NCERT Solutions for Class 10

- NCERT Solutions for Class 10 Maths
- NCERT Solutions for Class 10 Science
- NCERT Solutions for Class 10 Social
- NCERT Solutions for Class 10 English
- NCERT Solutions for Class 10 English First Flight
- NCERT Solutions for Class 10 English Footprints Without Feet
- NCERT Solutions for Class 10 Hindi Sanchyan
- NCERT Solutions for Class 10 Hindi Sparsh
- NCERT Solutions for Class 10 Hindi Kshitiz
- NCERT Solutions for Class 10 Hindi Kritika
- NCERT Solutions for Class 10 Sanskrit
- NCERT Solutions for Class 10 Foundation of Information Technology

Board: CBSE
Textbook: NCERT
Class: Class 10
Subject: Maths
Chapter: Chapter 7
Chapter Name: Coordinate Geometry
Exercise: Ex 7.1, Ex 7.2, Ex 7.3, Ex 7.4
Number of Questions Solved: 33
Category: NCERT Solutions

NCERT Solutions For Class 10 Maths Chapter 7 Coordinate Geometry

7. Coordinate Geometry
   7.1 Introduction
   7.2 Distance Formula
   7.3 Section Formula
   7.4 Area Of A Triangle
   7.5 Summary

NCERT Solutions For Class 10 Maths Chapter 7 Coordinate Geometry Exercise 7.1
Question-1

Find the distance between the following pairs of points:
(i) (2, 3), (4, 1) (ii) (-5, 7), (-1, 3) (iii) (a, b), (-a, -b).

Solution:
(i) (2, 3) (4, 1)
Distance = \( \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \)
= \( \sqrt{(4 - 2)^2 + (1 - 3)^2} \)
= \( \sqrt{4 + 4} = 2\sqrt{2} \)

(ii) (-5, 7) (-1, 3)
Distance = \( \sqrt{(-1 + 5)^2 + (3 - 7)^2} \)
= \( \sqrt{16 + 16} = 4\sqrt{2} \)

(iii) (a, b) (-a, -b)
Distance = \( \sqrt{(-a - a)^2 + (-b - b)^2} \)
= \( 2\sqrt{a^2 + b^2} \).

Question-2

Find the distance between the points (0, 0) and (36, 15). Can you now find the distance between the two towns A and B.

Solution:
Let A (0, 0), B(36, 15)
\[ AB = \sqrt{(0 + 36)^2 + (0 - 15)^2} \]
= \( \sqrt{1296 + 225} \)
= \( \sqrt{1521} \)
In section 7.2, A is (36, 0)
And B is (0, 15)
\[ \text{Distance is } \sqrt{36^2 + 15^2} = \sqrt{1521} \].

More Resources

- NCERT Solutions
- NCERT Solutions for Class 10 Maths
- NCERT Solutions for Class 10 Science
- NCERT Solutions for Class 10 Social
- NCERT Solutions for Class 10 English
- NCERT Solutions for Class 10 Hindi
NCERT Solutions for Class 10 Maths

- NCERT Solutions for Class 10 Sanskrit
- NCERT Solutions for Class 10 Foundation of IT
- RD Sharma Class 10 Solutions

Formulae Handbook for Class 10 Maths and Science
Question-3

Check whether (5, -2), (6, 4) and (7, -2) are the vertices of an isosceles triangle.

Solution:

Let A (5,-2), B(6,4) and (7,-2) be the vertices of triangle.

then we have

\[ AB = \sqrt{(6 - 5)^2 + (4 + 2)^2} = \sqrt{1 + 36} = \sqrt{37} \]
\[ BC = \sqrt{(7 - 6)^2 + (-2 - 4)^2} = \sqrt{1 + 36} = \sqrt{37} \]
\[ AC = \sqrt{(7 - 5)^2 + (-2 + 2)^2} = \sqrt{4} = 2 \]

Here AB = BC

triangle ABC is an isosceles triangle.
In a classroom, 4 friends are seated at the points A, B, C and D as shown in this figure Champa and Chameli walk into the class and after observing for a few minutes Champa asks Chameli, "Don't you think ABCD is a square?" Chameli disagrees. Using distance formula, find which of them is correct.

