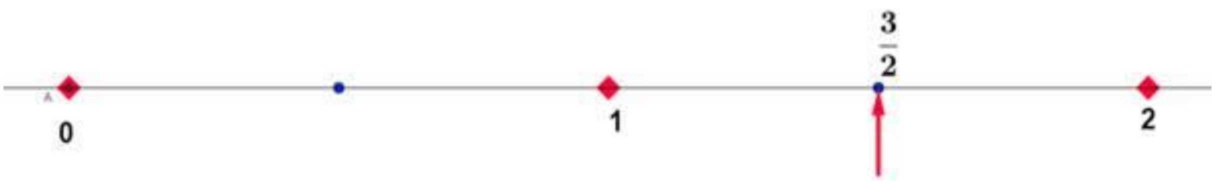
Rational And Irrational Numbers

Practice set 1.1

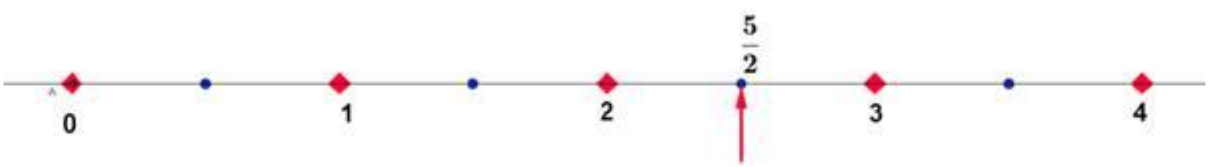
Q. 1. A. Show the following numbers on a number line. Draw a separate number line for each example.

$\frac{3}{2}, \frac{5}{2}, -\frac{3}{2}$

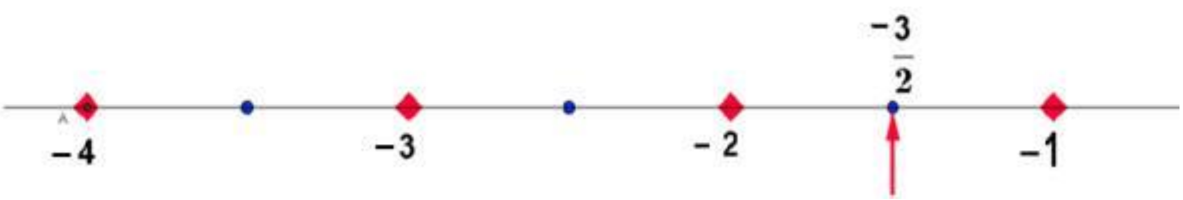
Answer : For $\frac{3}{2}$ the number line will be:



For $\frac{5}{2}$ the number line will be:



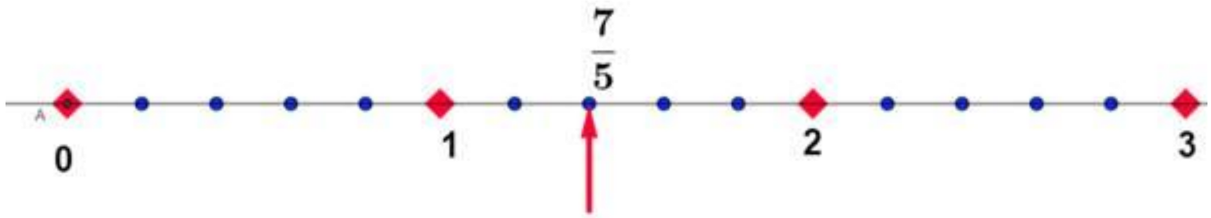
For $\frac{-3}{2}$ the number line will be:



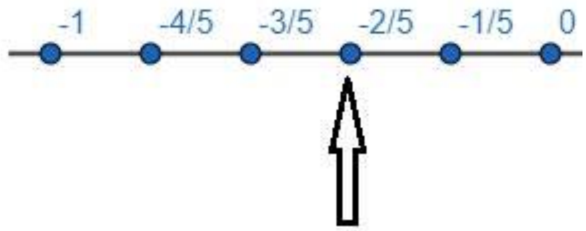
Q. 1. B. Show the following numbers on a number line. Draw a separate number line for each example.

