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# CBSE MATH

## Made Simple

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# Introduction

This book links high school coordinate geometry to linear algebra and matrix analysis through solved problems.



# Chapter 1

## Vectors

### 1.1. 2023

1.1.1 In what ratio, does  $x$ -axis divide the line segment joinin the points

$\mathbf{A}(3, 6)$  and  $\mathbf{B}(-12, -3)$  ?

(a)  $1 : 2$

(b)  $1 : 4$

(c)  $4 : 1$

(d)  $2 : 1$

1.1.2 The distance between the point  $(0, 2\sqrt{5})$  and  $(-2\sqrt{5}, 0)$  is

(a)  $2\sqrt{10}$  units

(b)  $4\sqrt{10}$  units

(c)  $2\sqrt{20}$  units

(d) 0 units

1.1.3 If  $(-5, 3)$  and  $(5, 3)$  are two vetices of an equilateral triangle, then co-ordinates of the third vertex, given that origin lies inside the triangle

(take  $\sqrt{3} = 1.7$ )

1.1.4 Show that the points  $(-2, 3)$ ,  $(8, 3)$  and  $(6, 7)$  are the vertices of right-angled triangle

1.1.5 If  $\mathbf{Q} = (0, 1)$  is equidistant from  $\mathbf{P} = (5, -3)$  and  $\mathbf{R} = (x, 6)$ , find the value of  $x$ .

1.1.6 The distance of the point  $(-6, 8)$  from origin is :

- (a) 6
- (b)  $-6$
- (c) 8
- (d) 10

1.1.7 The points  $(-4, 0)$ ,  $(4, 0)$  and  $(0, 3)$  are the vertices of a :

- (a) right triangle
- (b) isosceles triangle
- (c) equilateral triangle
- (d) scalene triangle

## 1.2. 2022

1.2.1.  $\vec{a}$  and  $\vec{b}$  are two unit vectors such that

$$\left| 2\vec{a} + 3\vec{b} \right| = \left| 3\vec{a} - 2\vec{b} \right|. \quad (1.2.1.1)$$



Find the angle between  $\vec{a}$  and  $\vec{b}$ .

1.2.2. If  $\vec{a}$  and  $\vec{b}$  are two vectors such that

$$\vec{a} = \hat{i} - \hat{j} + \hat{k} \quad (1.2.2.1)$$

and

$$\vec{b} = 2\hat{i} - \hat{j} - 3\hat{k} \quad (1.2.2.2)$$

then find the vector  $\vec{c}$ , given that

$$\vec{a} \times \vec{c} = \vec{b} \quad (1.2.2.3)$$

and

$$\vec{a} \cdot \vec{c} = 4. \quad (1.2.2.4)$$

1.2.3.

$$If \left| \vec{a} \times \vec{b} \right|^2 + \left| \vec{a} \cdot \vec{b} \right|^2 = 400 \quad (1.2.3.1)$$

and

$$\left| \vec{b} \right| = 5 \quad (1.2.3.2)$$

find the value of  $|\vec{a}|$ .

1.2.4. If

$$\vec{a} = \hat{i} + \hat{j} + \hat{k}, \vec{a} \cdot \vec{b} = 1 \quad (1.2.4.1)$$

and

$$\vec{a} \times \vec{b} = \hat{j} - \hat{k} \quad (1.2.4.2)$$

, then find  $|\vec{b}|$

1.2.5. If

$$|\vec{a}| = 3, |\vec{b}| = 2\sqrt{3} \quad (1.2.5.1)$$

and

$$\vec{a} \cdot \vec{b} = 6, \quad (1.2.5.2)$$

then find the value of  $|\vec{a} \times \vec{b}|$ .

1.2.6.  $|\vec{a}| = 8, |\vec{b}| = 3$  and  $\vec{a} \cdot \vec{b} = 12\sqrt{3}$ , then the value of  $|\vec{a} \times \vec{b}|$  is

(a) 24

(b) 144

(c) 2

(d) 12

1.2.7. If

$$\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}, \hat{b} = -\hat{i} + 2\hat{j} + \hat{k} \quad (1.2.7.1)$$

and

$$\vec{c} = 3\hat{i} + \hat{j} + 2\hat{k} \quad (1.2.7.2)$$

, then find  $\vec{a} \cdot (\vec{b} \times \vec{c})$ .

