Exerise 1.2

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.*

Sol. (*i*) True, as real numbers consist of rational and irrational numbers.

(*ii*) False, as $\frac{3}{2}$ on the number line cannot be a square root of a natural number.

Also, a negative number cannot be a square root of natural number, as $\sqrt{m}$ represents a positive value.

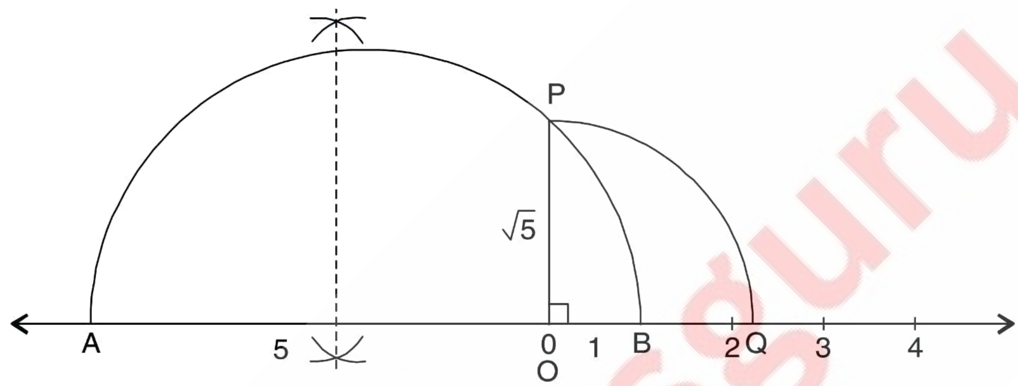
(*iii*) False, as 2 is a real number but not an irrational number.

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.*

Sol. No. For example, $\sqrt{9} = 3$, $\sqrt{16} = 4$, etc., 3, 4 are rational numbers.

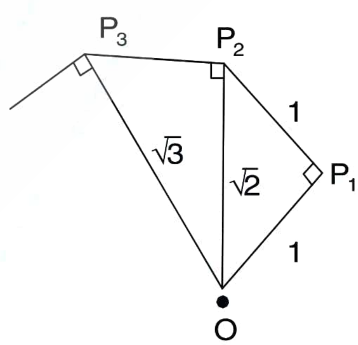
3. *Show how $\sqrt{5}$ can be represented on the number line.*

Sol. For $\sqrt{5}$, we have 5 = 5 × 1. On a number line, take O at position 0 and OA = 5 and OB = 1. With AB as diameter draw a semicircle. Draw OP ⊥ AB meeting semicircle at P. With O as centre and OP as radius an arc is drawn meeting the number line at Q.



Then, OQ = OP = $\sqrt{5}$ and Q represents $\sqrt{5}$ on the number line.

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 OP_1 of unit length. Draw a line segment P_1P_2 perpendicular to OP_1 of unit length (see* Figure*).*



Constructing square root spiral

Now, draw a line segment P_2P_3 perpendicular to OP_2 of unit length. Then, draw a line segment P_3P_4 perpendicular to OP_3 of unit length. Continuing in this manner, you can get the line segment $P_{n-1}P_n$ by 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, ..., P_n, ..., and joined them to create a beautiful spiral depicting $\sqrt{2}$, $\sqrt{3}$, $\sqrt{4}$, ...

Sol.