

## FRACTIONS

A rational number in the form of  $\frac{p}{q}$ , where p and q are integers and q is not zero, is called a fraction.

Example:  $\frac{3}{7}, \frac{5}{11}$ , etc.

### Kinds of Fractions

- **Like fractions:** All those fractions whose denominators are the same are called like fractions.

Examples:

$\frac{1}{2}, \frac{3}{2}, \frac{7}{2}, \frac{11}{2}$  are like fractions.

$\frac{2}{11}, \frac{3}{11}, \frac{5}{11}, \frac{11}{11}$  are like fractions.

- **Unlike fractions:** All those fractions whose denominators are different are called unlike fractions.

Example:

$\frac{1}{2}, \frac{3}{4}, \frac{7}{5}, \frac{11}{12}$  are unlike fractions.

$\frac{2}{11}, \frac{3}{1}, \frac{5}{4}, \frac{1}{17}$  are unlike fractions.

- **Proper fractions:** When the denominator of a fraction is greater than the numerator of the fraction, that fraction is called a proper fraction.

Example:  $\frac{1}{2}$  is a proper fraction as  $2 > 1$

$\frac{4}{7}$  is a proper fraction as  $7 > 4$

- **Improper fractions:** When the numerator of a fraction is greater than or equal to the denominator of the fraction, that fraction is called an improper fraction.

Example:  $\frac{7}{5}$  is an improper fraction as  $7 > 5$

$\frac{11}{2}$  is an improper fraction as  $11 > 2$

$\frac{7}{7}$  is an improper fraction as  $7 = 7$

- **Mixed fractions:** A mixed fraction is the combination of a natural number and a proper fraction.

Exempld:  $1\frac{2}{5}, 4\frac{5}{12}, 6\frac{5}{6}$  etc. are mixed fractions.

### Equivalent Fractions

When the numerator and denominator of a fraction are divided/multiplied by the same integer ( $\neq 0$ ), the resultant fraction is called the equivalent fraction of the original fraction.

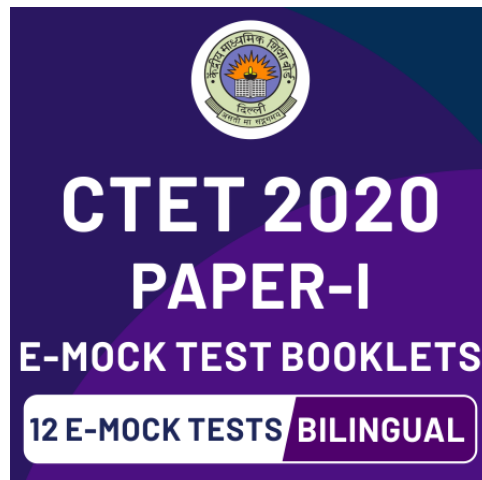
Example: Equivalent fractions of  $\frac{1}{2}$

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

$$\frac{1}{2} = \frac{1 \times 3}{2 \times 3} = \frac{3}{6}$$

$$\frac{1}{2} = \frac{1 \times 4}{2 \times 4} = \frac{4}{8}$$

Therefore,  $\frac{2}{4}, \frac{3}{6}, \frac{4}{8}$ , etc. are equivalent fractions of  $\frac{1}{2}$



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## Simplest Form of Fractions

A fraction is said to be in the simplest form if the only factors common to both its numerator and denominator are 1.

Example: Conversion of  $\frac{15}{36}$  into the simplest form.

Here, HCF of 15 and 36=3

$$\text{Therefore, } \frac{15}{36} = \frac{15 \div 3}{36 \div 3} = \frac{5}{12}$$

Now, HCF of 5 and 12 is 1.

Hence,  $\frac{5}{12}$  is in the simplest form of fraction.

## Comparing Fractions

If the denominators of two fractions are the same, the fraction whose numerator is greater is the greater fraction.

Example: In  $\frac{2}{3}$  and  $\frac{4}{3}$ , the denominator of both fractions are equal to 3.