**Solution:**

In the figure A is (3, 4)  
B is (6, 7)  
C is (9, 4)  
D is (6, 1)

\[
AB = \sqrt{(3 - 6)^2 + (4 - 7)^2} = \sqrt{9 + 9} = 3\sqrt{2}
\]

\[
BC = \sqrt{(6 - 9)^2 + (7 - 4)^2} = 3\sqrt{2}
\]

\[
CD = \sqrt{(9 - 9)^2 + (4 - 4)^2} = 3\sqrt{2}
\]

\[
DA = \sqrt{(6 - 3)^2 + (1 - 4)^2} = 3\sqrt{2}
\]

Since AB = BC = CD = DA  
ABCD is a square or rhombus.

\[
BD = \sqrt{(6 - 6)^2 + (7 - 1)^2} = \sqrt{36}
\]

\[
AC = \sqrt{(9 - 3)^2 + (4 - 4)^2} = \sqrt{36}
\]

Diagonal, BD = AC hence it is a square.
Name the type of quadrilateral formed, if any, by the following points, and give reasons for your answer:
(i) (-1, -2), (1, 0), (-1, 2), (-3, 0)
(ii) (-3, 5), (3, 1), (0, 3), (-1, -4)
(iii) (4, 5), (7, 6), (4, 3), (1, 2).

Solution:
(i) (-1, -2), (1, 0), (-1, 2), (-3, 0)

\[
\begin{align*}
AB &= \sqrt{(-1 - 1)^2 + (-2 - 2)^2} = \sqrt{4 + 4} = \sqrt{8} \\
BC &= \sqrt{(1 - 1)^2 + (0 - 2)^2} = \sqrt{4} = 2 \\
CD &= \sqrt{(-1 + 3)^2 + (0 - 2)^2} = \sqrt{4 + 4} = \sqrt{8} \\
DA &= \sqrt{(-3 + 1)^2 + (0 - 2)^2} = \sqrt{4 + 4} = \sqrt{8} \\
AB &= BC = CD = DA \\
AC &= \sqrt{(-1 + 1)^2 + (-2 - 2)^2} = \sqrt{4} = 2 \\
BD &= \sqrt{(1 + 3)^2} = \sqrt{4^2} = 4 \\
\text{Diagonals } AC &= BD \\
\therefore \text{ABCD is a square}
\end{align*}
\]
(ii) \((-3, 5)\), \((3, 1)\), \((0, 3)\), \((-1, -4)\)

A = \((-3, 5)\)
B = \((3, 1)\)
C = \((0, 3)\)
D = \((-1, -4)\)

\[AB = \sqrt{(-3 - 3)^2 + (5 - 1)^2} = \sqrt{36 + 16} = \sqrt{52}\]
\[BC = \sqrt{(3 - 0)^2 + (1 - 3)^2} = \sqrt{9 + 4} = \sqrt{13}\]
\[CD = \sqrt{(-1 - 3)^2 + (-4 - 3)^2} = \sqrt{16 + 49} = \sqrt{65}\]
\[DA = \sqrt{(-1 - 3)^2 + (-4 - 5)^2} = \sqrt{16 + 81} = \sqrt{97}\]

\[AB \neq BC \neq CD \neq DA\]
\[\therefore\] It is a quadrilateral

(iii) \((4, 5)\), \((7, 6)\), \((4, 3)\), \((1, 2)\)

A = \((4, 5)\)
B = \((7, 6)\)
C = \((4, 3)\)
D = \((1, 2)\)

\[AB = \sqrt{(4 - 7)^2 + (5 - 6)^2} = \sqrt{10}\]
\[BC = \sqrt{(7 - 4)^2 + (6 - 3)^2} = \sqrt{18}\]
\[CD = \sqrt{(4 - 1)^2 + (3 - 2)^2} = \sqrt{10}\]
\[DA = \sqrt{(1 - 4)^2 + (2 - 5)^2} = \sqrt{18}\]

AB = CD
BC = DA.