1.2.8.  $\vec{a}, \vec{b}, \vec{c}$  and  $\vec{d}$  are four non-zeros vectors such that  $\vec{a} \times \vec{b} = \vec{c} \times \vec{d}$  and

$$\vec{a} \times \vec{c} = 4\vec{b} \times \vec{d} \quad (1.2.8.1)$$

, then show that  $(\vec{a} - 2\vec{d})$  is parallel to  $(2\vec{b} - \vec{c})$  where

$$\vec{a} \neq 2\vec{d}, \vec{c} \neq 2\vec{b} \quad (1.2.8.2)$$

1.2.9. If

$$\vec{a} = \hat{i} + \hat{j} + \hat{k}, \vec{a} \cdot \vec{b} = 1 \quad (1.2.9.1)$$

and

$$\vec{a} \times \vec{b} = \hat{j} - \hat{k}, \quad (1.2.9.2)$$

then find  $\left| \vec{b} \right|$

1.2.10. If  $\vec{a}$  and  $\vec{b}$  are two vectors such that

$$\left| \vec{a} + \vec{b} \right| = \left| \vec{b} \right|, \quad (1.2.10.1)$$

then prove that  $(\vec{a} + 2\vec{b})$  is perpendicular to  $\vec{a}$ .

1.2.11. If  $\vec{a}$  and  $\vec{b}$  are unit vectors and  $\theta$  is the angle between them , then prove that  $\sin$

$$\frac{\theta}{2} = \frac{1}{2} \left| \vec{a} - \vec{b} \right| \quad (1.2.11.1)$$

1.2.12. If  $\vec{a}$  and  $\vec{b}$  are two unit vectors such that and  $\theta$  is the angle between them, then prove that

$$\sin \frac{\theta}{2} = \frac{1}{2} \left| \vec{a} - \vec{b} \right| \quad (1.2.12.1)$$

1.2.13. If

$$\vec{a} = 2\hat{i} + y\hat{j} + \hat{k} \quad (1.2.13.1)$$

and

$$\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k} \quad (1.2.13.2)$$

are two vectors for which the vector  $(\vec{a} + \vec{b})$  is perpendicular to the

vector  $(\vec{a} - \vec{b})$  then find all the possible values of  $y$ .

1.2.14. Write the projection of the vector  $(\vec{b} + \vec{c})$  on the vector  $\vec{a}$ , where

$$\vec{a} = 2\hat{i} - 2\hat{j} + \hat{k}, \vec{b} = \hat{i} + 2\hat{j} - 2\hat{k} \quad (1.2.14.1)$$

and

$$\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}. \quad (1.2.14.2)$$

1.2.15. If

$$\vec{a} = 2\hat{i} - \hat{j} + \hat{k}, \vec{b} = \hat{i} + \hat{j} - 2\hat{k} \quad (1.2.15.1)$$

and

$$\vec{c} = \hat{i} + 3\hat{j} - \hat{k} \quad (1.2.15.2)$$

and the projection of vector  $\vec{c} + \lambda\vec{b}$  on vector  $\vec{a}$  is  $2\sqrt{6}$ , find the value of  $\lambda$ .

1.2.16. If  $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}, \vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$  and

$$\vec{c} = 3\hat{i} + \hat{j} + 2\hat{k} \quad (1.2.16.1)$$

, then find  $\vec{a} \cdot (\vec{b} \times \vec{c})$ .

1.2.17. If

$$\vec{a} = 2\hat{i} - \hat{j} + 2\hat{k} \quad (1.2.17.1)$$

and

$$\vec{b} = 5\hat{i} - 3\hat{j} - 4\hat{k} \quad (1.2.17.2)$$

, then find the ratio  $\frac{\text{projection of vector } \vec{a} \text{ on vector } \vec{b}}{\text{projection of vector } \vec{b} \text{ on vector } \vec{a}}$

1.2.18. Show that the three vectors  $2\hat{i} - \hat{j} + \hat{k}$ ,  $\hat{i} - 3\hat{j} - 5\hat{k}$ , and  $3\hat{i} - 4\hat{j} - 4\hat{k}$  form the vertices of a right-angled triangle. If  $\vec{a} = 2\hat{i} + 2\hat{j} + 3\hat{k}$ ,  $\vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$  and

$$\vec{c} = 3\hat{i} + \hat{j} \quad (1.2.18.1)$$

are such that the vector  $(\vec{a} + \lambda \vec{b})$  is perpendicular to vector  $\vec{c}$ , then find the value of  $\lambda$ .

