

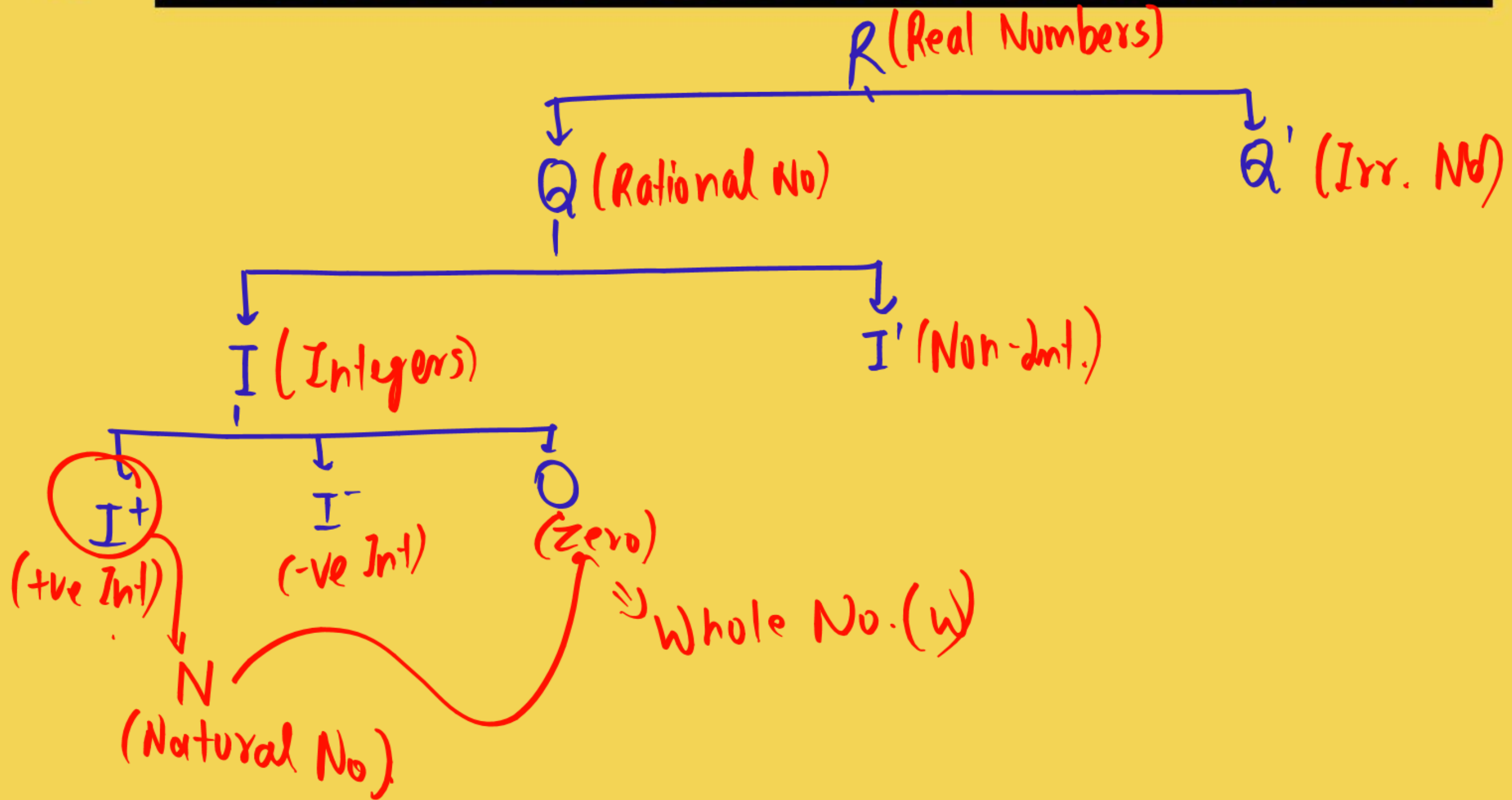
[Aim: 100/100 in Maths]

अभ्यास CLASS 9

NUMBER - SYSTEM

CHAPTER - 1

NUMBERS KI JAANKARI :



Natural Numbers: दोड़ा की गिनती $\{1, 2, 3, 4, 5, 6, 7, \dots\}$

Whole Numbers: $\{0, 1, 2, 3, 4, 5, 6, 7, \dots\}$

Integers: $\{\dots, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, \dots\}$
-ve Int. +ve Integers
neither +ve
nor -ve

