

East Asian Design- Lesson Plans

6th Gr. Math & Science

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Rationale:

For 6th grade Math, students are asked to plot polygons on coordinate planes given coordinates as vertices (CCSS.MATH.CONTENT.6.G.A.3). We will look specifically at Japanese design aesthetic used in interior spaces and relate the shapes and angles to polygons and quadrilaterals on coordinate planes. Ultimately, students will create abstract artwork using coordinates on the coordinate plane based on their own interior designs at home.

Math Lesson (Designed for Distance Learning preferably)

Skill Objective:

Students will be able to plot coordinates on a coordinate plane and create polygons and quadrilaterals. Students will be able to identify quadrilaterals by type and locate coordinates on a coordinate plane.

Content Standards: [CCSS.MATH.CONTENT.6.G.A.3](#) Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

Prior Knowledge:

Students can create coordinate planes and label (x & y) axes and quadrants on graph paper. Students can identify different polygons.

Materials:

Notebook, Graph paper, Ruler, Pencil, workspace

In our lecture, we discovered the prominence of rectangular shapes in the interior design of Japanese homes. This aesthetic was similar to abstract artwork and compared to Piet Modrian paintings. As students are working more from home during distance, using their own workspaces as inspiration, they will create abstract artwork by translating the design of their interior spaces (furniture, objects, decorations) onto coordinate planes.

Day 1 Opening Activity



(Photo from Hakone Estates in Saratoga, CA taken by Thomas Pineda)

Showing a photo of a traditional Japanese interior, start class with these discussion questions:

-What do you think this is?

-What do you notice?

-What shapes are prominent/do you notice?

Students can turn & talk with partners and share ideas. Bring class together and list any ideas or shapes. Students may be familiar with shape names (square, rectangle), share that there are other names used in Geometry to describe specific shapes. Finish opening discussion by asking, "What shapes are used in the design or decoration of your workspace at home?". Students can list examples in their notebooks.

Activity

We will identify the shapes used around us and apply the academic terms for them used in Geometry. Using their notebooks, student will start vocabulary Frayer model notes and definitions/examples for terms:

<u>Term</u>	<u>Definition</u>	<u>Visual example</u>
Polygon	A flat 2-D closed shape with sides and angles	(students draw)
Quadrilateral	A polygon with 4 sides and angles	
Trapezoid	a quadrilateral with exactly one pair of opposite sides parallel	
Parallelogram	a quadrilateral with opposite sides parallel and congruent	
Rhombus	a parallelogram with four equal sides (plural – rhombi)	
Rectangle	a parallelogram with four right angles	
Square	a rectangle with four equal sides or a rhombus with four right angles or a parallelogram with four equal sides and four right angles	

On their notepaper, students will draw visual examples based on the photo shown previously. The teacher will draw/annotate directly on the photo and label examples of each quadrilateral in the presentation. At least one accurate example for each quadrilateral should be shown. Students can identify other examples in the photo and annotate as well as a whole class activity. If students are not able to annotate in a whole class presentation, a digital copy of the photo can be provided and students can draw and submit their own edited and labeled drawings using an online photo editor or other app.

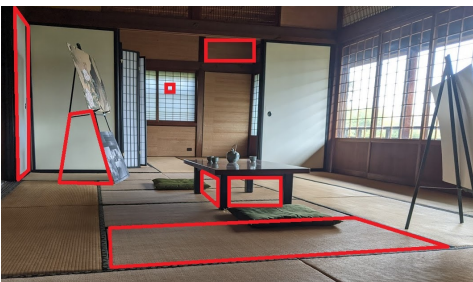
Debrief & Assessment

Students will discuss the differences they noticed between shapes (What makes a square different than a rectangle? different than a trapezoid?) They can share what new shapes they learned and where they have recognized them before.

Students should have at least 2 accurate examples for each vocabulary term created in their Frayer Model notes.

Extension

Students can use another photo from the web or one taken by them and it can be edited to show any of the shapes listed above or other shapes they know.



Day 2 Opening Activity

Slideshow of other interiors- any style or personal workspace examples.

