

class - IX, Sub - Maths, Study Material
 chapter - Number System

Introduction :-

1. Natural number :- All counting numbers are called natural number. eg. $N = \{1, 2, 3, 4, 5, \dots\}$
2. Whole number :- The natural number together with zero are called whole numbers eg. $W = \{0, 1, 2, 3, 4, 5, \dots\}$
3. Integers :- All positive natural numbers, negative natural numbers including zero are Integers eg. $Z = \{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$
4. Rational numbers :- A number that can be written in the form $\frac{p}{q}$ where p, q are integers and $q \neq 0$, is called Rational number. eg. $\frac{4}{3}, -\frac{2}{5}, \frac{4}{9}$ etc.
5. Irrational number :- A number which cannot be written in the form $\frac{p}{q}$ where p, q are integers and $q \neq 0$ are called irrational numbers. eg. $\sqrt{2}, \sqrt{3}, \sqrt{5}, \pi$ etc.

Real numbers and their decimal expansions :-

The decimal expansion of rational numbers are either terminating or nonterminating but recurring

eg. $\frac{1}{2} = 0.5 =$ terminating
 $\frac{1}{3} = 0.333\dots = 0.\bar{3}$ nonterminating recurring

Decimal expansion of irrational numbers are non terminating and non recurring

$\sqrt{2} = 1.4142135623 \dots$
 $\pi = 3.1415926535 \dots$

Q1. Is 0 a rational number?

yes $0 = \frac{0}{1} = \frac{0}{2}$

it can be written in the form $\frac{p}{q}$, where p, q are integers and $q \neq 0$

Q2. Find six rational numbers between 3 and 4.

Here $n = 6$ $n+1 = 6+1 = 7$

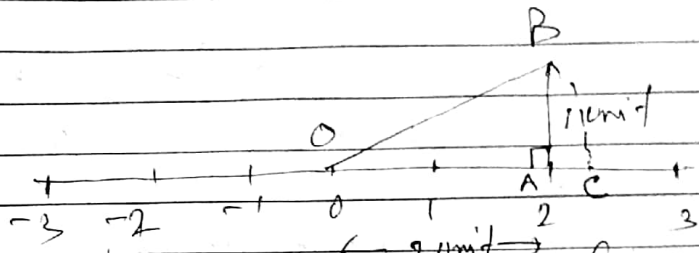
First make common denominator and then multiply N & D by 7

$3 = \frac{3}{1} = \frac{3 \times 7}{1 \times 7} = \frac{21}{7}$, $4 = \frac{4}{1} = \frac{4 \times 7}{1 \times 7} = \frac{28}{7}$

\therefore Six rational numbers are $\frac{22}{7}, \frac{23}{7}, \dots, \frac{27}{7}$

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Q3. Show how $\sqrt{5}$ can be represented on the number line.
 $\sqrt{5} = \sqrt{2^2 + 1^2}$

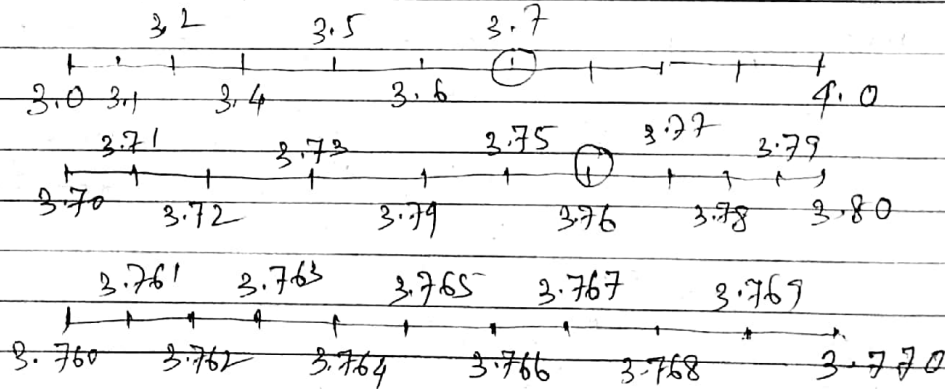


Point C represents $\sqrt{5}$ on the number line.
 Similarly we can represent $\sqrt{8}$, $\sqrt{10}$, $\sqrt{17}$ etc.
 $\sqrt{8} = \sqrt{2^2 + 2^2}$, $\sqrt{10} = \sqrt{3^2 + 1^2}$, $\sqrt{17} = \sqrt{4^2 + 1^2}$

Q4. Write the following in decimal form

- i) $\frac{36}{100} = 0.36 = \text{terminating}$
- ii) $\frac{1}{11} = 0.09090909 \dots = 0.\overline{09} = \text{non terminating}$
- iii) $4\frac{1}{8} = 4.125 = \text{terminating}$
- iv) $\frac{9}{13} = 0.\overline{230769} = \text{non terminating}$

