Chapter ⇒ 1

By ⇒

Number System

Exercise ⇒ 1.1

1. Is zero is rational number? Can you write it in the form $\frac{p}{q}$, where q and p are integer and $q \neq 0$.

Solution ÷ Yes, zero is a rational numbers
Because it is a form of $\frac{p}{q} = \frac{0}{1}$ Ans ÷

2. Find six rational numbers between 3 and 4.

Solution ÷ $N = 6$ $(N+1) = 6 + 1 = 7$

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

Rational number between $\frac{21}{7}$ and $\frac{28}{7}$.

$\Rightarrow \frac{22}{7}, \frac{23}{7}, \frac{24}{7}, \frac{25}{7}, \frac{26}{7}, \frac{27}{7}$ Ans

3. Find five rational numbers between $\frac{3}{5}$ and $\frac{4}{5}$.

Solution ⇒ $N = 5$ $(N+1) = 5 + 1 = 6$

$\Rightarrow \frac{3 \times 6}{5 \times 6} = \frac{18}{30}$, $\frac{4}{5} \times \frac{6}{6} = \frac{24}{30}$

Five rational numbers between $\frac{18}{30}$ and $\frac{24}{30}$

$\Rightarrow \frac{19}{30}, \frac{20}{30}, \frac{21}{30}, \frac{22}{30}, \frac{23}{30}$ Ans

Q4. State whether the following statements are true or false. Give reason for your Answer:

(i) Every Natural No is a whole No $\Rightarrow$ True

Reason $\Rightarrow$ Natural no' Started by 1, 2 ..... ∞ and whole no started with 0, 1, 2 ∞
Hence, the natural no Come in whole number.

ii) Every integer is a whole number $\Rightarrow$ False

Reason $\Rightarrow$ Integers [-3, -2, -1. 0 1, 2, 3, 4, etc.]
Whole no [0, 1, 2, 3, 4, 5, 6, 7 etc.]
-2 = Integer
by but $-2 \neq$ whole no

iii) Every rational numbers is a whole Number $\Rightarrow$ False.

ason $\Rightarrow$ Rational Number $\frac{1}{2}$

$\Rightarrow$ Whole no = 0, 1, 2, 3, 4 etc

$\Rightarrow \frac{1}{2}$ rational No $\Rightarrow$ by $\frac{1}{2} \neq$ Whole No.

Exercise $\Rightarrow$ 1.2

Irrational Number

1. State whether the following statements are true of.

or false. Justify your answer.

i) Every irrational Number is a real no.

Ans ⇒ It is true because the real no made of two type of no that are rational and irrational no. Hence every irrational no is a real no.

ii) Every point on the number line is of the form $\sqrt{m}$, where m is a natural no.

Ans ⇒ False, no negative no can be the square root of any natural no.

iii) Every real Number is an irrational No.

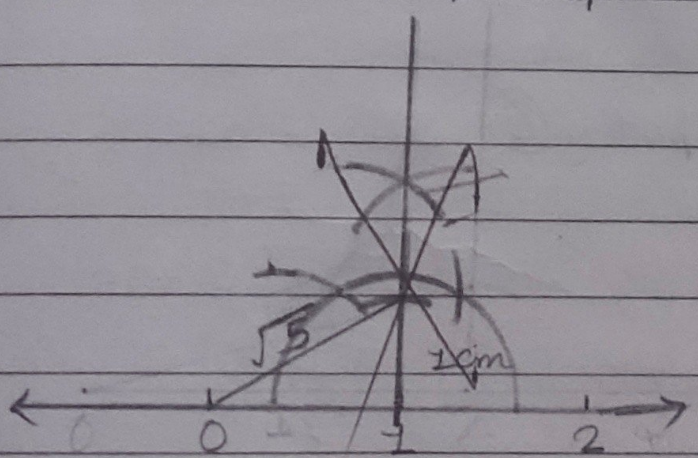
Ans ⇒ It is False. Because 2 is a real no but not Irrational no.

2. Are the square roots of all positive integers irrational? If not, give an example of all ~~degree~~ square root of no that is a rational?