$\frac{7}{5}, \frac{-2}{5}, \frac{-4}{5}$

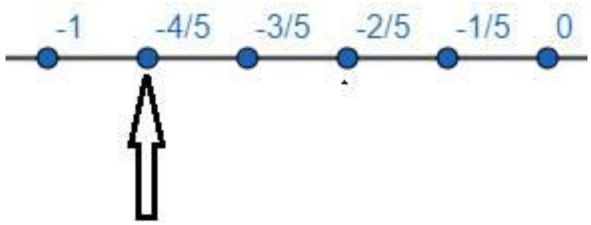
Answer : For $\frac{7}{5}$ the number line will be:



For $\frac{-2}{5}$ the number line will be:



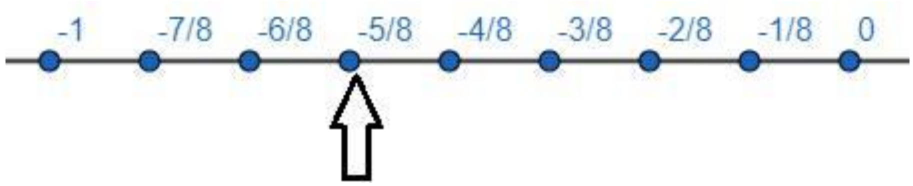
For $\frac{-4}{5}$ the number line will be:



Q. 1. C. Show the following numbers on a number line. Draw a separate number line for each example.

$\frac{-5}{8}, \frac{11}{8}$

Answer : For $\frac{-5}{8}$ the number line will be:

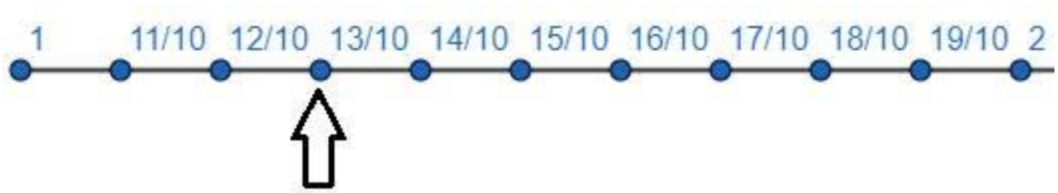


For $\frac{11}{8}$ the number line will be:

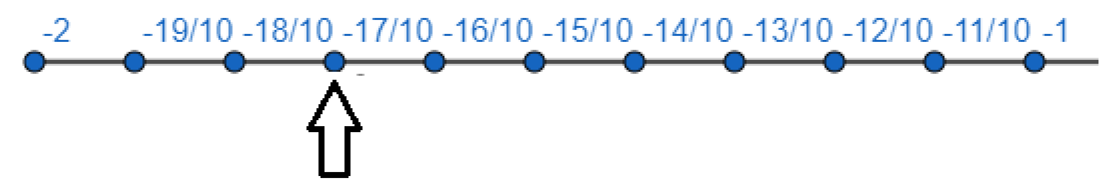
Q. 1. D. Show the following numbers on a number line. Draw a separate number line for each example.

$$\frac{13}{10}, \frac{-17}{10}$$

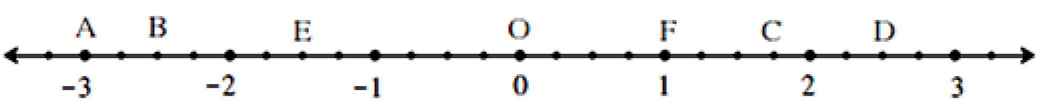
Answer : For $\frac{13}{10}$ the number line will be:



For $\frac{-17}{10}$ the number line will be:



Q. 2. Observe the number line and answer the questions.



(1) Which number is indicated by point B?

(2) Which point indicates the number $1\frac{3}{4}$ **?**

(3) State whether the statement, 'the point D denotes the number 5/2, is true or false.

