

DETAILED LESSON PLAN

SUBJECT : Mathematics

CLASS : 10

TOPIC : L-7 Coordinate Geometry

REQUIRED PERIODS : 8

LEARNING OUTCOMES

Knowledge

Students will be able

- To understand the term abscissa, ordinate, quadrant.
- To understand a point on x-axis is $(x, 0)$ and a point on y-axis is $(0, y)$.
- To find the distance between two points whose coordinates are given using distance formula.
- To find the distance between origin and a point whose coordinates are given.
- To find the type of triangle formed when coordinates of three points are given.
- To find the type of quadrilateral formed when coordinates of four points are given.
- To understand the condition of collinearity.
- To find the coordinates of a point that divides a line segment joining two points of known coordinates internally in a given ratio.
- To apply section formula to find the mid - point of the line segment whose end points are given.
- To understand the formula for finding the area of a triangle on a plane and its applications.

Skill

- Students will be able to understand the geometry of shapes using algebra.
- They will be able to understand algebra with the help of geometry.
- They will also learn the use of coordinate geometry in various fields such as physics, engineering, navigation, seismology and art.

Values

- To develop team spirit, unity, analytical thinking, critical thinking and problem-solving attitude.

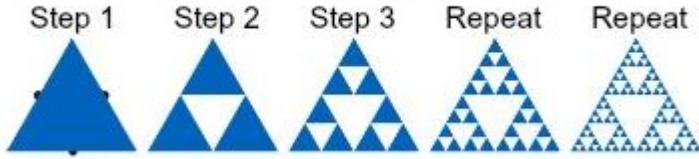
Period – 1	Duration: 35 min
Sub topics:	To reinforce the plotting of points in two - dimensional Cartesian coordinate system.
Learning Outcomes:	- Students will know and identify the different axes and points on them. - Students will be able to relate coordinate axes with everyday life and its uses.
Key Vocabulary:	- X-axis & Y-axis - Coordinates - Abscissa & Ordinate - Point of origin - Quadrants
Skills Developed:	Understanding, applying
Opening/Set Induction	Duration: 15 min
Teaching strategy : Graphical activity	Transaction would proceed in the following manner: Teacher to Begin the lesson by conducting a simple activity to help students recall prior knowledge on coordinate geometry. Students will draw the Cartesian plane on the graph paper and mark the axes and name them. Then, they will identify and name the four quadrants into which the axes divide the plane. They will mark a few points on the plane given to them.
Digital contents:	https://www.youtube.com/watch?v=8Oe_ksww0Pg
Discussion of the topic through Collaborative Learning	Duration: 10 min
Teaching strategy: Brain storming	Transaction would proceed in the following manner: - Teacher to discuss a few applications of coordinate geometry in real life. Coordinate geometry has various applications in real life. Some of the areas where coordinate Geometry is an integral part include. - In digital devices like computers, mobile phones, etc. to locate the position of cursor or finger. - In aviation to determine the position and location of airplanes accurately. - In maps and in navigation (GPS).

	To map geographical locations using latitudes and longitudes.
Closure	Duration: 10 min
Closure strategy: Verification – Think and answer	Felicitor will ask the following questions to assess the learning outcomes. - What is Abscissa and Ordinates in Coordinate Geometry? - What is a Cartesian plane? - What are the coordinates of origin? - Why do we Need Coordinate Geometry?
Home Assignment: Picture plotting	Objective: - Students will plot and connects the set of coordinates that result in various shapes such as sail boats, chimney etc. For example, if students plot and connects the points (1, 1), (2, 2), (3, 3), (4, 2), (3, 1) and (2, 1), it forms a hexagon. - They will also draw some shapes on graph paper and write their coordinates. Example: What are the coordinates that design this sailboat?
Period – 2	Duration: 35 min
Sub topics:	- Derive the distance formula to find the distance between the two points whose coordinates are given. - Calculate the distance between the two points whose coordinates are given. - Calculate the distance between origin and a point whose coordinates are given.
Learning Outcomes:	- Students will know and identify the concept of Distance formula. - They will be able to apply distance formula to find the distance between any two points accurately.
Skill Developed:	Understanding, analyzing, applying and creating.
Opening/Set induction (Recapitulation)	Duration: 10 min

