Fractions and Decimals

- **Multiplication of fractions with whole number**
  - A whole number is multiplied with a proper or improper fraction by multiplying the whole number with the numerator of the fraction, keeping the denominator same. For example, $\frac{4}{3} \times 2 = \frac{8}{3}$
  - A mixed fraction is first converted into an improper fraction and then multiplied with the whole number. For example, $1\frac{2}{3} \times 5 = \frac{5}{3} \times 5 = \frac{25}{3}$

- **Multiplication of fraction by fraction**
  - When two fractions are multiplied, the product is obtained as $\frac{\text{Product of numerators}}{\text{Product of denominators}}$

    For example, $\frac{2}{9} \times \frac{7}{3} = \frac{2 \times 7}{9 \times 3} = \frac{14}{27}$
  - The product of two proper fractions is always less than each of the fractions.

    For example, $\frac{2}{3} \times \frac{4}{7} = \frac{8}{21}$ Here $\frac{8}{21} < \frac{2}{3}$ and $\frac{8}{21} < \frac{4}{7}$
  - The product of two improper fractions is greater than each of the fractions.

    For example, $\frac{3}{2} \times \frac{7}{4} = \frac{21}{8}$ Here, $\frac{21}{8} > \frac{3}{2}$ and $\frac{21}{8} > \frac{7}{4}$
  - The product of a proper fraction and an improper fraction is greater than the proper fraction, but less than the improper fraction.

    For example, $\frac{2}{3} \times \frac{7}{4} = \frac{2}{3} \times \frac{7}{4} = \frac{7}{6}$ Here, $\frac{7}{6} > \frac{2}{3}$ and $\frac{7}{6} < \frac{7}{4}$

- **Reciprocal of a number** is obtained by interchanging the numerator and denominator of that number.

  For example, reciprocal of $\frac{1}{4}$ is $\frac{4}{1}$ or 4.

- **Division of fraction by whole number or fraction**

  The fraction is multiplied with the reciprocal of the divisor. For example,

$\frac{2}{9} \div \frac{4}{5} = \frac{2}{9} \times \frac{5}{4} = \frac{10}{36} = \frac{5}{9}$

$\frac{3}{11} \div 3 = \frac{3}{11} \times \frac{1}{3} = \frac{3}{33} = \frac{1}{11}$

- **Division of whole number by fraction**

  The whole number is multiplied with the reciprocal of the fraction. For example, $2 \div \frac{1}{5} = 2 \times 5 = 10$

- **Multiplication of decimals**

  To multiply two decimal numbers, the numbers have to be first multiplied as whole numbers. Then, decimal is put in the product by counting the digits from the rightmost digit equal to the sum of the number of digits to the right of the decimal in both the numbers. For example,

  0.32 × 0.4

  Here, the number of digits to the right of the decimal in 0.32 is 2 and in 0.4 is 1.

  32 × 4 = 128

  Putting the decimal in 128 by counting (2 + 1) = 3 places to the left of 8, we obtain

  0.32 × 0.4 = 0.128

- When a decimal number is multiplied by 10, 100, or 1000, the digits in the product are same as in the decimal number, but the decimal point in the product is shifted to the right to as many places as there are zeroes i.e.,

  0.42 × 10 = 4.2

  0.42 × 100 = 42

  0.42 × 1000 = 420

- **Division of decimal numbers**

  When a decimal number is divided by 10, 100, or 1000, the quotient is same as the decimal number, but the decimal point in the quotient shifts to the left by as many places as there are zeroes. For example,

  $\frac{43.2}{10} = 4.32$

  $\frac{43.2}{100} = 0.432$

  $\frac{43.2}{1000} = 0.0432$

- To divide a decimal number by a whole number, it is first divided as whole numbers and then the decimal is put in the quotient to as many places from the right as in the decimal number. For example,

$$\frac{8.4}{7} = 1.2$$

- To divide a decimal number by another decimal number, firstly both the divisor and dividend are changed into fractional forms and then the dividend is multiplied with the reciprocal of the divisor.

For example, 0.96 can be divided by 0.8 as follows:

$$\begin{aligned} 0.96 \div 0.8 &= \frac{96}{100} \div \frac{8}{10} \\ &= \frac{96}{100} \times \frac{10}{8} \\ &= \frac{96 \times 1}{10 \times 8} \\ &= \frac{12}{10} \\ &= 1.2 \end{aligned}$$