(iv) $\begin{bmatrix} \cdots \\ 3 & 4 & 5 \end{bmatrix}$ (v) $\begin{bmatrix} 0 & 2 & 1 \\ 3 & 3 & 1 \end{bmatrix}$ (vi) $\begin{bmatrix} \cdots \\ 2 & 2 \end{bmatrix}$

6. (i) $\begin{bmatrix} 3 & -20 \\ 15 & -4 \end{bmatrix}$ (ii) $\begin{bmatrix} 2 & 15 \\ -25 & -16 \end{bmatrix}$ 7. $a = \frac{13}{2}, b = \frac{2}{3}$

EXERCISE 1.4

1. (i), (ii), (iv), (v) 2. (i) $AB = \begin{bmatrix} 18 \\ 4 \end{bmatrix}$

3. (i) [4] (ii) [−3] (iii) [−12] (iv) [24] (v) $\begin{bmatrix} 4 & -3 \\ -12 & -15 \\ 24 & 34 \end{bmatrix}$

4. (a) $\begin{bmatrix} 13 & -2 \\ 5 & -1 \\ -6 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 4 & 13 \\ 13 & 34 \end{bmatrix}$ (c) $\begin{bmatrix} 9 & 12 & 15 \\ 19 & 26 & 33 \\ 3 & 3 & 3 \end{bmatrix}$

(d) $\begin{bmatrix} -4 & 0 \\ -4 & 1 \end{bmatrix}$ (e) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

EXERCISE 1.5

1. (i) −2 (ii) −8 (iii) 0 (iv) 10
2. (i) singular (ii) non-singular (iii) non-singular (iv) singular
3. (i) $A^{-1} = \begin{bmatrix} 0 & 1/2 \\ 1/3 & 1/6 \end{bmatrix}$ (ii) $B^{-1} = \begin{bmatrix} -5 & -2 \\ 3 & 1 \end{bmatrix}$

(iii) C^{-1} does not exist (iv) $D^{-1} = \begin{bmatrix} 8 & -3 \\ -4 & 2 \end{bmatrix}$

5. (i) inverses (ii) inverses

EXERCISE 1.6

1. (i) $x = 2, y = 0$ (ii) $x = \frac{7}{2}, y = -4$ (iii) $x = \frac{3}{5}, y = \frac{14}{5}$ (iv) $x = -2, y = 0$
(v) no solution (vi) $x = 4, y = -7$ (vii) $x = 2, y = 0$ (viii) $x = 4, y = 2$.
2. 15, 60 3. 18.5 cm, 15 cm 4. 49°, 49°, 82° 5. 26°, 64°
6. 50 km/h, 56 km/h

REVIEW EXERCISE 1

(iii) a (iv) b (v)

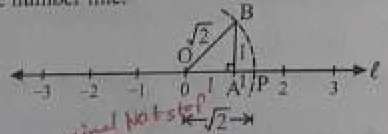
Divide the distance between 2 and 3 into seven equal parts. The point P represents the number $\frac{15}{7} = 2\frac{1}{7}$.

(iii) For representing the rational number, $-1\frac{7}{9}$, divide the unit length between -1 and -2 into nine equal parts. Take the end of the 7th part from -1. The point M in the following figure represents the rational number, $-1\frac{7}{9}$.

Irrational numbers such as $\sqrt{2}$, $\sqrt{5}$ etc. can be located on the line ℓ by geometric construction. For example, the point corresponding to $\sqrt{2}$ may be constructed by forming a right ΔOAB with sides (containing the right angle) each of length 1 as shown in the figure. By Pythagoras Theorem,

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

By drawing an arc with centre at O and radius OB = $\sqrt{2}$ we get the point P representing $\sqrt{2}$ on the number line.