Teaching strategy: Activity	Students will be given a crossword containing key words they have learned in previous session. It will help them to recall the concept done so far.
Discussion of the topic through Collaborative Learning:	Duration: 10 min
Teaching strategy: Induction-Deduction	Transaction would proceed in the following manner: Students will be given graph papers. They will mark two points on it and find their coordinates. They will also find the distance between these two points using Pythagoras Theorem. Teacher will help them to generalize the result and derive the 'Distance formula'.
Digital content:	Children can also go through the following link to understand the derivation of 'Distance formula'. https://www.youtube.com/watch?v=Zqx58JfzRCI
Closure:	Duration: 15 min
Closure strategy: Problem solving.	Felicitator will guide the students to solve various questions from exercise 7.1 of NCERT textbook.
Home Assignment:	To mark coordinate axes on your city map and find distances between important landmarks - bus stand, railway station, airport, hospital, school etc.
Period – 3	Duration: 15 min
Sub topics:	- Condition for collinearity of three points given on a plane. - Applications of distance formula.
Learning Outcomes:	- Students will determine the condition for collinearity of three points given on a plane. - Students will be able to apply the distance formula in determining the type of the triangle obtained by joining the three points on a plane. - Students will be able to determine the type of the quadrilateral obtained by joining the four points on a plane.
Skill Developed:	Critical thinking and problem solving.
Opening/set induction	Duration: 20 min
Teaching strategy: Demonstration and observation	Transaction would proceed in the following manner: Teacher will plot three points say A, B, C on the board and join them. Students will observe that by joining any three non collinear points they will get a triangle. Students will find out the distance AB, BC and CA using distance formula. Eventually they will observe the following outcomes.

	• If the triangle is isosceles then $AB = BC$ or $AB = AC$ or $AC = BC$ • If the triangle is equilateral then $AB = BC = AC$ • If the triangle is Right triangle then $AC^2 = AB^2 + BC^2$ or $AB^2 = AC^2 + BC^2$ or $BC^2 = AB^2 + AC^2$ When the points are on a line then any one of the following conditions will be true. • $AB + BC = AC$ • $AB + AC = BC$ • $AC + BC = AB$ They will also extend their knowledge to determine the type of the quadrilateral obtained by joining any four points given on a plane.
Closure:	Duration: 15 min
Closure strategy: Problem solving.	Felicitor will guide the students to solve various questions from exercise 7.1 of NCERT textbook.
Home Assignment:	A practice worksheet would be given containing multiple choice questions covering the concept done so far.
Period – 4	Duration: 35 min
Sub topics:	• Identify and apply Section formula with accuracy.
Learning Outcomes:	• Children will know and understand the Section formula which is used to find the coordinates of a point which divides the given line segment internally. • Students would be able to attempt questions and apply the knowledge with accuracy.
Skill Developed:	• Understanding, analyzing, applying and problem solving.
Opening/set induction	Duration: 15 min
Teaching strategy: Brain storming	• Students will be shown pictures depicting difference between similarity and congruency. • The students will be told about the criteria's of similarity and its applications. • Students would be taught the Section formula to calculate the coordinates of the point which divides the line segment in the given ratio. It will be explained to the students how is it related to the similarity of the triangle.
Closure:	Duration: 20 min
Closure strategy: Problem solving.	Felicitor will guide the students to solve various questions from exercise 7.2 of NCERT text book.
Home Assignment:	• A practice worksheet containing very short and short answer type questions would be given covering the concept of distance formula and section

