ACTIVITY

An Irrational Number

Objective

To represent an irrational number on the number line.
(To represent $\sqrt{2}$ on a number line).

Material Required

A sheet of white paper, pencil, compass, eraser and ruler etc.

Theory

Pythagoras theorem:

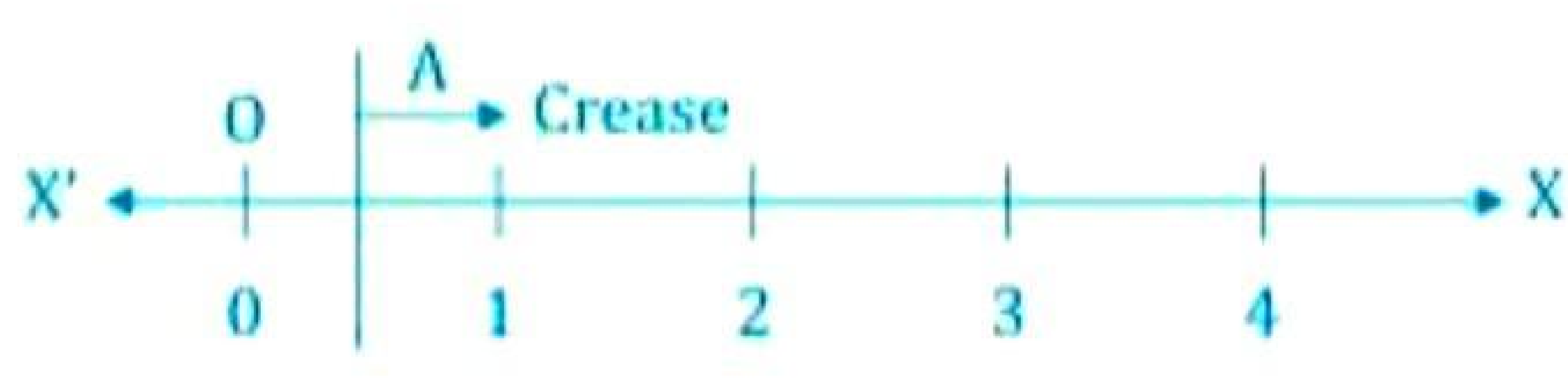
In a right-angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides containing a right angle.

In a right-angled triangle, if the base and perpendicular are of 1 unit each, the hypotenuse will be $\sqrt{(1^2 + 1^2)} = \sqrt{2}$.

Now, by using this concept, we will represent $\sqrt{2}$ on the number line.

Procedure

1. Draw a line X'OX. on the white sheet.
2. Divide the line into equal parts from point O by paper folding activity taking each part as 1 unit. Mark the points as 1,2,3 .... etc.
3. Draw the perpendicular at the point marked as '1' by paper folding.
4. Unfold the paper and draw the line at the crease so formed.
5. Mark a point A on this crease at 1 unit from line X'OX.
6. Join O and A, we get OA = $\sqrt{2}$ units. (By Pythagoras theorem)
7. Take O as a center, OA as radius, draw an arc intersecting the line X'OX at M.



