SpeedLabs

MATHS

CBSE 9th

TEEVRA EDUTECH PVT. LTD.

Number system

Exercise-1.5

1. 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

Ans - **(i)** $= 2 - 2-\sqrt{5}\ 2.2360679\ldots$

$= -\ 0.2360679\ldots$

As the decimal expansion of this expression is non-terminating non-recurring, therefore, it is an irrational number.

(ii) $(3+\sqrt{23})-\sqrt{23} = 3 = \frac{3}{1}$

As it can be represented in $\frac{p}{q}$ form, therefore, it is a rational number.

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

As it can be represented in $\frac{p}{q}$ form, therefore, it is a rational number.

(iv) $\frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2} = 0.7071067811\ldots$

As the decimal expansion of this expression is non-terminating non-recurring, therefore, it is an irrational number.

(v) $2\pi = 2(3.1415\ \ldots)$

$= 6.2830\ \ldots$

As the decimal expansion of this expression is non-terminating non-recurring, therefore, it is an irrational number.

2. Simplify each of the following expressions:

(i) $(3+\sqrt{3})(2+\sqrt{2})$ **(ii)** $(3+\sqrt{3})(3+\sqrt{3})$ **(iii)** $(5-\sqrt{2})^2$ **(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 $(3+\sqrt{3})(2+\sqrt{2})$.

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

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

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 $(3+\sqrt{3})(3+\sqrt{3})$.

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

$= 9 + 3\sqrt{3} + 3\sqrt{3} - 3$

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

(iii) We need to apply the formula $(a+b)^2 = 2ab + b^2$ to find value of.

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

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

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

$= 7 + 2\sqrt{10} \quad = 6$

Therefore, on simplifying $(5-\sqrt{2})^2$, we get $= 7 + 2\sqrt{10}$.

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

We need to apply the formula $(a-b)(a+b) = a^2 - b^2$ to find value of $(5-\sqrt{2})^2$

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

$= 5-2 \qquad = 3$

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

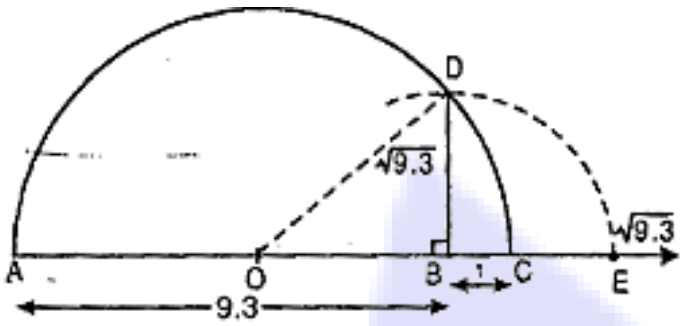
3. Recall, is defined as the ratio of the circumference (say c) of a circle to its diameter (say d). That is, $\pi = \frac{c}{d}$. This seems to contradict the fact that π is irrational. How will you resolve this contradiction?

Ans - We know that when we measure the length of a line or a figure by using a scale or any device, we do not get an exact measurement. In fact, we get an approximate rational value. So, we are not able to realize that either circumference (c) or diameter (d) of a circle is irrational.

Therefore, we can conclude that as such there is not any contradiction regarding the value of and we realize that the value of π is irrational.

4. Represent 9.3 on the number line.

Ans - Mark the distance 9.3 units from a fixed point A on a given line to obtain a point B such that AB = 9.3 units. From B mark a distance of 1 unit and call the new point as C. Find the mid-point of AC and call that point as O. Draw a semi-circle with centre O and radius OC = 5.15 units. Draw a line perpendicular to AC passing through B cutting the semi-circle at D. Then BD = $\sqrt{9.3}$.



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5. Rationalize 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)** $\frac{1}{\sqrt{7}-2}$

Ans - **(i)** $\frac{1}{\sqrt{7}} = \frac{1\times\sqrt{7}}{1\times\sqrt{7}} = \frac{\sqrt{7}}{7}$

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

$= \frac{(\sqrt{7}+\sqrt{6})}{(\sqrt{7})^2-(\sqrt{6})^2}$

(iii) $\frac{1}{\sqrt{5}-\sqrt{2}} = \frac{1 \quad (\sqrt{5}-\sqrt{2})}{(\sqrt{5}-\sqrt{2})\,(\sqrt{5}-\sqrt{2})}$

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

$= \frac{(\sqrt{5}+\sqrt{2})}{3}$

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

$= \frac{(\sqrt{7}+2)}{(\sqrt{7})^2-(2)^2}$

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