STD – 10 MATHS

CHAPTER - 1

REAL NUMBER

EXERCISE-1.3 (Q.1)(Q.2)

1. Prove that $\sqrt{5}$ is irrational.

- **Let us assume, that $\sqrt{5}$ is rational number.**

i.e. $\sqrt{5} = \frac{x}{y}$ (where, x and y are co - primes)

$y\sqrt{5} = X$

Squaring both the sides, we get,

$(y\sqrt{5})^2 = x^2$

$\Rightarrow 5y^2 = x^2$ …………………. (1)

Thus, x^2 is divisible by 5, so x is also divisible by 5.

Let us say, $x = 5k$, for some value of k and substituting the value of x in equation (1), we get,

$5y^2 = (5k)^2$

$\Rightarrow y^2 = 5k^2$

y^2 is divisible by 5 it means y is divisible by 5.

Clearly, x and y are not co-primes. Thus, our assumption about $\sqrt{5}$ is rational is incorrect.

Hence, $\sqrt{5}$ is irrational number.

2. Prove that $3 + 2\sqrt{5}$ + is irrational.

- **Let us assume $3 + 2\sqrt{5}$ is rational.**

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

  $3 + 2\sqrt{5} = \frac{X}{Y}$

  Rearranging, we get,

  $2\sqrt{5} = \frac{X}{Y} - 3$

  $\sqrt{5} = \frac{1}{2}\left(\frac{X}{Y} - 3\right)$

Since, x and y are integers, thus,

$$\frac{1}{2}\left(\frac{X}{Y} - 3\right)$$

is a rational number.

Therefore, $\sqrt{5}$ is also a rational number. But this contradicts the fact that $\sqrt{5}$ is irrational.

So, we conclude that $3 + 2\sqrt{5}$ is irrational.

Thanks

For watching