Exercise 1.1

Q.1 Identify each of the following as a rational or irrational numbers：

Rational numbers

（i)2357535（ii) 0.6 (ix）$\frac{15}{4}$（x)$(2-\sqrt{2})(2+\sqrt{2})$

Irrational numbers

（iii） 2236067．．．．．．199（iv）$\sqrt{7}$

（v） e （Vi）π exports

（vii） $5+\sqrt{11}$ （viii）$\sqrt{3}+\sqrt{13}$ menims

Q.2 Represent the following numbers on number line：

（i）$\sqrt{2}$

Solution：

$\sqrt{2}$ can be located on the real line by geometric construction. Mark a perpendicular line of $m\overline{AB}=1$ unit at A， where $m\overline{OA}=1$ unit, and we have a right－angle triangle OAB . By using Pythagoras theorem

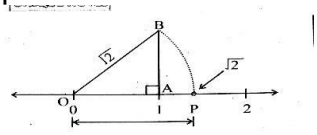
$$(m\overline{OB})^2=(m\overline{OA})^2+(m\overline{AB})^2$$

$$\sqrt{(m\overline{OB})^2}=\sqrt{(m\overline{OA})^2+(m\overline{AB})^2}$$

$$m\overline{OB}=\sqrt{(1)^2+(1)^2}=\sqrt{1+1}=\sqrt{2}$$

Taking 0 as centre, draw ay are of nothis m $\overline{OB}=\sqrt{2}$ Wrowl car the number tine ais P W o gat fail "P" represeming $\sqrt{2}$ an the number lowe

So, $|\overrightarrow{OP}|=\sqrt{2}$



(iii) $\sqrt{3}$

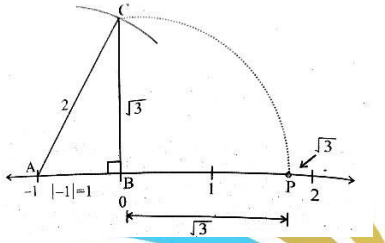
Solution:

$\sqrt{3}$ an be located on the real line by geometric method.Mark a line of $m\overline{AB}=1$ unit at A . With centre at A draw an arc of radius 2 units above the line. From point B draw a perpendicolar lime segment so that it cuts the arc at C. Join A to C.We have a right-angled $\triangle ABC$ on which $m\overline{AB}$ =1 unit and $m\overline{AC}=2$ units. By using pythagoras theorem

$$\left(m\overline{AC}\right)^2 = \left(m\overline{AB}\right)^2 + \left(m\overline{BC}\right)^2$$
$$(2)^2 = (1)^2 + \left(m\overline{BC}\right)^2$$
$$4 = 1 + \left(m\overline{BC}\right)^2$$
$$4 - 1 = \left(m\overline{BC}\right)^2$$
$$3 = \left(m\overline{BC}\right)^2$$
$$\sqrt{\left(m\overline{BC}\right)^2} = \sqrt{3}$$
$$m\overline{BC} = \sqrt{3}$$

Now consider B is at 0.Taking B as centre: draw an arc of radius in $m\overline{Bc} = \sqrt{3}$, which cut the number line at P.We get proint " P representing $\sqrt{3}$ on the mumber line.

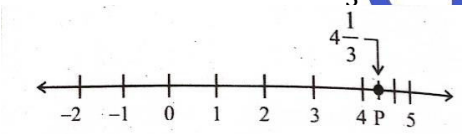
So, $|\overrightarrow{BP}| = \sqrt{3}$



(iii) $4\frac{1}{3}$

Solution:

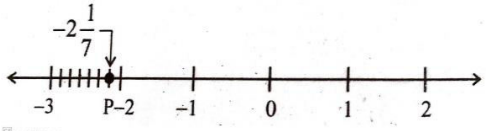
Point P represents $4\frac{1}{3}$ on the number line.



(iv) $-2\frac{1}{7}$

Solution:

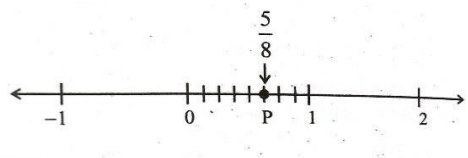
Point P represents $-2\frac{1}{7}$ on the number line.



(v) $\frac{5}{8}$

Solution :

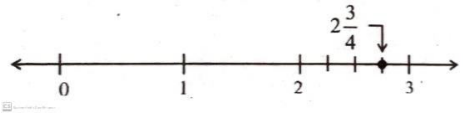
Point P represents $\frac{5}{8}$ on the number line.



(vi) $2\frac{3}{4}$

Solution:

Point P represents $2\frac{3}{4}$ on the number line.