	formula.
Period – 5	Duration: 35 min
Sub topics:	• Mid - point formula and its applications.
Learning Outcomes:	• Students would be able to apply section formula to derive the formula for mid - point of a line segment. • Use mid-point formula to find the centre of a circle when end points of a diameter are given. • Use mid-point formula to find the centroid of a triangle.
Skill Developed:	Understanding, analyzing, applying and problem solving.
Opening/set induction	Duration: 10 min
Teaching strategy: Induction\ Deduction	Transaction would proceed in the following manner: Children will be shown various points and asked to use section formula. Students would then be asked to use same when ratio is 1 : 1 thereby getting mid-point formula.
Independent Practice:	Duration: 10 min Children will go through the solved example before Ex. 7.2 of NCERT textbook.
Closure:	Duration: 20 min
Closure strategy: Problem solving.	Felicitator will guide the students to solve various questions from exercise 7.2 of NCERT text book.
Home Assignment:	Creating Sierpinski triangle. (An integration of art and geometry) The Sierpinski Triangle is an extremely interesting geometric construction which may be created using the following steps: 1. Start with an equilateral triangle, ΔABC, and locate the midpoints of each of the sides of the triangle. 2. Connect each of the midpoints with a line segment, and remove the triangle you just created. 3. You now have three equilateral triangles within the original equilateral triangle. Repeat steps 1 and 2 for each of these triangles. This process can be continued indefinitely or until you choose to stop.

	Step 1 Step 2 Step 3 Repeat Repeat  All of the triangles within the Sierpinski Triangle are similar to the original figure. 
Period – 6	Duration: 35 min
Sub topics:	• Application of section/mid - point formula continued.
Learning Outcomes:	• Students would be able to reason effectively and critically differentiate between cases when to use both formulae objectively.
Opening/set induction	Duration: 15 min
Teaching strategy: Brainstorming	Transaction would proceed in the following manner: • Students would be asked to write the different formulae and then asked about various triangles related concepts like centroid and medians. • Formula for centroid would be discussed.
Closure:	Duration: 20 min
Closure strategy: Problem solving.	Felicitator will guide the students to solve various questions from exercise 7.2 of NCERT text book.
Home Assignment:	Self-study
Period – 7	Duration: 35 min
Sub topics:	• Area of triangle whose vertices are given.
Learning Outcomes:	• Children will understand the formula for finding the area of a triangle whose vertices are given. • They will be able to calculate the area of the triangle whose vertices are given. • They will be able to find the condition of collinearity using formula for area.
Skill Developed:	• Critical thinking and problem solving.

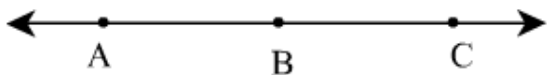
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Teaching strategy: Discussion and demonstration	Transaction would proceed in the following manner: Teacher will help students to recall various methods to calculate the area of a given triangle and explain if the vertices of the triangle are (x1, y1), (x2, y2) and (x3, y3), then area of triangle can be calculated as: Area = $\frac{1}{2}[x_1 (y_2 - y_3) + x_2 (y_3 - y_1) + x_3 (y_1 - y_2)]$ Students will also observe that if points are on a line no triangle can be formed so the area of the triangle can be assumed 0.																		
Independent Practice:	Duration: 10 min Children will go through the solved example before Ex. 7.3 of NCERT textbook																		
Closure:	Duration: 10 min																		
Closure strategy: Problem solving.	Felicitator will guide the students to solve various questions from exercise 7.3 of NCERT text book.																		
Home Assignment:	Self-Study																		
Period – 8	Duration: 35 min																		
Sub topics:	• Error remediation. • Recapitulation of the whole concept.																		
Learning Outcomes:	• Students will be aware of possible errors occur while solving various sums. • They will understand the correct method to solve them.																		
Error analysis and remediation:	Duration: 20 min																		
	<table><tr><th colspan="3">ERROR ANALYSIS</th></tr><tr><th>Sl no</th><th>POSSIBLE ERRORS</th><th>REMEDATIONS</th></tr><tr><td>1</td><td>Some students find midpoint of the line segment joining the given points instead of taking ratio as K:1 Some students get confused when ratio is given as $\frac{6}{25} : 1$</td><td>Concept of section formula should be explained for different situations</td></tr><tr><td>2</td><td>While solving questions students exchange the ordered pairs and sometimes do not take the negative sign</td><td>Concept should be made clear about the coordinates and practice should be given</td></tr><tr><td>3</td><td>Condition for collinearity – confusion in use of distance formula and area of triangle formula</td><td>Students should be thoroughly drilled to use the appropriate formula as per the given problem.</td></tr><tr><td>4</td><td>Recognising the type of quadrilateral when coordinates of vertices are given</td><td>Properties of different types of quadrilaterals should be thoroughly explained to distinguish from each other</td></tr></table>	ERROR ANALYSIS			Sl no	POSSIBLE ERRORS	REMEDATIONS	1	Some students find midpoint of the line segment joining the given points instead of taking ratio as K:1 Some students get confused when ratio is given as $\frac{6}{25} : 1$	Concept of section formula should be explained for different situations	2	While solving questions students exchange the ordered pairs and sometimes do not take the negative sign	Concept should be made clear about the coordinates and practice should be given	3	Condition for collinearity – confusion in use of distance formula and area of triangle formula	Students should be thoroughly drilled to use the appropriate formula as per the given problem.	4	Recognising the type of quadrilateral when coordinates of vertices are given	Properties of different types of quadrilaterals should be thoroughly explained to distinguish from each other
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Closure:	Duration: 10 min																		
Closure strategy: Problem solving	A diagnostic worksheet will be given to solve and remedial measure would be taken based on individual needs.																		
Assessments:	Class test, Practice worksheet including MCQs, Very short, short and long answer type questions, facts sheet.																		

