Bismihi Tala

Rabbi Zidni Ilma (Sure Taaha)

8th Standard
MATHEMATICS

Chapters :

RATIONAL NUMBER

LINEAR EQUATION IN ONE VARIABLE

Compiled and Solved by

B.M. Abdul Khadeer Qureshi

President, Nashir-e-Islam & Able Education & Welfare Soceity, Shimoga

Edited by

Saher Kounain.K

Asst.Teacher, Khidwai English School, Shimoga

Class : 8th Standard

RATIONAL NUMBER

1) **Number :** A number is a figure or a symbol used to represent the quantity

Eg. : 5, 5, ೫, ۵ etc

2) **Positive numbers** : Numbers greater than zero (0) are called positive numbers

Eg. : 7, +9, 0.3, 23 etc

3) Negative numbers : Numbers Less than zero (0) are called negative numbers

Eg. : -3, -2.3, - 23 etc

4) Even numbers : The numbers which are divisible by 2 are called even numbers

Eg. : 6, 14, 2022, 1946 etc

5) Odd numbers : The numbers which are not divisible by 2 are called odd numbers

Eg. : 15, 37, 135 2047 etc

6) Prime numbers : The numbers which are divisible by 1 or itself are called prime numbers numbers. Eg. : 2, 3, 5, 7, 11, 13, 17, 23 etc

7) Triangular numbers : The triangular number sequence is the representation of the numbers in the form of equilateral triangle arranged in a series or sequence. These numbers are in a sequence of 1, 3, 6, 10, 15, 21, 28,36, 45, and so on.

8) Composite numbers : composite numbers are the numbers which have more than two factors, unlike prime numbers which have only two factors, i.e. 1 and the number itself. These numbers are also called composites.

All the natural numbers which are not prime numbers are composite numbers as they can be divided by more than two numbers. For example, 6 is composite because it is divisible by 1, 2, 3 and even 6, such as

$6 \div 2 = 3$, $6 \div 3 = 2$, $6 \div 6 = 1$, $6 \div 1 = 6$

1). Natural numbers : Counting numbes are called natural numbers

Eg. : N = {1, 2, 3, 4, ... ∞ (infinity)}

Properties of Natural numbers

1) Natural number starts from 1 to ∞ (infinity)

2) All Natural numbers are postive

3) The difference between any two consecutive natural numbers is ‘1’

