



### Real Numbers Ex 1.5 Q3

**Answer :**

Let us assume that  $\sqrt{5} + \sqrt{3}$  is rational. Then, there exist positive co primes  $a$  and  $b$  such that

$$\sqrt{5} + \sqrt{3} = \frac{a}{b}$$

$$\sqrt{5} = \frac{a}{b} - \sqrt{3}$$

$$(\sqrt{5})^2 = \left(\frac{a}{b} - \sqrt{3}\right)^2$$

$$5 = \left(\frac{a}{b}\right)^2 - \frac{2a\sqrt{3}}{b} + 3$$

$$\Rightarrow 5 - 3 = \left(\frac{a}{b}\right)^2 - \frac{2a\sqrt{3}}{b}$$

$$\Rightarrow 2 = \left(\frac{a}{b}\right)^2 - \frac{2a\sqrt{3}}{b}$$

$$\Rightarrow \left(\frac{a}{b}\right)^2 - 2 = \frac{2a\sqrt{3}}{b}$$

$$\Rightarrow \frac{a^2 - 2b^2}{b^2} = \frac{2a\sqrt{3}}{b}$$

$$\Rightarrow \left(\frac{a^2 - 2b^2}{b^2}\right) \left(\frac{b}{2a}\right) = \sqrt{3}$$

$$\Rightarrow \sqrt{3} = \left(\frac{a^2 - 2b^2}{2ab}\right)$$

Here we see that  $\sqrt{3}$  is a rational number which is a contradiction as we know that  $\sqrt{3}$  is an irrational number.

Hence  $\sqrt{5} + \sqrt{3}$  is irrational

### Real Numbers Ex 1.5 Q4

**Answer :**

Let us assume that  $\sqrt{p} + \sqrt{q}$  is rational. Then, there exist positive co primes  $a$  and  $b$  such that

$$\sqrt{p} + \sqrt{q} = \frac{a}{b}$$

$$\sqrt{p} = \frac{a}{b} - \sqrt{q}$$

$$(\sqrt{p})^2 = \left(\frac{a}{b} - \sqrt{q}\right)^2$$

$$p = \left(\frac{a}{b}\right)^2 - \frac{2a\sqrt{q}}{b} + q$$

$$p - q = \left(\frac{a}{b}\right)^2 - \frac{2a\sqrt{q}}{b}$$

$$p - q = \left(\frac{a}{b}\right)^2 - \frac{2a\sqrt{q}}{b}$$

$$\left(\frac{a}{b}\right)^2 - (p - q) = \frac{2a\sqrt{q}}{b}$$

$$\frac{a^2 - b^2(p-q)}{b^2} = \frac{2a\sqrt{q}}{b}$$

$$\left(\frac{a^2 - b^2(p-q)}{b^2}\right)\left(\frac{b}{2a}\right) = \sqrt{q}$$

$$\sqrt{q} = \left(\frac{a^2 - b^2(p-q)}{2ab}\right)$$

Here we see that  $\sqrt{q}$  is a rational number which is a contradiction as we know that  $\sqrt{q}$  is an irrational number

Hence  $\sqrt{p} + \sqrt{q}$  is irrational

## Real Numbers Ex 1.5 Q5

**Answer :**

Let us assume that  $\sqrt{3} + \sqrt{4}$  is rational .Then, there exist positive co primes  $a$  and  $b$  such that

$$\sqrt{3} + \sqrt{4} = \frac{a}{b}$$

$$\sqrt{4} = \frac{a}{b} - \sqrt{3}$$

$$(\sqrt{4})^2 = \left(\frac{a}{b} - \sqrt{3}\right)^2$$

$$4 = \left(\frac{a}{b}\right)^2 - \frac{2a\sqrt{3}}{b} + 3$$

$$4 - 3 = \left(\frac{a}{b}\right)^2 - \frac{2a\sqrt{3}}{b}$$

$$1 = \left(\frac{a}{b}\right)^2 - \frac{2a\sqrt{3}}{b}$$

$$\left(\frac{a}{b}\right)^2 - 1 = \frac{2a\sqrt{3}}{b}$$

$$\frac{a^2 - b^2}{b^2} = \frac{2a\sqrt{3}}{b}$$

$$\left(\frac{a^2 - b^2}{b^2}\right)\left(\frac{b}{2a}\right) = \sqrt{3}$$

$$\sqrt{3} = \left(\frac{a^2 - b^2}{2ab}\right)$$

Here we see that  $\sqrt{3}$  is a rational number which is a contradiction as we know that  $\sqrt{3}$  is an irrational number

Hence  $\sqrt{3} + \sqrt{4}$  is irrational

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