

Chapter: 1

સંખ્યા પદ્ધતી Number System

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- * પૂર્ણાંક સંખ્યાઓ (N) (Natural Numbers): 1, 2, 3, 4,
- * પૂર્ણ સંખ્યાઓ (W) (Whole Numbers): 0, 1, 2, 3, 4,
- * સંપૂર્ણ સંખ્યાઓ (Z) (Integers): ..., -3, -2, -1, 0, 1, 2,
- * યોગ્ય સંખ્યાઓ (Rational Numbers) (Q)

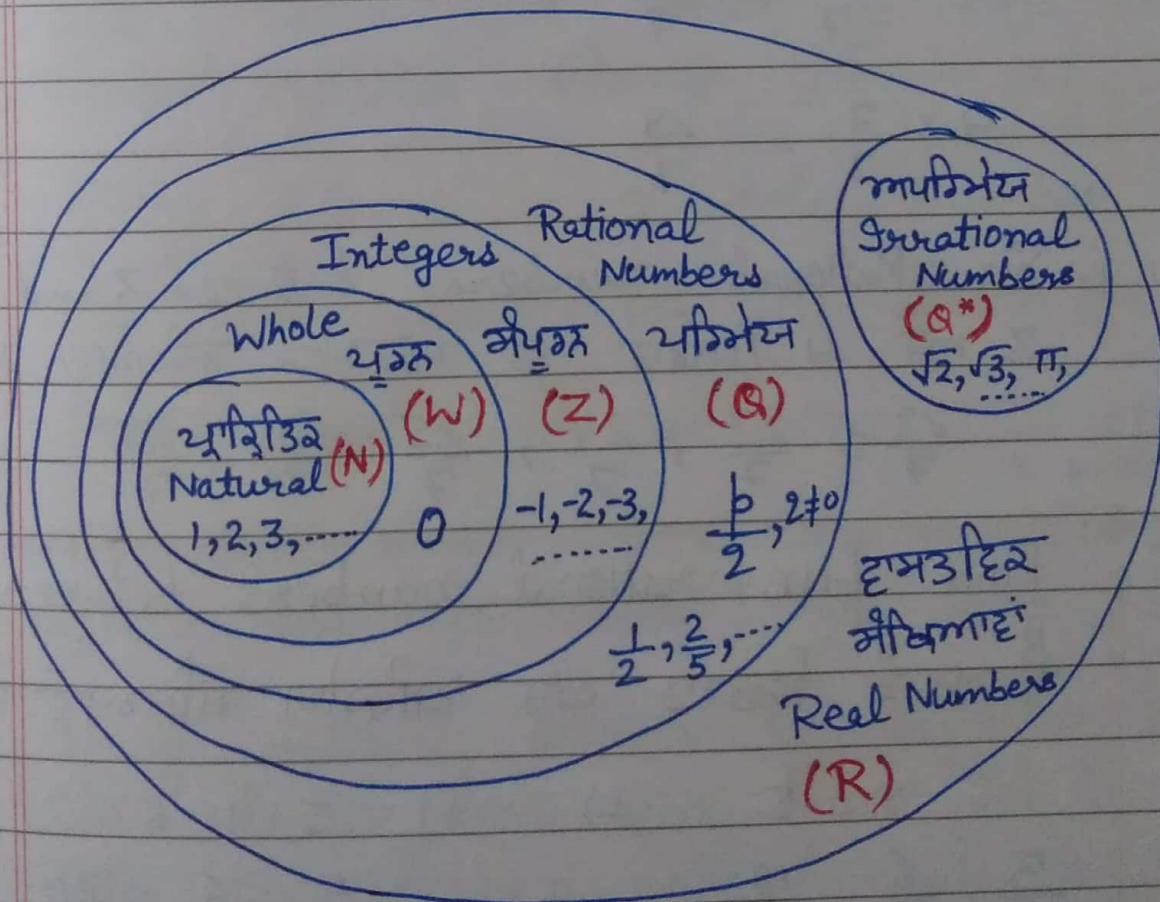
$$\frac{p}{q}, q \neq 0 \quad \text{e.g. } \frac{1}{2}, \frac{2}{5}, \dots$$

- * અયોગ્ય સંખ્યાઓ (Irrational Numbers) (Q*)

$$\sqrt{p}, p \text{ અવિભાજ્ય સંખ્યા (prime Number)}$$

$$\text{e.g. } \sqrt{2}, \sqrt{3}, \sqrt{5}, \sqrt{7}, \pi, \dots$$

- * હામડાદાર સંખ્યાઓ (Real Numbers) (R)
- { યોગ્ય, અયોગ્ય } { Rational, Irrational }



Ques ①

Ans:

Is Zero a rational number? વી મિલક યામિએક મીધમા છે?

Yes, zero is a rational number.

because, we can write zero in the form $\frac{p}{q}$

$$\text{as } \frac{0}{1}, \frac{0}{2}, \dots$$

જાં, 0 હિં યામિએક મીધમા છે. રિહિરિં અમીં 0 ને $\frac{p}{q}$ છે હુય હિં લિય મરદે જાં નિદે $\frac{0}{1}, \frac{0}{2}, \dots$

Q②

Find six rational numbers between 3 and 4.
3 મરે 4 દિલરા હે યામિએક મીધમાદાં લેડે.

Ans:

$$n = 6 \Rightarrow n + 1 = 6 + 1 = 7$$

$$3 \times \frac{7}{7} = \frac{21}{7}$$

$$4 \times \frac{7}{7} = \frac{28}{7}$$

$\therefore$ Six Rational numbers between 3 and 4 are:-

3 મરે 4 દિલરા હે યામિએક મીધમાદાં જાં:-

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

Q③:

Find five rational numbers between $\frac{3}{5}$ and $\frac{4}{5}$.
 $\frac{3}{5}$ મરે $\frac{4}{5}$ દિલરા યાં યામિએક મીધમાદાં લેડે.