Opposite sides are equal so it is a parallelogram.
Question-6

Find the point on the X axis which is equidistant from (2, -5) and (-2, 9).

Solution:
Let the point on x axis be \(X(x, 0)\)
Let \(P(2, -5), Q(-2, 9)\)
\[PX = \sqrt{(x - 2)^2 + (-5)^2}\]
\[= \sqrt{(x - 2)^2 + 25}\]
\[QX = \sqrt{(x + 2)^2 + 9^2}\]

Given \(PX = QX \Rightarrow PX^2 = QX^2\)
\[(x - 2)^2 + 25 = (x + 2)^2 + 9^2\]
\[x^2 - 4x + 4 + 25 = x^2 + 4x + 4 + 81\]
\[8x = 56\]
\[x = 7\]
\[\text{The required point on x-axis is (7, 0).}\]

Question-7

Find the values of \(y\) for which the distance between the points \(P(2, -3)\) and \(Q(10, y)\) is 10 units.

Solution:
Given \(PQ = 10\)
\[PQ = \sqrt{(2 - 10)^2 + (-3 - y)^2}\]
\[= \sqrt{64 + (y^2 + 6y + 9)} = 10\]
\[y^2 + 6y + 73 = 100\]
\[y^2 + 6y = 27\]
\[y^2 + 9y - 3y - 27 = 0\]
\[y(y + 9) - 3(y + 9) = 0\]
\[\Rightarrow y = 3, y = -9\]
\[\therefore \text{Co-ordinate of } y \text{ are -9 or 3.}\]
Question-8

If Q(0, 1) is equidistant from P(5, -3) and R(x, 6), find the values of x. Also find the distances QR and PR.

Solution:
Q = (0, 1)
P = (5, -3)
R = (x, 6)
PQ = QR (given)
PQ = \sqrt{(0 - 5)^2 + (1 + 3)^2} = \sqrt{25 + 16} = \sqrt{41}
QR = \sqrt{(0 - x)^2 + (1 - 6)^2} = \sqrt{x^2 + 25}
Given PQ^2 = QR^2
41 = x^2 + 25
\therefore x^2 = 16
\Rightarrow x = \pm 4
QR = \sqrt{16 + 25} = \sqrt{41}
PR = \sqrt{(5 - 4)^2 + 0^2} \text{ or } \sqrt{1 + 0^2} = \sqrt{2}.

NCERT Solutions For Class 10 Chapter 7 Coordinate Geometry Exercise 7.2

Question-9

Find the coordinates of the point which divides the join of (-1, 7) and (4, -3) in the ratio 2 : 3.

Solution:
Given, A(-1, 7) and B(4, -3) divides internally in the ratio 2 : 3.
Let C be the required point, using section formula, we get

\[
(x, y) = \left(\frac{2\times4 + 3\times(-1)}{2 + 3}, \frac{2\times(-3) + 3\times7}{2 + 3}\right) \\
= \left(\frac{8 - 3}{5}, \frac{-6 + 21}{5}\right) \\
= (1, 3).
\]
Question-10

Find the coordinates of the points of trisection of the line segment joining (4, -1) and (-2, -3).

Solution:

Let C and D be the point of trisection C divides AB in the ratio 1 : 2 and D divides AB in the ratio 2 : 1.

∴ The coordinates of C are 

\[
\left( \frac{1 \times (-2) + 2 \times (4)}{1 + 2}, \frac{1 \times (-3) + 2 \times (-1)}{1 + 2} \right) \text{ or } \left( \frac{-2 + 8}{3}, \frac{-3 - 2}{3} \right) \text{ or } \left( \frac{6}{3}, \frac{-5}{3} \right) \text{ or } \left( 2, -\frac{5}{3} \right)
\]

Now, D divides AB internally in the ratio, 2 : 1.

