Cosmo School

Class – 7

Chapter – 1

Rational and Irrational Number

Lecture sheet – 6

Rational number: A rational number is a number that can be express as the ratio of two integers.

1,2,3,4,…….. etc. are natural numbers. These numbers can be expressed in the form of a fraction of two natural numbers.

1 = $\frac{1}{1}$, 2 = $\frac{2}{1}$, 3 = $\frac{3\times2}{2}$ = $\frac{6}{2}$, ……etc.

Again, 0.1, 1.5, 2.03, ….. etc. are decimal numbers.

Here, 0.1 = $\frac{1}{10}$, 1.5 = $\frac{15}{10}$, 2.03 = $\frac{203}{100}$ which are fractional forms of the numbers.

Again, 0 = $\frac{0}{1}$, is a fractional number.

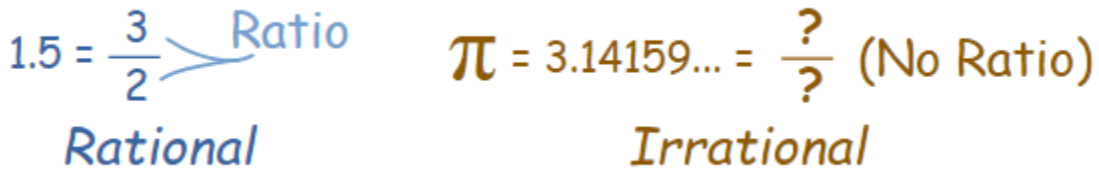
The numbers discussed above are rational numbers.

So, zero, all natural numbers and fractions are rational number.

Irrational number: An Irrational Number is a real number that cannot be written as a simple fraction. Irrational means not Rational.

$\sqrt{2}$ = 1.4142135……. the numbers of digits after decimal are not fixed. So, it cannot be expressed in a fractional form of two natural numbers. Similarly, the number $\sqrt{3}$, $\sqrt{5}$, $\sqrt{6}$, ……..etc. can not be expressed in a fractional form of two natural numbers. These are irrational number.

$\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$, $\sqrt{6}$, ……..etc. are irrational numbers and the numbers 2, 3, 5, 6,….etc. are not perfect squares. So, the square root of the numbers which is not perfect square is an irrational number.



Example 1: Choose the irrational number from the following numbers 0.12, $\sqrt{25}$, $\sqrt{72}$, $\frac{\sqrt{49}}{7}$.

Here, 0.12 = $\frac{12}{100}$ = $\frac{3}{25}$, which is a fractional number.

$\sqrt{25}$ = $\sqrt{5 \times 5}$ = 5, which is natural number

$\sqrt{72}$ = $\sqrt{2 \times 36}$ = $\sqrt{2 \times 6 \times 6}$ = $6\sqrt{2}$, which can not be written as a fraction.

And $\frac{\sqrt{49}}{7}$ = $\frac{\sqrt{7 \times 7}}{7}$ = $\frac{7}{7}$ = 1, which is a natural number

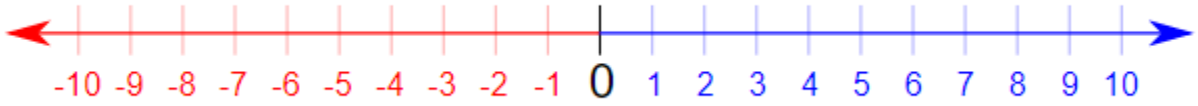
$\therefore$ 0.12, $\sqrt{25}$, $\frac{\sqrt{49}}{7}$ are rational number and $\sqrt{72}$ is an irrational number.

1. Exercise (Do yourself)

*Separate the rational and irrational number form $1\frac{1}{2}$, $\sqrt{\frac{4}{25}}$, $\sqrt{\frac{27}{16}}$, 1.0563, $\sqrt{32}$, $\sqrt{121}$.

Integers

Integers are like whole numbers, but they also include negative numbers ... but still no fractions allowed!