1.2.19. If  $\vec{a}$ ,  $\vec{b}$  and  $\vec{c}$  are the position vectors of the points  $\mathbf{A}(2, 3, -4)$ ,  $\mathbf{B}(3, -4, -5)$  and  $\mathbf{C}(3, 2, -3)$  and respectively, then  $|\vec{a} + \vec{b} + \vec{c}|$  is equal to

(a)  $\sqrt{113}$

(b)  $\sqrt{185}$

(c)  $\sqrt{203}$

(d)  $\sqrt{209}$

1.2.20. A circle has its center at  $(4, 4)$ . If one end of a diameter is  $(4, 0)$ , then find the coordinates of the other end.

1.2.21. Find the values  $\lambda$ , for which the distance of point  $(2, 1, \lambda)$  from plane

$$3x + 5y + 4z = 11 \quad (1.2.21.1)$$

is  $2\sqrt{2}$  units.

1.2.22. Find the coordinates of the point where the line through  $(3, 4, 1)$  crosses the ZX-plane

1.2.23. Using vectors, find the area of the triangle with vertices  $\mathbf{A}(-1, 0, -2)$ ,  $\mathbf{B}(0, 2, 1)$  and  $\mathbf{C}(-1, 4, 1)$

1.2.24. Using integration, find the area of triangle region whose vertices are  $(2, 0)$ ,  $(4, 5)$  and  $(1, 4)$ .

1.2.25. The distance between the points  $(0, 0)$  and  $(a - b, a + b)$  is

(a)  $2\sqrt{ab}$

(b)  $\sqrt{2a^2 + ab}$

(c)  $2\sqrt{a^2 + b^2}$

(d)  $\sqrt{2a^2 + 2b^2}$

1.2.26. The value of  $m$  which makes the point  $(0, 0)$ ,  $(2m, -4)$  and  $(3, 6)$  collinear, is \_\_\_\_\_

1.2.27. If a line makes  $60^\circ$  and  $45^\circ$  angles with the positive directions of X-axis and z-axis respectively, then find the angle that it makes with the

positive direction of y-axis. Hence, write the direction cosines of the line.

1.2.28. The Cartesian equation of a line  $AB$  is :

$$\frac{2x-1}{12} = \frac{y+2}{2} = \frac{z-3}{3} \quad (1.2.28.1)$$

1.2.29. Find the direction cosines of a line parallel to line  $AB$ .

1.2.30. Find the direction cosines of a line whose cartesian equation is given as

$$3x + 1 = 6y - 2 = 1 - z. \quad (1.2.30.1)$$

1.2.31. A vector of magnitude 9 units in the direction of the vector  $-2\hat{i} - \hat{j} + 2\hat{k}$  is \_\_\_\_\_

1.2.32. The two adjacent sides of a parallelogram are represented by  $2\hat{i} - 4\hat{j} - 5\hat{k}$  and  $\hat{i} + 2\hat{j} + 3\hat{k}$ . Find the unit vectors parallel to its diagonals. Using the diagonal vectors, find the area of the parallelogram also.

1.2.33. The two adjacent sides of a parallelogram are represented by vectors  $2\hat{i} - 4\hat{j} + 5\hat{k}$  and  $\hat{i} - 2\hat{j} - 3\hat{k}$ . Find the unit vector parallel to one of its diagonals. Also, find the area of the parallelogram.



1.2.34. If

$$\vec{a} = \vec{i} + 2\vec{j} + 3\vec{k} \quad (1.2.34.1)$$

and

$$\vec{b} = 2\hat{i} + 4\hat{j} - 5\hat{k} \quad (1.2.34.2)$$

represent two adjacent sides of a parallelogram, then find the unit vector parallel to the diagonal of the parallelogram

1.2.35. Find the area of the quadrilateral  $ABCD$  whose vertices are  $\mathbf{A}(-4, -3)$ ,  $\mathbf{B}(3, -1)$ ,  $\mathbf{C}(0, 5)$  and  $\mathbf{D}(-4, 2)$

1.2.36. If the points  $\mathbf{A}(2, 0)$ ,  $\mathbf{B}(6, 1)$ , and  $\mathbf{C}(p, q)$  form a triangle of area 12sq. units (positive only) and

$$2p + q = 10, \quad (1.2.36.1)$$

then find the values of  $p$  and  $q$ .



