CHAPTER 1 NUMBER SYSTEMS

EXERCISE 1.2 PAGE:8

Question 1. State whether the following statements are true or false. Justify your answers.

(i) Every irrational number is a real number.

(ii) Every point on the number line is of the form $\sqrt{m}$, where m is a natural number.

(iii) Every real number is an irrational number.

Solution :

(i) Consider the irrational numbers and the real numbers separately.

We know that irrational numbers are the numbers that cannot be converted in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

We know that a real number is the collection of rational numbers and irrational numbers.

Therefore, we conclude that, yes every irrational number is a real number.

(ii) Consider a number line. We know that on a number line, we can represent negative as well as positive numbers.

We know that we cannot get a negative number after taking square root of any number.

Therefore, we conclude that not every number point on the number line is of the form $\sqrt{m}$, where m is a natural number.

(iii) Consider the irrational numbers and the real numbers separately.

We know that irrational numbers are the numbers that cannot be converted in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

We know that a real number is the collection of rational numbers and irrational numbers.

So, we can conclude that every irrational number is a real number. But every real number is not an irrational number.

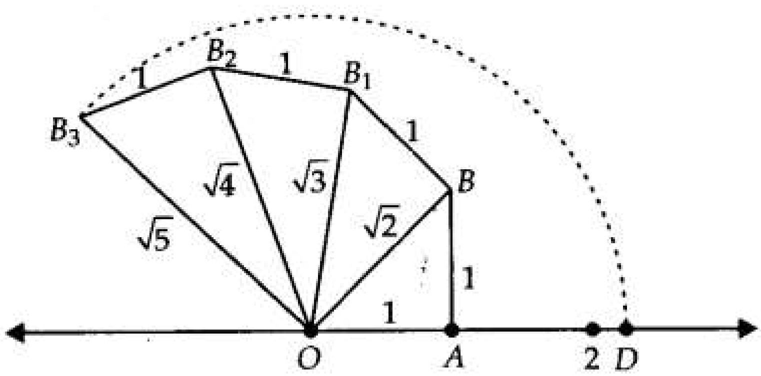
Therefore, we conclude that, every real number is not a rational number.

Question 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 : We know that square root of every positive integer will not yield an integer.

We know that $\sqrt{4}$ is 2, which is an integer. But, $\sqrt{7}$ or $\sqrt{10}$ will give an irrational number.

Therefore, we conclude that square root of every positive integer is not an irrational number.

Question 3. Show how √5 can be represented on the number line
Solution :
Draw a number line and take point O and A on it such that OA = 1 unit. Draw BA ⊥ OA as BA = 1 unit. Join OB = √2 units.
Now draw BB1 ⊥ OB such that BB1 =1 unit. Join OB1 = √3 units.
Next, draw B1B2⊥ OB1such that B1B2 = 1 unit.
Join OB2 = units.
Again draw B2B3 ⊥OB2 such that B2B3 = 1 unit.
Join OB3 = √5 units.



Take O as centre and OB3 as radius, draw an arc which cuts the number line at D.

Point D
represents $\sqrt{5}$ on the number line.

Question 4. Classroom activity (Constructing the 'square root spiral') :

Take a large sheet of paper and construct the 'square root spiral' in the following fashion. Start with a point O and draw a line segment OP1 of unit length. Draw a line segment P1P2 perpendicular to OP_1 of unit length (see Fig. 1.9). Now draw a line segment P_2P_3 perpendicular to OP_2. Then draw a line segment P_3P_4 perpendicular to OP_3. Continuing in Fig. 1.9 :