4) The set of Natural numbers is denoted by N

1) Closure Property

(a) Addition

For all a, b $\in$ N, a+b $\in$ N

Let a = 12 $\in$ N, b = 34 $\in$ N

a + b = 12 + 34 = 46 $\in$ N

Therefore Natural Number is closed under addition

(b) Multiplication

For all a, b $\in$ N, a x b $\in$ N

Let a = 10 $\in$ N, b = 15 $\in$ N

a x b = 10 x 15 = 150 $\in$ N

Therefore Natural Number is closed under Multiplication

(c) Subtraction

Let a = 5 $\in$ N, b = 13 $\in$ N

a - b = 5 - 13 = -8 $\notin$ N

Therefore Natural Number is not closed under Subtraction

(d) Division

Let a = 8 $\in$ N, b = 5 $\in$ N

a $\div$ b = 8 $\div$ 5 = $\frac{8}{5}$ $\notin$ N

Therefore Natural Number is not closed under Subtraction

6) Commutative Property

(a) Addition

For all a, b $\in$ N, a + b = b + a $\in$ N

Let a = 7 $\in$ N, b = 18 $\in$ N

a + b = 7 + 18 = 25 $\in$ N

$b + a = 18 + 7 = 25 \in N$

Therefore $a + b = b + a \in N$

Natural Number is Commutative under addition

(b) Multiplication

For all $a, b \in N$, $a \times b = b \times a \in N$

Let $a = 11, b = 12 \in N$

$a \times b = 11 \times 12 = 132 \in N$

$b \times a = 12 \times 11 = 132 \in N$

Therefore $a \times b = b \times a \in N$

Natural Number is Commutative under Multiplication

(c) Subtraction

Let $a = 6, b = 19 \in N$

$a - b = 6 - 19 = -13 \notin N$

$b - a = 19 - 6 = 13 \in N$

Therefore $a - b \neq b - a$

Natural Number is not Commutative under Subtraction

(d) Division

Let $a = 6, b = 7 \in N$

$a \div b = 6 \div 7 = \frac{6}{7} \notin N$

$b \div a = 7 \div 6 = \frac{7}{6} \notin N$

Therefore $a \div b \neq b \div a$

Natural Number is not Commutative under Division

2) Assosiative Property

(a) Addition

For all $a, b, c \in N$, $a + (b + c) = (a + b) + c \in N$

Let $a = 3 \in N, b = 4, c = 5 \in N$

$a + (b + c) = 3 + (4 + 5) = 3 + 9 = 12 \in N$

$(a + b) + c = (3 + 4) + 5 = 7 + 5 = 12 \in N$

$a + (b + c) = (a + b) + c$

Therefore Natural Number is Associative under addition

(b) Multiplication

Let $a = 5, b = 6, c = 7 \in N$

$a \times (b \times c) = 5 \times (6 \times 7) = 5 \times 42 = 210 \in N$

$(a \times b) \times c = (5 \times 6) \times 7 = 30 \times 7 = 210 \in N$

$a \times (b \times c) = (a \times b) \times c$

Therefore Natural Number is Associative under Multiplication

(c) Subtraction

Let $a = 2 \in N, b = 8, c = 4 \in N$

$a - (b - c) = 2 - (8 - 4) = 2 - 4 = -2 \notin N$

$(a - b) - c = (2 - 8) - 4 = -6 - 4 = -10 \notin N$

$a - (b - c) \neq (a - b) - c$

Therefore Natural Number is not Associative under Subtraction

(c) Division

Let $a = 2 \in N, b = 8, c = 4 \in N$

$a \div (b \div c) = 2 \div (8 \div 4) = 2 \div \frac{8}{4} = 2 \div 2 = 1 \in N$

$(a \div b) \div c = (2 \div 8) \div 4 = \frac{2}{8} \div 4 = \frac{2}{8} \times \frac{1}{4} = \frac{1}{16} \notin N$

$a \div (b \div c) \neq (a \div b) \div c$

Therefore Natural Number is not Associative under Division

3) Additive Identity

For all $a \in N$, $a + 0 = 0 + a = a \in N$

'0' is called Multiplictive Identity of Natural numbers

Example Let $a = 3 \in N$

$3 + 0 = 0 + 3 = 3$

3) Multiplicative Identity

For all $a \in N$, $a \times 1 = 1 \times a = a \in N$

'1' is called Multiplictive Identity of Natural numbers

Example Let $a = 3 \in N$

$3 \times 1 = 1 \times 3 = 3$

2 Whole numbers : Natural numbers including zero(0) are called Whole numbers

Eg. : W = { 0, 1, 2, 3, 4, ... ∞ (infinity)]

Note : The set of Whole numbers is denoted by W

Properties of Whole numbers

1) Closure Property

(a) Addition

Let $a = 12, b = 14 \in W$

$a + b = 12 + 14 = 26 \in W$

Therefore Whole number is closed under addition

(b) Multiplication

Let $a = 7 \in N, b = 0 \in W$

$a \times b = 7 \times 0 = 0 \in W$

Therefore Whole number is closed under Multiplication

(c) Subtraction

Let $a = 10, b = 13 \in W$

$a - b = 10 - 13 = -3 \notin W$

Therefore Whole number is not closed under Subtraction

(d) Division

Let $a = 8, b = 5 \in W$

$a \div b = 8 \div 5 = \frac{8}{5} \notin W$

Therefore Whole number is not closed under Subtraction

2) Assosiative Property

(a) Addition

Let $a = 3, b = 4, c = 5 \in W$

$a + (b + c) = 3 + (4 + 5) = 3 + 9 = 12 \in W$

$(a + b) + c = (3 + 4) + 5 = 7 + 5 = 12 \in W$

$a + (b + c) = (a + b) + c$

Therefore Whole number is Assosiative under addition

(b) Multiplication

Let $a = 5, b = 6, c = 7 \in W$

$a \times (b \times c) = 5 \times (6 \times 7) = 3 \times 42 = 210 \in W$

$(a \times b) \times c = (5 \times 6) \times 7 = 30 \times 7 = 210 \in W$

$a \times (b \times c) = (a \times b) \times c$

Therefore Whole number is Assosiative under Multiplication

(c) Subtraction

Let $a = 2, b = 8, c = 4 \in W$

$a - (b - c) = 2 - (8 - 4) = 2 - 4 = -2 \notin W$

$(a - b) - c = (2 - 8) - 4 = -6 - 4 = -10 \notin W$

$a - (b - c) \neq (a - b) - c$

Therefore Whole number is not Assosiative under Subtraction

(c) Division

Let $a = 2, b = 8, c = 4 \in W$

$a \div (b \div c) = 2 \div (8 \div 4) = 2 \div \frac{8}{4} = 2 \div 2 = 1 \in W$