Answer : As each part between integers divided into 4 parts on the number line hence each part equals $\frac{1}{4}$.

(1) Which number is indicated by point B?

Now point B is 10 places to left i.e. in the negative side of number line hence point **B is** $\frac{-10}{4}$.

(2) Which point indicates the number $1\frac{3}{4}$?

Now $1\frac{3}{4}$ can also be written as $\frac{7}{4}$, Which means seven places to right i.e. **Point C.**

(3) State whether the statement, 'the point D denotes the number 5/2, is true or false.

Now point D is 10 places away from zero i.e. it is $\frac{10}{4}$ which can also be written as $\frac{5}{2}$**.**

Hence the above statement is true.

Practice set 1.2

Q. 1. A. Compare the following numbers.

-7, -2

Answer : Now if there are two numbers, a and b such that a>b then

-a<-b.

Therefore, as 7>2

Hence **-7<-2.**

Q. 1. B. Compare the following numbers.

0, -9/5

Answer : As -9/5 is a negative quantity, it will be always less than zero.

0>-9/5.

Q. 1. C. Compare the following numbers.

8/7, 0

Answer : As 8/7 is a positive quantity, it will always be greater than zero.

0<8/7.

Q. 1. D. Compare the following numbers.

$$\frac{-5}{4}, \frac{1}{4}$$

Answer : As the denominator is same, we just need to check which number in the numerator is greater.

∴ As -5 < 1

$$\frac{-5}{4} < \frac{1}{4}$$

Q. 1. E. Compare the following numbers.

$$\frac{40}{29}, \frac{141}{29}$$

Answer : As the denominator is same, we just need to check which number in the numerator is greater.

∴ As 40 < 141

$$\frac{40}{29} < \frac{141}{29}$$

Q. 1. F. Compare the following numbers.

$$-\frac{17}{20}, \frac{-13}{20}$$

Answer : Now if there are two numbers, a and b such that a>b then

-a<-b.

Therefore, as 17>13

Hence -17<-13.

Also, As the denominator is same, we just need to check which number in the numerator is greater.

∴ As -17 < -13

$$\frac{-17}{20} < \frac{-13}{20}$$

Q. 1. G. Compare the following numbers.

$$\frac{15}{12}, \frac{7}{16}$$

Answer :

$$\frac{15}{12} = \frac{15 \times 4}{12 \times 4} = \frac{60}{48} \; \frac{7}{16} = \frac{7 \times 3}{16 \times 3} = \frac{21}{48}$$

As we have made denominator equal we now just need to check whose numerator is greater.

Therefore, as 60>21.

$$\frac{60}{48} > \frac{21}{48}$$

Hence, $\frac{15}{12} > \frac{7}{16}$

Q. 1. H. Compare the following numbers.

$$\frac{-25}{8}, \frac{-9}{4}$$

Answer : $\frac{-9}{4} = \frac{-9 \times 2}{4 \times 2} = \frac{-18}{8}$

As we have made denominator equal we now just need to check whose numerator is greater.

Therefore, as -25<-18.

Hence $\frac{-25}{18} < \frac{-9}{4}$.

Q. 1. I. Compare the following numbers.

$$\frac{12}{15}, \frac{3}{5}$$

Answer :

$$\frac{3}{5} = \frac{3 \times 3}{5 \times 3} = \frac{9}{15}$$

As we have made denominator equal we now just need to check whose numerator is greater.

Therefore, as 12 >9.

$$\frac{12}{15} > \frac{9}{15}$$

Hence, $\frac{12}{15} > \frac{3}{5}$

Q. 1. J. Compare the following numbers.

$$\frac{-7}{11}, \frac{-3}{4}$$

Answer :

$$\frac{-7}{11} = \frac{-7 \times 4}{11 \times 4} = \frac{-28}{44} \; \frac{-3}{4} = \frac{-3 \times 11}{4 \times 11} = \frac{-33}{44}$$

As we have made denominator equal we now just need to check whose numerator is greater.

