



NCERT solutions for class 9 Maths Number System Ex-1.5

**Q1.** Classify the following numbers as rational or irrational:

(i)  $2 - \sqrt{5}$

(ii)  $(3 + \sqrt{23}) - \sqrt{23}$

(iii)  $\frac{2\sqrt{7}}{7\sqrt{7}}$

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

(v)  $2\pi$

**Ans:** (i)  $2 - \sqrt{5}$

We know that

$\sqrt{5} = 2.236\dots$ , which is an irrational number.

$$2 - \sqrt{5} = 2 - 2.236\dots$$

$$= -0.236\dots,$$

which is also an irrational number.

Therefore, we conclude that  $2 - \sqrt{5}$  is an irrational number.

(ii)  $(3 + \sqrt{23}) - \sqrt{23}$

$$(3 + \sqrt{23}) - \sqrt{23} = 3 + \sqrt{23} - \sqrt{23}$$

$$= 3$$

Therefore, we conclude that  $(3 + \sqrt{23}) - \sqrt{23}$  is a rational number.

$$(iii) \frac{2\sqrt{7}}{7\sqrt{7}}$$

We can cancel  $\sqrt{7}$  in the numerator and denominator, as  $\sqrt{7}$  is the common number in numerator as well as denominator, to get

$$\frac{2\sqrt{7}}{7\sqrt{7}} = \frac{2}{7}$$

Therefore, we conclude that  $\frac{2\sqrt{7}}{7\sqrt{7}}$  is a rational number.

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

We know that

$\sqrt{2} = 1.414.....$ , which is an irrational number .

We can conclude that, when 1 is divided by  $\sqrt{2}$ , we will get an irrational number.

Therefore, we conclude that  $\frac{1}{\sqrt{2}}$  is an irrational number.

(v)  $2\pi$

We know that

$\pi = 3.1415\dots$ , which is an irrational number.

We can conclude that  $2\pi$  will also be an irrational number.

Therefore, we conclude that  $2\pi$  is an irrational number.

**Q2.** Simplify each of the following expressions:

(i)  $(3 + \sqrt{3})(2 + \sqrt{2})$

(ii)  $(3 + \sqrt{3})(3 - \sqrt{3})$

(iii)  $(\sqrt{5} + \sqrt{2})^2$

(iv)  $(5 - \sqrt{2})(5 + \sqrt{2})$

**Ans:** (i)  $(3 + \sqrt{3})(2 + \sqrt{2})$

We need to apply distributive law to find value of  $(3 + \sqrt{3})(2 + \sqrt{2})$ .

$$\begin{aligned}(3 + \sqrt{3})(2 + \sqrt{2}) &= 3(2 + \sqrt{2}) + \sqrt{3}(2 + \sqrt{2}) \\ &= 6 + 3\sqrt{2} + 2\sqrt{3} + \sqrt{6}\end{aligned}$$

Therefore, on simplifying  $(3 + \sqrt{3})(2 + \sqrt{2})$ , we get  $6 + 3\sqrt{2} + 2\sqrt{3} + \sqrt{6}$ .

(ii)  $(3 + \sqrt{3})(3 - \sqrt{3})$

We need to apply distributive law to find value of  $(3 + \sqrt{3})(3 - \sqrt{3})$ .

$$\begin{aligned}(3 + \sqrt{3})(3 - \sqrt{3}) &= 3(3 - \sqrt{3}) + \sqrt{3}(3 - \sqrt{3}) \\ &= 9 - 3\sqrt{3} + 3\sqrt{3} - 3\end{aligned}$$

Therefore, on simplifying  $(3 + \sqrt{3})(3 - \sqrt{3})$ , we get 6.

(iii)  $(\sqrt{5} + \sqrt{2})^2$

We need to apply the formula

$$(a+b)^2 = a^2 + 2ab + b^2 \text{ to find value of } (\sqrt{5} + \sqrt{2})^2$$

$$(\sqrt{5} + \sqrt{2})^2 = (\sqrt{5})^2 + 2 \times \sqrt{5} \times \sqrt{2} + (\sqrt{2})^2$$

$$= 5 + 2\sqrt{10} + 2$$

$$= 7 + 2\sqrt{10}.$$

$$= 6$$

Therefore, on simplifying  $(\sqrt{5} + \sqrt{2})^2$ , we get

$$7 + 2\sqrt{10}.$$

$$(iv) (\sqrt{5} - \sqrt{2})(\sqrt{5} + \sqrt{2})$$

We need to apply the formula

$$(a-b)(a+b) = a^2 - b^2 \text{ to find value of } (\sqrt{5} + \sqrt{2})^2.$$

$$(\sqrt{5} - \sqrt{2})(\sqrt{5} + \sqrt{2}) = (\sqrt{5})^2 - (\sqrt{2})^2$$

$$= 5 - 2$$

$$= 3$$

Therefore, on simplifying  $(\sqrt{5} - \sqrt{2})(\sqrt{5} + \sqrt{2})$ ,  
we get 3.

**Q3.** Recall,  $\pi$  is defined as the ratio of the  
circumference (say  $c$ ) of a circle to its diameter

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