$(a \div b) \div c = (2 \div 8) \div 4 = \frac{2}{8} \div 4 = \frac{2}{8} \times \frac{1}{4} = \frac{1}{16} \notin W$

$a \div (b \div c) \neq (a \div b) \div c$

Therefore Whole number is not Assosiative under Division

3) Additive Identity

For all $a \in W$, $a + 0 = 0 + a = a \in W$

'0' is called additive Identity of Whole numbers

Example Let $a = 7 \in W$

$7 + 0 = 0 + 7 = 7$

4) Multiplicative Identity

For all $a \in W$, $a \times 1 = 1 \times a = a \in W$

'1' is called Multiplictive Identity of Whole numbers

Example Let $a = 5 \in W$

$5 \times 1 = 1 \times 5 = 5$

3. Integers : Integers Contain both positive numbers, negative numbers along with zer(0)

Eg. : Z= { ....-4, -3, -2, -1,0, 1, 2, 3, 4, ... }

Properties of Integers

1) The set of Integers contain positive numbers, negative numbers along with zer(0)

2) It does not contain fractions

3) The set of Integers is denoted by Z

1) Closure Property

(a) Addition : Let $a = -12, b = 14 \in Z$

$a + b = -12 + 14 = 2 \in Z$

Therefore Integers is closed under addition

(b) Multiplication

Let $a = -7, b = 3 \in Z$

$a \times b = -7 \times 3 = -21 \in Z$

Therefore Integers is closed under Multiplication

(c) Subtraction

Let $a = -10 \in Z, b = 13 \in Z$

$a - b = -10 - 13 = -23 \in Z$

Therefore Integers is closed under Subtraction

(d) Division

Let $a = 8 \in N, b = -5 \in Z$

$a \div b = 8 \div -5 = -\frac{8}{5} \notin Z$

Therefore Integers is not closed under Subtraction

2) Assosiative Property

(a) Addition

Let $a = -3 \in Z, b = 4, c = 0 \in Z$

$a + (b + c) = -3 + (4 + 0) = -3 + 4 = 1 \in Z$

$(a + b) + c = (-3 + 4) + 0 = 1 + 0 = 1 \in Z$

$a + (b + c) = (a + b) + c$

Therefore Integers is Associative under addition

(b) Multiplication

Let $a = -5 \in Z, b = 6, c = -7 \in Z$

$a \times (b \times c) = -5 \times (6 \times -7) = -5 \times -42 = 210 \in Z$

$(a \times b) \times c = (-5 \times 6) \times -7 = -30 \times -7 = 210 \in Z$

$a \times (b \times c) = (a \times b) \times c$

Therefore Integers is Associative under Multiplication

(c) Subtraction

Let $a = 2 \in Z, b = -8, c = 4 \in Z$

$a - (b - c) = 2 - (-8 - 4) = 2 - (-12) = 2+12 =14 \in Z$

$(a - b) - c = [2 - (-8)] - 4 = 10 - 4 = 6 \in Z$

$a - (b - c) \neq (a - b) - c$

Therefore Integers is not Associativeunder Subtraction

(c) Division

Let $a = 2, b = 8, c = -4 \in Z$

$a \div (b \div c) = 2 \div (8 \div -4) = 2 \div -\frac{8}{4} = 2 \div -2 = -1 \in Z$

$(a \div b) \div c = (2 \div 8) \div -4 = \frac{2}{8} \div -4 \quad \frac{1}{4} \times -\frac{1}{4} = -\frac{1}{16} \notin Z$

$a \div (b \div c) \neq (a \div b) \div c$

Therefore Integers is not Associative under Division

3) Additive Identity

For all $a \in Z$, $a + 0 = 0 + a = a \in Z$

'0' is called additive Identity of Whole numbers

Example Let $a = 7 \in Z$

$7 + 0 = 0 + 7 = 7$

4) Multiplicative Identity

For all $a \in Z$, $a \times 1 = 1 \times a = a \in Z$

'1' is called Multiplictive Identity of Whole numbers

Example Let $a = 5 \in Z$

$5 \times 1 = 1 \times 5 = 5$

5) Additive inverse

For all $a \in Z$, $a + (-a) = 0$

'-a' is called additive inverse of a in integers

Example 1) Let $a = 7 \in Z$

There fore -7 is called the additive inverse of 7

2) Let $a = -10 \in Z$

There fore +10 is called the additive inverse of -10

4) Rational Number : A number which can be written in the form of $\frac{p}{q}$, where p and q are integers and $q \neq 0$ is caled a rational number

Eg. : $\frac{2}{7}, -\frac{5}{9}, 0,$ etc

Properties of Rational numbers:

1) The set of Rational numberscontain positive numbers,negative numbers,fractions along with zero

2) The set of rational numbers is denoted by Q

1) Closure Property

(a) Addition

Let $a = 12, b = \frac{7}{6} \in Q$

$a + b = 12 + \frac{7}{6} = \frac{12 \text{ x } 6 + 7}{6} = \frac{72 + 7}{6} = \frac{79}{6} \in Q$

Therefore Rational numbes is closed under addition

(b) Multiplication

Let $a = -7, b = \frac{3}{2} \in Q$

$a \text{ x } b = -7 \text{ x } \frac{3}{2} = \frac{-21}{2} \in Q$

Therefore Rational numbes is closed under Multiplication

(c) Subtraction

Let $a = \frac{7}{4}, b = \frac{8}{4} \in Q$

$a - b = \frac{7}{4} - \frac{8}{4} = \frac{7-8}{4} = \frac{-1}{4} \in Q$

Therefore Rational numbes is closed under Subtraction

(d) Division

Let $a = 3, b = 0 \in Q$

$a \div b = 3 \div 0 = \frac{3}{0}$ = undefined $\notin Q$

Therefore Rational numbes is not closed under Subtraction

2) Assosiative Property

(a) Addition

Let $a = 6 \in Z, b = -15, c = \frac{1}{2} \in Q$

$a + (b + c) = 6 + (-15 + \frac{1}{2}) = 6 + \frac{-30+1}{2} = 6 + \frac{-29}{2} = \frac{12-29}{2} = \frac{-17}{2} \in Q$

$(a + b) + c = (6 - 15) + \frac{1}{2} = -9 + \frac{1}{2} = \frac{-18+1}{2} = \frac{-17}{2} \in Q$

$a + (b + c) = (a + b) + c$

Therefore Rational numbes is Associative under addition

(b) Multiplication

Let $a = \frac{15}{2}, b = -\frac{3}{15}, c = 9 \in Q$

$\frac{15}{2} \text{ x } (-\frac{3}{15} \text{ x } 9) = \frac{15}{2} \text{ x } -\frac{9}{5} = -\frac{27}{2} \in Q$

$(a \text{ x } b) \text{ x } c = (\frac{15}{2} \text{ x } -\frac{3}{15}) \text{ x } 9 = -\frac{3}{2} \text{ x } 9 = -\frac{27}{2} \in Q$

a x (b x c) = (a x b) x c

Therefore Rational numbers is Associative under Multiplication

(c) Subtraction

Let $a = 2 \in Q$, b = -8, $c = 4 \in Q$

a - (b - c) = 2 - (-8 - 4) = 2 - (-12) = 2+12 =14 $\in Q$

(a - b) - c = [2 - (-8)]- 4 = 10- 4 = 6 $\in Q$

a - (b - c) $\neq$ (a - b) - c

Therefore Rational numbers is not Associativeunder Subtraction

3) Additive Identity

For all $a \in Q$, $a + 0 = 0 + a = a \in Q$

'0' is called additive Identity of Whole numbers

Example Let $a = \frac{15}{14} \in Q$

$\frac{15}{14} + 0 = 0 + \frac{15}{14} = \frac{15}{14}$

4) Multiplicative Identity

For all $a \in Q$, a x 1 = 1 x a = $a \in Q$

'1' is called Multiplictive Identity of Whole numbers

Example Let $a = -\frac{7}{5} \in Q$

$-\frac{7}{5} \text{ x } 1 = 1 \text{ x } -\frac{7}{5} = -\frac{7}{5}$

5) Additive inverse

For all $a \in Q$, a + (-a) = 0

'-a' is called additive inverse of a in integers

Example 1) Let $a = \frac{1}{2} \in Q$

There fore $-\frac{1}{2}$ is called the additive inverse of 7

2) Let $a = -10 \in Q$

There fore +10 is called the additive inverse of -10

6) Multiplicative inverse

For all $a \in Q$, $a \times (\frac{1}{a}) = 1$

'-a' is called additive inverse of a in integers

Example 1) Let $a = \frac{1}{2} \in Q$

There fore 2 is called the Multiplicative inverse of $\frac{1}{2}$

2) Let $a = -\frac{7}{5} \in Q$

There fore $-\frac{5}{7}$ is called the additive inverse of $-\frac{7}{5}$

and $q \neq 0$ is caled a rational number

Eg. : $\frac{2}{7}$, $-\frac{5}{9}$, 0, etc

Properties of Rational numbers:

1) The set of Rational numberscontain positive numbers, negative numbers, fractions along with zer(0)