Ans:

$$n = 5 \Rightarrow n + 1 = 5 + 1 = 6$$

$$\frac{3}{5} \times \frac{6}{6} = \frac{18}{30}$$

$$\frac{4}{5} \times \frac{6}{6} = \frac{24}{30}$$

∴ Five rational numbers between $\frac{3}{5}$ and $\frac{4}{5}$ are $\frac{3}{5}$ and $\frac{4}{5}$ દિશામાં વાળા પાંચેય રેશનલ સંખ્યાઓ છે:—

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

મગી માં ગણતરી

Q4: State whether following statements are true/false
(i) Every natural number is a whole number.

જેવું પૂર્ણાંક સંખ્યા છે તે પૂર્ણ સંખ્યા હોય છે.

Sol: True, since the collection of whole numbers contain all the natural numbers.

મગી, વિશેષ પૂર્ણ સંખ્યા છે એમ કહી શકાય છે. આથી પૂર્ણ સંખ્યાઓ હોય છે.

(ii) Every integer is a whole number.

જેવું સંપૂર્ણ સંખ્યા છે તે પૂર્ણ સંખ્યા હોય છે.

Sol: False, since -4 is an integer but it is not a whole number.

ગણતરી, જેવું સંપૂર્ણ સંખ્યા છે તે પૂર્ણ સંખ્યા નથી હોતી. વિશેષ -4 છે સંપૂર્ણ સંખ્યા છે, પણ પૂર્ણ નથી.

(iii) Every rational number is a whole number.
જેવું રેશનલ સંખ્યા પૂર્ણ સંખ્યા હોય છે.

Sol: False, since $\frac{3}{4}$ is a rational number but not whole number.
ગણતરી, વિશેષ $\frac{3}{4}$ રેશનલ સંખ્યા છે પણ પૂર્ણ નથી.

Exercise : 1.2

Moments

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Q1

State whether the following statements are true or false. Justify your answers:

ਜੇਹਾਂ ਵਿੱਚੋਂ ਕੁਝ ਸਹੀ ਅਤੇ ਜੇਹਾਂ ਗਲਤ? ਕਾਰਨ ਦਿਓ।

(i) Every irrational number is a real number.
ਜੇਹੇ ਅਪਰਿਮੇਯ ਸੰਖਿਆਵਾਂ ਵਿੱਚੋਂ ਦਸਤਾਵੇਜ਼ ਸੰਖਿਆਵਾਂ ਹੁੰਦੀਆਂ ਹਨ।

Sol:

True, since real number contain both rational and irrational numbers.

ਸਹੀ, ਕਿਉਂਕਿ ਦਸਤਾਵੇਜ਼ ਸੰਖਿਆਵਾਂ ਦਾ ਸਮੂਹ ਅਪਰਿਮੇਯ ਅਤੇ ਅਪਰਿਮੇਯ ਸੰਖਿਆਵਾਂ 'ਤੇ ਮਿਲ ਕੇ ਬਣਦਾ ਹੈ।

(ii) Every point on the number line is of the form $\sqrt{m}$, where m is a natural number.
ਸੰਖਿਆ ਰੇਖਾ ਦਾ ਜੇਹੇ ਬਿੰਦੂ $\sqrt{m}$ ਦੇ ਰੂਪ ਵਿੱਚ ਹੁੰਦੇ ਹਨ, ਜਿੱਥੇ m ਇੱਕ ਪ੍ਰਾਕ੍ਰਿਤਿਕ ਸੰਖਿਆ ਹੈ।

Sol:

False, since -2 is a real number but it is not the square root of any natural number.

ਗਲਤ, ਕਿਉਂਕਿ -2 ਇੱਕ ਦਸਤਾਵੇਜ਼ ਸੰਖਿਆ (-2) ਹੈ ਜੋ ਕਿ ਪ੍ਰਾਕ੍ਰਿਤਿਕ ਸੰਖਿਆ ਦਾ ਵਰਗਮੂਲ ਨਹੀਂ ਹੋ ਸਕਦੀ।

(iii) Every real number is an irrational number.
ਜੇਹੇ ਦਸਤਾਵੇਜ਼ ਸੰਖਿਆਵਾਂ ਵਿੱਚੋਂ ਅਪਰਿਮੇਯ ਸੰਖਿਆਵਾਂ ਹੁੰਦੀਆਂ ਹਨ।

Sol: False, Since 2 is a real number but it is not irrational number.

ਗਲਤ, ਕਿਉਂਕਿ 2 ਇੱਕ ਵਾਸਤਵਿਕ ਸੰਖਿਆ ਹੈ ਪਰੰਤੂ
ਅਪਰਿਮੇਯ ਨਹੀਂ।

Q2 Are the square roots of all positive integers irrational?
ਕੀ ਸਾਰੀਆਂ ਧਨਾਤਮਕ ਸੰਪੂਰਨ ਸੰਖਿਆਵਾਂ ਦੇ ਵਰਗਮੂਲ
ਅਪਰਿਮੇਯ ਹੁੰਦੇ ਹਨ?