Rational No $\Rightarrow \left\{ \frac{p}{q} / q \neq 0, p, q \in \mathbb{Z} \right\}$

S	0
3	4
7	0
6	-1

$$\frac{2}{3} = 0.66666 \dots$$

$$= 0.\overline{6}$$

[Repeating]

$$\frac{3}{2} = 1.5$$

[Terminate]

$$\frac{1}{2} = 0.5$$

[Terminate]

$$\frac{22}{7}$$

$$= 3.142857 \dots$$

$= \pi = \text{irr.}$

[Non-repeating
Non-terminating]

*After decimal

→ Repeat / Terminate = Q

→ NRNT = Q'

▶▶▶ #LP : Which of the following are $\mathbb{Q}$ / $\mathbb{Q}'$?

1. $1.4 \rightarrow \text{terminate} \rightarrow \mathbb{Q}$

2. $6 \rightarrow \mathbb{Q}$

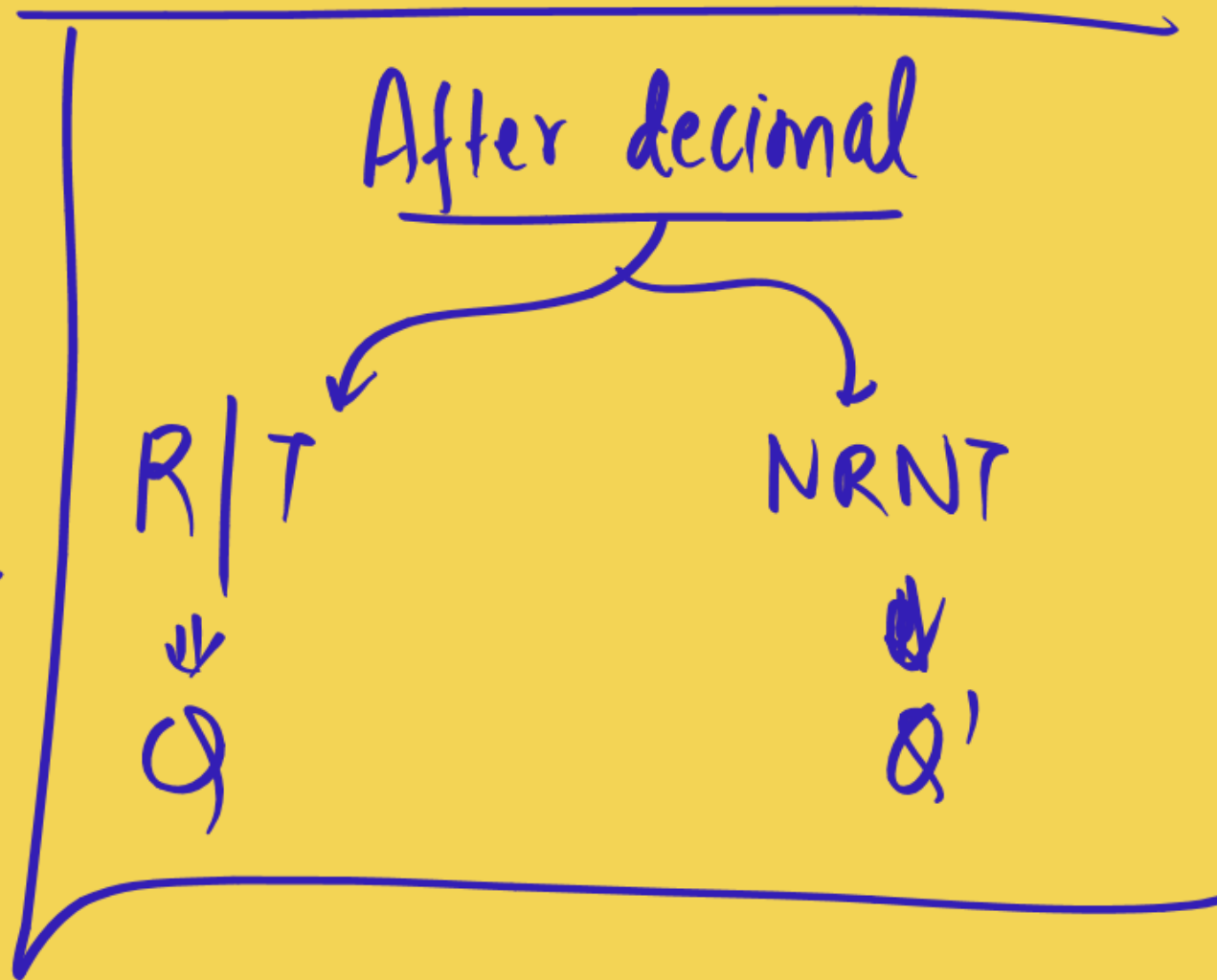
3. $6.743\dots$ NRNT $\Rightarrow \mathbb{Q}'$

