STD – 10 MATHS

CHAPTER - 1

REAL NUMBER

EXERCISE-1.3 (Q.3)

3. Prove that the following are irrationals:

(i) $\frac{1}{\sqrt{2}}$

Let us assume $\frac{1}{\sqrt{2}}$ is rational.

Then we can find co-prime x and y ($y \neq 0$) such that $\frac{1}{\sqrt{2}} = \frac{X}{Y}$

Rearranging, we get,

$\sqrt{2} = \frac{y}{x}$

Since, x and y are integers, thus, $\sqrt{2}$ is a rational number, which contradicts the fact that $\sqrt{2}$ is irrational.

Hence, we can conclude that $\frac{1}{\sqrt{2}}$ is irrational.

(ii) $7\sqrt{5}$

Let us assume $7\sqrt{5}$ is a rational number.

Then we can find co-prime a and b (b $\neq$ 0) such that

$$7\sqrt{5} = \frac{x}{y}$$

Rearranging, we get,

$$\sqrt{5} = \frac{x}{7y}$$

Since, x and y are integers, thus, $\sqrt{5}$ is a rational number, which contradicts the fact that $\sqrt{5}$ is irrational.

Hence, we can conclude that $7\sqrt{5}$ is irrational.

(iii) $6 + \sqrt{2}$

Let us assume $6 + \sqrt{2}$ is a rational number.

Then we can find co-primes x and y ($y \neq 0$) such that

$$6 + \sqrt{2} = \frac{x}{y}$$

Rearranging, we get,

$$\sqrt{2} = \left(\frac{x}{y}\right) - 6$$

Since, x and y are integers, thus ($\frac{x}{y}$) - 6 is a rational number and therefore, $\sqrt{2}$ is rational. This contradicts the fact that $\sqrt{2}$ is an irrational number. Hence, we can conclude that 6 + $\sqrt{2}$ is irrational.

Thanks

For watching