Sol: No, the square roots of all positive integers are not irrational.
Since $\sqrt{4} = 2$ is a rational number, not irrational.
ਕੀ, ਉਦਾਹਰਣ ਦੇ ਲਈ $\sqrt{4} = 2$ ਪਰਿਮੇਯ ਸੰਖਿਆ ਹੈ
ਅਪਰਿਮੇਯ ਨਹੀਂ।

Q3 Show how $\sqrt{5}$ can be represented on number line.
ਦਿਖਾਓ ਕਿ ਸੰਖਿਆ ਰੇਖਾ 'ਤੇ $\sqrt{5}$ ਨੂੰ ਕਿਸ ਤਰ੍ਹਾਂ ਨਿਰੂਪਤ ਕੀਤਾ
ਜਾ ਸਕਦਾ ਹੈ?

Sol:

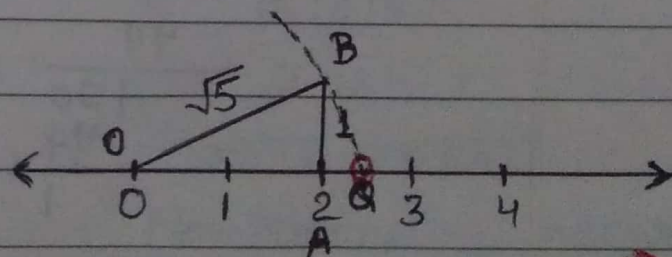
$$5 = 2^2 + 1^2$$

$$\Rightarrow OB^2 = OA^2 + AB^2$$

$$= 2^2 + 1^2$$

$$= 4 + 1 = 5$$

$$\therefore OB = \sqrt{5}$$



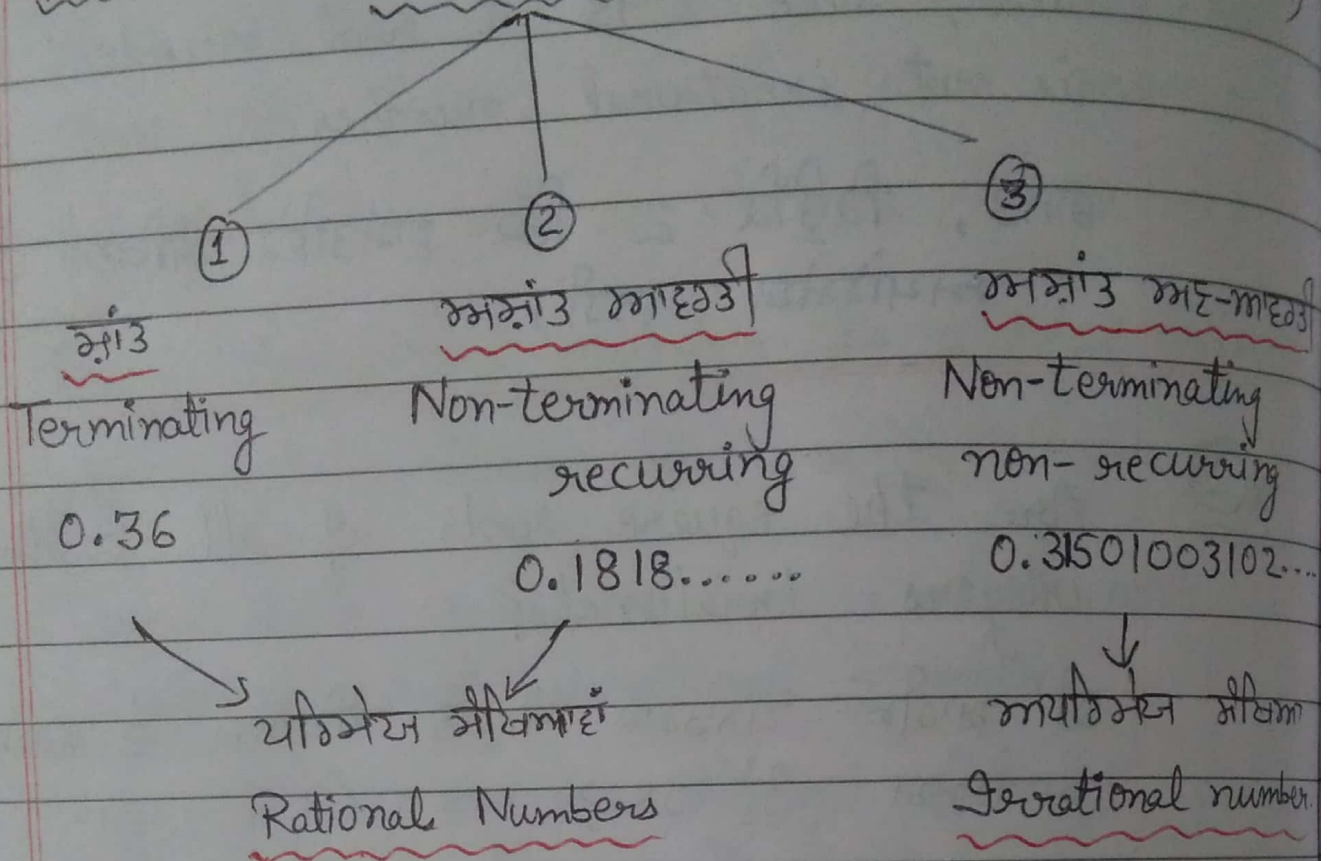
Point ਦਿਖਾਏ $\sqrt{5}$

Exercise : 1.3

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Note:

ਦਸ਼ਮਲਵ ਵਿਸਤਾਰ (Decimal Expansion)



Q 1 ਦਸ਼ਮਲਵ ਰੂਪ ਵਿੱਚ ਦਿੱਤੇ ਅੰਕਾਂ ਦੇ ਦਸ਼ਮਲਵ ਵਿਸਤਾਰ ਦਾ ਕੀ ਕਾਰਨ ਹੈ।

Write in decimal form and say what kind of decimal expansion each has :

(i) $\frac{36}{100} = 0.36$ ਸਮਾਂਤ ਦਸ਼ਮਲਵ ਵਿਸਤਾਰ
Terminating decimal expansion.