## Chapter 2

# Linear Forms

## 2.1. 2022

2.1.1. Solve the equations  $x + 2y = 6$  and  $2x - 5y = 12$  graphically.

2.1.2. Solve the following equations for  $x$  and  $y$  using cross-multiplication method:

$$(ax - by) + (a + 4b) = 0 \quad (2.1.2.1)$$

$$(bx + ay) + (b - 4a) = 0 \quad (2.1.2.2)$$

2.1.3. Find the co-ordinates of the point where the line  $\frac{x-3}{-1} = \frac{y+4}{1} = \frac{z+5}{6}$  crosses the plane passing through the points  $\left(\frac{7}{2}, 0, 0\right), (0, 7, 0), (0, 0, 7)$ .

2.1.4. Electrical transmission wires which are laid down in winters are stretched tightly to accommodate expansion in summers.

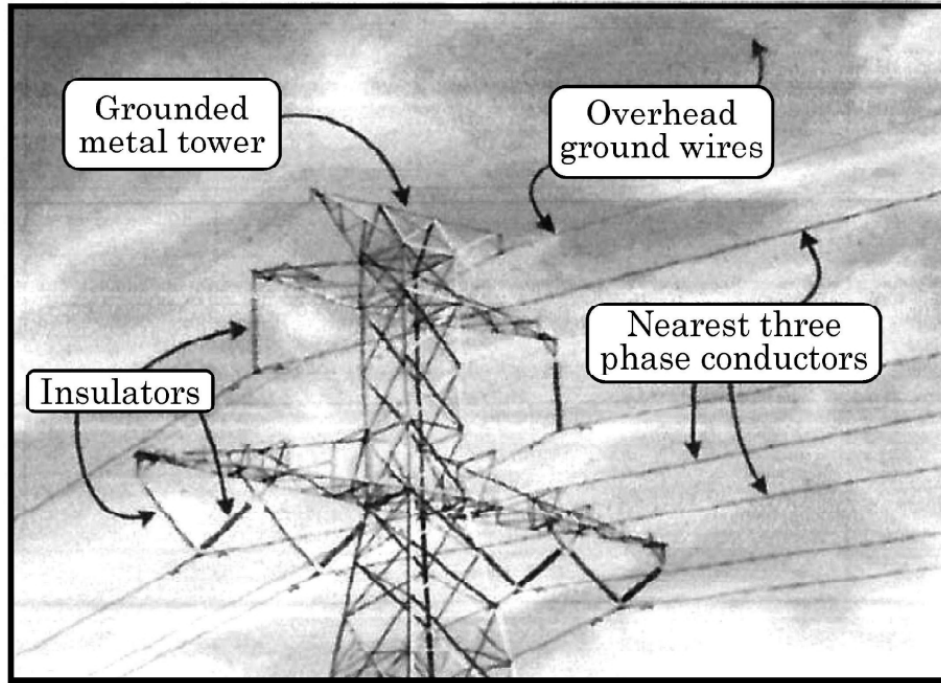


Figure 2.1.4.1: Electrical transmission wires connected to a transmission tower.

Two such wires in the figure 2.1.4.1 lie along the following lines:

$$l_1 : \frac{x+1}{3} = \frac{y-3}{-2} = \frac{z+2}{-1} \quad (2.1.4.1)$$

$$l_2 : \frac{x}{-1} = \frac{y-7}{3} = \frac{z+7}{-2} \quad (2.1.4.2)$$

Based on the given information, answer the following questions:

- (a) Are the  $l_1$  and  $l_2$  coplanar? Justify your answer.
- (b) Find the point of intersection of lines  $l_1$  and  $l_2$ .

2.1.5. Write the cartesian equation of the line PQ passing through points

P(2, 2, 1) and Q(5, 1, -2). Hence, find the y-coordinate of the point on the line PQ whose z-coordinate is -2.

2.1.6. Find the distance between the lines  $x = \frac{y-1}{2} = \frac{z-2}{3}$  and  $x+1 = \frac{y+2}{2} = \frac{z-1}{3}$ .