And  $4 > 2$

$$\text{Hence, } \frac{4}{3} > \frac{2}{3}$$

If the numerators of two fractions are the same, the fraction whose denominator is smaller fraction.

Example: In  $\frac{2}{3}$  and  $\frac{2}{5}$ , the

Numerators of both fractions are equal to 2.

And  $5 > 3$

$$\text{Hence, } \frac{2}{3} > \frac{2}{5}$$

If both numerators and denominators are unequal, the equivalent fractions are determined such that the denominators of both are the same. Then, the fractions are compared.

Example: In  $\frac{2}{3}$  and  $\frac{3}{2}$ , the numerators and denominators of both fractions are unequal.

Now,

LCM of 3 and 2 = 6

$$\frac{2}{3} = \frac{2 \times 2}{3 \times 2} = \frac{4}{6}$$

$$\text{And } \frac{3}{2} = \frac{3 \times 3}{2 \times 3} = \frac{9}{6}$$

Now,  $9 > 4$

$$\text{Therefore, } \frac{9}{6} > \frac{4}{6}$$

$$\text{Hence, } \frac{3}{2} > \frac{2}{3}$$

## Addition of Fractions

If denominators are equal, then taking them as the common denominator, numerators are added. The resultant fraction is the addition of fractions.

$$\text{Example: } \frac{1}{7} + \frac{2}{7} = \frac{1+2}{7} = \frac{3}{7}$$

If the denominators are unequal, the LCM of the denominators is calculated so that we get a common denominator.

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Example:  $\frac{2}{3} + \frac{3}{4}$

Here, LCM of 3 and 4 = 12

$$\frac{2}{3} = \frac{2 \times 4}{3 \times 4} = \frac{8}{12}$$

And

$$\frac{3}{4} = \frac{3 \times 3}{4 \times 3} = \frac{9}{12}$$

Therefore,

$$\frac{2}{3} + \frac{3}{4} = \frac{8}{12} + \frac{9}{12} = \frac{8+9}{12} = \frac{17}{12}$$

## Subtraction of Fractions

If denominators are equal, then taking them as the common denominator, numerators are subtracted. The resultant fraction is the subtraction of fractions.

Example:  $\frac{4}{7} - \frac{2}{7} = \frac{4-2}{7} = \frac{2}{7}$

If denominators are unequal, the LCM of the denominators is calculated so that we get a common denominator.

Example:  $\frac{3}{4} - \frac{2}{3}$

Here, LCM of 4 and 3 = 12

$$\frac{3}{4} = \frac{3 \times 3}{4 \times 3} = \frac{9}{12}$$

And

$$\frac{2}{3} = \frac{2 \times 4}{3 \times 4} = \frac{8}{12}$$

Therefore,

$$\frac{3}{4} - \frac{2}{3} = \frac{9}{12} - \frac{8}{12} = \frac{9-8}{12} = \frac{1}{12}$$

## Product of Fractions

To get the product of fractions, the numerator is multiplied by the numerator and the denominator is multiplied by the denominator.

Example:  $\frac{3}{4} \times \frac{2}{5} = \frac{6}{20}$

## Division of fractions

To get the divisions of fractions, the sign of division is changed to the sign of multiplication and every fraction just after the division sign is flipped. Now, the question becomes to find the product of fractions, which is calculated as discussed above.

Example:  $\frac{15}{32} \div \frac{5}{8}$

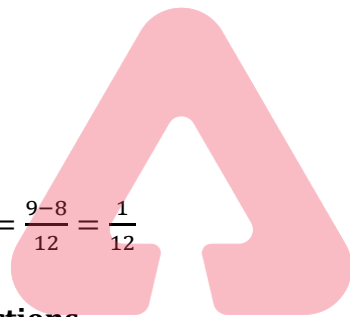
$$= \frac{15}{32} \times \frac{8}{5}$$

$$= \frac{120}{160}$$

HCF of 120 and 160 = 40

$$\frac{120}{160} = \frac{120 \div 40}{160 \div 40} = \frac{3}{4}$$

Hence,  $\frac{15}{32} \div \frac{5}{8} = \frac{3}{4}$



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