Therefore, as -28>-33.

Hence $\frac{-7}{11} > \frac{-3}{4}$.

Practice set 1.3

Q. 1. A. Write the following rational numbers in decimal form.

9/37

Answer :

```
      0.243243
    ----------
37 |  90
    - 74
    -----
      160
     -148
    ------
       120
      -111
      -----
         90
        -74
      ------
        160
       -148
       -----
         120
       - 111
        -----
           90
```

We divide now 9 by 37 what we write down as 9/37 and we get 0.243243243243243243.......

Here we can see 243 in being repeated again and again so we can 243 is in recursion

$\therefore \frac{9}{37} = 0.243243 = \overline{0.243}$

Note: “A important note in every example except 4 we get solution recursive that is because when we divide it the remainder never becomes zero as in example 4 and remember the numbers which are repeated again and again should be given $\overline{(\ )}$ symbol above them.”

Q. 1. B. Write the following rational numbers in decimal form.

18/42

Answer :

```
       0.42857142
42 |  180
     -168
      120
     - 84
       360
      - 336
        240
       - 210
          300
         -294
             60
            -42
              180
             -168
               120
              - 84
                360
```

$\frac{18}{42}$ = 0.428571428571428571…

So, as we can see 428751 repeats itself so we can write it as $0.\overline{428571}$

$\therefore \frac{18}{42} = \frac{3}{7} = 0.42857142857142857\ldots = 0.\overline{428571}$

Note: "A important note in every example except 4 we get solution recursive that is because when we divide it the remainder never becomes zero as in example 4 and remember the numbers which are repeated again and again should be given $(\overline{\ \ })$ symbol above them."

Q. 1. C. Write the following rational numbers in decimal form.

9/14

Answer :

```
      0.642857142
    ___________
14 |  90
     - 84
    ______
       60
      -56
    ______
        40
      -  28
    ______
         120
        -114
    ______
           80
          - 70
    ______
            100
           -  98
    ______
              20
            - 14
    ______
               60
              -56
    ______
                40
               -28
    ______
                120
```

$\frac{9}{14}$ Cannot be further reduced so we have to divide it and we get 0.64285714285714… . As we can see 428571 is recursive so we can write it as $0.6\overline{428571}$. It is important to note that 6 is not recurring so there is no $(\overline{\ })$ symbol above it.

$\therefore \frac{9}{14} = 0.6\overline{428571}$.

Note: “A important note in every example except 4 we get solution recursive that is because when we divide it the remainder never becomes zero as in example 4 and remember the numbers which are repeated again and again should be given $\overline{(\ )}$ symbol above them."

Q. 1. D. Write the following rational numbers in decimal form.

-103/5

Answer :

```
     20.6
5 | 103
   - 10
   -----
     03
    -00
   -----
      30
    - 30
   ------
      00
```

The above solution is for $\frac{103}{5}$ when we multiply the quotient by negative (-) sign. We get the solution for $\frac{-103}{5}$.

$\therefore \frac{-103}{5} = -20.6$

Note: "A important note in every example except 4 we get solution recursive that is because when we divide it the remainder never becomes zero as in example 4 and remember the numbers which are repeated again and again should be given $\overline{(\ )}$ symbol above them."

Q. 1. E. Write the following rational numbers in decimal form.

-11/13

Answer :

$$
\begin{array}{r|l}
 & 0.84615384 \\
13 & 110 \\
 & -104 \\ \hline
 & 60 \\
 & -52 \\ \hline
 & 80 \\
 & -78 \\ \hline
 & 20 \\
 & -13 \\ \hline
 & 70 \\
 & -65 \\ \hline
 & 50 \\
 & -39 \\ \hline
 & 110 \\
 & -104 \\ \hline
 & 60 \\
 & -52 \\ \hline
 & 80
\end{array}
$$

We get 0.8461538461538… . As we can see 846153 is recursive so we can write it as $0.\overline{8461538}$