(ii) $\frac{1}{11} = 0.0909.....$
ਅਸਮਾਂਤ ਮੁੜਰੁਪ
Non-terminating recurring.

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

$$\begin{array}{r} 4.125 \\ 8 \overline{) 33.000} \\ \underline{32} \\ 10 \\ \underline{8} \\ 20 \\ \underline{16} \\ 40 \\ \underline{40} \\ \hline \end{array}$$

$4\frac{1}{8} = 4.125$ માં 3 સ્થાનો પર
Terminating.

(iv) $\frac{3}{13}$

$$\begin{array}{r} 0.230769 \\ 13 \overline{) 3.00000} \\ \underline{26} \\ 40 \\ \underline{39} \\ 100 \\ \underline{91} \\ 90 \\ \underline{78} \\ 120 \\ \underline{117} \\ 3 \\ \hline \end{array}$$

$\frac{3}{13} = 0.230769$

અમાં 3 સ્થાનો પર

Non-terminating recurring.

(v) $\frac{2}{11}$

$$\begin{array}{r} 0.1818 \dots \\ 11 \overline{) 2.0} \\ \underline{11} \\ 90 \\ \underline{88} \\ 20 \\ \underline{11} \\ 90 \\ \underline{88} \\ \hline \end{array}$$

$\frac{2}{11} = 0.1818 \dots$
 $= 0.\overline{18}$

અમાં 2 સ્થાનો પર

Non-terminating recurring

(vi) $\frac{329}{400}$

$$\begin{array}{r} 0.8225 \\ 400 \overline{) 329.000} \\ \underline{3200} \\ 900 \\ \underline{800} \\ 1000 \\ \underline{800} \\ 2000 \\ \underline{2000} \\ 0 \end{array}$$

$$\frac{329}{400} = 0.8225$$

ਸਾਂਤ ਦਸਮਲਕ ਦਿਸਤ

Terminating

Q. (2)

$\frac{1}{7} = 0.\overline{142857}$ ਜਾਂ $\frac{2}{7}, \frac{3}{7}, \frac{4}{7}, \frac{5}{7}, \frac{6}{7}$ ਦੇ ਦਸਮਲਕ ਦਿਸਤ

$\frac{1}{7} = 0.\overline{142857}$. Can you predict the decimal expansions of $\frac{2}{7}, \frac{3}{7}, \frac{4}{7}, \frac{5}{7}, \frac{6}{7}$.

Sol:

$$\frac{2}{7} = 2 \times \frac{1}{7} = 2 \times 0.\overline{142857} = 0.\overline{285714}$$

$$\frac{3}{7} = 3 \times \frac{1}{7} = 3 \times 0.\overline{142857} = 0.\overline{428571}$$

$$\frac{4}{7} = 4 \times \frac{1}{7} = 4 \times 0.\overline{142857} = 0.\overline{571428}$$

$$\frac{5}{7} = 5 \times \frac{1}{7} = 5 \times 0.\overline{142857} = 0.\overline{714285}$$

$$\frac{6}{7} = 6 \times \frac{1}{7} = 6 \times 0.\overline{142857} = 0.\overline{857142}$$

Q3) $\frac{p}{2}$ છે ગુપ દિલ્લ સમાપ્ત:

Express in the form $\frac{p}{2}$, $2 \neq 0$.

(i) $0.\overline{6}$

Sol: Let $x = 0.666\ldots \rightarrow \text{①}$
મન સર

મમીરણ ① ને 10 તાલ ગુપા રગ 3

Multiplying both sides of ① by 10,

$$10x = 10 \times 0.666\ldots$$

$$10x = 6.666\ldots \rightarrow \text{②}$$

મમીરણ ② દિલ્લ ① ને પગાઉ 3
Subtract eqn. ① from eqn. ②

$$10x = 6.666\ldots$$

$$- 1x = 0.666\ldots$$

$$9x = 6.000$$

$$x = \frac{6}{9}$$

$$x = \frac{2}{3} \text{ Ans.}$$

(ii) $0.4\overline{7}$

Let મન સર $x = 0.47777\ldots \rightarrow \text{①}$

મમીરણ ① ને 10 તાલ ગુપા રગ 3,

Multiplying both sides of ① by 10

$$10x = 10 \times 0.47777\ldots$$

$$10x = 4.7777 \dots \rightarrow (2)$$

સમીકરણ (2) દિઠ (1) ની પાછાડિયે કે

Subtract eqn. (1) from eqn. (2)

$$10x = 4.7777 \dots$$

$$- 1x = 0.4777 \dots$$

$$9x = 4.3000$$

$$x = \frac{4.3}{9}$$

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

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

Let મોન સંકેત $x = 0.001001001 \dots \rightarrow (1)$

સમીકરણ (1) ની 1000 તાલ ગુણ રાખ કે

Multiplying both sides of eqn. (1) by 1000.

$$1000x = 1000 \times 0.001001001 \dots$$

$$1000x = 1.001001001 \dots \rightarrow (2)$$

સમીકરણ (2) દિઠ (1) પાછાડિયે કે

Subtract eqn. (1) from eqn. (2)

$$1000x = 1.001001001 \dots$$

$$- 1x = 0.001001001 \dots$$

$$999x = 1.0000 \dots$$

$$x = \frac{1}{999}$$

Q.4) $0.999\ldots$ ਨੂੰ $\frac{p}{q}$ ਦੇ ਰੂਪ ਵਿੱਚ ਲਿਖੋ

Express $0.999\ldots$ in the form $\frac{p}{q}$

Sol: Let ਮੰਨ ਲਵੋ $x = 0.999\ldots \rightarrow \text{①}$

ਸਮੀਕਰਨ ① ਨੂੰ 10 ਨਾਲ ਗੁਣਾ ਕਰੋ

Multiplying both sides of eqn. ① by 10

$$10x = 10 \times 0.999\ldots$$

$$10x = 9.999\ldots \rightarrow \text{②}$$

ਸਮੀਕਰਨ ② ਵਿੱਚ ① ਘਟਾਉਣ 'ਤੇ

Subtract eqn. ① from eqn. ②

$$10x = 9.999\ldots$$

$$-x = 0.999\ldots$$

$$9x = 9.000$$

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

$$x = 1$$

Q.6) For rational numbers in the form of $\frac{p}{q}$ (terminating decimal) ($q \neq 0$)

Can you guess what property q must satisfy?

