NCERT Solutions for Class 9 Maths Chapter 1 Number Systems Ex 1.5

Question 1.

Classify the following numbers as rational or irrational:

(i) 2 –√5

(ii) (3 +√23)- √23

(iii) 2√7/7√7

(iv) 1/√2

(v) 2

Solution.

We know that, √5 = 2.2360679…

Here, 2.2360679…is non-terminating and non-recurring.

Now, substituting the value of √5 in 2 –√5, we get,

2-√5 = 2-2.2360679… = -0.2360679

Since the number, – 0.2360679…, is non-terminating non-recurring, 2 –√5 is an irrational number.

(ii) (3 +√23)- √23

(3 +√23) –√23 = 3+√23–√23

= 3

= 3/1

Since the number 3/1 is in p/q form, (3 +√23)- √23 is rational.

(iii) 2√7/7√7

2√7/7√7 = (2/7)× (√7/√7)

We know that (√7/√7) = 1

Hence, (2/7)× (√7/√7) = (2/7)×1 = 2/7

Since the number, 2/7 is in p/q form, 2√7/7√7 is rational.

(iv) 1/√2

Multiplying and dividing numerator and denominator by √2 we get,

(1/√2) ×(√2/√2)= √2/2 (since √2×√2 = 2)

We know that, √2 = 1.4142…

Then, √2/2 = 1.4142/2 = 0.7071..

Since the number , 0.7071..is non-terminating non-recurring, 1/√2 is an irrational number.

(v) 2

We know that, the value of = 3.1415

Hence, 2 = 2×3.1415.. = 6.2830…

Since the number, 6.2830…, is non-terminating non-recurring, 2 is an irrational number.

Question 2.

Simplify each of the following expressions:

(i) (3+√3)(2+√2)

(ii) (3+√3)(3-√3)

(iii) $(√5+√2)^2$

(iv) (√5-√2)(√5+√2)

Solution:

(3+√3)(2+√2)

Opening the brackets, we get, (3×2)+(3×√2)+(√3×2)+(√3×√2)

= 6+3√2+2√3+√6

(ii) (3+√3)(3-√3)

(3+√3)(3-√3) = 3^2-$(√3)^2$ = 9-3

= 6

(iii) $(√5+√2)^2$

$(√5+√2)^2 = √5^2+(2×√5×√2)+ √2^2$

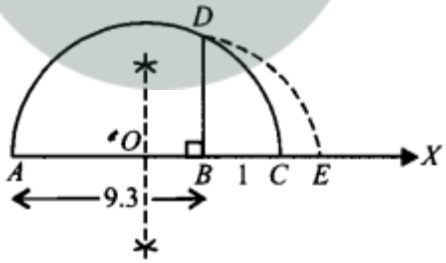
= 5+2×√10+2 = 7+2√10

(iv) (√5-√2)(√5+√2)

(√5-√2)(√5+√2) = ($√5^2$-$√2^2$) = 5-2 = 3

Question 3.
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 n is irrational. How will you resolve this contradiction?
Solution.
When we measure the length of a line with a scale or with any other device, we only get an approximate ational value, i.e. c and d both are irrational.
∴ c/d is irrational and hence π is irrational.
Thus, there is no contradiction in saying that it is irrational.

Question 4.
Represent √9.3 on the number line.
Solution.
Draw a line segment AB = 9.3 units and extend it to C such that BC = 1 unit.
Find mid point of AC and mark it as O.
Draw a semicircle taking O as centre and AO as radius. Draw BD ⊥ AC.
Draw an arc taking B as centre and BD as radius meeting AC produced at E such that BE = BD = √9.3 units.



Question 5.
Rationalise the denominator of the following

(i) 1/√7

(ii) 1/(√7-√6)

(iii) 1/(√5+√2)

(iv) 1/(√7-2)

Solution.

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

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

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

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

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

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

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