Q5. Visualise 3.765 on the number line



Q6. Express $1.\overline{32} + 0.\overline{35}$ as a fraction

Let $x = 1.\overline{32}$, $y = 0.\overline{35}$

$10x = 13.\overline{2}$, $100x = 132.\overline{2}$

$\therefore 100x - 100x = 132.\overline{2} - 13.\overline{2} = 119$

$\Rightarrow x = \frac{119}{90}$

$y = 0.\overline{35} = 0.3535 \dots$

$100y = 35.\overline{35}$

$100y - y = 35.\overline{35} - 0.\overline{35} = 35$

$\Rightarrow y = \frac{35}{99}$ $\therefore x + y = \frac{553}{990}$

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Q.7. Simplify $\frac{6-4\sqrt{3}}{6+4\sqrt{3}}$ by rationalising the denominator

Here denominator is $6+4\sqrt{3}$. Multiply the N & D by its conjugate $6-4\sqrt{3}$, we get

$$\frac{6-4\sqrt{3}}{6+4\sqrt{3}} = \frac{(6-4\sqrt{3})(6-4\sqrt{3})}{(6+4\sqrt{3})(6-4\sqrt{3})}$$

$(a-b)^2 = a^2 - 2ab + b^2$
 $(a+b)(a-b) = a^2 - b^2$

$$= \frac{36 - 48\sqrt{3} + 48}{36 - 48} = \frac{84 - 48\sqrt{3}}{-12} = \frac{12(7 - 4\sqrt{3})}{-12}$$

Q.8. If $x = 3 + 2\sqrt{2}$, then find whether $x + \frac{1}{x}$ is rational or irrational.

$$\frac{1}{x} = \frac{1}{3+2\sqrt{2}} = \frac{1 \times (3-2\sqrt{2})}{(3+2\sqrt{2})(3-2\sqrt{2})} = \frac{3-2\sqrt{2}}{9-8}$$

$$\therefore x + \frac{1}{x} = 3+2\sqrt{2} + 3-2\sqrt{2} = 6 = \text{rational.}$$

Q.9. Simplify $\sqrt[4]{81} - 8(\sqrt[3]{216}) + 15(\sqrt[5]{32}) + \sqrt{225}$

$$= 3^{1 \times \frac{1}{4}} - 8 \cdot (6^{3 \times \frac{1}{3}}) + 15 \cdot 2^{5 \times \frac{1}{5}} + \sqrt{15 \times 15}$$

$$= 3 - 8 \times 8 + 15 \times 2 + 15$$

$$= 3 + 30 + 15 - 48 = 48 - 48 = 0$$

Q.10. Simplify $[\sqrt[4]{5 \{ 8^{\frac{1}{3}} + 27^{\frac{1}{3}} \}}]^{\frac{1}{4}}$

$$= [\sqrt[4]{5 \{ 2^{3 \times \frac{1}{3}} + 3^{3 \times \frac{1}{3}} \}}]^{\frac{1}{4}} = [\sqrt[4]{5(2+3)}]^{\frac{1}{4}}$$

$$= (5 \times 5)^{\frac{1}{4}} = 5^{2 \times \frac{1}{4}} = 5^{\frac{1}{2}} = \sqrt{5}$$

class - IX

Sub: Math, Assignment - 1. (Numbers)

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Q. 1. Is -25 a rational number? Give reason. 1×4

Q. 2. Evaluate $(256)^{0.16} \times (256)^{0.09}$ $= 4$

Q. 3. Rationalise the denominator of $\frac{1}{\sqrt{7}}$

Q. 4. Find the value of $\sqrt[4]{(81)^{-2}}$ $2 \times 4 = 8$

Q. 5. Find three rational numbers between $\frac{1}{4}$ and $\frac{1}{5}$.

Q. 6. Evaluate $\sqrt[4]{12} \times \sqrt[3]{6}$

Q. 7. Convert into decimal form of $\frac{1}{7}$

Q. 8. Express $0.404040 \dots$ in the form $\frac{p}{q}$

Q. 9. Represent $\sqrt{8.1}$ on the number line. 3×9

Q. 10. Simplify $0.13\bar{7} - 0.003\bar{2}$ and express the result in the form $\frac{p}{q}$ $= 12$

Q. 11. Simplify

$$\frac{\sqrt{5} + \sqrt{3}}{\sqrt{80} + \sqrt{48} - \sqrt{27} - \sqrt{45}}$$

Q. 12. Visualise using successive magnification 5.377

Q. 13. Express $0.\bar{6} + 0.\bar{7} + 0.4\bar{7}$ in the form $\frac{p}{q}$

Q. 14. Simplify $\frac{7\sqrt{3}}{\sqrt{10} + \sqrt{3}} - \frac{2\sqrt{5}}{\sqrt{6} + \sqrt{5}} - \frac{3\sqrt{2}}{\sqrt{15} + 3\sqrt{2}}$

Q. 15. If $x = \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}$, find $x^2 + \frac{1}{x^2}$

Q. 16. If $x = \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}$ and $y = \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$ then find the value of $x^2 + xy + y^2$

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