∴ The coordinates of D are

\[
\left( \frac{2 \times (-2) + 1 \times (4)}{2 + 1}, \frac{2 \times (-3) + 1 \times (-1)}{2 + 1} \right) \text{ or } \left( \frac{-4 + 4}{3}, \frac{-6 + (-1)}{3} \right) \text{ or } \left( \frac{0}{3}, \frac{-7}{3} \right) \text{ or } \left( 0, -\frac{7}{3} \right)
\]
Question 11

To conduct Sports Day activities, in your rectangular shaped school ground ABCD lines have been drawn with chalk powder at a distance of 1 m each. 100 flower pots have been placed at a distance of 1 m from each other along AD, as shown in fig. Niharika runs 1 1/5th the distance AD on the 2nd line and posts a green flag. Preet runs 1/5th the distance AD on the 8th line and posts a red flag. What is the distance between both the flags? If Rashmi has to post a blue flag exactly halfway between the two flags, where should she post her flag?
Solution:
Now let us find out the distance AD. Since 100 flower pots have been arranged at a distance of 1 m between each pot, the total distance of AD is $(100 \times 1 \text{ m}) = 100 \text{ m}.
To find out the location of the green flag taken by Niharika please observe below)
Distance run by Niharika = $\frac{1}{4} \times 100 \text{ m} = 25 \text{ m}$
As Niharika starts from the 2$^{nd}$ line the position of green flag P is $(2, 25)$ (To find out the location of the blue flag taken by Preet please observe below)
Distance run by preet = $\frac{1}{5} \times 100 = 20 \text{ m}$.
As Preet starts from 8$^{th}$ line location of red flag Q is $(8, 20)$ (To find the distance between the two flags, the green at P and red at Q we find the same using distance formula)
Distance between P$(2, 25)$ and Q$(8, 20)$ using the formula
$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(8 - 2)^2 + (20 - 25)^2}$$
$$= \sqrt{(6)^2 + (-5)^2}$$
$$= \sqrt{36 + 25}$$
$$= \sqrt{61}$$
$$= 7.81 \text{ m}$$
(To find the position where Rashmi can post her blue flag exactly between the other two flags we can find the same using the mid-point formula)
Mid point of P$(2, 25)$ and Q$(8, 20)$ using the formula $\left[\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right]$
$$= \left(\frac{2 + 8}{2}, \frac{25 + 20}{2}\right)$$
$$= (5, 22.5)$$
Rashmi has to travel a distance of 22.5 starting from the fifth line.
**Question-12**

Find the ratio in which the line segment joining the points \((-3, 10)\) and \((6, -8)\) is divided by \((-1, 6)\).

**Solution:**

Let the ratio be \((m_1, m_2)\)

\[
\frac{6m_1 - 3m_2}{m_1 + m_2} = -1
\]

\[
6m_1 - 3m_2 = -m_1 - m_2
\]

\[
6m_1 + m_1 = -m_2 + 3m_2
\]

\[
7m_1 = 2m_2
\]

\[
\Rightarrow \frac{m_1}{m_2} = \frac{2}{7}
\]

\[
\therefore \text{The ratio at which the point } (-1, 6) \text{ divides the line segments joining the points } (-3, 10) \text{ and } (6, -8) \text{ is } 2 : 7.
\]
Question-13

Find the ratio in which the line segment joining \(A(1, -5)\) and \(B(-4, 5)\) is divided by the \(x\)-axis. Also find the coordinates of the point of division.

Solution:

\(A(1, -5), B(-4, 5)\)

Let the co-ordinate of point of division be \((x, 0)\)

Let the ratio be \(m_1 : m_2\)

The coordinate of \(C = \left(\frac{-4m_1 + m_2}{m_1 + m_2}, \frac{5m_1 - 5m_2}{m_1 + m_2}\right)\)

Given the \(y\) co-ordinate = 0 (since it cuts the \(x\) axis)

\[
\therefore m_1 : m_2 = 1 : 1 \left(\frac{5m_1 - 5m_2}{m_1 + m_2}\right) = 0
\]

\(\Rightarrow 5m = 5m_2 \Rightarrow \frac{m_1}{m_2} = 1 : 1\)

\(\therefore\) The co-ordinates of point of division = \(( -3/2, 0)\)
Question-14

If \((1, 2), (4, y), (x, 6)\) and \((3, 5)\) are the vertices of a parallelogram taken in order, find \(x\) and \(y\).

