LESSON PLAN TEMPLATE

Lesson Title	Transformations and Coordinates in the Cartesian Plane
Learning Area/s	Mathematics
Name of Teacher/s	DEPED TAMBAYAN PH (www.depedtambayanph.net)
Grade Level and Section	Grade 10
No. of Sessions	4 Sessions
References	None specified
Declaration of AI use	This lesson plan was co-created using Gemini AI to assist with unpacking competencies into a 4-session learning design, structuring activities, and assessment formulation.

Intentions.

Meaningful learning experiences are anchored in how we frame them. Start by deciding what you want learners to master by the end of the lesson – keep it clear and simple.

Learning Competency and Curriculum Standards:	**Learning Competency:** Describe the position of points in the Cartesian plane. Describe translations, reflections, and rotations, in the Cartesian plane using coordinates. **Content Standards:** The learners should have knowledge and understanding of... • the laws of sines and the laws of cosines • translations, reflections, and rotations, in the Cartesian plane • quadratic inequalities in one variable and in two variables • absolute value equations and inequalities in one variable and their graphs • box - and - whisker plots, and cumulative frequency histograms and polygons • quartiles, deciles, and percentiles; interquartile range, and outliers **Performance Standards:** By the end of the term, the learners are able to... • find sides and angles in oblique triangles using the laws of sines and the laws of cosines. • describe translations, reflections, and rotations in the Cartesian plane. • solve and graph the solutions of quadratic inequalities in one variable and in two variables. • solve absolute value equations in one variable and absolute value inequalities in one variable, and graph the solutions. • construct and interpret box - and - whisker plots, and cumulative frequency histograms and polygons. • calculate quartiles, deciles, and percentiles; interquartile range, and outliers.

	Session 1	Session 2	Session 3	Session 4
Learning Objectives:	● Identify and plot points in the Cartesian plane accurately. ● Describe and perform translations of points and figures using coordinate notation (x + h, y + k). ● Apply the concept of translation to describe real-life movements in a local community setting.	● Describe reflections across the x-axis, y-axis, and the origin. ● Identify the pattern in coordinate changes when a figure is reflected. ● Create symmetrical designs using reflection principles in the Cartesian plane.	● Describe rotations of 90°, 180°, and 270° about the origin. ● Identify the coordinate rules for rotations in the Cartesian plane. ● Relate rotations to circular movements found in traditional Filipino dances or games.	● Differentiate between translation, reflection, and rotation based on coordinate changes. ● Perform multiple transformations on a single figure. ● Describe positions and movements in a Cartesian plane to solve a community-based problem.
Learner Context:	Learners exhibit a mix of readiness levels, with many showing a strong preference for visual and hands-on activities. Most can plot points in the first quadrant but struggle with signs in the second, third, and fourth quadrants. They are generally enthusiastic when mathematical concepts are linked to local landmarks or community navigation. A common barrier is the confusion	Learners show high engagement with visual patterns and symmetry, often seen in local 'Banig' (mat) weaving or 'Parol' (lantern) making. While they grasp the concept of a 'mirror image' easily, they occasionally mix up the rules for reflecting over the x-axis versus the y-axis. The visual nature of this topic helps bridge the gap for those with lower numeracy skills.	Learners are kinesthetically inclined and respond well to movement-based learning. They find rotations more abstract than translations or reflections. A primary barrier is distinguishing between clockwise and counter-clockwise directions. They benefit from physical manipulatives like 'spinners' or rotating coordinate overlays.	The class shows a wide range of mastery. Some are ready to combine transformations, while others still need to reference their 'rule sheets.' They are motivated by competitive group activities and tasks that feel 'real,' such as designing or navigating. Barrier: Multi-step instructions can be overwhelming for those with shorter attention spans.