4. $6.\overline{383} \Rightarrow 6.383383383383383383383383\dots \textcircled{R} \rightarrow \mathbb{Q}$

5. $5.83 \text{ terminate} \Rightarrow \mathbb{Q}$

6. $0 \rightarrow \mathbb{Q}$

7. $14.\underline{567}\underline{567}\underline{567} \leftarrow \text{terminate} \Rightarrow \mathbb{Q}$



▶▶▶ #LP : State "TRUE" or "FALSE" :-

1. Every whole number is a natural number. (F)

$\{0, 1, 2, 3, 4, \dots\}$

$\{1, 2, 3, 4, 5, \dots\}$

2. Every integer is a rational number. (T)

$\{2, -1, 0, 1, 2, 3, \dots\}$

3. Every rational number is an integer. (F)

$-\frac{2}{3}$

4. Every natural number is a whole number. (T)

$\{1, 2, 3, \dots\}$

$\{0, 1, 2, 3, \dots\}$

5. Every integer is a whole number. (F)

6. Every rational number is a whole number. (F)

$\frac{2}{3}$



▶▶▶ #LP : Find the decimal expansion of $1/7$ using long division, can you predict the decimal expansion of $4/7$ without actually doing long division ?

$$7 \overline{) 10} \quad 0.14285714285714$$

$$\begin{array}{r} 7 \\ \hline 30 \end{array}$$

$$\begin{array}{r} 28 \\ \hline 20 \end{array}$$

$$\begin{array}{r} 14 \\ \hline 60 \end{array}$$

$$\begin{array}{r} 56 \\ \hline 40 \end{array}$$

$$\begin{array}{r} 35 \\ \hline 50 \end{array}$$

$$\begin{array}{r} 49 \\ \hline 10 \end{array}$$

$$\begin{array}{r} 10 \\ \hline 20 \end{array}$$

$$\begin{array}{r} 30 \\ \hline 10 \end{array}$$

$$\begin{array}{r} 20 \\ \hline 14 \end{array}$$

$$\begin{array}{r} 60 \\ \hline 56 \end{array}$$

$$\begin{array}{r} 40 \\ \hline 35 \end{array}$$

$$\begin{array}{r} 50 \\ \hline 49 \end{array}$$

$$\begin{array}{r} 10 \\ \hline 20 \end{array}$$

$$\begin{array}{r} 30 \\ \hline 10 \end{array}$$

$$\frac{1}{7} = 0.142857142857142857 \dots$$

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

$$\frac{4}{7} = 4 \times \left(\frac{1}{7} \right)$$

$$= 4 \times 0.142857$$

$$\Rightarrow 0.571428 = \frac{4}{7}$$

✓

$$\frac{9}{7} \Rightarrow 9 \times \left(\frac{1}{7} \right)$$

$$\frac{8}{7} \Rightarrow 8 \times \left(\frac{1}{7} \right)$$



INSERTING RATIONAL NUMBERS BETWEEN TWO RATIONAL NUMBERS :

$$a \quad \text{-----} \quad b$$

$$\uparrow$$
$$\left[\frac{a+b}{2} \right]$$

← this is a rational no. b/w a & b.

LP : Insert a rational numbers between 1 and 2 .

$$\textcircled{1} \quad \text{-----} \quad \textcircled{2}$$

$$\frac{1+2}{2} \Rightarrow \textcircled{\frac{3}{2}} \text{ is a rat. no b/w 1 \& 2.}$$





#LP : Insert five rational numbers between 1 and 2.