Project: (Group activity)- An integration with ICT

Children will research on the real life applications of coordinate geometry and create a power point presentation.

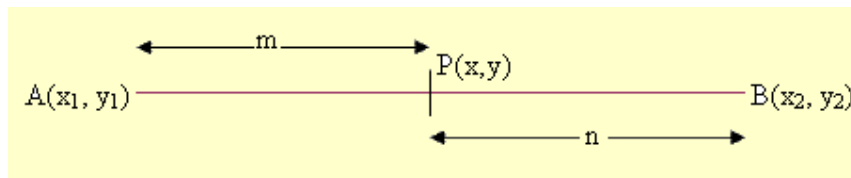
Fact Sheet (Important points to remember)

- For a given point, the abscissa and ordinate are the distance of the given point from y-axis and x-axis respectively.
For example, the point P(2, 3) is at a distance of 3 unit from y-axis and 2 unit from x-axis
- The x-coordinate or abscissa of every point on y-axis is zero while y coordinate or ordinate of every point on x-axis is zero.
- The coordinates of origin is (0, 0).
- **Use of distance formula:**
- **Collinear points:** To show collinearity of three points, we prove that the sum of the distance between two pair of points is equal to the third pair of point.
For example, points A, B, C are collinear because $AB + BC = AC$.

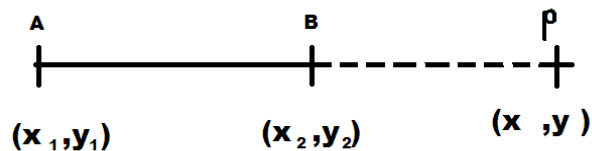


- **Equidistance:** To prove that a point 'P' is equidistance from two points A and B, we prove $PA = PB$
 - **Geometrical figure:**
If three or four points are given, then in order to prove that a given figure is:
 - Triangle, we prove that sum of lengths of any two sides is greater than the length of third side.
 - Isosceles triangle, we prove that any two sides are equal.
 - Equilateral triangle, we prove that all three sides are equal.
 - Right angled triangle, we prove that the sum of the squares of any two sides is equal to the square of the third side.
 - Parallelogram, we prove that opposite sides are equal.
 - Rhombus, we prove that all four sides are equal.
 - Rectangle, we prove that opposite sides are equal and diagonals are also equal.
 - Square, we prove that four sides are equal and diagonals are also equal.
 - **Facts related to section formula and its use:**
 - In case of internal division, point dividing the line segment lie on it, while in external division, point dividing the line segment does not lie on it.
For example,

Internal division



External division



- To show the collinearity of three points A, B, C by using section formula, first we assure that any one point say C divides AB in the ratio of $k : 1$. Then we find coordinate of C by using section formula and equate them with x and y coordinate of C. If value of k from both the equations are same, then given points are collinear.
- **Collinearity of points by using area formula:**
To prove the collinearity of three points A, B, C by using area formula, we find area of triangle ABC formed assuming vertices as given points A, B and C. If area so obtained is zero, then given points are collinear.