	between horizontal and vertical shifts when working with negative integers.			
Learning Experience. **A learning experience is like a thoughtfully designed journey. Each activity and interaction builds towards meaningful understanding and growth. Identify activities and interactions to help learners gain knowledge, skills, or understanding in a purposeful way.**				
Pre-Lesson:	• **Mapping the Barangay:** Students are given a simplified grid map of a local barangay. They must identify the coordinates of the 'Sari-sari Store,' 'Church,' and 'Barangay Hall' relative to the 'Plaza' at (0,0).	• **Mirror, Mirror:** Students use a small mirror placed on a line (x or y axis) on a coordinate sheet to see where a plotted point 'appears' on the other side.	• **Human Compass:** Students stand up. The teacher calls out '90 degrees clockwise' or '180 degrees.' Students must turn accordingly, relating their body orientation to a grid on the floor.	• **Quick-Fire Review:** A 5-minute quiz using the projector where students identify the type of transformation shown in a gif (Is it a slide, flip, or turn?).
Flow:	**1. Active Retrieval:** Review plotting points by playing 'Coordinate Bingo' where students mark points on their own Cartesian grids based on called-out coordinates. **2. Scaffolding (I Do):** Introduce 'Translation' as a 'Slide.'	**1. Discovery Activity:** Students plot a triangle in Quadrant I. They are asked to fold their paper along the y-axis and 'trace' the points onto Quadrant II. They record the new coordinates. **2. Pattern Recognition (Scaffolding):** Based on the	**1. Hands-on Modeling:** Give each student a piece of tracing paper with a coordinate grid. They plot a point, place a pencil tip at (0,0), and rotate the tracing paper 90 degrees to see where the point lands on the paper underneath. **2. Guided**	**1. Scaffolding (Synthesis):** Model a 'Double Transformation.' Take a point, reflect it over the x-axis, then translate it 3 units left. Show the step-by-step coordinate path. **2. Social Learning:** 'The Great Barangay Race.' In teams,

	Demonstrate moving a point (2,3) to (5,1) on the board, explaining the change in x and y (3 units right, 2 units down). **3. Social Learning (We Do):** In pairs, students use a physical 'Jeepney' cut-out on a large grid. They follow 'routes' (e.g., 'Move 4 units left and 2 units up') and record the new coordinates of the Jeepney's nose. **4. Check for Understanding:** Use 'Think-Pair-Share' to determine the new coordinates of point A(-3, 2) if it is translated 5 units right and 4 units down. **5. Independent Practice (You Do):** Students complete a worksheet where they translate geometric shapes (triangles/squares) and write the resulting coordinates.	folding, students compare (x, y) with the new coordinates. Guide them to see that reflecting over the y-axis changes the sign of x: (-x, y). **3. Collaborative Group Work:** Groups are assigned either the x-axis or the origin. They must find the 'transformation rule' by plotting points and observing changes, then present their 'rule' to the class. **4. Active Retrieval:** Flash cards with coordinates (e.g., 'Reflect (4, -5) over the x-axis'). Students show their answers on mini-whiteboards. **5. Creative Application:** Students design a simple 'Mat Pattern' in one quadrant and reflect it across both axes to create a full symmetrical design.	**Instruction (I Do):** Explicitly teach the rules: (x, y) becomes (-y, x) for 90° CCW, and (-x, -y) for 180°. Use visual aids to show the 'swapping' of x and y values. **3. Check for Understanding:** Use a 'Fist-to-Five' to gauge confidence in the 90-degree rule before moving to the 180-degree rule. **4. Social Learning:** In groups, students simulate a 'Balse' (waltz) or folk dance movement on a floor grid, recording their coordinates at every 90-degree turn. **5. Active Retrieval:** 'Coordinate Scavenger Hunt' - Students start at a point and must follow a series of rotation 'clues' to find the final hidden coordinate.	students receive a 'mission' (e.g., 'The delivery truck starts at (2,2). It reflects over the y-axis to pick up cargo, then rotates 180 degrees to head home. Where is it?'). **3. Active Retrieval:** Each student creates their own 'Secret Code' using transformations for a partner to solve. 'Start at (1,1), apply [Transformation], what is the result?' **4. Check for Understanding:** 'Error Analysis' - Show a sample student work with a mistake in a rotation. Students must identify the error and correct it. **5. Summative Task:** Students design a 'Community Logo' on a Cartesian plane using at least one translation, one reflection, and one rotation, listing all vertex coordinates for each step.
Learning Resources:	● Graphing boards or Cartesian plane posters ● Jeepney cut-outs ● Worksheet: 'Navigating	● Small mirrors ● Graph paper and coloring materials ● Mini-whitebo ards ● PowerPoint showing	● Tracing paper ● Floor grid (using masking tape) ● Protractors (for visual reference)	● Projector and PowerPoint ● 'Mission Cards' for the race ● Logo design templates ● Coloring