2.1.7. Find the shortest distance between the following lines:

$$\mathbf{r} = 3\hat{i} + 5\hat{j} + 7\hat{k} + \lambda(\hat{i} - 2\hat{j} + \hat{k}) \quad (2.1.7.1)$$

$$\mathbf{r} = (-\hat{i} - \hat{j} - \hat{k}) + \mu(7\hat{i} - 6\hat{j} + \hat{k}) \quad (2.1.7.2)$$

2.1.8. Two motorcycles A and B are running at a speed more than the allowed speed on the road (as shown in figure 2.1.8.1) represented by the following lines

$$\mathbf{r} = \lambda(\hat{i} + 2\hat{j} - \hat{k}) \quad (2.1.8.1)$$

$$\mathbf{r} = (3\hat{i} + 3\hat{j}) + \mu(2\hat{i} + \hat{j} + \hat{k}) \quad (2.1.8.2)$$

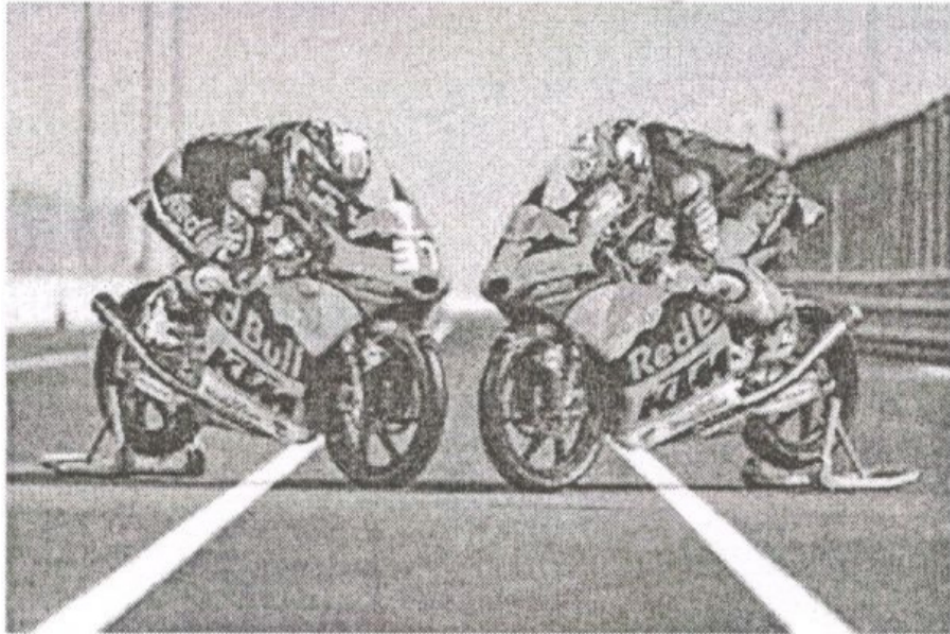


Figure 2.1.8.1: Two motorcycles moving along the road in a straight line.

Based on the following information, answer the following questions:

- (a) Find the shortest distance between the given lines.
- (b) Find a point at which the motorcycles may collide.

2.1.9. Find the shortest distance between the following lines

$$\mathbf{r} = (\lambda + 1)\hat{i} + (\lambda + 4)\hat{j} - (\lambda - 3)\hat{k} \quad (2.1.9.1)$$

$$\mathbf{r} = (3 - \mu)\hat{i} + (2\mu + 2)\hat{j} + (\mu + 6)\hat{k} \quad (2.1.9.2)$$

2.1.10. Find the shortest distance between the following lines and hence write

whether the lines are intersecting or not.

$$\frac{x-1}{2} = \frac{y+1}{3} = z, \frac{x+1}{5} = \frac{y-2}{1}, z = 2 \quad (2.1.10.1)$$

2.1.11. Find the equation of the plane passing through the points  $(2, 1, 0)$ ,  $(3, -2, -2)$  and  $(1, 1, 7)$ . Also, obtain its distance from the origin.

2.1.12. The foot of a perpendicular drawn from the point  $(-2, -1, -3)$  on a plane is  $(1, -3, 3)$ . Find the equation of the plane.

2.1.13. Find the cartesian and the vector equation of a plane which passes through the point  $(3, 2, 0)$  and contains the line  $\frac{x-3}{1} = \frac{y-6}{5} = \frac{z-4}{4}$ .

