}{24}}{2} = \frac{10+11}{48} = \frac{21}{48}$

$\therefore$ Any four rational numbers between $\frac{1}{3}$ and $\frac{1}{2}$ are $\frac{5}{12}, \frac{9}{24}, \frac{11}{24}, \frac{21}{48}$

(8) A bus can cover 62.5 km in one hour. How much distance can it cover in 18 hours ?

Solution : Distance covered by the bus in 1 hour = 62.5 km

∴ Distance covered in 18 hours

= (62.5 × 18) km = 1125 km

Hence, the bus can cover 1125 km in 18 hours.

(9) Simplify: $\left(\frac{-7}{18} \times \frac{15}{-7}\right) - \left(1 \times \frac{1}{4}\right) + \left(\frac{1}{2} \times \frac{1}{4}\right)$

Solution:

$$= \left(\frac{-7}{18} \times \frac{15}{-7}\right) - \left(\frac{1}{1} \times \frac{1}{4}\right) + \left(\frac{1}{2} \times \frac{1}{4}\right)$$

$$= \frac{-7 \times 15}{18 \times -7} - \frac{1 \times 1}{1 \times 4} + \frac{1 \times 1}{2 \times 4}$$

$$= \frac{1 \times 5}{6 \times 1} - \frac{1 \times 1}{1 \times 4} + \frac{1 \times 1}{2 \times 4} = \frac{5}{6} - \frac{1}{4} + \frac{1}{8}$$

$$= \frac{5 \times 4 + (-1) \times 6 + 1 \times 3}{24} = \frac{20 + (-6) + 3}{24} = \frac{17}{24}$$

(10) The product of two rational numbers is $\frac{-28}{81}$. If one of the number is $\frac{14}{27}$, find the other.

Solution : We have,

Product of two numbers $= \frac{-28}{81}$, One number $= \frac{14}{27}$

So, the other number is obtained by dividing the product by the given number.

$\therefore$ Othere number $= \frac{-28}{81} \div \frac{14}{27}$

$$= \frac{-28}{81} \times \frac{27}{14} = \frac{-28 \times 27}{81 \times 14} = \frac{-(28 \times 27)}{81 \times 14} = \frac{-(2 \times 1)}{3 \times 1} = \frac{-2}{3}$$

(11) A small bottle holds 0.845 kg of sauce. How much sauce will be there in 72 such bottles ?

Solution: Capacity of 1 sauce bottle = 0.845 kg

∴ Capacity of 72 such bottles = (0.845 × 72) kg = 60.84 kg

Hence, the capacity of 72 bottles of sauce will be 60.84 kg.

(12) Add the rational numbers $\frac{7}{-18}$ and $\frac{8}{27}$.

Solution : We will first write each of the given numbers with positive denominators.

$$\frac{7}{-18} = \frac{7 \times (-1)}{-18 \times (-1)} = \frac{-7}{18}$$

The denominators of the given rational numbers are 18 and 27.

LCM of 18 and 27 is 54.

Now,

$$\frac{-7}{18} = \frac{-7 \times 3}{18 \times 3} = \frac{-21}{54} \text{ and } \frac{8}{27} = \frac{8 \times 2}{27 \times 2} = \frac{16}{54}$$

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$$\frac{7}{-18}+\frac{8}{27}=\frac{-21}{54}+\frac{16}{54}=\frac{-21+16}{54}=\frac{-5}{54}$$

(13) The sum of two rational numbers is -2. If one of the numbers is $\frac{-14}{5}$, find the other.

Solution : Let the other number be x.

Now, $x+\frac{-14}{5}=-2$

$$x-\frac{14}{5}=-2$$

$$x=-2+\frac{14}{5}$$

$$x=\frac{(-2)\times 5+14}{5}$$

$$x=\frac{-10+14}{5}$$

$$x=\frac{4}{5}$$

(14) Walking at 4 km an hour, a person reaches his office 5 minutes late. If he walks at 5 km an hour, he will be 4 minutes too early. Find the distance of his office from his residence.

Solution :

Let the distance of his office from his residence be x km.

Time taken to reach office at 4 km/hr $=\frac{x}{4}\times 60$

= 15x min

Time taken to reach office at 5 km/hr $=\frac{x}{5}\times 60$

= 12x min

The difference between the time taken in both the cases = 9 min.

$\Rightarrow 15x - 12x = 9$

$\Rightarrow 3x = 9$

$\Rightarrow x = 3$ (Dividing both sides by 3)

Hence, the distance of his office from his residence is 3 km.