$\therefore \frac{-11}{13} = 0.\overline{8461538}$

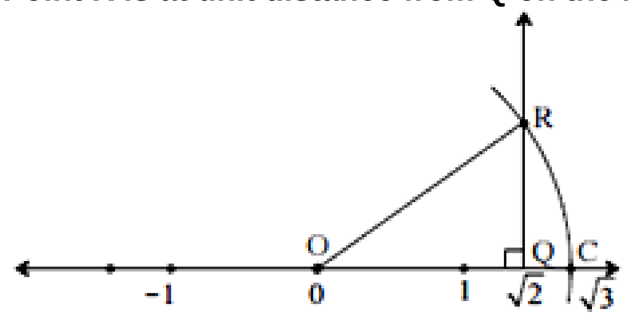
Note: "A important note in every example except 4 we get solution recursive that is because when we divide it the remainder never becomes zero as in example 4 and remember the numbers which are repeated again and again should be given $(\overline{\ \ })$ symbol above them."

Practice set 1.4

Q. 1. The number √2 is shown on a number line. Steps are given to show √3 on the number line using √2. Fill in the boxes properly and complete the activity.

Activity :

● The point Q on the number line shows the number.......
● A line perpendicular to the number line is drawn through the point Q. Point R is at unit distance from Q on the line.



● Right angled ΔORQ is obtained by drawing seg OR.

● $l(OQ) = \sqrt{2}$, $l(QR) = 1$

∴ by Pythagoras theorem,

$[l(OR)]^2 = [l(OQ)]^2 + [l(QR)]^2$

$= \square^2 + \square^2 = \square + \square$

$= \square$ ∴ $l(OR) = \square$

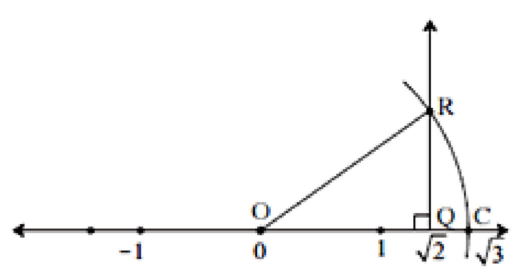
Draw an arc with center O and radius OR. Mark the point of intersection of the line and the arc as C. The point C shows the number √3.

Answer : Activity :

● The point Q on the number line shows the number ...$\sqrt{2}$... .

● A line perpendicular to the number line is drawn through the point Q.

Point R is at unit distance from Q on the line. (Here unit distance means 1 cm or any other unit that you choose earlier)



● Right angled ΔORQ is obtained by drawing seg OR.

● $l(OQ) = \sqrt{2}$, $l(QR) = 1$

∴ By Pythagoras theorem,

$[l(OR)]^2 = [l(OQ)]^2 + [l(QR)]^2$

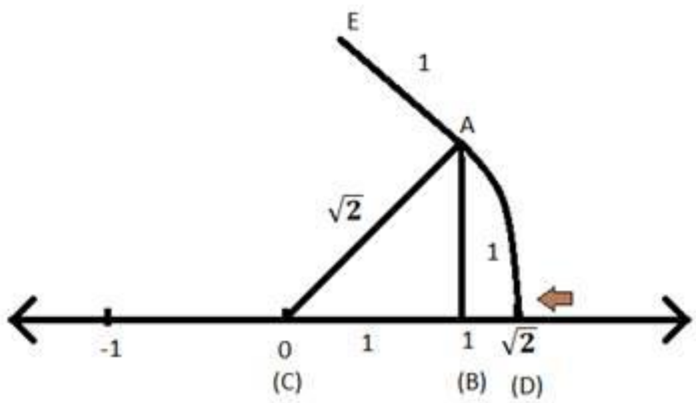
$= (\sqrt{2})^2 + (1)^2 = 2 + 1$

$= 3$ ∴ $l(OR) = \sqrt{3}$

The solution for drawing $\sqrt{3}$:

To represent √3 on the number line, first of all, we have to represent √2 on the number line. The procedure for the representation of √2 will be same as shown in the activity. So, let's start from there only. The steps further followed will be as:

Step I: Now we need to construct a line which is perpendicular to line AB from point A such that this new line has unity length and let's name the new line as AE.



