

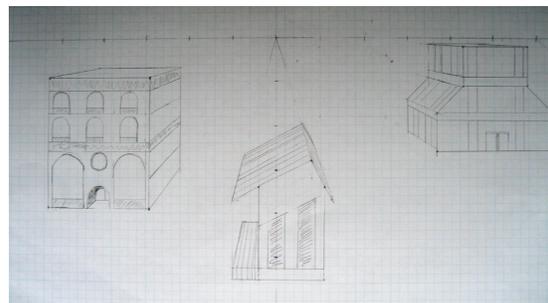
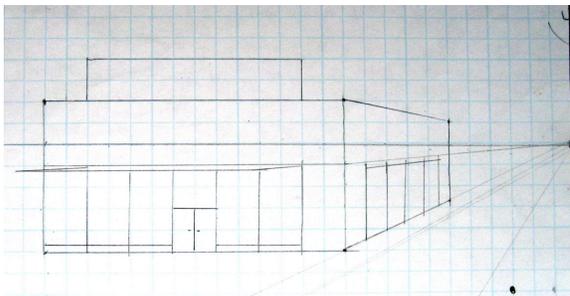
ARTS IMPACT—ARTS-INFUSED INSTITUTE LESSON PLAN (YR2-MAP)

EIGHTH GRADE—LESSON TWO: Transformations: Building Designs

Artist-Mentor – Shannon Eakins (edits by Jason Sobottka and Joe Schliesman)

Grade Level: 8

Examples:



Enduring Understanding

Assigning numerical values can communicate shared visual information and document changes.

Art and Math

Target: Records a building's placement on a coordinate plane.

Criteria: Plots: pairs of numbers (X- value—left or right +/- and Y- value—up or down +/-) for points in a plane relative to the origin; vertices of the front face.

Math

Target: Reflects a peer's building design on the Y-axis.

Criteria: Reverses X- coordinates relative to the origin; graphs the reflected building.

Math

Target: Dilates the coordinates of three peers' building face/facade designs.

Criteria: Multiplies the coordinates by 1.5 and records calculations in the Architecture Data Sheet.

Math

Target: Translates three dilated building face/facade designs on the coordinate plane.

Criteria: Graphs and maintains congruence (same side lengths and angle measurements) and orientation.

Art and Math

Target: Adds depth to transformed building faces.

Criteria: Uses orthogonal lines leading to a (0, 0) vanishing point from building face/facade vertices on coordinate plane.

Art

Target: Uses craftsmanship and accuracy in design.

Criteria: Measures for accuracy; aligns tools with grid lines; uses straight edges for drawing all shapes/figures.

<p>Materials Mechanical pencils, rulers, 8.5 x 11" 4x4 grid paper, vinyl erasers, folders for storage, Architecture Data Sheet Workbook (ADS), ELMO or overhead projector</p>	<p>Learning Targets</p> <ul style="list-style-type: none"> Records a building's placement on a coordinate plane. Reflects a peer's building design on the Y-axis. Dilates the coordinates of three peers' building face/facade designs.
<p>Do Now Students reflect their own building across the Y-axis to begin their cityscape. Students form architecture firms and trade coordinates and dilate/translate other students' coordinate pairs to create three more buildings. Double check a partner's work.</p>	
<p>Activities/Prompts</p> <ul style="list-style-type: none"> Review Ask students to explain: 2-dimensional, 3-dimensional, parallel, perpendicular, orthogonal, origin/vanishing point, coordinate plane and quadrants. Show Chester Arnold's <i>Addition</i> from TAM. ADS 11-6 <ul style="list-style-type: none"> Ask students to describe the image. Focus on image as a bird's eye view (from above). Show the roof of the building (top of a prism) placed below the horizon line as a bird's viewpoint looking down on it. Ask students what a worm's eye view might be. Break students into groups of four. <ul style="list-style-type: none"> Students name their firm and list their own building coordinates and building's purpose. ADS 11-8 Model completing the reflection portion of the data sheet and requests students complete the reflection for their own building. ADS 11-9 Demonstrate plotting the reflected coordinate pairs on a new sheet of graph paper-<i>Remember this will be on the left side of the Y-axis.</i> Activate the X- and Y-axis on the graph paper to create the coordinate plane: <ul style="list-style-type: none"> Place the origin/vanishing point (0, 0) two squares left from upper right of paper (using whole blocks) and two squares down. Label the coordinate plane across the negative X-axis and the negative Y-axis. Remind students that they are drawing their reflected building in Quadrant 3. Plot the reflected coordinates for the new facade. Use rulers and pencils to draw a rectangle facade. 	<p>Big Math Ideas Adjacent angles Complementary/ supplementary Grid Origin Quadrants 1, 2, 3, 4 Transversals X- and Y-axis Vertex/vertices</p> <p>Big Art Ideas Horizontal Parallel Perpendicular Symmetry Vanishing point (VP) Horizon line (HL) Vertical Bird's eye view Worm's eye view Architecture firm</p> <p>Note: For building 4, students can use (x-20, y20) OR, for more variation, change the X-axis from x-10 to x20.</p>