2) The set of rational numbers is denoted by Q

1) Closure Property

(a) Addition

Let $a = 12, b = \frac{7}{6} \in Q$

$a + b = 12 + \frac{7}{6} = \frac{12 \times 6 + 7}{6} = \frac{72 + 7}{6} = \frac{79}{6} \in Q$

Therefore Rational numbes is closed under addition

(b) Multiplication

Let $a = -7, b = \frac{3}{2} \in Q$

$a \times b = -7 \times \frac{3}{2} = \frac{-21}{2} \in Q$

Therefore Rational numbes is closed under Multiplication

(c) Subtraction

Let $a = \frac{7}{4}, b = \frac{8}{4} \in Q$

$a - b = \frac{7}{4} - \frac{8}{4} = \frac{7-8}{4} = \frac{-1}{4} \in Q$

Therefore Rational numbes is closed under Subtraction

(d) Division

Let $a = \frac{7}{4}, b = \frac{8}{4} \in Q$

$a \div b = \frac{7}{4} \div \frac{8}{4} = \frac{7}{4} x \frac{4}{8} = \frac{7}{8} \notin Q$

Therefore Rational numbes is closed under Subtraction

2) Assosiative Property

(a) Addition

Let $a = 6 \in Z, b = -15, c = \frac{1}{2} \in Q$

$a + (b + c) = 6 + (-15 + \frac{1}{2}) = 6 + \frac{-30+1}{2} = 6 + \frac{-29}{2} = \frac{12-29}{2} = \frac{-17}{2} \in Q$

$(a + b) + c = (6 - 15) + \frac{1}{2} = -9 + \frac{1}{2} = \frac{-18+1}{2} = \frac{-17}{2} \in Q$

$a + (b + c) = (a + b) + c$

Therefore Rational numbes is Associative under addition

(b) Multiplication

Let $a = \frac{15}{2}, b = -\frac{3}{15}, c = 9 \in Q$

$\frac{15}{2} x (-\frac{3}{15} x 9) = \frac{15}{2} x -\frac{9}{5} = -\frac{27}{2} \in Q$

$(a x b) x c = (\frac{15}{2} x -\frac{3}{15}) x 9 = -\frac{3}{2} x 9 = -\frac{27}{2} \in Q$

$a x (b x c) = (a x b) x c$

Therefore Rational numbers is Associative under Multiplication

(c) Subtraction

Let $a = 2 \in Q, b = -8, c = 4 \in Q$

$a - (b - c) = 2 - (-8 - 4) = 2 - (-12) = 2+12 = 14 \in Q$

$(a - b) - c = [2 - (-8)]- 4 = 10- 4 = 6 \in Q$

$a - (b - c) \neq (a - b) - c$

Therefore Rational numbers is not Associativeunder Subtraction

(c) Division

Let $a = \frac{3}{2}, b = -\frac{7}{5}, c = -\frac{15}{14} \in Q$

$a \div (b \div c) = \frac{3}{2} \div (-\frac{7}{5} \div -\frac{15}{14}) = \frac{3}{2} \div (-\frac{7}{5} x -\frac{14}{15}) = -\frac{3}{2} \div \frac{98}{75} = -\frac{3}{2} x \frac{75}{98} = -\frac{225}{196} \in Q$

$(a \div b) \div c = (\frac{3}{2} \div -\frac{7}{5}) \div -\frac{15}{14} = (\frac{3}{2} x -\frac{5}{7}) \div -\frac{14}{15} = \frac{15}{14} x -\frac{14}{15} = -\frac{225}{196} \in Q$

$a \div (b \div c) = (a \div b) \div c$

Therefore Rational numbers Associative under Division

3) Additive Identity

For all $a \in Q$, $a + 0 = 0 + a = a \in Q$

'0' is called additive Identity of Whole numbers

Example Let $a = \frac{15}{14} \in Q$

$\frac{15}{14} + 0 = 0 + \frac{15}{14} = \frac{15}{14}$

4) Multiplicative Identity

For all $a \in Q$, $a x 1 = 1 x a = a \in Q$

'1' is called Multiplictive Identity of Whole numbers

Example Let $a = -\frac{7}{5} \in Q$

$-\frac{7}{5} x 1 = 1 x -\frac{7}{5} = -\frac{7}{5}$

5) Additive inverse

For all $a \in Q$, $a + (-a) = 0$

'-a' is called additive inverse of a in integers

Example 1) Let $a = \frac{1}{2} \in Q$

There fore $-\frac{1}{2}$ is called the additive inverse of 7

2) Let $a = -10 \in Q$

There fore +10 is called the additive inverse of -10

6) Multiplicative inverse

For all $a \in Q$, $a \times (\frac{1}{a}) = 1$

'-a' is called additive inverse of a in integers

Example 1) Let $a = \frac{1}{2} \in Q$

There fore 2 is called the Multiplicative inverse of $\frac{1}{2}$

2) Let $a = -\frac{7}{5} \in Q$

There fore $-\frac{5}{7}$ is called the additive inverse of $-\frac{7}{5}$

Exercise 1.1

1. Using appropriate properties find

(i) $-\frac{2}{3} \times \frac{3}{5} + \frac{5}{2} - \frac{3}{5} \times \frac{1}{6}$

