CHAPTER END TEST

NUMBER SYSTEM

(Covers Part – I, II & III)

Class - IX

SOLUTIONS

SECTION – A

1. (i) $3\sqrt{\frac{6}{5}} < \frac{3}{2}\sqrt{5} < \frac{9}{\sqrt{2}} < 4\sqrt{3}$ (ii) $-\sqrt{3} < \frac{5}{\sqrt{3}} < \frac{7}{3}\sqrt{2} < 2\sqrt{7} < 3\sqrt{5}$ [½+½]

2. $\frac{1}{3}, \frac{100}{3}$ [½+½]

3. 0.22010010001 [1]

4. $\frac{13^{\frac{1}{4}}}{13^{\frac{1}{8}}} = 13^{\frac{1}{4}-\frac{1}{8}} = 13^{\frac{1}{8}}$ [1]

5. – 1 [1]

6. By long division, we have

$$
\begin{array}{r|l}
45 & 16.0000 \;(0.3555 \\
 & \underline{135} \\
 & \;\;250 \\
 & \;\;\underline{225} \\
 & \;\;\;250 \\
 & \;\;\;\underline{225} \\
 & \;\;\;\;250 \\
 & \;\;\;\;\underline{225} \\
 & \;\;\;\;\;25
\end{array}
$$

$\therefore \quad \frac{-16}{45} = -0.355\ldots = -0.3\overline{5}$ [1]

7. Rational number '0' multiplied by any irrational number 'a' gives a rational number. [1]

SECTION – B

8. $\frac{5+\sqrt{11}}{3-2\sqrt{11}} = \frac{5+\sqrt{11}}{3-2\sqrt{11}} \times \frac{3+2\sqrt{11}}{3+2\sqrt{11}} = \frac{15+10\sqrt{11}+3\sqrt{11}+2\times 11}{(3)^2-\left(2\sqrt{11}\right)^2}$

$= \dfrac{37+13\sqrt{11}}{9-44} = \dfrac{37+13\sqrt{11}}{-35} = -\dfrac{37}{35} - \dfrac{13}{55}\sqrt{11}$ **[1]**

$\therefore \quad x + y\sqrt{11} = -\dfrac{37}{35} - \dfrac{13}{35}\sqrt{11} = \left(-\dfrac{37}{35}\right) + \left(-\dfrac{13}{35}\right)\sqrt{11}$

Equating rational parts on both sides, we get

$x = \dfrac{37}{35}$ and $y = -\dfrac{13}{35}$. **[1]**

9. Here $\sqrt{7}-\sqrt{3} = (\sqrt{7}-\sqrt{3}) \times \dfrac{\sqrt{7}+\sqrt{3}}{\sqrt{7}+\sqrt{3}} = \dfrac{7-3}{\sqrt{7}+\sqrt{3}} = \dfrac{4}{\sqrt{7}+\sqrt{3}}$

and, $\sqrt{5}-1 = (\sqrt{5}-1) \times \dfrac{(\sqrt{5}+1)}{(\sqrt{5}+1)} = \dfrac{5-1}{\sqrt{5}+1} = \dfrac{4}{\sqrt{5}+1}$

Now, $\sqrt{7} > \sqrt{5}$ and $\sqrt{3} > 1 \quad \Rightarrow \quad (\sqrt{7}+\sqrt{3}) > (\sqrt{5}+1)$ **[1]**

$\Rightarrow \quad \dfrac{1}{\sqrt{7}+\sqrt{3}} < \dfrac{1}{\sqrt{5}+1} \quad \Rightarrow \quad \dfrac{4}{\sqrt{7}+\sqrt{3}} < \dfrac{4}{\sqrt{5}+1} \quad \Rightarrow \quad (\sqrt{7}-\sqrt{3}) < (\sqrt{5}-1)$

Thus, $\sqrt{5}-1$ is greater than $\sqrt{7}-\sqrt{3}$. **[1]**

10. Let $x = 0.2353535$ .... $(= 0.2\overline{35})$

[Here 2 does not repeat, but the block 35 repeats.]