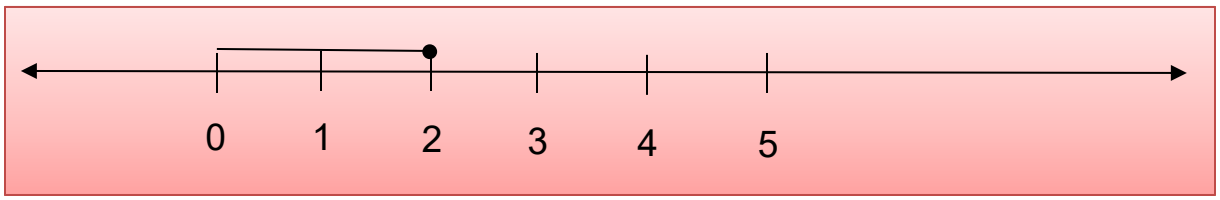


So, integers can be negative {−1, −2, −3, −4, ... }, positive {1, 2, 3, 4, ... }, or zero {0}

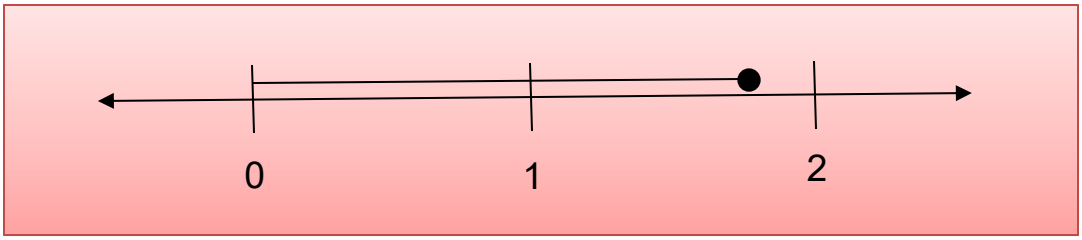
We can put that all together like this:

Integers = {..., −4, −3, −2, −1, 0, 1, 2, 3, 4, ...}

Rational numbers of number line: Observe the number line below –



The dark point on the above number line denotes the position of 2.

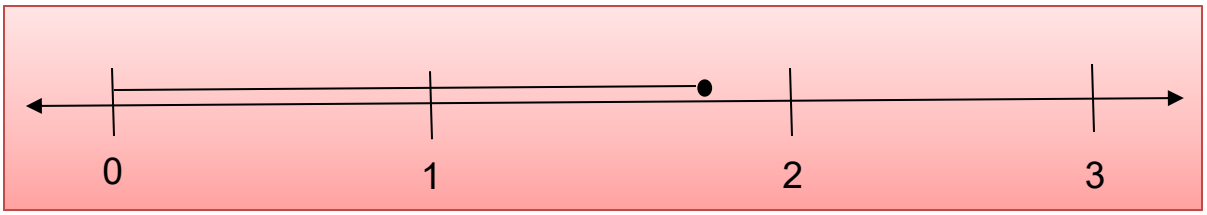


Again, in the above number line, the position of the dark point lies between 1 and 2. The denoted dark point lies at 3 out of 4 parts. Hence, the dark point denotes $1 + \frac{3}{4} = 1\frac{3}{4}$

Irrational numbers of number line:

$\sqrt{3}$ is an irrational number where $\sqrt{3}$ = 1.732……..= 1.7 (approx.)

Now, dividing the segment in between 1 and 2 into equal parts, mark 7th part with a dark point which denotes 1.7 (it denotes $\sqrt{3}$ approximately).



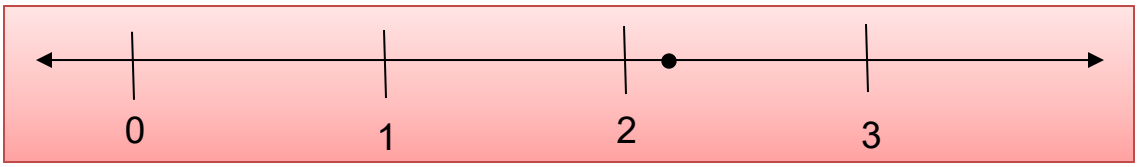
So, the darkened point is the location of $\sqrt{3}$ on the number line.

Example 2: Locate the number $\sqrt{5}$ on the number line.

Solution: $\sqrt{5}$ is irrational number.

Here, $\sqrt{5}$ = 2.236…….. = 2.2

The number line is given below:



Here we divide 10 parts between 2 and 3 and mark the 2nd part that represents the position 2.2 or $\sqrt{5}$.

2. Exercise (Do yourself)

* Locate the numbers 3, $\frac{3}{2}$, 1.455 on the number line.