EXERCISE # 1.1

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

(i) $\mathbf{2.353535}$

It is rational.

(ii) $\mathbf{0.\overline{6}}$

$= 0.6666666 \ldots \ldots$
It is rational.

(iii) $\mathbf{2.236067}$

It is irrational.

(iv) $\sqrt{7}$

It is irrational.

(v) $\boldsymbol{e}$

As we know $e = 2.7182818284 \ldots \ldots$
It is irrational.

(vi) $\boldsymbol{\pi}$

As we know $\pi = 3.14159265 \ldots \ldots$
It is irrational.

(vii) $\mathbf{5 + \sqrt{11}}$

It is irrational.

(viii) $\sqrt{3} + \sqrt{13}$

It is irrational.

(ix) $\frac{15}{4}$

It is rational.

(x) $(\mathbf{2}-\sqrt{\mathbf{2}})(\mathbf{2}+\sqrt{\mathbf{2}})$

$= (2-\sqrt{2})(2+\sqrt{2})$

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

$= 4 - 2$

$= 2$

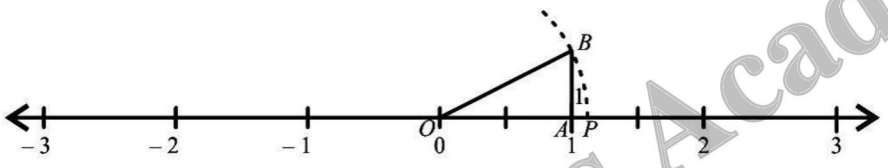
It is rational.

Q#2: Represent the following numbers on a number line.

(i) $\sqrt{\mathbf{2}}$

Solution:

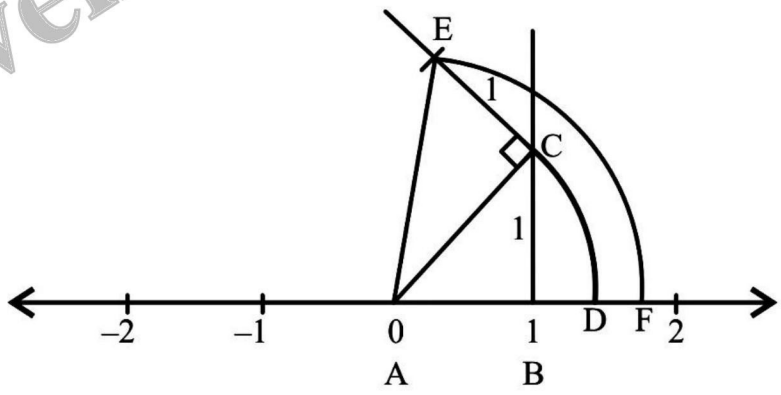
$\sqrt{2} = 1.414$



(ii) $\sqrt{\mathbf{3}}$

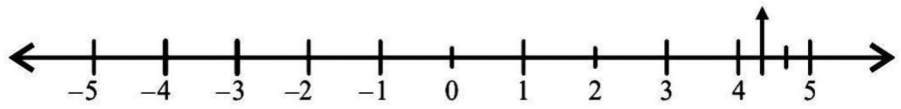
Solution:

$\sqrt{3} \approx 1.732$



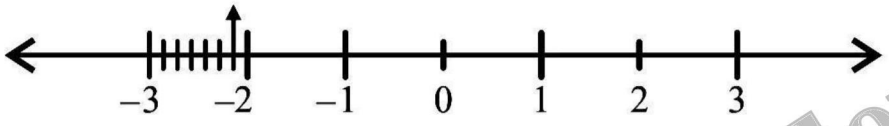
(iii) $\mathbf{4\frac{1}{3}}$

Solution:



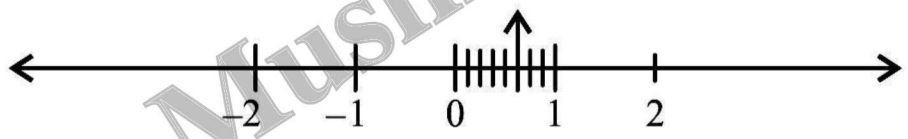
(iv) $-2\frac{1}{7}$

Solution:



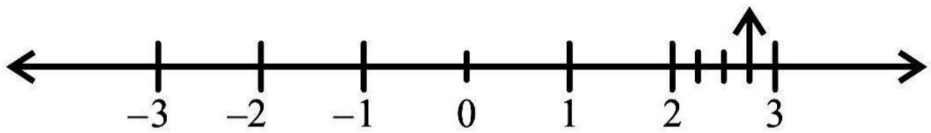
(v) $\frac{5}{8}$

Solution:



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

Solution:



Q#3: Represent the following as a rational number where p and q are integers and q ≠ 0:

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

Solution:

$$x = 0.\overline{4}$$
$$x = 0.4444444 \ldots \ldots$$

Multiplying 10 on both sides

$$10 \times x = 10 \times 0.4444444 \ldots \ldots$$
$$10x = 4.4444444 \ldots \ldots \ldots$$
$$10x = 4 + 0.4444444 \ldots \ldots$$
$$10x = 4 + x$$
$$10x - x = 4$$
$$9x = 4$$
$$\boxed{x = \frac{4}{9}}$$

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

Solution:

$$x = 0.\overline{37}$$
$$x = 0.3737373737 \ldots \ldots \ldots$$

Multiplying 100 on both sides

$$100 \times x = 100 \times 0.37373737 \ldots \ldots$$
$$100x = 37.37373737 \ldots \ldots \ldots$$
$$100x = 37 + 0.37373737 \ldots \ldots \ldots$$
$$100x = 37 + x$$
$$100x - x = 37$$
$$99x = 37$$
$$\boxed{x = \frac{37}{99}}$$

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

Solution:

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

$$x = 0.2121212121 \ldots\ldots\ldots$$

Multiplying by 100 on both sides

$$100 \times x = 100 \times 0.21212121 \ldots\ldots..$$

$$100x = 21.21212121 \ldots....$$

$$100x = 21 + 0.21212121 \ldots....$$

$$100x = 21 + x$$

$$100x - x = 21$$

$$99x = 21$$

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

Q#4: Name the property used in the following:

(i) $\mathbf{(a + 4) + b = a + (4 + b)}$

Associative property over addition

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

Commutative property over addition

(iii) $\mathbf{x - x = 0}$

Additive inverse

(iv) $\mathbf{a(b + c) = ab + ac}$

Left distributive property over addition

(v) $\mathbf{16 + 0 = 16}$

Additive identity

(vi) $\mathbf{100 \times 1 = 100}$

Multiplicative identity

(vii) $\mathbf{4 \times (5 \times 8) = (4 \times 5) \times 8}$

Associative property under multiplication

(viii) $\mathbf{ab = ba}$

Commutative property under multiplication

Q#5: Name the property used in the following:

(i) $\mathbf{-3 < -1 \rightarrow 0 < 2}$

$= -3 + 3 < -1 + 3$

$= 0 < 2$

Additive property

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

Reciprocal property

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

Additive property

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

Multiplicative property

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

Multiplicative property

(vii) $\mathbf{Either\ a > b\ or\ a = b\ or\ a < b}$

Trichotomy property

Q#6: Insert two rational numbers between:

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

Solution:

$$\text{First average} = \frac{1}{3} + \frac{1}{4}$$

$$= \frac{3+4}{12} = \frac{7}{12}$$

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

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

$$\text{Second average} = \frac{7}{24} + \frac{1}{4}$$

$$= \frac{7+6}{24} = \frac{13}{24}$$

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

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

(ii) 3 and 4

Solution:

$$\text{First average} = (3+4) \times \frac{1}{2}$$

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

$$\text{Second average} = \frac{7}{2} + 4$$

$$= \frac{7+8}{2} = \frac{15}{2}$$

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

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

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

Solution:

$$\text{First average} = \frac{3}{5} + \frac{4}{5}$$

$$= \frac{3+4}{5} = \frac{7}{5}$$

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

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

$$\text{Second average} = \frac{7}{10} + \frac{4}{5}$$

$$= \frac{7+8}{10} = \frac{15}{10}$$

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

$$\boxed{\text{2nd number} = \frac{15}{20}}$$