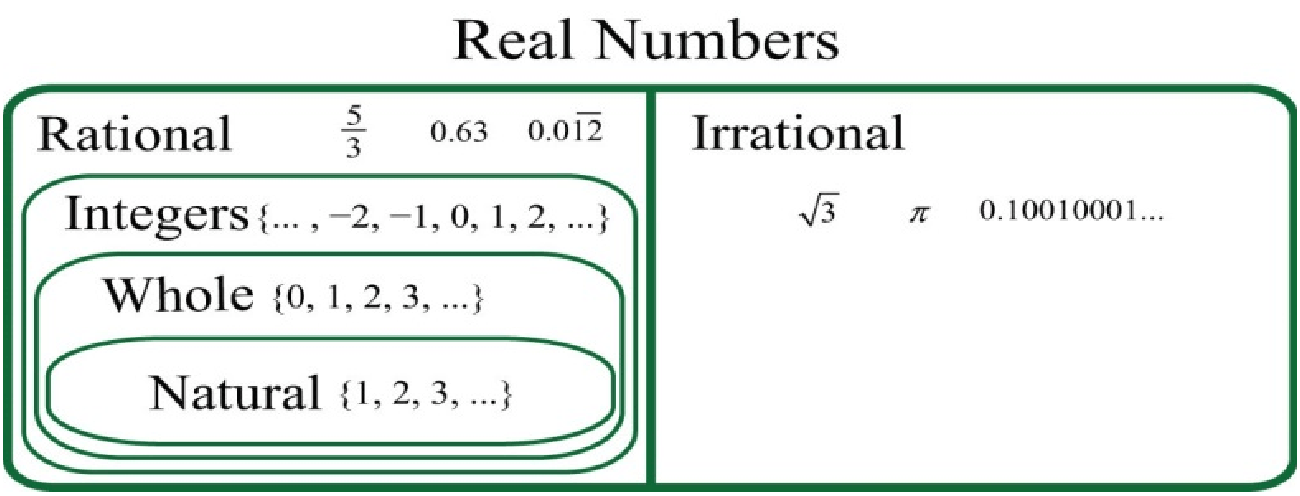
NCERT Class 9 Solutions: Number Systems (Chapter 1) Exercise 1.2

Q. 1 State whether the following statements are true or false. Justify your answer

1. Every irrational number is a real number.
2. Every point on the number line is of the form $\sqrt{m}$, where m is a natural number.
3. Every real number is an irrational number.

Solution:



1. 1st statement is true. Irrational numbers are those which cannot be expressed accurately in the form $\frac{p}{q}$, i.e.. as a fraction. Irrational numbers, when written as decimal numbers, do not terminate, nor do they repeat. Rational numbers on the other hand can be expressed as a fraction. Note that $0.\dot{3}$ is a repeating decimal, therefore it can be accurately and exactly expressed as a fraction $\left(\frac{1}{3}\right)$ and hence is a rational number. All the rational and irrational numbers are contained in the set of real numbers.
2. 2nd statement is wrong. Every point on the number line is not a square root of a natural number. For example $\frac{3}{2}$ is a point on the number line. It is not square root of a natural number. It is square root of $\frac{9}{4}$. Similarly 0.5 is the square root of 0.25 and so on.
3. As we explained in 1,3rd statement is wrong. Even all rational numbers are real numbers.

Q. 2 Are the square roots of all positive integers irrational? If not, give an example of the square root of a number that is a rational number.

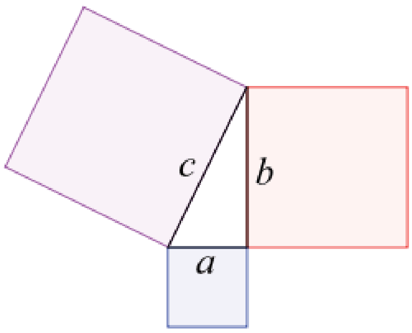
Solution:

- Square roots of all positive integers are not irrational.
- Example 4, 9,16, 25, etc. are a positive integers
- And their square roots are 2,3, 4,5 which are rational numbers

Q. 3 Show how $\sqrt{5}$ can be represented on the number line.

Solution:

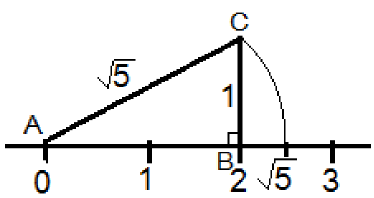
The idea of this construction is to use the Pythagoras theorem which states that in a right triangle:



$$c^2 = a^2 + b^2$$

Another way to understand this is that the area of square drawn at hypotenuse would be the sum of areas of squares drawn on the two sides.

In the following construction we construct a right triangle with two sides whose square add to be 5. Now, $1^2 + 2^2 = 5$.



Step: 1 – Let AB be a line of length 2 inch on number line

Step: 2 – B draw a perpendicular line BC of length 1 inch, then join CA

Step: 3 – in Triangle ABC is a right angled triangle, Applying Pythagoras theorem

$$AB^2 + BC^2 = CA^2$$

$$2^2 + 1^2 = CA^2$$

$$CA^2 = 5$$

$$CA = \sqrt{5}$$

Step: 4 – Taking CA as a radius and A as a center draw an arc touching the number line. Since any point on the circumference of a circle is ‘radius’ distance away from the center. Therefore, the point at which number line will get intersected by arc is at $\sqrt{5}$ distance from 0 because it is a radius of the circle whose center was A.