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) 2π

Sol. (i) $\because$ 2 is a rational number and $\sqrt{5}$ is an irrational number.

$\therefore$ $2-\sqrt{5}$ is an irrational number.

(ii) $(3+\sqrt{23})-\sqrt{23} \Rightarrow (3+\sqrt{23})-\sqrt{23} = 3$ is a rational number.

(iii) $\frac{2\sqrt{7}}{7\sqrt{7}} = \frac{2}{7}$ Rational number.

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

$\because$ 1 is a rational number and $\sqrt{2}$ is an irrational number.

So, $\frac{1}{\sqrt{2}}$ is irrational number.

(v) 2π

$\because$ 2 is a rational number and π is an irrational number

So, 2π is 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) $(\sqrt{5}-\sqrt{2})(\sqrt{5}+\sqrt{2})$

Sol. (i) $(3+\sqrt{3})(2+\sqrt{2}) = 3(2+\sqrt{2})+\sqrt{3}(2+\sqrt{2})$

$= 6+3\sqrt{2}+2\sqrt{3}+\sqrt{6}$

(ii) $(3+\sqrt{3})(3-\sqrt{3}) = (3)^2-(\sqrt{3})^2 = 9-3 = 6$

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

$= \left(\sqrt{5}\right)^2 + 2\sqrt{10} + \left(\sqrt{2}\right)^2$

$= 7 + 2\sqrt{10}$

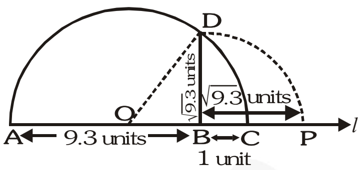
(iv) $\left(\sqrt{5}-\sqrt{2}\right)\left(\sqrt{5}+\sqrt{2}\right) = 5-2 = 3$

Q3. Recall, π is defined as the ratio of the circumference (say c) of a circle to its diameter (say d). That is, π = c/d. This seems to contradict the fact that π is irrational. How will you resolve this contradiction ?

Sol. There is no contradiction. When we measure a length with a scale or any other device, we only get an approximate rational value. Therefore, we may not realise that c or d is irrational.

Q4. Represent $\sqrt{9.3}$ on the number line.

Sol.



Let l be the number line.

Draw a line segment AB = 9.3 units and BC = 1 unit. Find the mid point O of AC.

Draw a semicircle with centre O and radius OA or OC.

Draw BD ⊥ AC intersecting the semicircle at D. Then, BD = $\sqrt{9.3}$ units. Now, with centre B and radius BD, draw an arc intersecting the number line ℓ at P.

Hence, BD = BP = $\sqrt{9.3}$

Q5. Rationalise the denominators of the following :

(i) $\frac{1}{\sqrt{7}}$ (ii) $\frac{1}{\sqrt{7}-\sqrt{6}}$ (iii) $\frac{1}{\sqrt{5}+\sqrt{2}}$ (iv) $\frac{1}{\sqrt{7}-2}$

Sol. (i) $\frac{1}{\sqrt{7}} = \frac{1}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} = \frac{\sqrt{7}}{7}$

(ii) $\frac{1}{\sqrt{7}-\sqrt{6}} = \frac{1}{\sqrt{7}-\sqrt{6}} \times \frac{\sqrt{7}+\sqrt{6}}{\sqrt{7}+\sqrt{6}}$

$= \frac{\sqrt{7}+\sqrt{6}}{7-6} = \frac{\sqrt{7}+\sqrt{6}}{1} = \sqrt{7}+\sqrt{6}$

(iii) $\frac{1}{\sqrt{5}+\sqrt{2}}$

$\frac{1}{\sqrt{5}+\sqrt{2}} \times \frac{\sqrt{5}-\sqrt{2}}{\sqrt{5}-\sqrt{2}} = \frac{\sqrt{5}-\sqrt{2}}{3}$

(iv) $\frac{1}{\sqrt{7}-2} = \frac{1}{\sqrt{7}-2} \times \frac{\sqrt{7}+2}{\sqrt{7}+2}$

$= \frac{\sqrt{7}+2}{7-4} = \frac{\sqrt{7}+2}{3}$