Ans ⇒ No $\sqrt{4} = 2$ is a rational no

3. Show how $\sqrt{5}$ can be represented on number line.

⇒



$\sqrt{5}$

$\Rightarrow \sqrt{4+1}$

$\Rightarrow \sqrt{(2)^2+(1)^2}$

$H^2 = l^2 + b^2 \Rightarrow (OA)^2 = (AB)^2 + (BO)^2$

$\Rightarrow (OA)^2 = 1^2 + 2^2 \Rightarrow (OA)^2 = 1+4 \Rightarrow (OA)^2 = 5$

$(OA)^2 = 5$

$OA = \sqrt{5}$ Ans

Exercise ⇒ 1.3

Rational Number ⇒ Terminating decimal expression
Irrational Number ⇒ Non-terminating decimal expansion
Also ⇒ Non terminating repeating decimal expansion

1. Write the following in decimal form and say what kind of decimal expansion each has:

(a) $\frac{36}{100}$ ⇒ terminating

⇒ 100) 360 (0.36
300
600
600
×××

(b) $\frac{1}{11}$ ⇒ Non-terminating

⇒ 11) 100 (0.0999
99
100
99
100
99
1

(c) $4\frac{1}{8} = \frac{33}{8}$ = terminating

8) 33 (4.125
32
10
8
20
16
40
40
××

(d) $\frac{2}{11}$ ⇒ Non-terminating

11) 20 (0.181
11
90
88
20
11
9

(e) $\frac{8}{13}$ ⇒ Non-terminating repeating

13) 30 (
26
40
39
100
91
90
78
120
117
30
26
4

(f) $\frac{329}{400} = \frac{329}{4} \times \frac{1}{100}$

4) 329 (82.25
32
9
8
10
8
20
20
××

② You know that $\frac{1}{7} = 0.\overline{142857}$. Can you predict what the decimal expansion of $\frac{2}{7}, \frac{3}{7}, \frac{4}{7}, \frac{5}{7}, \frac{6}{7}$ are without actually doing the long division? If so how?

Solution: ① $\frac{1}{7} = 0.\overline{142857}$ Ans

② $\frac{2}{7} = 2\times\frac{1}{7} = 2\times 0.\overline{142857}$ Ans

③ $\frac{3}{7} = \frac{3}{7}\times\frac{1}{7} = 3\times 0.\overline{142857}$ Ans

④ $\frac{4}{7} = \frac{4}{7}\times\frac{1}{7} = 4\times 0.\overline{142857}$ Ans

⑤ $\frac{5}{7} = 5\times\frac{1}{7} = 5\times 0.\overline{142857}$ Ans

⑥ $\frac{6}{7} = 6\times\frac{1}{7} = 6\times 0.142857 = 0.\overline{857142}$ Ans

5 Express the following in the form $\frac{p}{q}$ where p and q are integers $q \neq 0$.

i) $0.\bar{6}$ ⇒ Solution: Let $x = 0.6666$ — ①

by equation ① × 10

$10x = 6.6666$

Subtract equation ⑪ from ①

$10x = 6.6666$ — ⑪

$x = 0.6666$

$9x = 6.0000$

$x = \frac{\cancel{6}^2}{\cancel{9}_3}$

$\boxed{x = \frac{2}{3}}$ Ans

ii) $0.4\bar{7}$

Solution: Let $x = 0.4777$

eq. $10x = 4.7777$ ① ⇒ by equation (i) ×10

$\Rightarrow 100x = 47.7$ —— (ii)

Substract equation (ii) from (i)

$100x = 47.7777$

$10x = 4.7777$

$90x = 43.0000$

$x = \frac{43}{90}$ Ans

(iii) $0.\overline{001}$

Solution ⇒ Let $x = 0.001001001$ — (i)

by equation (i) × 1000

$1000x = 1.001001....$ (2)

by equation = (ii) − (i)

$1000x = 1.001001$ —— (1)

$- x = 0.001001$ —— (2)

$999x = 1.000000$

$x = \frac{1}{99}$ Ans

Q6. What can the maximum number of digits be in the reapeating black of digits in decimal expansion of $\frac{1}{17}$ of a perform the division to check answer.

solve ⇒ $17 \overline{) 100 (} \; 0.0588235294117647$

85
150
136
140
136
40
34
60
51
90
85
50
34
160
153
70
68

20
17
30
17
130
119
110
102
80
68
120
119

Q4. Express 0.99999 .... are the form $\frac{p}{q}$. Are you support by your answer & with your teachers and class mate's discuss why the answer makes sense.