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Exercise

FILL IN THE BLANKS

(1) The value of product of the two proper fractions is always_____ than each of the fractions.
(2) If $\frac{4}{5}$ of $\left(\frac{4}{9}+\frac{2}{3}\right) \div 2\frac{2}{3}$ is simplified, then the answer is_____.
(3) A rectangular sheet of paper is $12\frac{1}{2}\text{cm}$ long and $10\frac{2}{3}\text{cm}$ wide. Fnd its perimeter
(4) Rakesh bought a new bike. He went on a road trip of 165.9 km on bike. After a week, he went for another trip of 102.04 km. What will be the reading on meter reader of the bike?
(5) Rama's age is $\frac{3}{4}$ times Ramesh's age and Ramesh's age is $\frac{2}{3}$ times of Vishal's age. If Vishal's age is 90 years, then Vishal's age is_____ times Rama's age.
(6) Find, in kilograms, the total mass of a bag of flour of mass 2.5 kg, a jar of jam of mass 360 g, and a packet of rice of mass 400 g.
(7) Add 3.42 and 6.409 and multiply the result by 2.3_____
(8) $\frac{4}{5}-\frac{3}{10}\div\frac{1}{2}=$ _____

TRUE OR FALSE

(1) If $\frac{a}{b},\frac{c}{d}$ are two fractions and $a \times d > b \times c$, then $\frac{a}{b} < \frac{c}{d}$.
(2) A decimal in which some of the digits in the decimal part are repeated and the rest are not repeated is called a recurring decimal.
(3) If we take $\frac{5}{6}$ and $\frac{2}{3}$, then the fraction between them is $\frac{7}{9}$.
(4) Descending order of $\frac{2}{9},\frac{2}{3},\frac{8}{21}$ is $\frac{2}{9} > \frac{8}{21} > \frac{2}{3}$.
(5) Ritu ate $\frac{3}{5}$ part of an apple and the remaining apple was eaten by her brother Somu. The share of Ritu was larger.
(6) If the length of side of a square is 14.32 cm, then its area is 105.0624.
(7) The length of a side of a regular 6-sided polygon (hexagon) is 10.9 cm. The perimeter of the polygon is 65.4cm.

OBJECTIVE TYPE QUESTION

(1) A CD rotates in a CD player at about 350 revolutions per minute. How many revolutions would the CD have made after 1 hours?

(A) 2100 (B) 21000
(C) 350 (D) 210000

(2) A barrel has 56.32 litres capacity. If Supriya used 21.19 litres, how much water would be left in the barrel?

(A) 35.13 (B) 77.51
(C) 56.32 (D) 21.19

(3) If the product of 38.46 and another number is 658.17, what is the other number?

(A) 27.11 (B) 17.11
(C) 38.46 (D) 21.19

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(4) Find the value of $\dfrac{\frac{2}{3}-\overline{\frac{1}{2}-\frac{1}{3}}\ \text{of}\ \frac{1}{2}}{\overline{\frac{5}{6}-\frac{2}{3}}\ \text{of}\ \frac{1}{3}+\frac{1}{9}}$

(A) $\frac{7}{2}$
(B) $\frac{7}{4}$
(C) $\frac{9}{2}$
(D) $\frac{9}{4}$

(5) If $14 \times 4 = 56$, then value of 0.14×4 is

(A) 5.6
(B) 0.056
(C) 0.56
(D) None of these

(6) A pharmacist counts 24 tablets and puts them into a bottle. Each tablet weighs $\frac{1}{4}$ of a gram and the weight of the bottle is $112\frac{1}{2}$ grams. What is the total weight (in gram)?

(A) $116\frac{1}{2}$
(B) $118\frac{1}{2}$
(C) $118\frac{1}{4}$
(D) $116\frac{3}{4}$

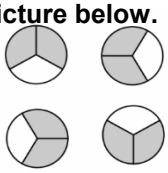
(7) The value of $2.2 \times 0.2 \times 0.001$ is equal to

(A) 4.2
(B) 0.00044
(C) 4.4
(D) None of these

(8) _____is an improper fraction.

(A) $\frac{4}{7}$
(B) $\frac{7}{4}$
(C) $\frac{5}{7}$
(D) $\frac{9}{11}$

(9) Write the multiplication expression for shaded region represented by the picture below.



(A) $4 \times \frac{2}{3}$
(B) $4 \times \frac{1}{3}$
(C) 4×4
(D) 4×3

(10) $\frac{5}{10} =$ ___?

(A) $\frac{1}{2}$
(B) $\frac{2}{1}$
(C) 5
(D) 50

(11) 0.8007 × 1000 is equal to

(A) 800.7
(B) 8.007
(C) 8007.0
(D) None of these

(12) The value of 25.75 ÷ 100 is equal to

(A) 2.575
(B) 257.5
(C) 0.2575
(D) None of these

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Answer Key

FILL IN THE BLANKS

(1) Less
(2) 1/3
(3) $46\frac{1}{3}$ cm
(4) 267.94 km
(5) 2 Times
(6) 3.26 kg
(7) 22.6067
(8) $\frac{1}{5}$

TRUE OR FALSE

(1) False
(2) True
(3) True
(4) False
(5) True
(6) False
(7) True

OBJECTIVE TYPE QUESTION

(1)	(B)	**(2)**	(A)	**(3)**	(B)	**(4)**	(A)	**(5)**	(C)
(6)	(B)	**(7)**	(B)	**(8)**	(B)	**(9)**	(A)	**(10)**	(A)
(11)	(A)	**(12)**	(C)						

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