$\frac{p}{q}$ ਦੇ ਰੂਪ ਦੀਆਂ ਪਰਿਮਾਣ ਮੀਧਮਾਣਾਂ ਲਈ, q ਦਾ ਕਿਹੜਾ ਗੁਣ ਜ਼ਰੂਰ ਮੰਤਵਪੂਰਨ ਹੋਣਾ ਚਾਹੀਦਾ ਹੈ? ਸਾਂਤ ਦਸ਼ਮਲਵ ਵਿਸਤਾਰ ਲਈ।

Sol:

2 ਦੇ ਗੁਣਕਾਂ 2 ਦੀ ਘਾਤ ਜਾਂ 5 ਦੀ ਘਾਤ ਜਾਂ ਦੋਨੋਂ ਦੁੱਧੇ ਚਾਹੀਦੇ ਹਨ।

2 must have either 2 or 5 or both of them as the only prime factors.

Q 7

Write three numbers whose decimal expansions are non-terminating non-recurring.

ਅਨਿਸ਼ਚਿਤ ਤਿੰਨ ਸੰਖਿਆਵਾਂ ਲਿਖੋ ਜਿਨ੍ਹਾਂ ਦੇ ਦਸ਼ਮਲਵ ਵਿਸਥਾਰ ਅਨਿਸ਼ਚਿਤ ਅਤੇ-ਪਰਤਰਨ ਹੋਣ।

Sol:

(i) 0.01001000102.....

(ii) 0.2020020003.....

(iii) 0.003030004.....

Q 8

Find three irrational numbers between $\frac{5}{7}$ and $\frac{9}{11}$.

$\frac{5}{7}$ ਅਤੇ $\frac{9}{11}$ ਵਿਚਾਲੇ ਤਿੰਨ ਅਪਰਿਮਾਣ ਸੰਖਿਆਵਾਂ ਲੱਭੋ।

Sol:

$$\begin{array}{r}
 0.71428571\ldots \\
 7 \overline{) 5.00} \\
 \underline{49} \\
 10 \\
 \underline{7} \\
 30 \\
 \underline{28} \\
 20 \\
 \underline{14} \\
 60 \\
 \underline{56} \\
 40 \\
 \underline{35} \\
 50 \\
 \underline{49} \\
 10 \\
 \underline{7}
 \end{array}$$

$$\begin{array}{r}
 0.8181\ldots \\
 11 \overline{) 9.0} \\
 \underline{88} \\
 20 \\
 \underline{11} \\
 90 \\
 \underline{88} \\
 20 \\
 \underline{11} \\
 9
 \end{array}$$

Three irrational numbers between $\frac{5}{7}$ and $\frac{9}{11}$ are
 $\frac{5}{7}$ અને $\frac{9}{11}$ દિશામાં કેટલાક અપરિમેય સંખ્યાઓ જાણો:-

(i) 0.72010010003.

(ii) 0.760700703.

(iii) 0.8013200103.

Q9) Classify rational or irrational :-

પરિમેય અને અપરિમેય સંખ્યાઓ યાજો:-

(i) $\sqrt{23}$ અપરિમેય Irrational

(ii) $\sqrt{225} = \sqrt{15 \times 15} = 15$ પરિમેય Rational

(iii) 0.3796 જાણે છે અમરજી દિશામાં $\Rightarrow$ પરિમેય
 Terminating decimal expansion $\Rightarrow$ Rational

(iv) $7.478478. = 7.\overline{478}$

અમરજી જાણે છે $\Rightarrow$ અપરિમેય

Non-terminating Recurring $\Rightarrow$ Rational

(v) 1.101001000100001.

અમરજી અનન્ય-અમરજી $\Rightarrow$ અપરિમેય

Non-terminating non-recurring $\Rightarrow$ Irrational

Exercise : 1.4

Moments

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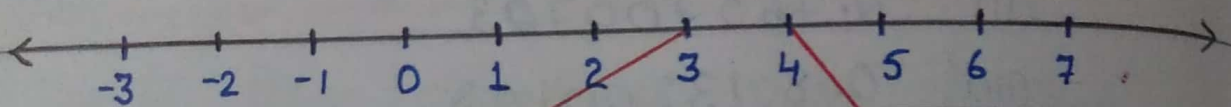
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Q(1)

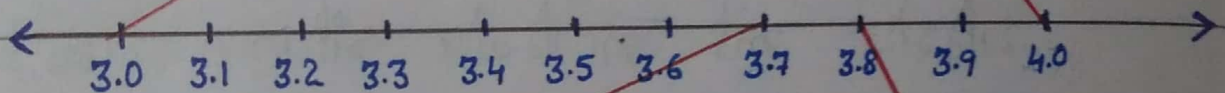
ਲਗਤਰ ਆਇਤਰਨ ਕਰਕੇ ਸੀਖਿਆ ਜੇਕਰ 3.765 ਨੂੰ ਦਰਸਾਇਆ ਜਾਵੇ

Visualise 3.765 on number line, using successive magnification.