Solution: 0.9

Let $x = 0.9999 \ldots$ —— (i)

by equation (i) $\times 10$

$10x = 9.9999$ —— (ii)

by equations (ii) − (i)

$$
\begin{array}{r}
10x = 9.99999 \\
0.99999 \\
\hline
9x = 9.000000
\end{array}
$$

$x = \frac{9}{9}$ $\boxed{x = 1}$ Ans

Q5. Look at several example of rational number in the form $\frac{p}{q}$ $(q \neq 0)$ where p and q are integers with no common factors that other than 1 and having terminating decimal representations (expansion). Can you guess what property q must satisfy.

Solution ÷ $\frac{1}{2} = 0.5$	$\frac{1}{5} = 0.2$
$\frac{1}{4} = 0.25$	$\frac{1}{25} = 0.04$

Q. Write three no. whose decimal expansion ~~are~~ are non-terminating non-recurring.

Solution: Irrational No $\longrightarrow$ $\sqrt{\text{Imperfect Square}}$

$\Rightarrow \sqrt{2} \Rightarrow 1.4142135$ ——

$\sqrt{3} \Rightarrow 1.7320508075$ ——

$\sqrt{5} \Rightarrow 2.2360679$ ——

Q.8 Find three different irrational no between the rational no $\frac{5}{7}$ and $\frac{9}{11}$.

Solution ÷ $0.\overline{714285}$ ___, ___, ___ $\frac{9}{11} = 0.\overline{85}$

0.72387
0.733842
0.745976

Q.9. Classify the following no are rational or irrational.

(i) $\sqrt{23}$ ⇒ $\sqrt{23}$ is irrational No Ans

(ii) $\sqrt{225}$ ⇒ $\sqrt{15 \times 15}$

$\sqrt{(15)^2}$ $= \frac{15}{1}$ rational no Ans

(iii) 0.3796

Solution ⇒ 0.3796 is terminating
Hence this no is a rational no.

(iv) $7.\overline{478}$

Solution ⇒ $7.\overline{478}$ non-terminating repeating. Hence these no are rational no.

(v) 1.101001000100001....

Solution ⇒ 1.101001000100001.... is a non terminating non recurring Hence these no are irrational no.

Exercise ⇒ 1.5

Rules ⇒ (i) Negative of an irrational no is an irrational no.
(ii) The Sum. or difference of irrational Number and rational number is an irrational Number.

(iii) The product of an non-zero rational Number and an irrational Numbers an. irrational Number.

(iv) The sum, difference, product and quotient two irrational numbers need not be an Irrational number.

1. Classify the following numbers as rational or irrational.

a) $2-\sqrt{5}$
⇒ 2 is rational No and $\sqrt{5}$ is an irrational no and the difference of the rational no and an irrational no is Irrational. No.

b) $(3+\sqrt{23})-\sqrt{23}$
⇒ $3+\cancel{\sqrt{23}}-\cancel{\sqrt{23}}$
⇒ 3 is a rational Number.

c) $\frac{2\sqrt{3}}{7\sqrt{7}}$

⇒ Solution ⇒ $\frac{2}{7}\frac{\cancel{\sqrt{7}}}{\cancel{\sqrt{7}}}$ $\frac{2}{7}$ is a rational no.

d) $\frac{1}{\sqrt{2}} = 1\div\sqrt{2}$

⇒ 1 is a rational no and $\sqrt{2}$ is an irrational No. this is irrational No.

(e) 2π

$\Rightarrow$ 2 is a rational No and π is irrational. Hence the Product of rational no and irrational no is irrational

(F) $2\pi r$

Solution $\Rightarrow$ Circumference of circle $= 2\pi r$

$\Rightarrow C = \pi d$

$\Rightarrow \pi = \frac{C}{d}$

$\Rightarrow$ So, $\frac{c}{d}$ is a rational but if we calculate

$\Rightarrow \frac{c}{d}$ it gives π

$\Rightarrow$ π is a irrational No. Quotient of two irrational no is always irrational So $\pi \neq \frac{c}{d}$.

(4) Represent $\sqrt{9.3}$ on the number line.

Solution:- On the Secoand Page

(5) Rationalise the denominator of the following.