2.1.14. The distance between the planes  $4x-4y+2z+5=0$  and  $2x-2y+z+6=0$  is

- (a)  $\frac{1}{6}$
- (b)  $\frac{7}{6}$
- (c)  $\frac{11}{6}$
- (d)  $\frac{16}{6}$

2.1.15. Find the equation of the plane through the line of intersection of the planes

$$\mathbf{r} \cdot (\hat{i} + 3\hat{j}) + 6 = 0 \quad (2.1.15.1)$$

$$\mathbf{r} \cdot (3\hat{i} - \hat{j} - 4\hat{k}) = 0 \quad (2.1.15.2)$$

which is at a unit distance from the origin.

2.1.16. If the distance of the point  $(1, 1, 1)$  from the plane  $x - y + z + \lambda = 0$  is  $\frac{5}{\sqrt{3}}$ , find the value(s) of  $\lambda$ .

2.1.17. Find the distance of the point  $(2, 3, 4)$  measured along the line  $\frac{x-4}{3} = \frac{y+5}{6} = \frac{z+1}{2}$  from the plane  $3x + 2y + 2z + 5 = 0$ .

2.1.18. Find the distance of the point  $P(4, 3, 2)$  from the plane determined by the points  $A(-1, 6, -5)$ ,  $B(-5, -2, 3)$  and  $C(2, 4, -5)$ .

2.1.19. The distance of the line

$$\mathbf{r} = (\hat{i} - \hat{j}) + \lambda(\hat{i} + 5\hat{j} + \hat{k}) \quad (2.1.19.1)$$

from the plane

$$\mathbf{r} \cdot (\hat{i} - \hat{j} + 4\hat{k}) = 5 \quad (2.1.19.2)$$

is

- (a)  $\sqrt{2}$
- (b)  $\frac{1}{\sqrt{2}}$
- (c)  $\frac{1}{3\sqrt{2}}$
- (d)  $\frac{-2}{3\sqrt{2}}$

2.1.20. Find a unit vector perpendicular to each of the vectors  $(\mathbf{a} + \mathbf{b})$  and



$(\mathbf{a} - \mathbf{b})$  where

$$\mathbf{a} = \hat{i} + \hat{j} + \hat{k} \quad (2.1.20.1)$$

$$\mathbf{b} = \hat{i} + 2\hat{j} + 3\hat{k} \quad (2.1.20.2)$$

2.1.21. Find the distance of the point  $(1, -2, 9)$  from the point of intersection of the line

$$\mathbf{r} = 4\hat{i} + 2\hat{j} + 7\hat{k} + \lambda(3\hat{i} + 4\hat{j} + 2\hat{k}) \quad (2.1.21.1)$$

and the plane

$$\mathbf{r} \cdot (\hat{i} - \hat{j} + \hat{k}) = 10. \quad (2.1.21.2)$$

2.1.22. Find the area bounded by the curves  $y = |x - 1|$  and  $y = 1$ , using integration.

2.1.23. Find the coordinates of the point where the line through  $(4, -3, -4)$  and  $(3, -2, 2)$  crosses the plane  $2x + y + z = 6$ .

2.1.24. Fit a straight line trend by the method of least squares and find the trend value for the year 2008 using the data from Table 2.1.24.1:

Table 2.1.24.1: Table showing yearly trend of production of goods in lakh tonnes

Year	Production (in lakh tonnes)
2001	30
2002	35
2003	36
2004	32
2005	37
2006	40

## Chapter 3

# Intersection of Conics

### 3.1. 2022

3.1.1. Using integration, find the area of the region enclosed by the curve  $y = x^2$ , the x-axis and the ordinates  $x = -2$  and  $x = 1$ .

3.1.2. Using integration, find the area of the region enclosed by line  $y = \sqrt{3}x$  semi-circle  $y = \sqrt{4 - x^2}$  and x-axis in first quadrant.

3.1.3. Using integration, find the area of the smaller region enclosed by the curve  $4x^2 + 4y^2 = 9$  and the line  $2x + 2y = 3$ .

3.1.4. If the area of the region bounded by the curve  $y^2 = 4ax$  and the line  $x = 4a$  is  $\frac{256}{3}$  sq. units, then using integration, find the value of  $a$ , where  $a > 0$ .