Since two digits are repeating, we multiply x by 100 to get

$100x = 23.53535$ .....

$\Rightarrow \quad 100x = 23.3 + 0.2353535......$ $\quad \Rightarrow \quad 100x = 23.3 + x$ [½]

$\Rightarrow \quad 99x = 23.3$ $\quad \Rightarrow \quad 99x = \dfrac{233}{10}$

$\Rightarrow \quad x = \dfrac{233}{990}$ [Solving for x] **[1]**

Here $p = 233$

$q = 990(\neq 0)$ [½]

11. $\dfrac{1}{\sqrt{7}-\sqrt{6}}$

$\dfrac{1}{\sqrt{7}-\sqrt{6}} = \dfrac{1}{\sqrt{7}-\sqrt{6}} \times \dfrac{\sqrt{7}+\sqrt{6}}{\sqrt{7}+\sqrt{6}}$ [Multiplying and dividing by $\sqrt{7}+\sqrt{6}$] **[1]**

$= \dfrac{\sqrt{7}+\sqrt{6}}{7-6} = \sqrt{7}+\sqrt{6}$ **[1]**

12. $x = \sqrt{3} - \sqrt{2}$

$\therefore \frac{1}{x} = \frac{1}{\sqrt{3}-\sqrt{2}} = \frac{1}{\sqrt{3}-\sqrt{2}} \times \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ [Rationalizing the denominator]

$= \frac{\sqrt{3}+\sqrt{2}}{(\sqrt{3})^2-(\sqrt{2})^2} = \frac{\sqrt{3}+\sqrt{2}}{3-2} = \frac{\sqrt{3}+\sqrt{2}}{1} = \sqrt{3}+\sqrt{2}$

$\therefore x + \frac{1}{x} = (\sqrt{3}-\sqrt{2}) + (\sqrt{3}+\sqrt{2}) = 2\sqrt{3}$ **[1]**

Squaring both sides, we get $\left(x + \frac{1}{x}\right)^2 = (2\sqrt{3})^2$

$\Rightarrow x^2 + \frac{1}{x^2} + 2 = 4 \times 3 \quad \Rightarrow \quad x^2 + \frac{1}{x^2} = 12 - 2 = 10$ **[1]**

SECTION – C

13. We have $\frac{\sqrt{7}-1}{\sqrt{7}+1} - \frac{\sqrt{7}+1}{\sqrt{7}-1} = a + b\sqrt{7}$

$\Rightarrow \frac{(\sqrt{7}-1)(\sqrt{7}-1)-(\sqrt{7}+1)(\sqrt{7}+1)}{(\sqrt{7}+1)(\sqrt{7}-1)} = a + b\sqrt{7}$ **[1]**

$\Rightarrow \frac{(\sqrt{7}-1)^2-(\sqrt{7}+1)^2}{(\sqrt{7})^2-(1)^2} = a + b\sqrt{7}$

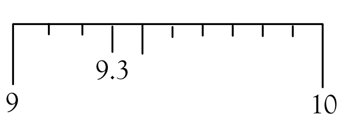
$\Rightarrow \frac{\{(\sqrt{7})^2-2(\sqrt{7})(1)+(1)^2\}-\{(\sqrt{7})^2+2(\sqrt{7})(1)+(1)^2\}}{7-1} = a + b\sqrt{7}$

$\Rightarrow \frac{(7-2\sqrt{7}+1)-(7+2\sqrt{7}+1)}{6} = a + b\sqrt{7}$ **[1]**

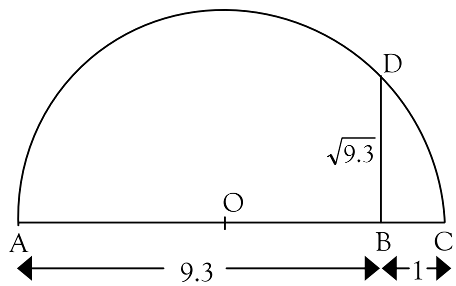
$\Rightarrow -\frac{4\sqrt{7}}{6} = a + b\sqrt{7} \quad \Rightarrow -\frac{2}{3}\sqrt{7} = a + b\sqrt{7}$

$\Rightarrow a = 0, b = -\frac{2}{3}$ **[1]**

14.