(i) $\frac{1}{\sqrt{7}}$ Solution:- $\frac{1}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} = \frac{\sqrt{7}}{(\sqrt{7})^2} = \frac{\sqrt{7}}{7}$ Ans

2. Simplify each of the following expression.

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

$\Rightarrow 6 + 3\sqrt{2} + 2\sqrt{3} + \sqrt{6}$ Ans

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

$a^2 - b^2 = (a+b) \cdot (a-b)$

$= 3^2 - [\sqrt{3}]$

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$\Rightarrow 9-3$

$\Rightarrow 6$ Ans

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

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

$\Rightarrow 5+2+2\times\sqrt{10}$

$\Rightarrow 7+2\sqrt{10}$ Ans

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

$\Rightarrow (a+b)(a-b) = a^2-b^2$

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

$= 5-2$

3 Ans

Recall π is a defined as the ration of the circumference (say c) of a circle diameter (say d) that is $\pi = \frac{c}{d}$ this seems to contradict the facts the π is irrational. How will you resolve this contradiction.

i) $\frac{1}{\sqrt{7}-\sqrt{6}} \Rightarrow \frac{1}{\sqrt{7}-\sqrt{6}} \times \frac{\sqrt{7}}{\sqrt{7}} + \frac{\sqrt{6}}{\sqrt{6}} = \frac{\sqrt{7}+\sqrt{6}}{(\sqrt{7})^2-(\sqrt{6})^2}$

$\sqrt{7}+\sqrt{6}$ Ans

$\frac{1}{\sqrt{5}+\sqrt{2}}$

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

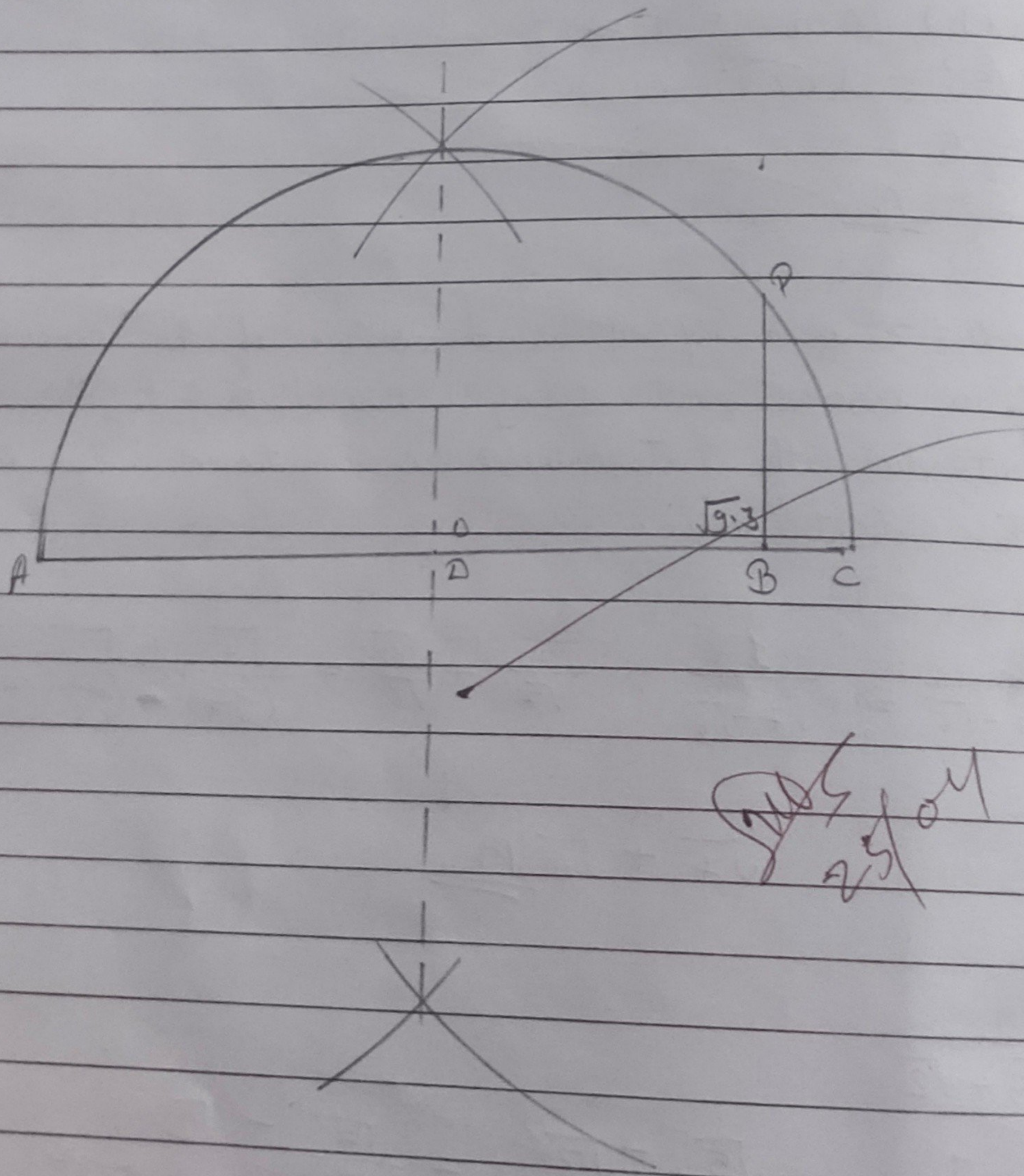
$\Rightarrow \frac{\sqrt{5}-\sqrt{2}}{5-2} \Rightarrow \frac{\sqrt{5}-\sqrt{2}}{3}$ Ans

