` Rational numbers

The numbers which can be written in the of p/q, where p and q are integers and q‡ 0 are called rational numbers.

Positive rational numbers: a rational number is said to be positive, it its numerator and denominator are either both positive and both negative.

Negative rational numbers: a rational numbers is said to be negative, if either numerator and denominator is negative.

Equivalent rational numbers

1. If p/q is a rational numbers and m is a non-zero integer, then $\frac{p}{q}=\frac{p\times m}{q\times m}$
2. If p/q is rational number and m is a common divisor of p and q, then $\frac{p}{q}=\frac{p\div m}{q\div m}$

Standard form of rational number

A rational number p/q is said to be in standard form, if denominator q is positive and p and q have no common divisor other than 1.

1. express each of the following rational numbers in standard form:
   a) $\frac{30}{-72}$ b) $\frac{95}{105}$ c) $\frac{-65}{104}$ d) $\frac{-54}{-81}$
2. Write down the rational number whose numerator is -3 and denominator is 4.
3. If numerator of a rational number is (-5) x2 and denominator is (10 -3), write down the rational number.
4. Express $\frac{-2}{3}$ as a rational number with numerator 4.
5. Write down rational numbers equivalent to the following rational numbers:
   a) $\frac{4}{3}$ b) $\frac{-6}{7}$
6. Which of the following are rational numbers?
   $\frac{0}{6}$,2, $\frac{3}{4}$, $\frac{-1}{\sqrt{2}}$, $\frac{5}{0}$
7. Identify the numerator and denominator in the following rational numbers.
   $\frac{-2}{3}$, $\frac{4}{1}$, $\frac{0}{3}$, $\frac{3}{-1}$, 5.
8. Express in standard form:
   a) $\frac{15}{65}$ b) $\frac{33}{-77}$
9. Find $|x-y|$ and $|y-x|$ when x=9 and y =$\frac{1}{5}$.
10. Find $|x+y|$ when x =-7 and y =3.

Representation of rational number on the number line:

1. Represent rational number -$\frac{4}{5}$ on the number line.
2. Represent$\frac{3}{8}$, - $\frac{1}{8}$ and $\frac{5}{8}$ on the number line.

Method of Comparing Rational Number:

Step 1: express the rational numbers with positive denominators.
Step 2: take L.C.M of the positive denominators.
Step 3: express each rational number (as in step 1) with L.C.M as common denominator.
Step 4: compare the numerators. The number having the greater numerator is greater.

1. Compare the following rational numbers:

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a) $\frac{3}{5}$ and $\frac{2}{3}$ b) $\frac{-3}{7}$ and $\frac{5}{-4}$

Method of comparing rational numbers:

1. Compare the following:

a) $\frac{-5}{8}$, $\frac{-3}{7}$ b) $\frac{-7}{5}$, $\frac{-11}{8}$

2. Arrange the following rational numbers in ascending order:

$\frac{-7}{4}$, $\frac{5}{6}$, $\frac{7}{-12}$.

3. Arrange the following rational numbers in the descending order:

$\frac{5}{7}$, $\frac{-11}{2}$, $\frac{2}{-7}$, $\frac{-3}{14}$.

4. Arrange the following rational numbers in ascending order:

a) $\frac{8}{-15}$, $\frac{-3}{10}$, $\frac{-13}{20}$, $\frac{17}{-30}$ b) $\frac{-13}{5}$, $\frac{7}{-3}$, -2, $\frac{2}{3}$

5. Represent the following rational numbers on the number line:

a) $\frac{-5}{6}$ b) $\frac{3}{7}$ c) $\frac{-2}{7}$ d) $\frac{-8}{11}$

Addition of rational numbers:

1. Find the sum of the following rational numbers:

a) $\frac{6}{11} + \frac{(-15)}{11}$ b) $\frac{6}{-7} + \frac{8}{7}$ c) $\frac{-4}{9} + \left(\frac{-6}{9}\right)$

Adding rational numbers when denominators of the given numbers are unequal.

2. Find the sum of the following rational numbers:

a) $\frac{6}{13}$ and $\frac{-4}{39}$ b) $\frac{-16}{9}$ and $\frac{-7}{12}$ c) $\frac{4}{3}$ and $\frac{5}{-7}$

Properties of addition of rational numbers:

1. Closure property:

If $\frac{a}{b}$ and $\frac{c}{d}$ are two rational numbers, then $\left(\frac{a}{b} + \frac{c}{d}\right)$ is also a rational number.

2. Commutative property:

Two rational numbers can be added in any order. If $\frac{a}{b}$ and $\frac{c}{d}$ are two rational numbers, then

$\left(\frac{a}{b} + \frac{c}{d}\right) = \left(\frac{c}{d} + \frac{a}{b}\right)$

3. Associative property:

While adding three rational numbers they can be grouped in any order.

If $\frac{a}{b}$, $\frac{c}{d}$, $\frac{e}{f}$ are three rational numbers, then

$\left(\frac{a}{b} + \frac{c}{d}\right) + \frac{e}{f} = \frac{a}{b} + \left(\frac{c}{d} + \frac{e}{f}\right)$

Subtraction of rational numbers:

The difference of two rational numbers $\frac{a}{b}$ and $\frac{c}{d}$ is defined as $\frac{a}{b} - \frac{c}{d}$ is defined as $\frac{a}{b} - \frac{c}{d}$ $= \frac{ad-bc}{bd}$.

1. Add the following rational numbers:

a) $\frac{5}{8}$ and $\frac{3}{-10}$ b) $\frac{-3}{8}$ and $\frac{7}{-15}$ c) 4 and $\frac{5}{6}$ d) $\frac{15}{-7}$ and $\frac{8}{3}$

2. Subtract the following rational numbers

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a) $\frac{8}{3}$ from $\frac{13}{7}$ b) $\frac{-4}{13}$ from $\frac{6}{-7}$ c) $\frac{11}{6}$ from $\frac{-2}{9}$ d) $\frac{-7}{10}$ from $\frac{2}{5}$

3. Simplify :
   a) $\frac{5}{6}-\frac{3}{8}+\frac{7}{12}$ b) $\frac{11}{-18}-\frac{5}{16}+\frac{4}{9}$ c) $2+\left(\frac{-2}{3}\right)+\left(\frac{-4}{5}\right)$ d) $\frac{-9}{2}+\left(\frac{-8}{3}\right)+\frac{11}{6}$
4. The sum of two numbers is $\frac{-5}{3}$. If one of the numbers is $\frac{-12}{3}$, what is the other number?
5. The sum of two number is $\frac{-23}{9}$. If one of the number is $\frac{5}{9}$, what is the other number?
6. What should be added to $\frac{1}{3}+\frac{1}{4}+\frac{1}{6}$ to get 1 ?
7. What number should be subtracted from $\frac{3}{5}$ to get $\frac{5}{3}$?

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