$= -\frac{2}{5} + \frac{5}{2} - \frac{1}{10}$

$= \frac{-4+25-1}{10}$

$= \frac{20}{10}$

$= 2$

(ii) $\frac{2}{5} \times \left(-\frac{3}{7}\right) - \frac{1}{6} \times \frac{3}{2} + \frac{1}{14} \times \frac{2}{5}$

$= -\frac{6}{35} - \frac{1}{4} + \frac{1}{35}$

$= -\frac{6}{35} + \frac{1}{35} - \frac{1}{4}$

$= \frac{-6+1}{35} - \frac{1}{4}$

$= \frac{-5}{35} - \frac{1}{4}$

$= \frac{-1}{7} - \frac{1}{4}$

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

$= \frac{-11}{28}$

2. Write the additive inverse of each of the following

(i) $\frac{2}{8}$

Soln. ; The additive inverse of $\frac{2}{8}$ is $-\frac{2}{8}$

(ii) $-\frac{5}{9}$

Soln. ; The additive inverse of $-\frac{5}{9}$ is $\frac{5}{9}$

(iii) $\frac{-6}{-5}$

Soln. ; The additive inverse of $\frac{-6}{-5}$ is $-\frac{6}{5}$

(iv) $\frac{2}{-9}$

Soln. ; The additive inverse of $\frac{2}{-9}$ is $\frac{2}{9}$

(v) $\frac{19}{-6}$

Soln. ; The additive inverse of $\frac{19}{-6}$ is $\frac{19}{6}$

3. Verify that -(-x)= x for

(i) $x = \frac{11}{15}$

Soln. ; Let $x = \frac{11}{15}$

$-x = -\frac{11}{15}$

$-(-x) = -\left(-\frac{11}{15}\right) = \frac{11}{15}$

Therefore -(-x) = x

(ii) $x = -\frac{13}{17}$

Soln. ; Let $x = -\frac{13}{17}$

$-x = -\left(-\frac{13}{17}\right)$

$-x = \frac{13}{17}$

$-(-x) = -\left(\frac{13}{17}\right) = -\frac{13}{17}$

Therefore -(-x) = x

4. Find the Multiplicative inverse of each of the following

(i) -13

Soln. ; The multiplicative inverse of -13 is $\frac{1}{-13}$

(ii) $\frac{-13}{19}$

Soln. ; The multiplicative inverse of $\frac{-13}{19}$ is $\frac{19}{-13}$

(iii) $\frac{1}{5}$

Soln. ; The multiplicative inverse of $\frac{1}{5}$ is 5

(iv) $\frac{-5}{8} x \frac{-3}{7}$

Soln. ; The multiplicative inverse of $\frac{-5}{8} x \frac{-3}{7} = \frac{15}{56}$ is $\frac{56}{15}$

(v) $-1 x \frac{-2}{5} = \frac{2}{5}$

Soln. ; The multiplicative inverse of $\frac{2}{5}$ is $\frac{5}{2}$

(vi) -1

Soln. ; The multiplicative inverse of -1 is -1

5. Name the property under the multiplication used in each of the following

(i) $\frac{-4}{5} x 1 = \frac{-4}{5} x 1 = \frac{-4}{5}$

Soln. : 1 is the Multiplicative identity

(ii) $\frac{13}{17} x \frac{-2}{7} = \frac{-2}{7} \quad \frac{13}{17}$

Soln. : Commutative Property of Multiplication

(iii) $\frac{-19}{29} x \frac{29}{-19} = 1$

Soln. : Multiplicative inverse

6. Multiply $\frac{6}{13}$ by the reciprocal of $\frac{-7}{16}$

Soln. : the reciprocal of $\frac{-7}{16}$ is $\frac{16}{-7}$

$\frac{6}{13}$ x $\frac{16}{-7}$ = - $\frac{96}{91}$

7. Tell what property allow you to compute $\frac{1}{3}$ x $\left(6 \times \frac{4}{3}\right)$ as $\left(\frac{1}{3} \times 6\right) \times \frac{4}{3}$