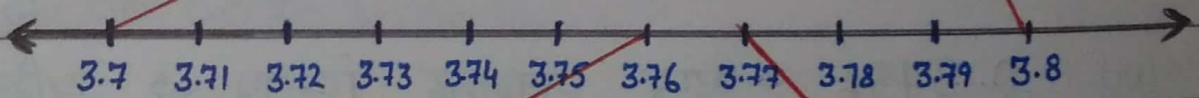
Sol: Step 1:



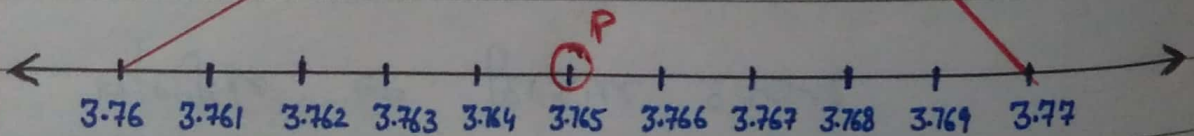
Step 2:



Step 3:



Step 4:



Point ਦਿਖਾਏ P $\leftrightarrow 3.765$

Q(2)

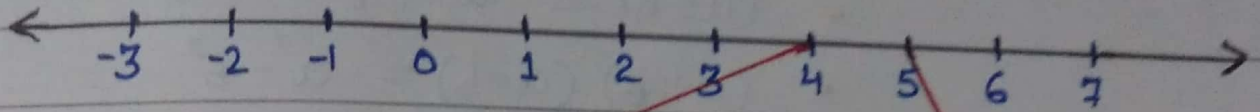
4 ਦਸਮਲਕ ਸਥਾਨਾਂ ਤੱਕ ਸੀਖਿਆ ਜੇਕਰ $4.\overline{26}$ ਨੂੰ ਦਰਸਾਇਆ ਜਾਵੇ

Visualise $4.\overline{26}$ on number line upto 4 decimal places.

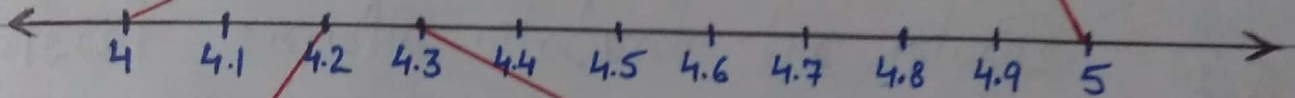
Sol:

$$4.\overline{26} = 4.2626 \dots$$

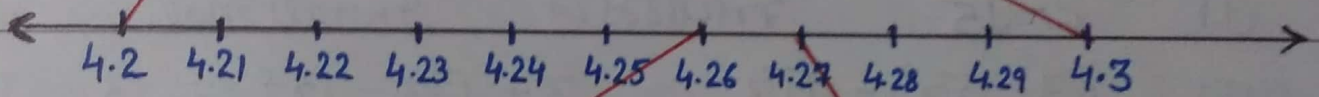
Step 1:



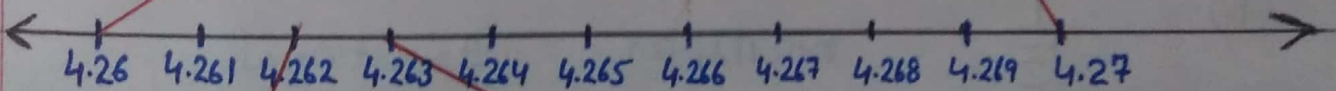
Step 2:



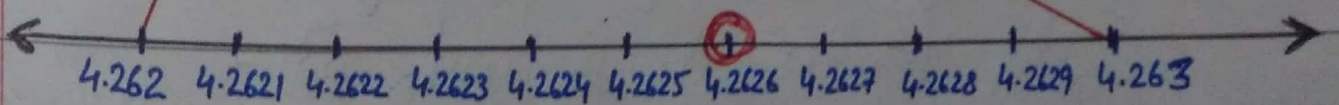
Step 3:



Step 4:



Step 5:



Exercise : 1.5

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Note:

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

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

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

$$* \sqrt{a} \times \sqrt{b} = \sqrt{ab}$$

$$* \sqrt{a} \times \sqrt{a} = (\sqrt{a})^2 = a$$

Q(1) યામિરેન ને મયામિરેન સીધામદી વિડીની સહ :-

Classify following nos as rational or irrational

(i) $2 - \sqrt{5}$ મયામિરેન Irrational

(ii) $(3 + \sqrt{23}) - \sqrt{23} = 3 + \sqrt{23} - \sqrt{23} = 3$ યામિરેન
Rational

(iii) $\frac{2\sqrt{7}}{7\sqrt{7}} = \frac{2}{7}$ યામિરેન Rational

(iv) $\frac{1}{\sqrt{2}}$ મયામિરેન Irrational

(v) 2π મયામિરેન Irrational

Q(2) Simplify each of following expressions:

જેર દિમીસર ને મરુર રો :-

$$\begin{aligned} \text{(i)} \quad & (3 + \sqrt{3})(2 + \sqrt{2}) \\ &= 3(2 + \sqrt{2}) + \sqrt{3}(2 + \sqrt{2}) \\ &= 6 + 3\sqrt{2} + 2\sqrt{3} + \sqrt{6} \end{aligned}$$

