

WAMC Lab Template

Math Concept(s): Transformational Geometry

Source / Text: CORD Geometry Textbook

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Attach the following documents:

- Lab Instructions
 - Please see additional word document for teacher instructions
- Student Handout(s)
 - Instructions for student by group A, B, C in the attached document
- Rubric and/or Assessment Tool
 - Please see additional word document

Short Description (Be sure to include where in your instruction this lab takes place):

- Students will work together to use the coordinates of paces up, left, right & down to create a polygon. Then the students will be instructed to reflect, translate or rotate the figure using the parking spaces in the parking lot. As a group we will continue our discussion on the results, findings & areas of difficult back in the classroom.

Lab Plan

Lab Title: Four Square (Parking Lot) Transformations

Prerequisite skills: Understanding polygons, use of graphing coordinates, able to work with others.

Lab objective: See how reflections, transitions and rotations work using outdoor space as an area of activity that help students think of other ways to implement transformational geometry in our daily life.

Standards: (Note SPECIFIC relationship to Science, Technology, and/or Engineering)

Mathematics K–12 Learning Standards:

- G-CO.4 – Develop definitions of rotations, reflections and translations in terms of angles, circles, perpendicular lines, parallel lines and line segments.

Standards for Mathematical Practice:

- MP.7 – Look for and make use of structure
- MP.3 - Construct viable arguments and critique reasoning of others
- MP.4 Model with mathematics

K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):

- W.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- RST.9-10.1 Cite specific textual evidence to support analysis of technical texts, attending to the precise details of explanations or descriptions.

- RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.9-10.4 Determine meaning of symbols, key terms, or other domain specific words and phrases as they are used in specific technical context
- RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form and translate information expressed verbally or mathematically into words.
- SL.9-10.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners building on others' ideas and expressing their own clearly and persuasively.
- SL.9-10.4 Present information, findings, and supportive evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

K-12 Science Standards

- HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

Technology

- 1.2.1 Communicate and collaborate to learn with others.
- 1.3.2 Locate and organize information from a variety of sources and media.
- 2.2.1 Develop skills to use technology effectively.
- 2.4.1 Formulate and synthesize new knowledge.

Engineering

- HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Leadership/21st Century Skills:

<u>21st Century Interdisciplinary themes</u> (Check those that apply to the above activity.)			
<input type="checkbox"/> Global Awareness	<input type="checkbox"/> Financial/Economic/Business/Entrepreneurial Literacy	<input type="checkbox"/> Civic Literacy	
<input type="checkbox"/> Health/Safety Literacy	<input type="checkbox"/> Environmental Literacy		
<u>21st Century Skills</u> (Check those that students will demonstrate in the above activity.)			
LEARNING AND INNOVATION	INFORMATION, MEDIA & TECHNOLOGY SKILLS	LIFE & CAREER SKILLS	Productivity and Accountability
<u>Creativity and Innovation</u>	<u>Information Literacy</u>	<u>Flexibility and Adaptability</u>	<u>Productivity and Accountability</u>
<input checked="" type="checkbox"/> Think Creatively	<input type="checkbox"/> Access and Evaluate Information	<input checked="" type="checkbox"/> Adapt to Change	<input type="checkbox"/> Manage Projects
<input checked="" type="checkbox"/> Work Creatively with Others	<input checked="" type="checkbox"/> Use and manage Information	<input checked="" type="checkbox"/> Be Flexible	<input checked="" type="checkbox"/> Produce Results
<input type="checkbox"/> Implement Innovations	<u>Media Literacy</u>	<u>Initiative and Self-Direction</u>	<u>Leadership and Responsibility</u>
<u>Critical Thinking and Problem Solving</u>	<input type="checkbox"/> Analyze Media	<input type="checkbox"/> Manage Goals and Time	<input type="checkbox"/> Guide and Lead Others
<input checked="" type="checkbox"/> Reason Effectively	<input type="checkbox"/> Create Media Products	<input type="checkbox"/> Work Independently	<input type="checkbox"/> Guide and Lead Others
<input type="checkbox"/> Use Systems Thinking	<u>Information, Communications and Technology (ICT Literacy)</u>	<input type="checkbox"/> Be Self-Directed Learners	<input checked="" type="checkbox"/> Be Responsible to Others
<input checked="" type="checkbox"/> Make Judgments and Decisions	<input type="checkbox"/> Apply Technology Effectively	<u>Social and Cross-Cultural</u>	
<input checked="" type="checkbox"/> Solve Problems		<input type="checkbox"/> Interact Effectively with Others	
<u>Communication and Collaboration</u>		<input type="checkbox"/> Work Effectively in Diverse Teams	
<input checked="" type="checkbox"/> Communicate Clearly			
<input checked="" type="checkbox"/> Collaborate with Others			

<https://wa-appliedmath.org/>

Teacher Preparation: (What materials and set-up are required for this lab?)

Materials

- Teacher Instructions
- Student Instructions
- String
- Clipboards
- Pencils

Set-Up Required:

- Parking Lot Spaces or use tape to create spaces on a basketball court.

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

- Students will use skills of communication and be able to reflect on the experiences and process.

Cooperative Learning:

- Students will need to be able to work together in groups and collaborate on the responsibilities each teammate will have in the exercise.

Expectations:

- Students will need to be able to show that they have reflected, rotated or translated the coordinates and figure properly according to the information provided.

Timeline:

- Students will have 30 minutes to complete the activity while the teacher continues to walk around and ask questions, making sure they are working together understanding the process and completing the exercise.

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- Relate how we use reflections in construction of the room we are in. How the some of the walls in the room are the same reflection.

Career Applications

- Fabric Designers
- Architects
- Robotics Engineer
- Landscape Designer
- Bricklayers
- Drafters
- Carpenters
- Surveyors

Optional or Extension Activities

- I would try this activity at the beginning and end of the unit on Transformational Geometry to measure the student's growth.