Q. 3 Express the following as a rational number $\frac{p}{q}$ where p and q are integers and $q \neq 0$.

(i) $0.\overline{4}$

Solution:

Let $x = 0.\overline{4}$

$x = 0.4444.$

Multiplying both sides by " 10 ", we get

$$10x = 10(0.4444\ldots)$$

$$10x = 4.444\ldots$$

Subtracting eq. (i) from (ii)

$$10x - x = (4.444\ldots) - (0.4444\ldots)$$

$$9x = 4$$

$$x = \frac{4}{9}$$

$$\Rightarrow 0.\overline{4} = \frac{4}{9}$$

(ii) $0.\overline{37}$

Solution:

Let $x = 0.\overline{37}$

$$x = 0.37373737\ldots$$

Multiplying both sides by " 100 "

$$100x = 100(0.37373737\ldots)$$

$$100x = 37.373737\ldots$$

Subtracting eq. (i) from (ii)

$$100x - x = (37.373737\ldots) - (0.37373737\ldots)$$
$$99x = 37$$
$$x = \frac{37}{99}$$
$$\Rightarrow 0.\overline{37} = \frac{37}{99}$$

(iii) $0.\overline{21}$

Solution:

Let $x = 0.\overline{21}$

$$x = 0.21212121\ldots$$

Multiplying both sides by " 100 "

$$100x = 100(0.21212121\ldots)$$
$$100x = 21.212121$$

Subtracting eq.(i) from (ii)

$$100x - x = (21.212121\ldots) - (0.21212121\ldots)$$
$$99x = 21$$
$$x = \frac{21}{99} = \frac{7}{33}$$
$$\Rightarrow 0.\overline{21} = \frac{7}{33}$$

Q. 4 Name the property used in the following

Solution:

Sr. No.		Property Name
(i)	$(a + 4) + b = a + (4 + b)$	Associative property w.r.t addition
(ii)	$\sqrt{2} + \sqrt{3} = \sqrt{3} + \sqrt{2}$	Commutative property w.r.t addition
(iii)	$\boldsymbol{x - x = 0}$	Additive Inverse
(iv)	$a(b + c) = ab + ac$	Left distributive property of multiplication over addition.
(v)	$16 + 0 = 16$	Additive Identity
(vi)	$100 \times 1 = 100$	Multiplicative identity

(vii)	$4 \times (5 \times 8) = (4 \times 5) \times 8$	Associative property w.r.t multiplication
(viii)	$a\ \mathrm{b} = \mathrm{b}a$	Commutative property w.r.t multiplication.

5. Name the property used in the following：

Solution：

(i) $-3 < -1 \Rightarrow 0 < 2$

Additive property of inequality

(ii) If $a < b$ then $\frac{1}{a} > \frac{1}{b}$

Reciprocal property

(iii) If $\mathrm{a} < \mathrm{b}$ then $\mathrm{a} + \mathrm{c} < \mathrm{b} + \mathrm{c}$

Additive property of inequality

(iv)If $\mathrm{ac} < \mathrm{bc}$ and $\mathrm{c} > 0$ then $a < \mathrm{b}$

Cancellation property of inequality w.r.t multiplication.

(v)If $ac < bc$ and $c < 0$ then $a > b$

Cancellation property of inequality w.r.t multiplication.

(vi) Either $\mathrm{a} > \mathrm{b}$ or $\mathrm{a} = \mathrm{b}$ or $\mathrm{a} < \mathrm{b}$

Trichotomy puoperty

6. Insert two rational numbers between

(i) $\frac{1}{3}$ and $\frac{1}{4}$

Solution：

Two nimal numbers berween $\frac{1}{3}$ and $\frac{1}{4}$

Average of $\frac{1}{3}$ and $\frac{1}{4} = \left(\frac{1}{3} + \frac{1}{4}\right) \div 2$

$$= \left[\frac{4+3}{12}\right] \times \frac{1}{2}$$

$$= \frac{7}{12} \times \frac{1}{2} = \frac{7}{24}$$

Now we find average of $\frac{1}{3}$ and $\frac{7}{24}$

Average of $\frac{1}{3}$ and $\frac{7}{24} = \left(\frac{1}{3} + \frac{7}{24}\right) \div 2$

$$= \frac{8+7}{24} \times \frac{1}{2}$$
$$= \frac{15}{24} \times \frac{1}{2} = \frac{15}{48} = \frac{5}{16}$$

Thus $\frac{5}{16}$ and $\frac{7}{24}$ are neo natical numbers benreen $\frac{1}{3}$ and $\frac{1}{4}$

(ii) 3 and 4

Solution:

Two rational numbers between 3 and 4

Average of 3 and $4 = \frac{3+4}{2} = \frac{7}{2}$

Average of $\frac{7}{2}$ and $4 = \left(\frac{7}{2} + 4\right) \div 2$

$$= \left(\frac{7+8}{2}\right) \div \frac{2}{1}$$
$$= \frac{15}{2} \times \frac{1}{2}$$
$$= \frac{15}{4}$$

Thus $\frac{7}{2}$ and $\frac{15}{4}$ are two rational numbers between 3 and 4 .

(iii) $\frac{3}{5}$ and $\frac{4}{5}$

Solution:

Two rational numbers between $\frac{3}{5}$ and $\frac{4}{5}$

Average of $\frac{3}{5}$ and $\frac{4}{5} = \left(\frac{3}{5} + \frac{4}{5}\right) \div 2$

$$= \left(\frac{3+4}{5}\right) \times \frac{1}{2}$$
$$= \frac{7}{5} \times \frac{1}{2} = \frac{7}{10}$$

Average of $\frac{7}{10}$ and $\frac{4}{5} = \left(\frac{7}{10} + \frac{4}{5}\right) \times 2$

$$= \left(\frac{7+8}{10}\right) \times \frac{1}{2}$$
$$= \frac{15}{10} \times \frac{1}{2}$$
$$= \frac{18}{20} = \frac{1}{4}$$

Thus $\frac{7}{10}$ and $\frac{3}{4}$ are two rational numbers between $\frac{3}{5}$ and $\frac{4}{5}$