①

$$\left(\frac{5}{4}\right)$$

$$\frac{1 + \frac{3}{2}}{2} \Rightarrow \frac{5}{4}$$

$$\left(\frac{11}{8}\right)$$

$$\left(\frac{3}{2}\right)$$

$$\frac{1 + 2}{2} = \frac{3}{2}$$

$$\left(\frac{3}{8}\right)$$

$$\left(\frac{7}{4}\right)$$

$$\frac{\frac{3}{2} + 2}{2} \Rightarrow \frac{7}{4}$$

②

$$\frac{\frac{3}{2} + \frac{7}{4}}{2} \Rightarrow \left(\frac{13}{8}\right)$$

$$\frac{\frac{5}{4} + \frac{3}{2}}{2} \Rightarrow \frac{5+6}{4} \Rightarrow \left(\frac{11}{8}\right)$$

~~50~~



50 Rat no b/w 1 & 2.

$$\textcircled{1} \times \frac{100}{100}$$

$$\textcircled{\frac{b}{q}}$$

$$\textcircled{2} \times \frac{100}{100}$$

$$\textcircled{\frac{100}{100}}$$

$$\frac{101}{100}$$

$$\frac{102}{100}$$

$$\frac{103}{100}$$

- - -

$$\frac{199}{100}$$

$$\textcircled{\frac{200}{100}}$$

choose any 50.

▶▶▶ #LP : Insert ~~five~~ rational numbers between $\frac{20}{10}$ and $\frac{30}{10}$.

$$\left(\frac{20}{10}\right), \frac{21}{10}, \frac{22}{10}, \frac{23}{10}, \frac{24}{10} \text{ --- } \frac{29}{10}, \left(\frac{30}{10}\right)$$

choose any 5.

$$\checkmark \frac{21}{10}, \frac{22}{10}, \frac{24}{10}, \frac{26}{10}, \frac{28}{10}$$

▶▶▶ #LP : Insert seven rational numbers between $\frac{70}{10}$ and $\frac{80}{10}$.

$$\left(\frac{70}{10}\right), \frac{71}{10}, \frac{72}{10}, \frac{73}{10} \text{ --- } \frac{79}{10}, \left(\frac{80}{10}\right)$$

choose any 7.





#LP : Insert fifteen rational numbers between $20/10$ and $60/20$.

$$\frac{20}{10} \times 2 \Rightarrow \left(\frac{40}{20} \right), \frac{41}{20}, \frac{42}{20}, \frac{43}{20} \dots \frac{59}{20} \left(\frac{60}{20} \right)$$

choose any 15.





#LP : Insert seventy rational numbers between 2 and 3.

अभय

$$\frac{2}{1} \times \frac{100}{100} \Rightarrow \frac{200}{100}$$

$$\frac{3}{1} \times \frac{100}{100} \Rightarrow \frac{300}{100}$$

$$\left(\frac{200}{100}\right), \frac{201}{100}, \frac{202}{100}, \frac{203}{100}, \frac{204}{100} - - - - - \frac{299}{100}, \left(\frac{300}{100}\right)$$

Choose any 70.





**SO , THE GOAL IS TO MAKE
“DENOMINATOR” SAME**





#LP : The max number of integers between two consecutive natural numbers is:

- A. zero**
- B. 2**
- C. 3**
- D. infinite**

Converting decimal numbers to rational (p/q) form :

$$\frac{p}{q} \xrightarrow{\text{dec}} 0.5$$

$$\text{dec} \rightarrow \frac{p}{q}$$

$$0.5 \rightarrow \frac{0.5}{1} \Rightarrow \left(\frac{1}{2}\right)$$

▶▶▶ #LP : Show that 3.142678 is a rational number . In other words , express 3.142678 in the form of p/q , where p and q are integers and $q \neq 0$.

$$\frac{3.142678}{1000000} = \left(\frac{p}{q}\right) \checkmark$$

Yes it's a rat. no.



Repeating



#LP : Express $0.\overline{5}$ in the form of p/q .

अभ्यास

let

$$x = 0.\overline{5} \quad \text{--- (I)}$$

Caution:- decimal के turant wala bar होना
हमी उसे (I) eqn बोलेगें

mult both sides by 10

$$10 \times x = 10 \times 0.\overline{5}$$

$$10x = 10 \times 0.55555 \dots$$

$$10x = 5.55555 \dots$$

$$10x = 5.\overline{5} \quad \text{--- (II)}$$

$$(II) - (I)$$

$$10x - x = 5.\overline{5} - 0.\overline{5}$$

$$9x = 5$$
$$x = \frac{5}{9}$$

$$\begin{array}{r} 5.555555 \dots \\ - 0.555555 \dots \\ \hline 5.000000 \end{array}$$

$$0.\overline{5} = \frac{5}{9} \quad \left(\frac{p}{q} \right) \checkmark$$

$$\frac{5}{9}$$

कितने digits

पर bar है ?