- **Label** the four coordinate pairs for each corner of the facade on the graph paper.
- **Draw** orthogonal (diminishing) lines from the visible corners to the origin/VP—*this will be towards the upper right side of the new paper.*
- **Complete** the rectangular prism by drawing a vertical line (parallel to the vertical sides of the facade) and a horizontal line (parallel to the top and bottom of the facade) in between the orthogonal lines.
- **Add** symmetry to the new building by duplicating exactly, the facade of the original building (across the Y-axis).
 - Use rulers to draw details in symmetry (same on both sides).
 - Remember the orthogonal sides must diminish to the origin/VP and have vertical lines parallel to the sides of the facade.
- **Write** students' names in the Architecture Data Sheet Workbook as the building designers. ADS 11-9 and 11-10
 - Students write the names of the other students by looking to their left and writing each student's name down for building 3, 4 and 5.
 - Students ask each student in the firm for each person's original coordinate pairs. (Building 1)
 - The original coordinate pairs serve as the starting data for buildings 3, 4 and 5.
- Students **dilate** and **translate** the coordinate pairs as specified on the data sheet to develop new, transformed buildings for their cityscape.

Assessment Criteria

- Plots pairs of numbers (X- value—left or right +/- and Y- value—up or down +/-) for points in a plane relative to the origin; vertices of the front face.
- Reverses X- coordinates relative to the origin; graphs the reflected building.
- Multiplies the coordinates by dilation and records calculations in the Architecture Data Sheets. ADS 11-9 and 11-10

Closure

- Put all materials and notes/data sheets in a folder.
- Return tools as directed.
- Self assess using checklist. ADS 11-11

Next Steps/Follow up Needs

Completing the calculations and plotting new buildings may take time. All students should end at the same point prior to the next lesson. Emphasize the need for peer-reviewed math and plotting to make sure the cities come together accurately.

Teaching and Learning Strategies

1. Warm-up: Initiates working in architectural firms. *Prompts:* Architects often work in firms where they work on projects in groups and therefore, can work faster and take on bigger projects. We have each designed a building independently. Now we will create architectural firms and share the information from our building designs with fellow designers. In this lesson, we will be creating cities using our own building design as well as three of our classmates' basic building designs. To begin, we will need to form architectural firms with at least four students in each firm. After you are placed in firms, write down your firm's associates and name your firm.

Student: Forms architectural firms with at least four members; lists the members of their firm on ADS 11-8.

2. Guides process of plotting building designs. *Prompts:* To be able to share and change our buildings, we need to plot the coordinates of each building. Once we have accurate coordinates, we should be able to insert your identical building on any graph in the classroom, just like an architect creating a design that can be repeated on a variety of pieces of land. Your buildings are plotted on a grid with an origin and an X- and Y-axis. To make it easier to count the lines on your grid, it helps to put a mark at every five spaces on each axis. Find the coordinates for each of the vertices of the front face, side face, top face (if applicable), and details of the buildings. Remember that the first number of the coordinate set represents the X-axis and the second represents the y-axis. The left side of the X-axis is negative number and the right side is positive; the top side of the Y-axis is positive and the bottom is negative. This is what makes up a four-quadrant grid. Once all the coordinates of your building are recorded, staple your drawing to the sheet with the coordinates, so it is ready to share with your firm members.

Student: Plots the coordinates of building in ADS 11-8; double checks coordinates.

Embedded Assessment: Criteria-based self-assessment

3. Discusses reflecting objects on a grid. *Prompts:* As we plan our city with each other's building designs, our original building design will exist in place, and we will perform transformations on our fellow firm member's basic building designs so they can occupy different spaces in our cities. Our first transformation will be reflections across the Y-axis. Reflections are a mirror image across an axis. If we reflect our building on the X-axis, what will happen to our building? To reflect across the Y-axis, change each (X, Y) into $(-X, Y)$. You can use a coordinate set that has different numbers such as $(1, 3)$. You can use a dilation such as 2.5. Practice using decimals.

Question for Students: If we were asked to reflect a point on the Y-axis, where would the point $(3, 7)$ land?