	the Grid' ● Chalkboard and colored chalk	T'nalak weaving patterns	● PowerPoint with animations of rotating figures	materials
Opportunities for integration:	Integration with **Araling Panlipunan (Geography)** through map reading and understanding coordinates in GPS/mapping systems.	Integration with **MAPEH (Arts)** by analyzing the symmetry in traditional Filipino weaving and architectural designs.	Integration with **PE (Dance)** through the study of rotational movements in folk dances like 'Cariñosa' or 'Tinikling' floor patterns.	Integration with **ICT** (Computer Science) by discussing how these transformations are the basis for computer graphics and video game movements.
Assessment. **Assessments reveal what learners have gained and what they still need help with. These are helpful in providing you with information to guide your future instruction throughout the entire session.**				
Formative Assessment:	**Observation Checklist:** Monitor students during the 'Jeepney route' activity to see if they correctly distinguish between x (horizontal) and y (vertical) movements. **Exit Ticket:** 'If a point at (-1, -1) moves to (2, 2), what was the translation rule?'	**Coordinate Comparison Table:** Students fill out a table showing a 'Pre-image' point and its 'Image' after reflecting over the x-axis, y-axis, and origin. Check for consistent application of sign changes.	**Worksheet Check:** A 'Rotate the Shape' activity where students must provide the new coordinates for a square rotated 90°, 180°, and 270° counter-clockwise. **Observation:** Note students who struggle with the x/y swap.	**Performance Task:** Evaluation of the 'Community Logo' and the accompanying coordinate list. Success is measured by the accuracy of the coordinates relative to the visual transformation. **Self-Reflection:** Students write one sentence on which transformation they find easiest and why.
Ways Forward. **Meaningful learning can also happen beyond the classroom – for both the learners and the teacher. Pause and reflect on what happened today.**				
Extended	For advanced	Challenge: 'What	Task: 'Prove that a	Intervention:

learning opportunities:	learners: Provide a series of two translations and ask them to find a single translation rule that achieves the same result. For struggling learners: Provide a 'cheat sheet' indicating that 'Right/Up' are positive and 'Left/Down' are negative.	happens if you reflect a point over the y-axis and then reflect that result over the x-axis? Is this the same as reflecting over the origin?'	270° clockwise rotation is the same as a 90° counter-clockwise rotation using coordinates.'	Peer-tutoring session where students who mastered rotations help those who are still struggling with the coordinate swap. Advanced: Introduce the concept of 'Dilation' (scaling) as an extension of transformations.
Reflections:	Did the students manage the transition from the first quadrant to all four quadrants? Which students struggled with the integer addition involved in translation?	Were students able to generalize the rule (x, -y) and (-x, y) from their observations? Did the 'paper folding' effectively mitigate the barrier of coordinate confusion?	Did the tracing paper help students visualize the 'swap' of coordinates? Which rotation (90, 180, 270) caused the most confusion?	Which transformation rules are now 'automatic' for the students? Did the integration of local context (Barangay Race) improve engagement for the learners who were previously disinterested?