Soln. : Associative Property of Multiplication

8. Is $\frac{8}{9}$ the multiplicative inverse of $-1\frac{1}{8}$? Why or why not?

Soln. : No because the product of $\frac{8}{9}$ and $-1\frac{1}{8}$ is not 1

$$\frac{8}{9} \times \frac{-7}{8} = \frac{-7}{9} \neq 1$$

9. Is 0.3 the multiplicative inverse of $3\frac{1}{3}$? Why or why not?

Soln. : No because the product of 0.3 and $3\frac{1}{3}$ is not 1

$$0.3 = \frac{10}{3}$$

$$3\frac{1}{3} = \frac{10}{3}$$

$$0.3 \times 3\frac{1}{3} = \frac{10}{3} \times \frac{10}{3} = \frac{100}{9} \neq 1$$

10. Write

(i) The rational number that does not have a reciprocal

Soln. : (Zero) 0

(ii) The rational number that are equal to their reciprocals

Soln. : 1 and -1

(iii) The rational number that are equal to its negative

Soln. : (Zero) 0

11. Fill in the blanks

(i) Zero has .... reciprocal

Soln. : No

(ii) The numbers .... and.............. are their own reciprocals

Soln. : 1 and -1

(iii) The reciprocal of -5 is.................

Soln. : $\frac{-1}{5}$

(iv) Reciprocal of $\frac{1}{x}$, where $x \neq 0$ is ....

Soln. : x

(v) The product of two rational numbers is always a.............

Soln. : Rational number

(vi) Reciprocal of a positive rational number is ....

Soln. : Positive rational number

1.4 Rational Numbers between Two Rational Numbers

1) Find a rational number between $\frac{1}{4}$ and $\frac{1}{2}$

Soln. : $\frac{1}{4} + \frac{1}{2} \div 2$

$$= \frac{1+2}{4} x \frac{1}{2} = \frac{3}{4} x \frac{1}{2} = \frac{3}{8}$$

2) Write any 3 rationa numbers between -2 and 0

Soln. : -2 can be written as $\frac{-20}{10}$ and 0 as $\frac{0}{10}$

Thus we have $\frac{-19}{10}, \frac{-18}{10}, \frac{-17}{10}, \frac{-16}{10}, \frac{-15}{10}, \frac{-14}{10}$ .... $\frac{-1}{10}$ between -2 and 0

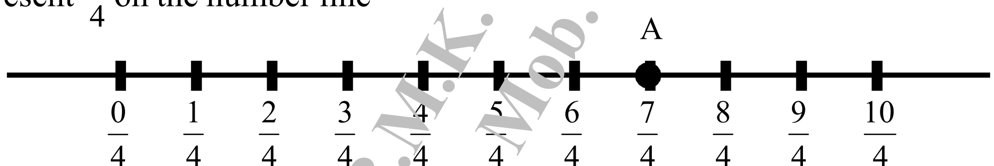
(Note : You can take any three of these)

I take 3 rationa numbers between -2 and 0 as $\frac{-19}{10}, \frac{-16}{10}$ and $\frac{-14}{10}$

Excercise 1.2

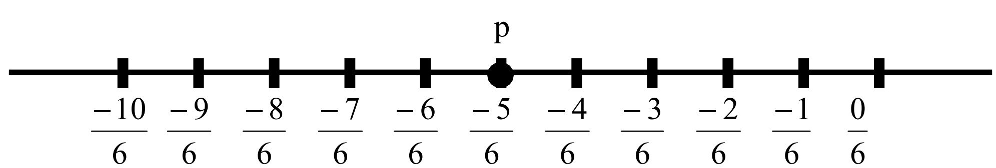
1) (i)Represent $\frac{7}{4}$ on the number line

Soln. :



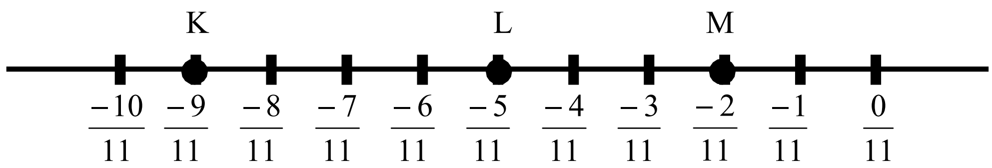
Here point A represent $\frac{7}{4}$ on the number line