Student: Trades a set of building coordinates with a firm member. Reverses the X- coordinate number and graphs the entire reflected building; original designers approve reflected building. ADS 11-9

Embedded Assessment: Criteria-based peer to peer assessment

Vocabulary	Materials and Community Resources	WA Essential Learnings & Frameworks
<p><u>Arts Infused:</u> Plotting Reflection Transformation</p> <p><u>Math:</u> Coordinate plane Dilation Translation Vector notation</p> <p><u>Arts:</u> Unity</p>	<p>Museum Artworks Armin Landek, <i>City Lane</i>, 1945, Drypoint, 1970.184.2</p> <p>Chester Arnold, <i>Addition</i>, 2002, Lithograph, 2002.40.1</p> <p>Beulah Hyde, <i>Old Mill</i>, 1995, Oil on canvas, 1991.11</p> <p>Photograph of Tacoma Art Museum</p> <p><i>Building Tradition</i> catalog</p> <ul style="list-style-type: none"> • Photo of Tacoma • Photo of TAM <p>Art Materials: Mechanical pencils Rulers 8.5 x 11" 4x4 grid paper Vinyl erasers Folders for storage Architecture Data Sheets Workbook (ADS) ELMO or overhead projector</p>	<p>Arts State Grade Level Expectations AEL 1.1 concepts <i>Identifies and demonstrates how line and value define form and space</i></p> <p>AEL 1.1.2 composition <i>Uses proportion to analyze size relationships in an artwork</i></p> <p>AEL 1.2 skills and techniques <i>Uses spatial devices (e.g., one-point perspective)</i></p> <p>AEL 4.2 connections between the arts and other content areas <i>Explains relationships between the arts and other content areas</i></p> <p>Math State Grade Level Expectations 8.2.B properties of geometric figures <i>Determines missing angle measures using the relationships among the angles formed by parallel lines and transversals</i></p> <p>8.2.D properties of geometric figures <i>Demonstrates and explains the effect of one or more translations, rotations, reflections, or dilations (centered at the origin) of a geometric figure on the coordinate plane</i></p>

ARTS IMPACT—ARTS-INFUSED INSTITUTE LESSON PLAN (YR2-MAP)

ARCHITECTURE FIRM DATA SHEET

EIGHTH GRADE—LESSON TWO: Transformations: Building Designs

Architectural Firm Associates

List the colleagues in your Architectural Firm. Name your firm.

1. _____ (BUILDING ONE and TWO)
2. _____ (BUILDING THREE)
3. _____ (BUILDING FOUR)
4. _____ (BUILDING FIVE)

Architecture Firm Name: _____

Teaching and Learning Strategy 2: Coordinates of BUILDING ONE:

List the Coordinates for **your** building design. *Plot only the facade!*

Front Face	Coordinates
<i>Example: Top Left</i>	<i>(20, -15)</i>
Top Left:	
Top Right:	
Bottom Left:	
Bottom Right:	

Building Designer: _____
Write your name.

Building's Purpose: _____
What is this building for? What is it?

Reflected Building/BUILDING TWO:

Perform a reflection on the facade coordinates for **your** building.

Building One Coordinates:	Coordinates Reflected (Building Two):	
Top Left:		
Top Right:		
Bottom Left:		
Bottom Right:		

Dilations and Translations for BUILDINGS THREE, FOUR and FIVE:

BUILDING THREE:

Building Designer: _____
Write your friend's name.

Building's Purpose: _____
What is this building for? What is it?

Face Coordinates	Dilated by 1.5	Translated (-5, -10)
Top Left:		
Top Right:		
Bottom Left:		
Bottom Right:		

BUILDING FOUR:

Building Designer: _____

Write your friend's name.

Building's Purpose: _____

What is this building for? What is it?

Face Coordinates	Dilated by 1.5	Translated (-20, -20)
Top Left:		
Top Right:		
Bottom Left:		
Bottom Right:		

BUILDING FIVE:

Building Designer: _____

Write your friend's name.

Building's Purpose: _____

What is this building for? What is it?

Face Coordinates	Dilated by 1.5	Translated (-40, -15)
Top Left:		
Top Right:		
Bottom Left:		
Bottom Right:		

ARTS-INFUSED INSTITUTE LESSON PLAN (YR2-MAP)
EIGHTH GRADE—LESSON TWO: Transformations: Building Designs
ASSESSMENT WORKSHEET

Disciplines	ART AND MATH	MATH			ART AND MATH	ART	Total 7 Points
		Reflections	Dilations	Translations			
Concept	Plotting						
Students	Plots: pairs of numbers (X- value—left or right +/- and Y- value—up or down +/-) for points in a plane relative to the origin; vertices of the front face	Reverses X- coordinates relative to the origin	Graphs the reflected building	Multiplies the coordinates of three peers' building face/facade design by 1.5	Graphs and maintains congruence (same side lengths and angle measurements) and orientation	Uses orthogonal lines leading to a (0, 0) vanishing point from building face/facade vertices on coordinate plane	Measures for accuracy; aligns tools with grid lines: straight edges for drawing all shapes/figures
1.							
2.							
3.							
4.							
5.							
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18.							
19.							
20.							
21.							
22.							
23.							
24.							
25.							
26.							
Total							
Percentage							

Criteria-based Reflection Questions: (Note examples of student reflections.)

Thoughts about Learning:

Which prompts best communicated concepts? Which lesson dynamics helped or hindered learning?

Lesson Logistics:

Which classroom management techniques supported learning?

Teacher: _____

Date: _____