(ii) $(3+\sqrt{3})(3-\sqrt{3})$ $a=3$
 $b=\sqrt{3}$

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

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

$$= 9 - 3 = 6$$

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

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

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

$$= 5 + 2 + 2\sqrt{10}$$

$$= 7 + 2\sqrt{10}$$

(iv) $(\sqrt{5} - \sqrt{2})(\sqrt{5} + \sqrt{2})$ $a=\sqrt{5}$
 $b=\sqrt{2}$

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

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

$$= 5 - 2 = 3$$

Q 3) Ans: $\pi = \frac{C}{d}$ Either C or d are irrational.
C or d में से कोई भी irrational होगा।

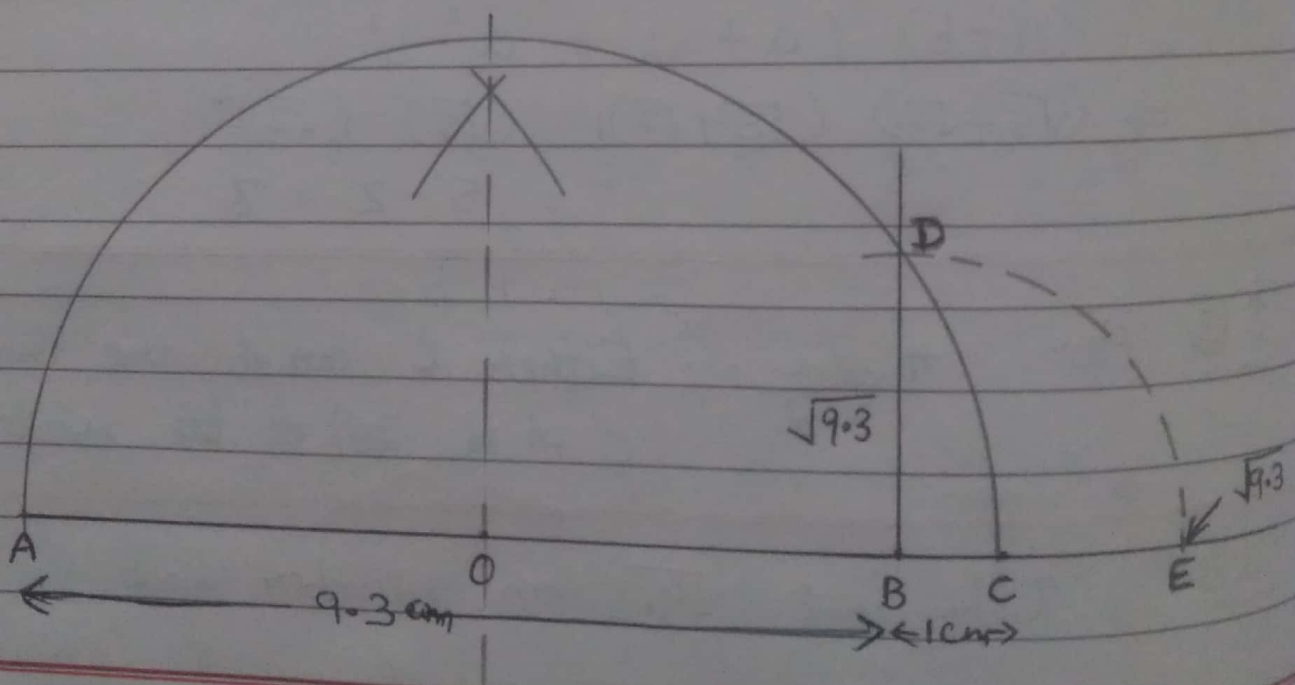
Q 4) Represent $\sqrt{9.3}$ on number line

सीधे से $\sqrt{9.3}$ को दर्शाओ।

- Sol:-
- | | |
|--|--|
| <p>① रेखाखंड $AB = 9.3$ cm खींचो।</p> <p>② $BC = 1$ cm लडो।</p> <p>③ AC को समद्विभाजित करो।</p> <p>④ रेखाखंड AC पर O से समद्विभाजित बिंदु खींचो।</p> | <p>① Draw line segment $AB = 9.3$ cm.</p> <p>② Extend AB to point C by 1 cm.</p> <p>③ Bisect line segment AC.</p> |
|--|--|

- ④ ਦਿੰਦੇ O ਨੂੰ ਰੇਖਾ ਸੈਨ ਦੇ ਸਥਿਤ
 OA ਨੂੰ ਮਾਪਦਿਸ਼ਾ ਸੈਨ ਦੇ
 ਇੱਕ ਮਾਪ ਚੋਰ ਚਿੱਠੇ।
- ⑤ ਦਿੰਦੇ B , ਤੇ $DB \perp AC$ ਚਿੱਠੇ।
- ⑥ $BD = \sqrt{9.3}$
- ⑦ ਦਿੰਦੇ B ਨੂੰ ਰੇਖਾ ਸੈਨ ਦੇ ਸਥਿਤ
 BD ਨੂੰ ਮਾਪਦਿਸ਼ਾ ਸੈਨ ਦੇ
 ਇੱਕ ਚਾਪ ਲਗਾਉ ਸਿਤੀ
 ਸੀਖਿਆ ਹੋਰਾ ਨੂੰ ਦਿੰਦੇ E ਤੇ ਰੱਧੇ।
- ⑧ ਦਿੰਦੇ $E \rightarrow \sqrt{9.3}$

- AC bisects at point O.
- ④ Draw a semicircle with Centre O and radius OA.
- ⑤ At point B, Draw $DB \perp AC$
- ⑥ $BD = \sqrt{9.3}$
- ⑦ Draw an arc with centre B and radius BD which intersect number line at point E
- ⑧ Point $E \rightarrow \sqrt{9.3}$