Solution:

Let \(A(1, 2), B(4, y), C(x, 6), D(3, 5)\) are the vertices of parallelogram \(ABCD\).

We know that diagonals of a parallelogram bisect each other.

\(A, C\) are divided at \(O\) in the ratio \(1 : 1\)

\[\text{\therefore Coordinate of } O = \left(\frac{1 + x}{2}, \frac{2 + 6}{2}\right)\]  \hspace{1cm} (1)

\(B, D\) are divided at \(O\) in the ratio \(1 : 1\)

\[\text{\therefore Coordinate of } O = \left(\frac{3 + 4}{2}, \frac{5 + y}{2}\right)\]  \hspace{1cm} (2)

Since both the coordinates in (1) and (2) are equal.

\[\frac{1 + x}{2} = \frac{7}{2}\]

\[\Rightarrow \quad x = 6\]

\[\frac{2 + 5}{2} = \frac{5 + y}{2}\]

\[\Rightarrow \quad y = 8 - 5 = 3\]

\[\therefore \quad x = 6, \quad y = 3.\]
Find the coordinates of a point A, where AB is the diameter of a circle whose centre is (2, -3) and B is (1, 4).

Find the coordinates of a point A, where AB is the diameter of a circle whose centre is (2, -3) and B is (1, 4).

Solution:
Let the coordinate of A be (x, y), O(2, -3) is the mid point of AB.

\[
\text{Coordinate of } O \text{ dividing } AB \text{ in ratio } 1:1 \text{ is } \left( \frac{1 + x}{2}, \frac{4 + y}{2} \right)
\]

Given the centre of the circle is O(2, -3)
\[
\frac{1 + x}{2} = 2 \Rightarrow 1 + x = 4 \Rightarrow x = 3
\]
\[
\frac{4 + y}{2} = -3 \Rightarrow y = -6 - 4 = -10
\]

∴ The coordinates of A (x, y) is (3, -10).

If A and B are (-2, -2) and (2, -4), respectively, find the coordinates of P such that AP = \(\frac{3}{7}\) AB and P lies on the line segment AB.

Solution:

\[
A \quad \frac{3}{7} \quad B
\]

(-2, -2) \quad P \quad (2, -4)

Given AP = \(\frac{3}{7}\) AB  
∴ PB = \(\frac{4}{7}\) AB  
(i.e) P divides AB in the ratio 3 : 4

Also A(-2, -2) = A(x_1, y_1) and B(2, -4) = B(x_2, y_2)

Coordinates of P is
\[
\left( \frac{3 \times 2 + 4 \times -2}{7}, \frac{3 \times -4 + 4 \times -2}{7} \right)
\]
\[
\left( \frac{-2}{7}, \frac{-20}{7} \right)
\]
Question 17

Find the coordinates of the points which divide the line segment joining A(−2, 2) and B(2, 8) into four equal parts.

Solution:

Let P, Q, R be the points which divide the line into 4 equal parts.

To find P, AP : PB is 1 : 3

$A(-2, 2) = A(x_1, y_1), B(2, 8) = B(x_2, y_2)$

Co-ordinates of P $\left(\frac{1 \times 2 - 2 \times 3}{4}, \frac{1 \times 8 + 3 \times 2}{4}\right)$

$= \left(\frac{-6 + 6}{4}, \frac{8 + 6}{4}\right) = \left(0, \frac{14}{4}\right) = \left(0, \frac{7}{2}\right)$

To find Q, AQ : QB = 2 : 2 (ie) 1 : 1

Coordinates of Q $\left(\frac{2 \times -2 + 2 \times 2}{4}, \frac{2 \times 2 + 2 \times 8}{4}\right)$

$= \left(\frac{-4 + 4}{4}, \frac{16}{4}\right) = \left(0, \frac{4}{4}\right) = (0, 5)$

To find R, AR : RB is 3 : 1

Co-ordinates of R $\left(\frac{3 \times 2 + 1 \times -2}{4}, \frac{3 \times 8 + 1 \times 2}{4}\right) = \left(1, \frac{13}{2}\right)$

\Required Co-ordinates (-1, 7/2), (0, 5), (1, 13/2) = (1, 13/2).
Question-18

Find the area of a rhombus if its vertices are (3, 0), (4, 5), (−1, 4) and (−2, −1) taken in order. [Hint: Area of a rhombus = \( \frac{1}{2} \) (product of its diagonals)].