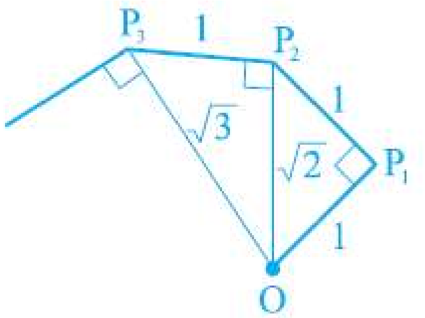
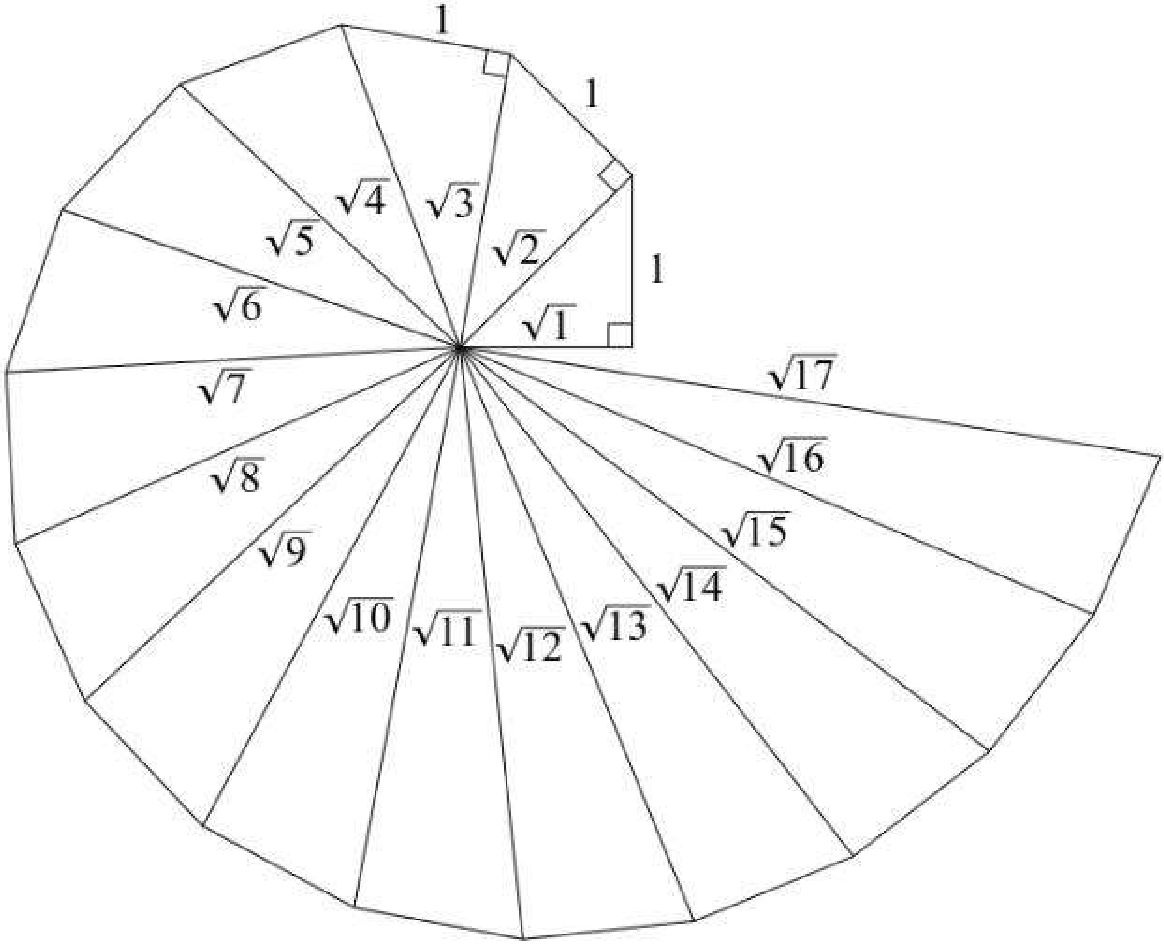


Fig. 1.9 : Constructing square root spiral

Constructing this manner, you can get the line segment P_{n-1}Pn by square root spiral drawing a line segment of unit length perpendicular to OP_{n-1}. In this manner, you will have created the points P_2, P_3,....,Pn,... ., and joined them to create a beautiful spiral depicting $\sqrt{2}$, $\sqrt{3}$, $\sqrt{4}$, ...

Solution:



Step 1: Mark a point O on the paper. Here, O will be the center of the square root spiral.

Step 2: From O, draw a straight line, OA, of 1cm horizontally.

Step 3: From A, draw a perpendicular line, AB, of 1 cm.

Step 4: Join OB. Here, OB will be of $\sqrt{2}$

Step 5: Now, from B, draw a perpendicular line of 1 cm and mark the end point C.

Step 6: Join OC. Here, OC will be of $\sqrt{3}$

Step 7: Repeat the steps to draw $\sqrt{4}$, $\sqrt{5}$, $\sqrt{6}$....