Step II: Now join (C) and (E). The length of line CE could be found out by using Pythagoras theorem in right angled triangle EAC. So;

$AE^2 + AC^2 = EC^2$

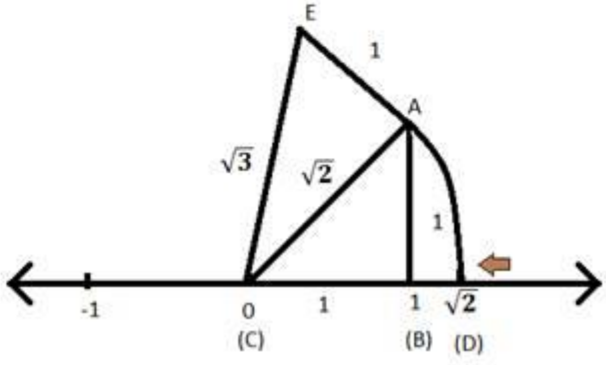
$\Rightarrow EC^2 = 1^2 + (\sqrt{2})^2$

$\Rightarrow EC^2 = 1 + 2$

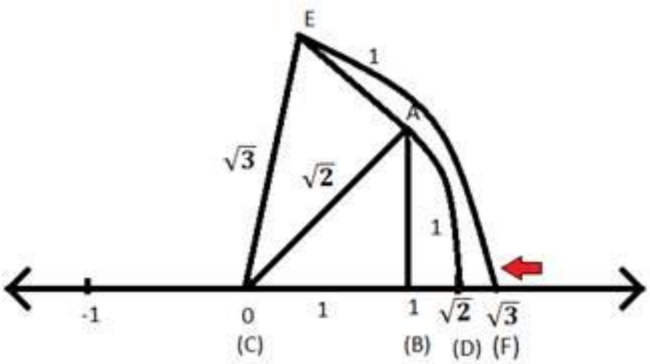
$\Rightarrow EC^2 = 3$

$\Rightarrow EC = \sqrt{3}$

So the length of EC line is found to be √3 units.



Step III: Now, with (C) as center and EC as the radius of circle cut an arc on the number line and mark the point as F. Since, OE is the radius of the arc, hence OF will also be the radius of the arc and will have the same length as that of OE. So, OF **=** √3 units. Hence, F will represent √3 on the number line.



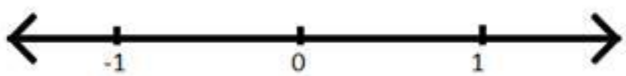
Similarly, we can represent any rational number on the number line. The positive rational numbers will be represented on the right of (C) and the negative rational numbers will be on the left of (C). If m is a rational number greater than the rational number y then on the number line the point representing x will be on the right of the point represents.

Q. 2. Represent √5 on the number line.

Answer : Steps involved are as follows:

Step I: Draw a number line and mark the center point as zero.

Step II: Mark right side of the zero as (1) and the left side as (-1).



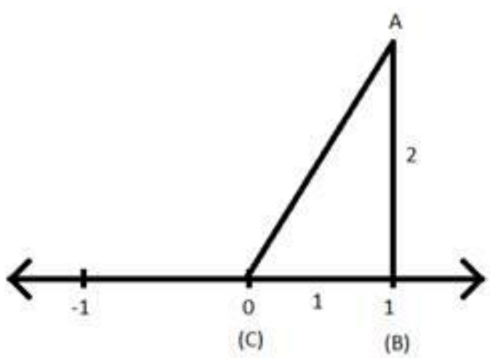
Step III: We won't be considering (-1) for our purpose.

Step IV: With 2 units as length draw a line from (1) such that it is perpendicular to the line.

Step V: Now join the point (0) and the end of the new line of 2 units length.

Step VI: A right-angled triangle is constructed.

Step VII: Now let us name the triangle as ABC such that AB is the height (perpendicular), BC is the base of triangle and AC is the hypotenuse of the right-angled ΔABC.