Solution:

Area of rhombus = \( \frac{1}{2} \) (product of its diagonals)

Let A(3, 0), B(4, 5), C(−1, 4) and D(−2, −1) be the vertices of the rhombus.

BD = \( \sqrt{(4 - 2)^2 + (5 + 1)^2} = \sqrt{6^2 + 6^2} = 6\sqrt{2} \)

AC = \( \sqrt{(3 + 1)^2 + (0 - 4)^2} = \sqrt{16 + 16} = 4\sqrt{2} \)

\( \text{Area of the rhombus} = \frac{1}{2} (6\sqrt{2} \times 4\sqrt{2}) \)

= \( \frac{24 \times 2}{2} = 24 \text{ sq. unit.} \)
NCERT Solutions For Class 10 Chapter 7 Coordinate Geometry Exercise 7.3

**Question-19**

Find the area of the triangle whose vertices are:
(i) (2, 3), (-1, 0), (2, -4)
(ii) (-5, -1), (3, -5), (5, 2).

**Solution:**

A = (x_1, y_1) = (2, 3)
B = (x_2, y_2) = (-1, 0)
C = (x_3, y_3) = (2, -4)

Area of triangle = \[
\frac{1}{2} \left[ x_1 (y_2 - y_3) + x_2 (y_3 - y_1) + x_3 (y_1 - y_2) \right]
\]

= \[
\frac{1}{2} \left[ 2(0 - 4) + (-1)(-4 - 3) + 2(3 - 0) \right]
\]

= \[
\frac{1}{2} \left[ -8 + 7 + 6 \right] = \frac{11}{2} \text{ sq.units.}
\]
(ii) 

A = \((x_1, y_1) = (-5, -1)\)
B = \((x_2, y_2) = (3, -5)\)
C = \((x_3, y_3) = (5, 2)\)

Area of triangle = \(\frac{1}{2} \left[ x_1 (y_2 - y_3) + x_2 (y_3 - y_1) + x_3 (y_1 - y_2) \right]\)

= \(\frac{1}{2} \left[ -5(-5 - 2) + 3(2 + 1) + 5(-1 + 5) \right]\)

= \(\frac{1}{2} \left[ -5(-7) + 3(3) + 5(4) \right]\)

= \(\frac{1}{2} \left[ 35 + 9 + 20 \right]\)

= \(\frac{1}{2} \left[ 64 \right]\)

= 32 \text{ sq. units}
Question-20

In each of the following find the value of "k", for which the points are collinear.
(i) (7, -2), (5, 1), (3, k)
(ii) (8, 1), (k, -4), (2, -5).

Solution:

(i) 
\[
\begin{array}{ccc}
(7, 2) & (5, 1) & (3, k) \\
A & B & C
\end{array}
\]

Given the points are collinear
⇒ Area of triangle = 0
A (7, -2)
B (5, 1)
C (3, k)
Area of triangle = \( \frac{1}{2} [7(1 - k) + 5(k + 2) + 3(-2 - 1)] \)
(i.e.,) \( \frac{1}{2} [7 - 7k + 5k + 10 - 9] = 0 \)
\(-2k + 8 = 0\)
k = 4

(ii)
A(8, 1)
B(k, -4)
C(2, -5)
∴ Area of Δ ABC = 0
∴ \( \frac{1}{2} [8 - 6k + 10] = 0 \)
\( = 18 - 6k = 0 \)
∴ k = 3.
Find the area of the triangle formed by joining the mid-points of the sides of the triangle whose vertices are (0, -1), (2, 1) and (0, 3). Find the ratio of this area to the area of the given triangle.

**Solution:**

Let $A(0, -1)$, $B(2, 1)$ and $C(0, 3)$ be vertices of the $	riangle ABC$.

\[ \text{Area of triangle } \triangle ABC = \frac{1}{2} \left| 0(1 - 3) + 2(3 + 1) + 0(-1 - 1) \right| = 1 \quad (\because \text{Area of triangle is non-negative}) \]

Let $P$, $Q$, $R$ be the midpoints of the sides.