iii) $\frac{1}{\sqrt{7}-2}$

Solution ⇒ $\frac{1}{\sqrt{7}-2} \times \frac{\sqrt{7}+2}{\sqrt{7}+2} = \frac{\sqrt{7}+2}{(\sqrt{7})^2(2)^2}$

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

(4)



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Exercise 1.6

Laws of Exponents

1. Find :-

i) $64^{\frac{1}{2}} \Rightarrow (2\times2\times2\times2\times2\times2)^{\frac{1}{2}} = (2^6)^{\frac{1}{2}} = 2^{\cancel{6}\times\frac{1}{\cancel{2}}} = 2^3$

ii) $32^{\frac{1}{5}} \Rightarrow (2\times2\times2\times2\times2)^{\frac{1}{5}} = (2^5)^{\frac{1}{5}} = 2^{\cancel{5}\times\frac{1}{\cancel{5}}} = 2^1 = 2$ Ans

iii) $125^{\frac{1}{3}} \Rightarrow (5\times5\times5)^{\frac{1}{3}} = (5^3)^{\frac{1}{3}} = 5^{\cancel{3}\times\frac{1}{\cancel{3}}} = 5$ Ans

2. Find.

i) $9^{3/2} = (3\times3)^{\frac{3}{2}} = (3^2)^{\frac{3}{2}} = 3^{\cancel{2}\times\frac{3}{\cancel{2}}} = 3^3 = 3\times3\times3 = 27$ Ans

ii) $32^{\frac{2}{5}} = (2\times2\times2\times2\times2)^{\frac{2}{5}} = (2^5)^{\frac{2}{5}} = 2^{\cancel{5}\times\frac{2}{\cancel{5}}} = 2^2 = 2\times2 = 4$ Ans

iii) $16^{\frac{3}{4}} = (2\times2\times2\times2)^{\frac{3}{4}} = (2^4)^{\frac{3}{4}} = 2^{\cancel{4}\times\frac{3}{\cancel{4}}} = 2^3 = 2\times2\times2 = 8$ Ans

iv) $125^{-\frac{1}{3}} = (5\times5\times5)^{-\frac{1}{3}} = (5^3)^{-\frac{1}{3}} = 5^{\cancel{3}\times\frac{(-1)}{\cancel{3}}} = 5^{-1} = \frac{1}{5}$ Ans

Q2. Simplify.

i) $2^{\frac{2}{3}} \cdot 2^{\frac{1}{5}} = 2^{\frac{2}{3}+\frac{1}{5}} = 2^{\frac{10+3}{15}} = 2^{\frac{13}{15}}$ Ans

ii) $\left[\frac{1}{3^3}\right]^7 = \frac{1}{3^{3\times7}} = \frac{1}{3^{21}} = 3^{-21}$ Ans

iii) $\frac{11^{\frac{1}{2}}}{11^{\frac{1}{4}}} = 11^{\frac{1}{2}} \times 11^{-\frac{1}{4}} = 11^{\frac{1}{2}+\left(-\frac{1}{4}\right)} = 11^{\frac{1}{2}-\frac{1}{4}} = 11^{\frac{1}{4}}$ Ans

iv) $7^{\frac{1}{2}} \cdot 8^{\frac{1}{2}} = (7\times8)^{\frac{1}{2}} = 56^{\frac{1}{2}}$ Ans