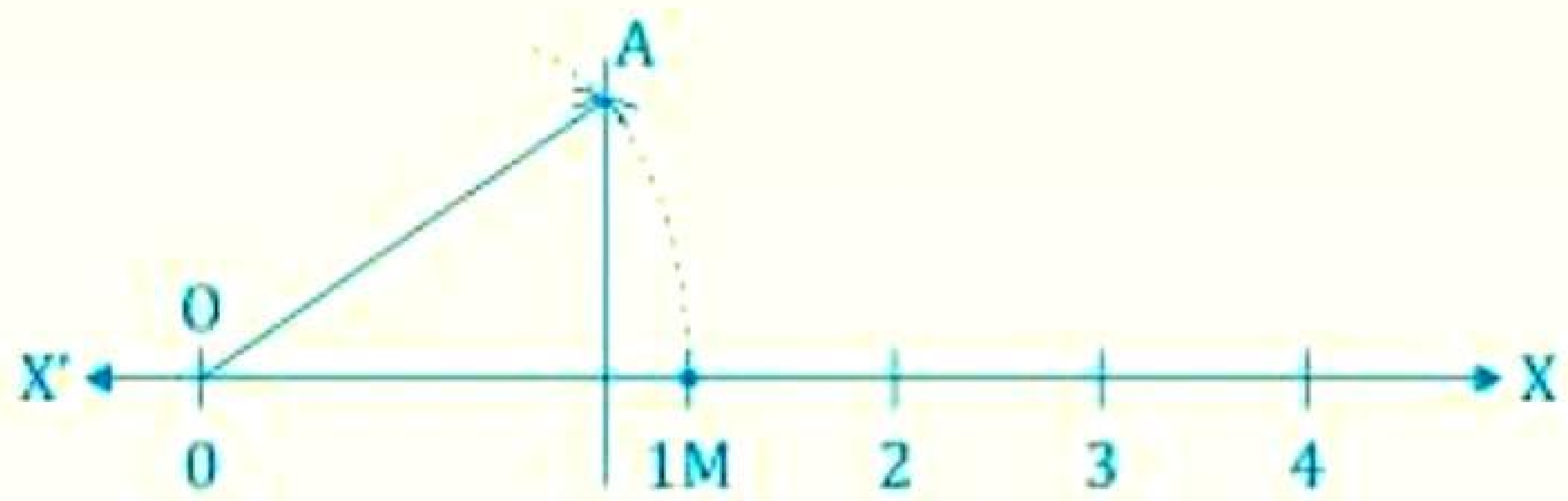
Observations

We observe that OA = OM = $\sqrt{2}$ units.

Result

An irrational number $\sqrt{2}$ is represented on the number line.