Students will refer to their notes as slideshow is shown. Students can play “I spy...” using the name of a quadrilateral and see if other classmates choose the correct object. Explain that geometric shapes can be found in many common places and that they will be identifying the shapes in a workspace in their home, drawing it out on a coordinate plane.

Activity

Students will need graph paper ([online version](#)) and will set up a coordinate plane with an X & Y axis. They will be making a 2-D drawing of space of their choice, preferably their workspace in front of them so they can draw while seated at their device. They should use a ruler to create a line for the ground at $Y = -10$. This can be demonstrated using the [online PDF graph paper](#) before students begin. They will be drawing large items such as desks, drawers, items on the desk or wall and making outlines only at the points on the coordinate plane. Students should be encouraged to try and start and finish straight lines only from the whole number coordinates. From there, students should include at least 7 objects or pieces of furniture that are polygons, emphasizing the outline (perimeter) of the objects. Objects that have curves can also be included and items can just be drawn as outlines with labels, or they can be accurate drawings. Students should be given at least 10 minutes to work independently.

Bring the class back together and display a teacher’s demo drawing. Model for students how to label the coordinates for a particular item that creates a quadrilateral. For example: Desk- rectangle $(-4,-10)$, $(-4,3)$, $(5,3)$, $(5,-10)$. When listing coordinates, students must use the appropriate positive and negative numbers, in the correct order of x then y , as well as using parentheses and commas between values and coordinate pairs. As a whole group, volunteers are called on to identify the coordinates of other objects or identify the object a particular coordinate pair belongs to.

Students will then choose 4 objects that are quadrilaterals and on a separate paper, list the corresponding coordinate pairs that make up those shapes in their own drawings. Their list should be written as:

“Object” - shape (coordinate pairs), (x,y) , (x,y) , (x,y)

Assessment & Debrief

Students will review what is needed to locate a point on a graph (*x -axis or y -axis labeled and numbered, coordinate pairs written in correct order, negative signs if necessary*). Explain that coordinate pairs can be used to find locations and that any drawing can be recreated with an accurate list of coordinates and correct plotting of the points. Students should have an accurate list of coordinate pairs for at least 4 quadrilaterals along with their graph paper drawing.

Extension

Students who have their lists finished can exchange their coordinates list with a classmate and can then recreate their partners drawing. When they are finished, they can compare their papers and look for any inaccuracies or mistakes.

Day 3 Opening Activity



Piet Mondrian- Composition with Large Red Plane, Yellow, Black, Grey and Blue, 1921

Showing both photos to the class, start the discussion asking what similarities there are and what differences are seen (colors are used in blocks, there are only rectangles in the painting, etc;). After discussing, share the origin of the painting and painter (Dutch painter from the early 1900s) and that artwork can be made using geometry found at home. While the two images have little connection to each other in reality, they share a very similar geometric language.

Activity

Students will be making similar abstract artwork using coordinate lists from their partners rooms. Each student will make a copy of their coordinate lists with the coordinate pairs only for at least 4 objects (not the object name or original shape). They will exchange their list with a partner and begin plotting the points on a new piece of graph paper. Students should then label the shapes with the type of quadrilateral they are, referring to their notes. After labeling them, they can be colored or decorated however the student artist would like.

After plotting the points, students can add their own shapes or lines. They can choose to color or decorate the shapes like the painting or in their own style. Their final drawing should have at least one type of each quadrilateral from our vocabulary, five in total (trapezoid, parallelogram, rhombus, rectangle, square). When they both partners have finished, they can compare their “abstract coordinate plane” to their partner’s original drawing for accuracy of the original shapes.

Debrief & Assessment

After all drawings have been finished, students can conduct a gallery walk or samples can be shown in a classroom slideshow presentation. Students can be asked to compare their artwork and find similarities to the original pictures of Japanese interiors, or they can search for other styles of design that their room or artwork resembles. Students should create a coordinate plane with with at least 5 quadrilaterals and they should be accurately labeled. Four of their shapes should match their partner’s original drawing (same location and same shape).