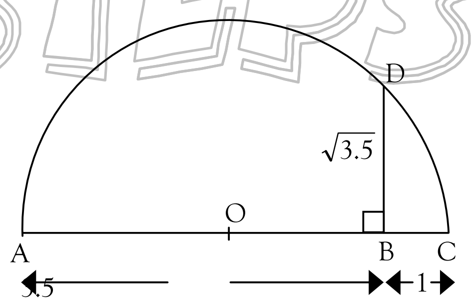


Mark the distance 9.3 from a fixed point A on a given line to obtain a point B such that AB = 9.3 units. From B mark a distance of 1 unit and mark the new point as C. Find the mid–point of AC and mark that point as O. Draw a semi–circle with centre O and radius OC. Draw a line perpendicular to AC passing through B and intersecting the semi–circle at D. then BD = $\sqrt{9.3}$. 'C' is a point on the number line representing the distance $\sqrt{9.3}$ units from the origin O.



[3]

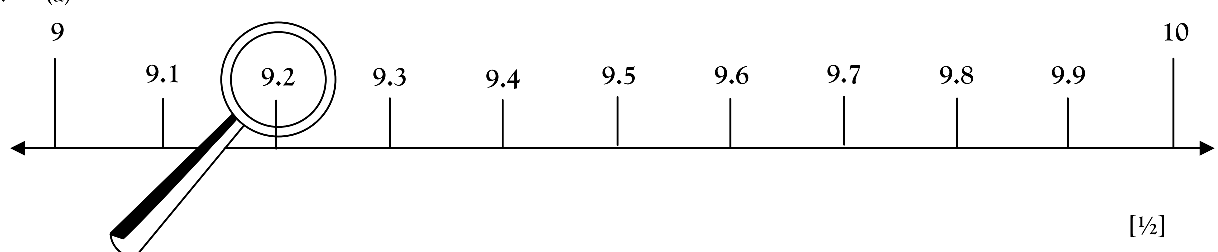
15. Mark the distance 3.5 from a fixed point A on a given line to obtain a point B such that AB = 3.5 units. From B mark a distance of 1 unit and mark the new point as C. Find the mid–point of AC and mark that point as O. Draw a semi–circle with center O and radius OC. Draw a line perpendicular to AC passing through B and Intersecting the semi–circle at D. Then BD = $\sqrt{3.5}$.



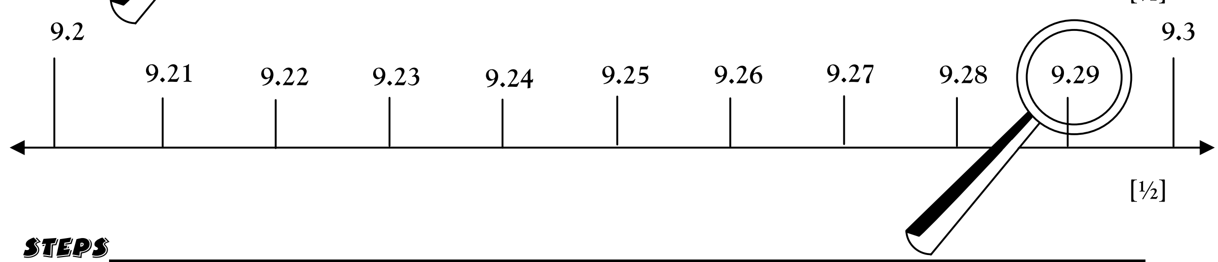
[3]