3.1.5. Find the area of the region enclosed by the curves  $y^2 = x$ ,  $x = \frac{1}{4}$ ,  $y = 0$  and  $x = 1$ , using integration.

3.1.6. If the area of the region bounded by the line  $y = mx$  and the curve  $x^2 = y$  is  $\frac{32}{3}$  sq. units, then find the positive value of  $m$ , using integration.

- 3.1.7. If the area between the curves  $x = y^2$  and  $x = 4$  is divided into two equal parts by the line  $x = a$ , then find the value of  $a$ , using integration.
- 3.1.8. Find the area bounded by the ellipse  $x^2 + 4y^2 = 16$  and the ordinates  $x = 0$  and  $x = 2$ , using integration.
- 3.1.9. Find the area of the region  $\{(x, y) : x^2 \leq y \leq x\}$ , using integration

## Chapter 4

# Tangent And Normal

### 4.1. 2022

4.1.1. Draw a circle of radius 2.5 cm. Take a point **P** outside the circle at a distance of 7 cm from the center. Then construct a pair of tangents to the circle from point **P**.

4.1.2. Write the steps of construction for constructing a pair of tangents to a circle of radius 4 cm from a point **P**, at a distance of 7 cm from its center **O**.

4.1.3. In Figure 4.1.3.1, there are two concentric circles with centre **O**. If  $ARC$  and  $AQB$  are tangents to the smaller circle from the point **A** lying on the larger circle, find the length of  $AC$ , if  $AQ = 5$  cm.

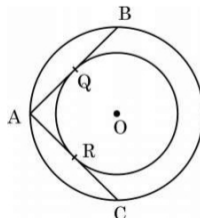


Figure 4.1.3.1: Two concentric circles with **O** as centre

- 4.1.4. In Figure 4.1.4.1, if a circle touches the side  $QR$  of  $\triangle PQR$  at **S** and extended sides  $PQ$  and  $PR$  at **M** and **N**, respectively,

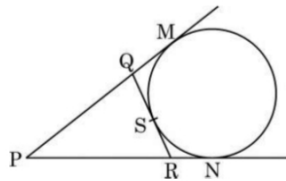


Figure 4.1.4.1: Two tangents are drawn from point **P** to the circle

prove that  $PM = \frac{1}{2}(PQ + QR + PR)$

- 4.1.5. In Figure 4.1.5.1, a triangle  $ABC$  is drawn to circumscribe a circle of radius 4 cm such that the segments  $BD$  and  $DC$  into which  $BC$  is divided by the point of contact **D** are of lengths 6 cm and 8 cm respectively. If the area of  $\triangle ABC$  is  $84 \text{ cm}^2$ , find the lengths of sides  $AB$  and  $AC$ .

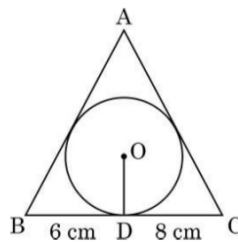


Figure 4.1.5.1: Circle with **O** as center circumscribed in triangle  $ABC$

- 4.1.6. In Figure 4.1.6.1,  $PQ$  and  $PR$  are tangents to the circle centered at **O**. If  $\angle OPR = 45^\circ$ , then prove that  $ORPQ$  is a square.

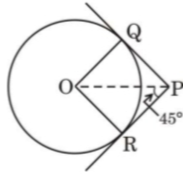


Figure 4.1.6.1: Two tangents drawn from point **P** to a circle whose centre is **O**

4.1.7. In Figure 4.1.7.1, **O** is the centre of a circle of radius 5 cm.  $PA$  and  $BC$  are tangents to the circle at **A** and **B** respectively. If  $OP$  is 13 cm, then find the length of tangents  $PA$  and  $BC$ .

