NUMBER SYSTEMS

1. Introduction:

In your earlier classes, you have learnt about the number line and how to represent various types of numbers on it.

The number line

Just imagine you start from zero and go on walking along this number line in the positive direction.

As far as your eyes can see, there are numbers, numbers and numbers!

2.Notes:

- There are infinitely many rational numbers between any two given rational numbers.
- A number ‘s’ is called irrational, if it cannot be written in the form pq, where pand q are integers and q≠ 0.
- The decimal expansion of an irrational number is non-terminating non-recurring.Moreover, a number whose decimal expansion is non-terminating non-recurringis irrational.

3.Example Sums:

*Find five rational numbers between 1 and 2.We can approach this problem in at least two ways.Solution 1 :

Recall that to find a rational number between r and s, you can add r ands and divide the sum by 2, that is 2rs+ lies between r and s. So, 32 is a numberbetween 1 and 2. You can proceed in this manner to find four more rational numbersbetween 1 and 2. These four numbers are 5/4, 11/8 13/8 and 7/4.

* :Locate 2 on the number line.Solution :

It is easy to see how the Greeks might have discovered2. Consider a square OABC, with each side 1 unit in length (seeFig. 1.6). Then you can see by the Pythagoras theorem thatOB = 22112+=. How do we represent 2 on the number line?This is easy. Transfer Fig. 1.6 onto the number line making sure that the vertex Ocoincides with zero (see Fig. 1.7).Fig. 1.7We have just seen that OB = 2. Using a compass with centre O and radius OB,draw an arc intersecting the number line at the point P. Then P corresponds to root 2 on the number line.

*Show that 0.3333... = 0 3. can be expressed in the form pq, where p andq are integers and q≠ 0.

Solution :Since we do not know what 0 3. is , let us call it ‘x’ and sox =0.3333...Now here is where the trick comes in. Look at10 x =10 × (0.333...) = 3.333...Now,3.3333... =3 + x, since x = 0.3333...Therefore,10 x =3 + xSolving for x, we get9x =3, i.e., x = 9.

4.Practice sums:

*Find five rational numbers between 3/5 and 4/5.

*Show how root 5 represents on number line.

* Express the following in the form pq, where p and q are integers and q≠ 0.(i)0 6.(ii)0. 47