- Q⑤ Rationalise the denominators: ਜੋ ਦਾ ਅੰਸ਼ਕਰਨ
- (i) $\frac{1}{\sqrt{7}} = \frac{1}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}}$
 $= \frac{\sqrt{7}}{7}$

$$\begin{aligned}
 \text{(ii)} \quad \frac{1}{\sqrt{7}-\sqrt{6}} &= \frac{1}{\sqrt{7}-\sqrt{6}} \times \frac{\sqrt{7}+\sqrt{6}}{\sqrt{7}+\sqrt{6}} \rightarrow \left[\begin{array}{l} (a+b)(a-b) \\ = a^2-b^2 \end{array} \right] \\
 &= \frac{\sqrt{7}+\sqrt{6}}{(\sqrt{7})^2-(\sqrt{6})^2} = \frac{\sqrt{7}+\sqrt{6}}{7-6} \\
 &= \frac{\sqrt{7}+\sqrt{6}}{1}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii)} \quad \frac{1}{\sqrt{5}+\sqrt{2}} &= \frac{1}{\sqrt{5}+\sqrt{2}} \times \frac{\sqrt{5}-\sqrt{2}}{\sqrt{5}-\sqrt{2}} \\
 &= \frac{\sqrt{5}-\sqrt{2}}{(\sqrt{5})^2-(\sqrt{2})^2} = \frac{\sqrt{5}-\sqrt{2}}{5-2} \\
 &= \frac{\sqrt{5}-\sqrt{2}}{3}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iv)} \quad \frac{1}{\sqrt{7}-2} &= \frac{1}{\sqrt{7}-2} \times \frac{\sqrt{7}+2}{\sqrt{7}+2} \\
 &= \frac{\sqrt{7}+2}{(\sqrt{7})^2-(2)^2} \\
 &= \frac{\sqrt{7}+2}{7-4} = \frac{\sqrt{7}+2}{3} \quad \text{Ans.}
 \end{aligned}$$

Exercise : 1.6

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Note :

- * $a^m \times a^n = a^{m+n}$
- * $a^m \div a^n = a^{m-n}$
- * $(a^m)^n = a^{mn}$
- * $a^m \times b^m = (ab)^m$
- * $a^0 = 1$
- * $a^{-m} = \frac{1}{a^m}$

Q(1) Find $\sqrt[4]{2^5}$:

$$\begin{aligned} \text{(i)} \quad (64)^{\frac{1}{2}} &= (8 \times 8)^{\frac{1}{2}} \\ &= (8^2)^{\frac{1}{2}} \\ &= 8^{2 \times \frac{1}{2}} \\ &= 8^1 = 8 \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad (32)^{\frac{1}{5}} &= (2 \times 2 \times 2 \times 2 \times 2)^{\frac{1}{5}} \\ &= (2^5)^{\frac{1}{5}} \\ &= 2^{5 \times \frac{1}{5}} \\ &= 2^1 = 2 \end{aligned}$$

$$\begin{array}{r} 2 \overline{) 32} \\ 2 \overline{) 16} \\ 2 \overline{) 8} \\ 2 \overline{) 4} \\ 2 \overline{) 2} \\ \hline 1 \end{array}$$

$$\begin{aligned} \text{(iii)} \quad (125)^{\frac{1}{3}} &= (5 \times 5 \times 5)^{\frac{1}{3}} \\ &= (5^3)^{\frac{1}{3}} \\ &= 5^{3 \times \frac{1}{3}} = 5 \text{ Ans.} \end{aligned}$$

$$\begin{array}{r} 5 \overline{) 125} \\ 5 \overline{) 25} \\ \hline 5 \end{array}$$

Q(2) Find $\sqrt[3]{2^7}$:

$$\begin{aligned} \text{(i)} \quad 9^{\frac{3}{2}} &= (3 \times 3)^{\frac{3}{2}} = (3^2)^{\frac{3}{2}} = (3)^{2 \times \frac{3}{2}} \\ &= (3)^3 = 3 \times 3 \times 3 = 27 \end{aligned}$$

$$\begin{aligned}
 \text{(ii)} \quad (32)^{2/5} &= (2^5)^{2/5} \\
 &= (2)^{5 \times \frac{2}{5}} \\
 &= (2)^2 \\
 &= 2 \times 2 \\
 &= 4
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii)} \quad (16)^{3/4} &= (2^4)^{3/4} \\
 &= (2)^{4 \times \frac{3}{4}} \\
 &= (2)^3 \\
 &= 2 \times 2 \times 2 \\
 &= 8
 \end{aligned}$$

$$\begin{aligned}
 \text{(iv)} \quad (125)^{-1/3} &= (5^3)^{-1/3} = (5)^{3 \times \frac{-1}{3}} = (5)^{-1} = \frac{1}{5} \text{ Ans.}
 \end{aligned}$$

Q(3) Find $2\sqrt{3} \cdot 2\sqrt{5}$

$$\begin{aligned}
 \text{(i)} \quad 2^{2/3} \cdot 2^{1/5} &= 2^{\frac{2}{3} + \frac{1}{5}} \\
 &= 2^{\frac{10+3}{15}} \\
 &= 2^{\frac{13}{15}}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii)} \quad \frac{11^{1/2}}{11^{1/4}} &= (11)^{\frac{1}{2} - \frac{1}{4}} \\
 &= (11)^{\frac{2-1}{4}} \\
 &= (11)^{1/4}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii)} \quad \left(\frac{1}{3^3}\right)^7 &= \left(\frac{1}{3}\right)^{3 \times 7} = \left(\frac{1}{3}\right)^{21}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iv)} \quad 7^{1/2} \cdot 8^{1/2} &= (7 \times 8)^{1/2} \\
 &= (56)^{1/2}
 \end{aligned}$$