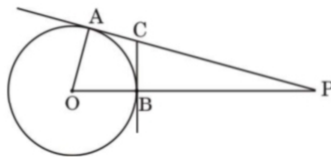


Figure 4.1.7.1: Two tangents drawn from point **C** to a circle whose centre is **O**

4.1.8. In Figure 4.1.8.1,  $AB$  is diameter of a circle centered at **O**.  $BC$  is tangent to the circle at **B. If  $OP$  bisects the chord  $AD$  and  $\angle AOP = 60^\circ$ , then find  $m\angle C$ .**

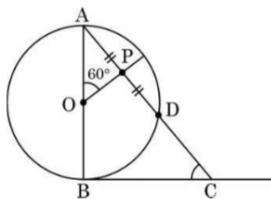


Figure 4.1.8.1: Tangent  $BC$  is drawn from point **C** to a circle whose centre is **O**

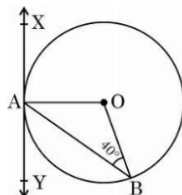


Figure 4.1.9.1: The line  $XAY$  is tangent to the circle centered at  $O$

4.1.9. In Figure 4.1.9.1,  $XAY$  is a tangent to the circle centered at  $O$ . If  $\angle ABO = 60^\circ$ , then find  $m\angle BAY$  and  $m\angle AOB$ .

4.1.10. Two concentric circles are of radii 4cm and 3 cm. Find the length of the chord of the larger circle which touches the smaller circle.

4.1.11. In Figure 4.1.11.1, a triangle  $ABC$  with  $\angle B = 90^\circ$  is shown. Taking  $AB$  as diameter, a circle has been drawn intersecting  $AC$  at point  $P$ . Prove that the tangent drawn at point  $P$  bisects  $BC$ .

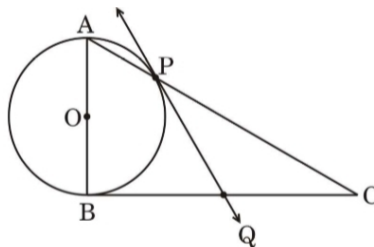


Figure 4.1.11.1:  $PQ$  is tangent to the circle centered at  $O$ .  $AB$  is the diameter and  $\angle B = 90^\circ$

4.1.12. Find the equation of tangent to the curve  $y = x^2 + 4x + 1$  at the point  $(3, 22)$ .



## Chapter 5

# Probability

### 5.1. 2023

5.1.1. Probability of happening of an event is denoted by  $p$  and probability of non-happening of the event is denoted by  $q$ . Relation between  $p$  and  $q$  is

(a)  $p+q=1$

(b)  $p=1, q=1$

(c)  $p=q-1$

(d)  $p+q+1=0$

5.1.2. A girl calculates that the probability of her winning the first prize in a lottery is 0.08. If 6000 tickets are sold, how many tickets has she bought ?

(a) 40

(b) 240

(c) 480

(d) 750

5.1.3. In a group of 20 people, 5 can't swim. If one person is selected at random, then the probability that he/sh can swim, is

(a)  $\frac{3}{4}$

(b)  $\frac{1}{3}$

(c) 1

(d)  $\frac{1}{4}$

5.1.4. A bag contain 4 red, 3 blue and 2 yellow balls. One ball is drawn at random from the bag. Find the probability that drawn ball is

(a) red

(b) yellow

5.1.5. A bag contain 100 cards numbered 1 to 100. A card is drawn at random from the bag. What is the probability that the number on the card is a perfect cube ?

(a)  $\frac{1}{20}$

(b)  $\frac{3}{50}$

(c)  $\frac{1}{25}$

(d)  $\frac{7}{100}$

5.1.6. If three coins are tossed simultaneously, what is the probability of getting a most one tail ?

(a)  $\frac{3}{8}$

(b)  $\frac{4}{8}$

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

(d)  $\frac{7}{8}$

5.1.7. Two dices are thrown together. The probability of getting the difference of numbers on their upper faces equals to 3 is :

(a)  $\frac{1}{9}$

(b)  $\frac{2}{9}$

(c)  $\frac{1}{6}$

(d)  $\frac{1}{12}$

5.1.8. A card is drawn at random from a well-shuffled pack of 52 cards. The probability that the card drawn is not an ace is :

(a)  $\frac{1}{13}$

(b)  $\frac{9}{13}$

(c)  $\frac{4}{13}$

(d)  $\frac{12}{13}$

5.1.9. **Assertion (A) :** The probability that a leap year has 53 Students is  $\frac{2}{7}$ .

**Reason (R) :** The probability that a non-leap year has 53 Sundays is  $\frac{5}{7}$ .

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

- (b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A).
- (c) Assertion (A) is true but Reason (R) is false.
- (d) Assertion (A) is false but Reason (R) is true.

**5.2. 2022**

## Chapter 6

# Construction

**6.1. 2022**