1 $\rightarrow \times 10$

2 $\rightarrow \times 100$

3 $\rightarrow \times 1000$

4 $\rightarrow \times 10000$

5 $\rightarrow \times 100000$

⋮



#LP : Express $0.\overline{27}$ in the form of p / q .

अभ्यास

$$x = 0.\overline{27} \quad \text{--- (I)}$$

mult by 100 both sides

$$100x = 100 \times 0.\overline{27} = 27.\overline{27}$$

$$100x = 27.\overline{27}$$

$$100x = 27.\overline{27} \quad \text{--- (II)}$$

$$\text{(II)} - \text{(I)}$$

$$100x - x = 27.\overline{27} - 0.\overline{27}$$

$$99x = 27$$

$$x = \frac{27}{99} = 0.\overline{27}$$

$$\begin{array}{r} 27.272727\ldots \\ - 0.272727\ldots \\ \hline 27.000000 \end{array}$$

$$0.\overline{27} = \frac{27}{99} = \frac{3}{11} \left(\frac{p}{q} \right) \checkmark$$

$$\frac{27}{99}$$





#LP : Express $0.\overline{237}$ in the form of p / q .

अभ्यास

$$x = 0.\overline{237} \text{ --- (I)}$$

$$\frac{237}{999}$$

mult by 1000 both sides

$$1000x = 1000 \times 0.\overline{237} = 237.237237 \dots$$

$$1000x = 237.237237237 \dots$$

$$1000x = 237.\overline{237} \text{ --- (II)}$$

$$\text{(II)} - \text{(I)}$$

$$999x = 237$$

$$x = \frac{237}{999} = 0.\overline{237}$$





#LP : Express $0.\overline{333}$ in the form of p / q .

अभ्यास

$$\frac{333}{999}$$

0.
→ ये trick तभी when decimal के
द्वारेत बाद bar हो।





#LP : Express $5.\overline{2}$ in the form of p / q .

अभ्यास

$$x = 5.\overline{2} \quad \text{--- (I)}$$

Mult by 10 both sides

$$10x = 10 \times 5.\overline{2} = 52.\overline{2}$$

$$10x = 52.\overline{2} \quad \text{--- (II)}$$

$$\text{(II)} - \text{(I)}$$

$$9x = 52.\overline{2} - 5.\overline{2}$$

$$9x = 47$$

$$x = \frac{47}{9} \quad \checkmark$$

$$\begin{array}{r} 52.\overline{2} \\ - 5.\overline{2} \\ \hline \end{array}$$

$$47.0$$

Method 2

$$x = 5.\overline{2}$$

$$x = 5 + 0.\overline{2}$$

$$x = 5 + \frac{2}{9}$$

$$x = \frac{45 + 2}{9} = \frac{47}{9} \quad \checkmark$$



#LP:- Express $46.\overline{7}$ in $\frac{p}{q}$ form:

$$\text{let } x = 46.\overline{7}$$

$$x = 46 + 0.\overline{7}$$

$$x = 46 + \frac{7}{9}$$

$$x = \frac{414 + 7}{9}$$

$$46.\overline{7} = \boxed{x = \frac{421}{9}} \cup \left(\frac{p}{q}\right) \checkmark$$

Q IP: $396.\overline{762}$ in $\frac{p}{q}$ form.

$$x = 396.\overline{762}$$

$$x = 396 + 0.\overline{762}$$

$$x = 396 + \frac{762}{999} \quad \checkmark$$



#LP : Express $4.\overline{42}$ in the form of p/q .

अभ्यास

$$x = 4.\overline{42}$$

jugaad

→ mult. by 10 both sides

$$10x = 10 \times 4.\overline{42}$$

$$10x = 44.\overline{2} \quad \text{--- (I)}$$

$$10x = 44 + 0.\overline{2}$$

$$10x = 44 + \frac{2}{9}$$

$$10x = \frac{398}{9}$$

$$4.\overline{42} = x = \frac{398}{90} \quad \left(\frac{199}{45} \right) \checkmark$$

$$\begin{array}{r} 3 \\ 44 \\ \hline 376 \end{array}$$

$$x = 3.\overline{972}$$

mult by 10 both sides

$$10x = 39.\overline{72} \quad \text{--- (I)}$$

$$10x = 39 + 0.\overline{72}$$

$$10x = 39 + \frac{72}{99}$$

$$x \checkmark$$