SECTION – D

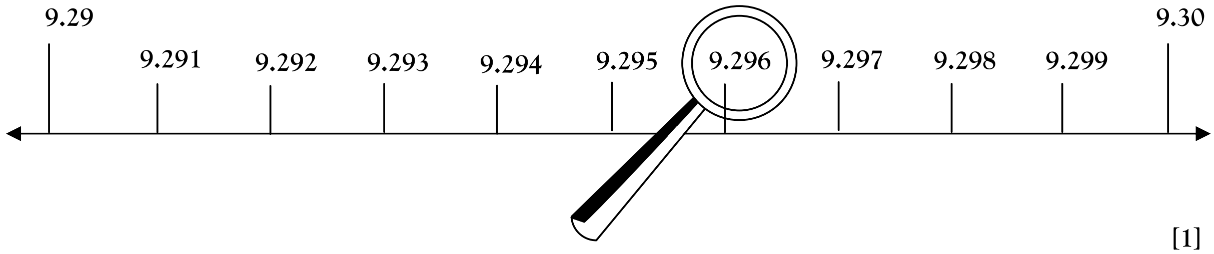
16. (a)



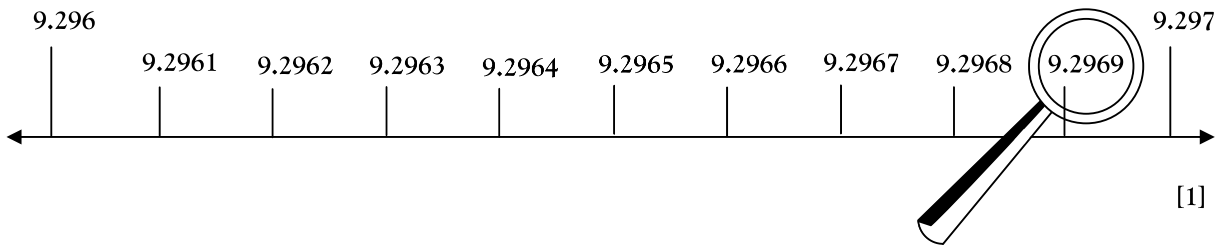
[½]



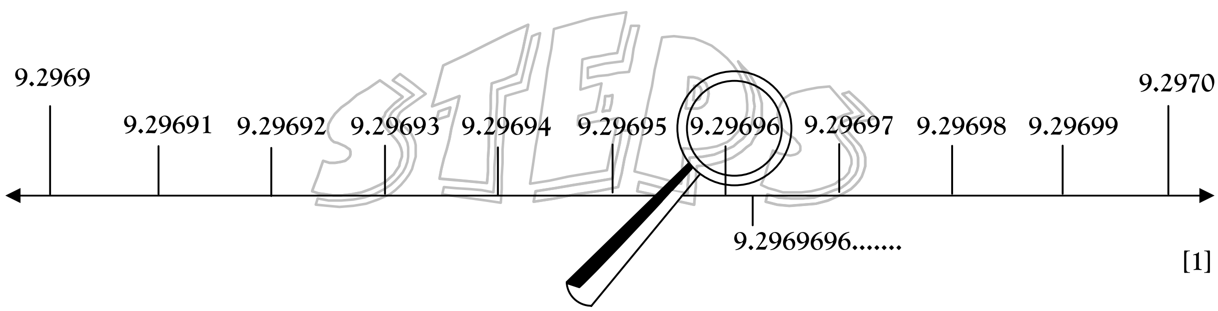
[½]



[1]



[1]



[1]

(b) $\sqrt[3]{2x-5}-5=0 \quad \Rightarrow \quad \sqrt[3]{2x-5}=5$

Cubing both sides:

$\Rightarrow \quad (\sqrt[3]{2x-5})^3 = 5^3 \quad \Rightarrow \quad 2x - 5 = 125$ [1]

$\Rightarrow \quad 2x = 130 \quad \Rightarrow \quad x = 65$ [1]