Step VIII: Now the length of the hypotenuse, i.e., AC can be found by applying Pythagoras theorem to the triangle ABC.

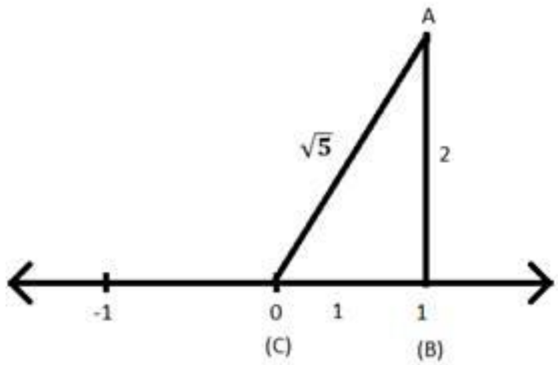
$AC^2 = AB^2 + BC^2$

$\Rightarrow AC^2 = 2^2 + 1^2$

$\Rightarrow AC^2 = 4 + 1$

$\Rightarrow AC^2 = 5$

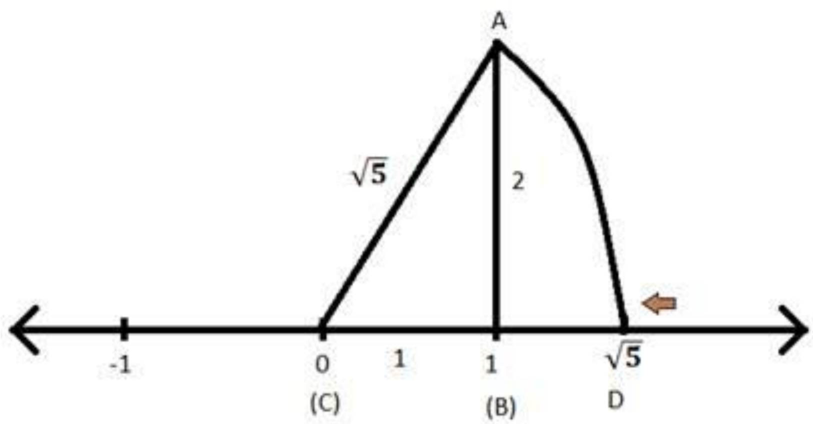
$\Rightarrow AC = \sqrt{5}$



Step IX: Now with AC as radius and C as the center cut an arc on the same number line and name the point as D.

Step X: Since AC is the radius of the arc and hence, the CD will also be the radius of the arc whose length is $\sqrt{5}$.

Step XI: Hence, D is the representation of $\sqrt{5}$ on the number line.



Q. 3. Show the number $\sqrt{7}$ on the number line.

Answer : Draw a number line l and mark the points O,A and B such that OA **=** OB **=** 1. Draw BC perpendicular to number line such that BC **=** 1 units. Join OC

In Right ΔOBC,

$OC^2 = OB^2 + BC^2$

$= (2)^2 + (1)^2$

$= 5$

OC = $\sqrt{5}$

Taking O as center and C and C as radius, draw an arc which cuts l in D.

Hence, OC = OD = $\sqrt{5}$

Now, draw DE perpendicular number line l such that DE = 1 Units. Join OE.

In Right ΔODE,

$OE^2 = OD^2 + DE^2$

$= (\sqrt{5})^2 + (1)^2$

= 5 + 1

= 6

$\therefore OE = \sqrt{6}$

Taking O as center and OE as radius, draw an arc which cuts l in F.

$\therefore OE = OF = \sqrt{6}$

Now, Draw GF perpendicular l such that GH = 1 units. Join OG.

In right $\Delta OGF,$

$OG^2 = OF^2 + GF^2$

$= (\sqrt{6})^2 + (1)^2$

= 6 + 1

= 7

OG = $\sqrt{7}$

Taking O as center and OG as radius, Draw an arc which cuts l in H.

Hence,

OG = OH = $\sqrt{7}$