1) (ii)Represent $\frac{-5}{6}$ on the number line



Here point P represent $\frac{-5}{6}$ on the number line

2) Represent $\frac{-2}{11}, \frac{-5}{11}, \frac{-9}{11}$ on the number line



Here point K, L and M represent $\frac{-2}{11}, \frac{-5}{11}, \frac{-9}{11}$ on the number line

3) Write five rational numbes which are smaller than 2

Soln. : $0, 1, \frac{1}{2}, \frac{1}{3}$ and $\frac{1}{4}$

4) Find 10 rational numbes between $\frac{-2}{5}$ and $\frac{1}{2}$

Soln. : The given rational numbers are $\frac{-2}{5}$ and $\frac{1}{2}$

$$\frac{-2}{5} = \frac{-2 \times 4}{5 \times 4} = \frac{-8}{20}$$

$$\frac{1}{2} = \frac{1 \times 10}{2 \times 10} = \frac{10}{20}$$

Ten Rational numbers between $\frac{-8}{20}$ and $\frac{10}{20}$ are

$$\frac{-7}{20}, \frac{-6}{20}, \frac{-5}{20}, \frac{-4}{20}, \frac{-3}{20}, \frac{-2}{20}, \frac{-1}{20}, 0, \frac{1}{20} \text{ and } \frac{2}{20}$$

$$= \frac{-7}{20}, \frac{-3}{10}, \frac{-1}{4}, \frac{-1}{5}, \frac{-3}{20}, \frac{-1}{10}, \frac{-1}{20}, 0, \frac{1}{20} \text{ and } \frac{1}{10}$$

5) (i) Find 5 rational numbes between $\frac{2}{3}$ and $\frac{4}{5}$

Soln. : The given rational numbers are $\frac{2}{3}$ and $\frac{4}{5}$

$$\frac{2}{3} = \frac{2 \times 20}{3 \times 20} = \frac{40}{60}$$

$$\frac{1}{2} = \frac{4}{5} = \frac{4 \times 12}{5 \times 12} = \frac{48}{60}$$

5 Rational numbers between $\frac{40}{60}$ and $\frac{48}{60}$ are

$$\frac{41}{60}, \frac{42}{60}, \frac{43}{60}, \frac{44}{60} \text{ and } \frac{45}{60}$$

$$= \frac{41}{60}, \frac{7}{10}, \frac{43}{60}, \frac{11}{15} \text{ and } \frac{3}{4}$$

5) (ii) Find 5 rational numbes between $\frac{-3}{2}$ and $\frac{5}{3}$

Soln. : The given rational numbers are $\frac{-3}{2}$ and $\frac{5}{3}$

$$\frac{-3}{2} = \frac{-3 \times 3}{2 \times 3} = \frac{-9}{6}$$

$$\frac{5}{3} = \frac{5 \times 2}{3 \times 2} = \frac{10}{6}$$

5 Rational numbers between $\frac{-9}{6}$ and $\frac{10}{6}$ are

$$\frac{-8}{6}, \frac{-7}{6}, \frac{-6}{6}, \frac{-5}{6} \text{ and } \frac{-4}{6}$$

$$= \frac{-4}{3}, \frac{-7}{6}, -1, \frac{-5}{6} \text{ and } \frac{-2}{3}$$

5) (iii) Find 5 rational numbes between $\frac{1}{4}$ and $\frac{1}{2}$

Soln. : The given rational numbers are $\frac{1}{4}$ and $\frac{1}{2}$

$$\frac{1}{4} = \frac{1 \times 8}{4 \times 8} = \frac{8}{32}$$

$$\frac{1}{2} = \frac{1 \times 16}{2 \times 16} = \frac{16}{32}$$

5 Rational numbers between $\frac{-9}{6}$ and $\frac{10}{6}$ are

$$\frac{9}{32}, \frac{10}{32}, \frac{11}{32}, \frac{12}{32} \text{ and } \frac{13}{32}$$

$$= \frac{9}{32}, \frac{5}{16}, \frac{11}{32}, \frac{3}{8} \text{ and } \frac{13}{32}$$

6) Find 10 rational numbes between $\frac{3}{5}$ and $\frac{3}{4}$

Soln. : The given rational numbers are $\frac{3}{5}$ and $\frac{3}{4}$

$$\frac{3}{5} = \frac{3 \times 32}{5 \times 32} = \frac{96}{160}$$

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

10 Rational numbers between $\frac{3}{5}$ and $\frac{3}{4}$ are

$$\frac{97}{160}, \frac{98}{160}, \frac{99}{160}, \frac{100}{160}, \frac{101}{160}, \frac{102}{160}, \frac{103}{160}, \frac{104}{160}, \frac{105}{160} \text{ and }, \frac{106}{160}$$