- Co-ordinates of $P$ are $\left( \frac{0 + 2}{2}, \frac{-1 + 1}{2} \right) = (1, 0)$
- Co-ordinates of $Q$ are $\left( \frac{0 + 0}{2}, \frac{-1 + 3}{2} \right) = (0, 1)$
- Co-ordinates of $R$ are $\left( \frac{2 + 0}{2}, \frac{1 + 3}{2} \right) = (1, 2)$

\[ \text{Area of } \triangle DPQR = \frac{1}{2} \left| 1(1 - 2) + 0(2 - 0) + 1(0 - 1) \right| = 1 \quad (\because \text{Area of triangle is non-negative}) \]

\[ \therefore \text{Area of } \triangle DPQR = 1 \text{ unit.} \]

Hence the ratio of area of triangle $ABC$ and area of triangle $PQR = 1$ unit.
Find the area of the quadrilateral whose vertices are (-4, -2), (-3, -5) and (3, -2), (2, 3).

Solution:

Area of quadrilateral = Area of Δ ABC + Area of Δ ADC

Area of Δ ABC = \( \frac{1}{2} [-4(-5 + 2) - 3(-2 + 2) + 3(-2 + 5)] \)
\[= \frac{1}{2} [12 + 9] = \frac{21}{2} \]
\( \therefore \) Area of Δ ADC = \( \frac{1}{2} [-4(3 + 2) + 2(-2 + 2) + 3(-2 - 3)] \)
\[= \frac{1}{2} [-20 - 15] = \frac{-35}{2} \]
\[= \frac{35}{2} \]

Area of quadrilateral = \( \frac{21}{2} + \frac{35}{2} = \frac{56}{2} = 28 \) sq units.

Question-14

If \( a \cos \theta - b \sin \theta = c \), show that \( a \sin \theta + b \cos \theta = \pm \sqrt{a^2 + b^2 - c^2} \).

Solution:

\( (a \cos \theta - b \sin \theta)^2 + (a \sin \theta + b \cos \theta)^2 \)
\[= a^2(\cos^2 \theta + \sin^2 \theta) + b^2(\sin^2 \theta + \cos^2 \theta) - 2ab \sin \theta \cos \theta + 2ab \sin \theta \cos \theta \]
\[\cos \theta \]
\[= a^2 + b^2 \]
\( \therefore \) (a \cos \theta - b \sin \theta)^2 + (a \sin \theta + b \cos \theta)^2 = a^2 + b^2

\( \therefore \) (a \cos \theta - b \sin \theta)^2 = a^2 + b^2 - (a \sin \theta + b \cos \theta)^2
\[= a^2 + b^2 - c^2 \]
\( \therefore \) a \sin \theta + b \cos \theta = \pm \sqrt{a^2 + b^2 - c^2} \).
The median of a triangle divides it into two triangles of equal areas. Verify this result for $\Delta ABC$ whose vertices are $A(4, -6), B(3, -2)$ and $C(5, 2)$.

**Solution:**

If $AD$ is the median of $\Delta ABC$, $D$ is the midpoint of $BC$ given by \( \left( \frac{3 + 5}{2}, \frac{-2 + 2}{2} \right) \) 

(i.e) $(4, 0)$

Hence Co-ordinates of $D$ is $(4, 0)$

\[
\text{Area of } \Delta ABD = \frac{1}{2} \left[ 4(-2 - 0) + 3(0 + 6) + 4(-5 + 2) \right] \\
= \frac{1}{2} \left[ -8 + 18 - 16 \right] = \frac{-6}{2} = 3 \\
\text{Area of } \Delta ADC = \frac{1}{2} \left[ 4(0 + 2) + 4(-2 + 5) + 5(-6 - 0) \right] \\
= \frac{1}{2} \left[ 8 + 16 - 30 \right] = \frac{-6}{2} = 3
\]

\[\text{Area of } \Delta ABD = \text{Area of } \Delta ADC = \frac{-6}{2} = 3.\]