EXERCISE 2.1

1. Identify which of the following are rational and irrational numbers.

(i) $\sqrt{3}$ (ii) $\frac{1}{6}$ (iii) π (iv) $\frac{15}{2}$ (v) 7.25 (vi) $\sqrt{29}$

2. Convert the following fractions into decimal fractions.

(i) $\frac{17}{25}$ (ii) $\frac{19}{4}$ (iii) $\frac{57}{8}$ (iv) $\frac{205}{18}$ (v) $\frac{5}{8}$ (vi) $\frac{25}{38}$

3. Which of the following statements are true and which are false?

(i) $\frac{2}{3}$ is an irrational number. (ii) π is an irrational number.

(iii) $\frac{1}{9}$ is a terminating fraction. (iv) $\frac{3}{4}$ is a terminating fraction.

(v) $\frac{4}{5}$ is a recurring fraction.

4. Represent the following numbers on the number line.

(i) $\frac{2}{3}$ (ii) $-\frac{4}{5}$ (iii) $1\frac{3}{4}$ (iv) $-2\frac{5}{8}$ (v) $2\frac{3}{4}$ (vi) $\sqrt{5}$

5. Give a rational number between $\frac{3}{4}$ and $\frac{5}{9}$.

6. Express the following recurring decimals as the rational number $\frac{p}{q}$ where p, q are integers and $q \neq 0$. (i) $0.\overline{5}$ (ii) $0.\overline{13}$ (iii) $0.\overline{67}$

2.2 Properties of Real Numbers

If a, b are real numbers, their sum is written as $a + b$ and their product as ab or $a \times b$ or $a \cdot b$ or $(a)(b)$.

(a) Properties of Real numbers with respect to Addition and Multiplication

Properties of real numbers under addition are as follows:

(i) Closure Property

$$a + b \in R, \ \forall a, b \in R$$

e.g., if -3 and $5 \in R$,

then $-3 + 5 = 2 \in R$

(ii) Commutative Property

$$a + b = b + a, \quad \forall a, b \in R$$

e.g., if $2, 3 \in R$,

then $2 + 3 = 3 + 2$

or $5 = 5$

(iii) Associative Property

$$(a + b) + c = a + (b + c), \quad \forall a, b, c \in R$$

e.g., if $5, 7, 3 \in R$,

then $(5 + 7) + 3 = 5 + (7 + 3)$

or $12 + 3 = 5 + 10$

or $15 = 15$

Exercise 1.6 (Questions)

EXERCISE 1.6

1. Use matrices, if possible, to solve the following systems of linear equations by: (i) the matrix inversion method (ii) the Cramer's rule.

(i) $2x - 2y = 4$
$3x + 2y = 6$

(ii) $2x + y = 3$
$6x + 5y = 1$

(iii) $4x + 2y = 8$
$3x - y = -1$

(iv) $3x - 2y = -6$
$5x - 2y = -10$

(v) $3x - 2y = 4$
$-6x + 4y = 7$

(vi) $4x + y = 9$
$-3x - y = -5$

(vii) $2x - 2y = 4$
$-5x - 2y = -10$

(viii) $3x - 4y = 4$
$x + 2y = 8$

Solve the following word problems by using
(i) matrix inversion method (ii) Crammer's rule.

2 The length of a rectangle is 4 times its width. The perimeter of the r[illegible] 150 cm. Find the dimensions of the rectangle.

3 Two sides of a rectangle differ by 3.5cm. Find the dimensions of the rectangle if its perimeter is 67cm.

4 The third angle of an isosceles triangle is $16°$ less than the sum of the two equal angles. Find three angles of the triangle.

5 One acute angle of a right triangle is $12°$ more than twice the other acute [illegible] Find the acute angles of the right triangle.

6 Two cars that are 600 km apart are moving towards each other. Their sp[illegible] differ by 6 km per hour and the cars are 123 km apart after $4\frac{1}{2}$ hours. Find t[illegible] speed of each car.

REVIEW EXERCISE 1

1. Select the correct answer in each of the following.

(i) The order of matrix $[2 \quad 1]$ is ....

(a) 2-by-1
(b) 1-by-2
(c) 1-by-1
(d) 2-by-2

(ii) $\begin{bmatrix} \sqrt{2} & 0 \\ 0 & \sqrt{2} \end{bmatrix}$ is called .... matrix.

(a) zero
(b) unit
(c) scalar
(d) singular