

Exercise 1.1

Rational Number:

A number which can be written in the form of $\frac{p}{q}$, where p and q are integers and $q \neq 0$, is called rational number.

Examples: $\frac{1}{4}$, $\frac{3}{8}$, $-\frac{4}{5}$, 0.32, $\sqrt{9}$ etc.

Irrational Number:

A number which cannot be written in the form of $\frac{p}{q}$, where p and q are integers and $q \neq 0$, is called irrational number.

Examples:

- (1) 0.333...
- (2) $\sqrt{5}$
- (3) $\pi = 3.1415926535897932...$
- (4) $e = 2.71828182845904...$

Decimal Representation of Rational Numbers

(i) Terminating Decimal Numbers:

A decimal number with a finite number of digits after the decimal point is called a terminating decimal number.

Examples: 0.25, 0.8, 0.375, 0.32 etc.

(ii) Non-Terminating Decimal Numbers:

A decimal number with an infinite number of digits after the decimal point is called a non-terminating decimal number.

Examples:

- (a) 0.333...
- (b) 3.142857142857...

(iii) Non-Terminating and Recurring Decimal Numbers:

A decimal number with an infinitely repeating pattern of digits after the decimal point is called a non-terminating and recurring decimal number.

Examples:

- (a) $0.\overline{3} = 0.3333...$
- (b) $0.\overline{4} = 0.44444...$

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Solution of Exercise

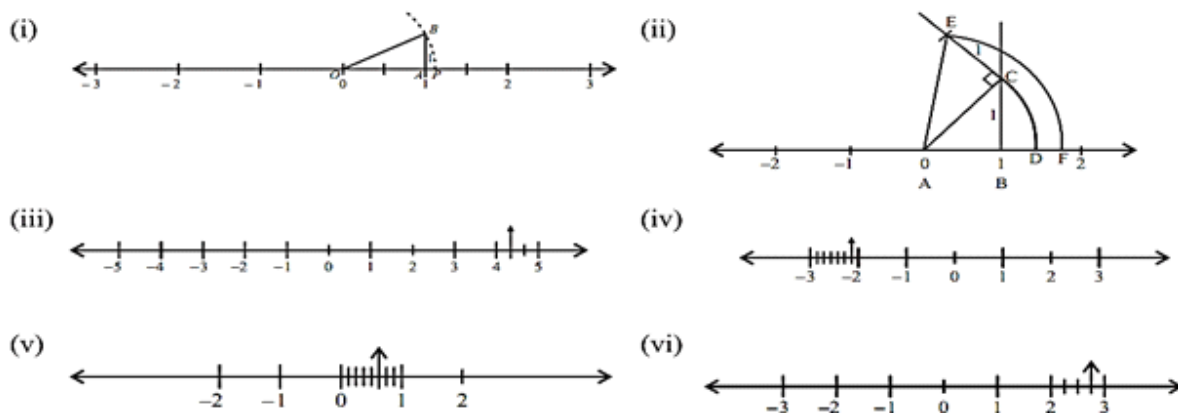
Question No. 1: Identify each of the following as a rational or irrational number.

Ans:

Sr.	Question	Rational or Irrational
(i)	2.353535	Rational
(ii)	0.6	Rational
(iii)	2.236067...	Irrational
(iv)	$\sqrt{7}$	Irrational
(v)	e	Irrational
(vi)	π	Irrational
(vii)	$5 + \sqrt{11}$	Irrational
(viii)	$\sqrt{3} + \sqrt{13}$	Irrational
(ix)	$\frac{15}{4}$	Rational
(x)	$(2 - \sqrt{2})(2 + \sqrt{2})$	Rational

Question No. 2: Represent the following numbers on number line:

Ans:



Question No. 3: Express the following as a rational number $\frac{p}{q}$, where p and q are integers and $q \neq 0$:

Ans:

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

Solution:

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

$$\Rightarrow x = 0.4444 \dots \quad (i)$$

Multiply both sides by 10:

$$\Rightarrow 10x = 10(0.4444\dots)$$

$$\Rightarrow 10x = 4.4444 \dots \quad (\text{ii})$$

Subtract eq. (i) from (ii):

$$\Rightarrow 10x - x = (4.4444 \dots) - (0.4444 \dots)$$

$$\Rightarrow 9x = 4$$

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

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

Solution:

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

$$\Rightarrow x = 0.373737 \dots \quad (\text{i})$$

Multiply both sides by 100:

$$\Rightarrow 100x = 100(0.373737 \dots)$$

$$\Rightarrow 100x = 37.373737 \dots \quad (\text{ii})$$

Subtract eq. (i) from (ii):

$$\Rightarrow 100x - x = (37.373737 \dots) - (0.373737 \dots)$$

$$\Rightarrow 99x = 37$$

$$\Rightarrow x = \frac{37}{99}$$

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

Solution:

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

$$\Rightarrow x = 0.212121 \dots \quad (\text{i})$$

Multiply both sides by 100:

$$\Rightarrow 100x = 100(0.212121 \dots)$$

$$\Rightarrow 100x = 21.212121 \dots \quad (\text{ii})$$

Subtract eq. (i) from (ii):

$$\Rightarrow 100x - x = (21.212121 \dots) - (0.212121 \dots)$$

$$\Rightarrow 99x = 21$$

$$\Rightarrow x = \frac{21}{99}$$

4. Name the property used in the following:

(i) $(a + 4) + b = a + (4 + b)$

(ii) $\sqrt{2} + \sqrt{3} = \sqrt{3} + \sqrt{2}$

(iii) $x - x = 0$

(iv) $a(b + c) = ab + ac$

(v) $16 + 0 = 16$

(vi) $100 \times 1 = 100$

(vii) $4 \times (5 \times 8) = (4 \times 5) \times 8$

(viii) $ab = ba$

Solution:

(i) Associative property over addition

(ii) Commutative property over addition

(iii) Additive inverse

(iv) Left distributive property

(v) Additive identity

(vi) Multiplicative identity

(vii) Associative property under multiplication

(viii) Commutative property under multiplication

5. Name the property used in the following:

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

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

(iii) If $a < b$ then $a + c < b + c$ (iv) If $ac < bc$ and $c > 0$ then $a < b$

(v) If $ac < bc$ and $c < 0$ then $a > b$ (vi) Either $a > b$ or $a = b$ or $a < b$

Solution:

(i) Additive property

(ii) Reciprocal property

(iii) Additive property

(iv) Multiplicative property

(v) Multiplicative property

(vi) Trichotomy property

6. Insert two rational numbers between:

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

(ii) 3 and 4

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

Solution:

(i) 1st number between given numbers = $\frac{\frac{1}{3} + \frac{1}{4}}{2}$

$$= \frac{\frac{4+3}{12}}{2}$$

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

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

$$\Rightarrow \text{1st number} = \frac{7}{24}$$

2nd number between given numbers = $\frac{\frac{7}{24} + \frac{1}{4}}{2}$

$$= \frac{\frac{7+6}{24}}{2}$$

$$= \frac{\frac{13}{24}}{\frac{2}{1}}$$

$$= \frac{13}{24} \times \frac{1}{2}$$

$$\Rightarrow \text{2nd number} = \frac{13}{48}$$

(ii) 1st number between given numbers = $\frac{3+4}{2}$

$$\Rightarrow \text{1st number} = \frac{7}{2}$$

2nd number between given numbers = $\frac{\frac{7}{2} + 4}{2}$

$$= \frac{\frac{7}{2} + \frac{4}{1}}{2}$$

$$= \frac{7+8}{\frac{2}{2}}$$

$$= \frac{15}{\frac{2}{1}}$$

$$= \frac{15}{2} \times \frac{1}{2}$$

$$\Rightarrow \text{2nd number} = \frac{15}{4}$$

(iii) 1st number between given numbers = $\frac{\frac{3}{5} + \frac{4}{5}}{2}$

$$= \frac{\frac{4+3}{5}}{2}$$

$$= \frac{\frac{7}{5}}{\frac{2}{1}}$$

$$= \frac{7}{5} \times \frac{1}{2}$$

$$\Rightarrow \text{1st number} = \frac{7}{10}$$

2nd number between given numbers = $\frac{\frac{7}{10} + \frac{4}{5}}{2}$

$$= \frac{\frac{7+8}{10}}{2}$$

$$= \frac{\frac{15}{10}}{\frac{2}{1}}$$

$$= \frac{15}{10} \times \frac{1}{2}$$

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

$$\Rightarrow \text{2nd number} = \frac{3}{4}$$