Learning Outcome

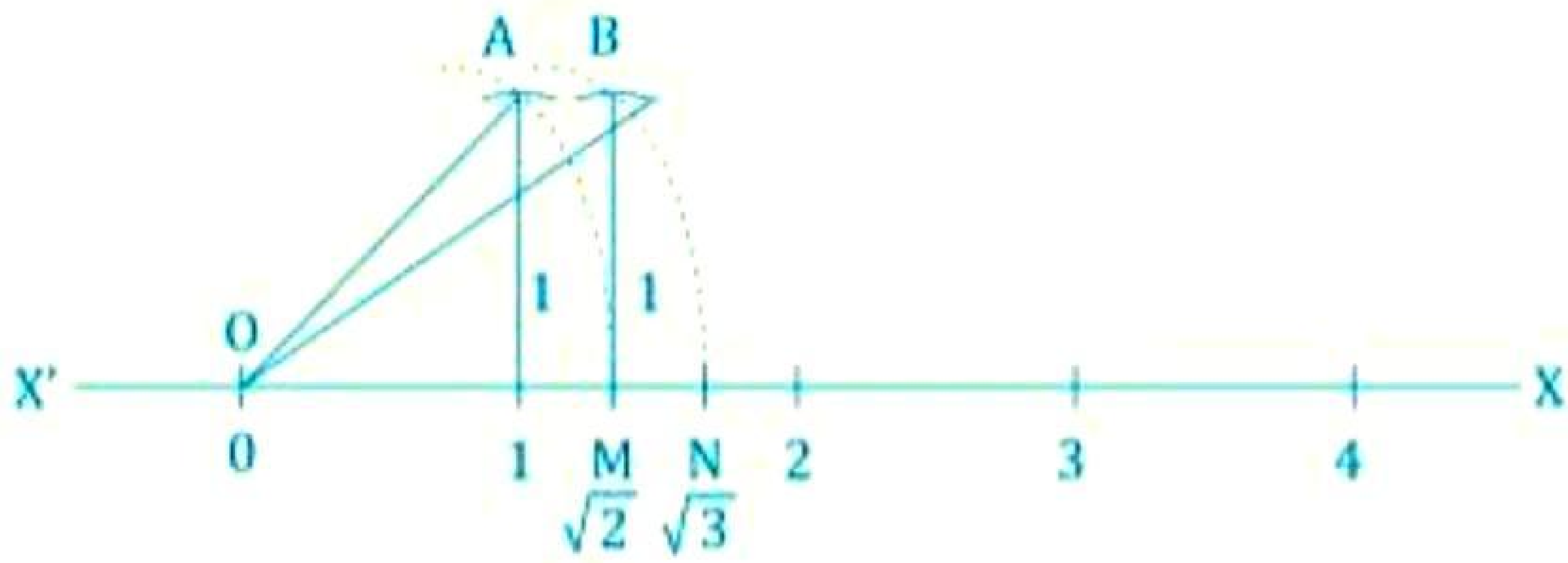


Students can represent any irrational number on a number line by using the above method.

e.g., $(\sqrt{3})^2 = (\sqrt{2})^2 + (1)^2$

At M, by paper folding draw perpendicular BM on the number line of 1 unit. Join OB with O as center and OB as radius draw an arc intersecting the line at N.

Thus OB = ON = $\sqrt{3}$ on the number line.



Activity Time

Represent other irrational numbers such as $\sqrt{3}, \sqrt{5}, \sqrt{7}$ ... on the number line

Viva Voce

Q1. Is every irrational number, a real number?

Ans. Yes, because real numbers consist of both rational and irrational numbers.

Q2. Does the square roots of all positive integers, irrational? Give reason.

Ans. No, square roots of all positive integers are not irrational, e.g., S = $\sqrt{9} = 3$, which is a rational number.

Q3. "Sum of two irrational numbers is an irrational number". Is this statement true?

Ans. No, it's not true, the sum of two irrational numbers may be irrational or rational.

Q4. Can we apply Pythagoras theorem in any triangle?

Ans. No, Pythagoras theorem is applicable only in the right-angled triangles.

Q5. How would you find a base of a right-angled triangle, if hypotenuse and perpendicular are given?

Ans. Base = $\sqrt{(\text{hypotenuse})^2 - (\text{perpendicular})^2}$

Q6. Is it possible that the sum of two irrational numbers can be represented on number line?

Ans. Yes.

Multiple Choice Questions

Q 1. From the choices given below mark the co-prime numbers:

(a) 2, 3 (b) 2, 4 (c) 2, 6 (d) 2, 10

Q 2. A rational number equivalent to $\frac{5}{7}$ is:

(a) $\frac{15}{17}$ (b) $\frac{25}{27}$ (c) $\frac{10}{14}$ (d) $\frac{10}{27}$

Q 3. An example of a whole number is:

(a) 0 (b) $-\frac{1}{2}$ (c) $\frac{11}{5}$ (d) -7

Q 4. Given a rational number $-\frac{5}{9}$.This rational number can also be known as:

(a) A natural number (b) A whole number
(c) A fraction (d) A real number

Q 5. The rational number $0.\overline{3}$ can also be written as:

(a) 0.3 (b) $\frac{3}{10}$ (c) 0.33 (d) $\frac{1}{3}$

Q 6. If the decimal representation of a number is non-terminating, non-repeating then the number is:

(a) A natural number (b) A rational number
(c) A whole number (d) An irrational number

Q 7. The square root of which number is rational:

(a) 7 (b) 1.96 (c) 0.04 (d) 13

Q 8. A rational number between $\frac{1}{7}$ and $\frac{2}{7}$ is:

(a) $\frac{10}{21}$ (b) $\frac{2}{21}$ (c) $\frac{5}{14}$ (d) $\frac{5}{21}$

Q 9. The number 1.101001000100001... is:

(a) A natural number (b) A whole number
(c) A rational number (d) An irrational number

Q 10. On adding $2\sqrt{3}$ and $3\sqrt{2}$ we get:

(a) $5\sqrt{5}$ (b) $5(\sqrt{3}+\sqrt{2})$
(c) $2\sqrt{3}+3\sqrt{2}$ (d) None of these

ANSWER KEY

1.(a)	2.(c)	3.(a)	4.(d)	5.(d)	6.(d)	7.(b)	8.(d)	9.(d)	10.(c)