

## **WAMC Lab Template**

Math Concept(s): **Transformations**

Source / Text: **N/A**

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### **Attach the following documents:**

- Lab Instructions
- Student Handout(s)
- Rubric and/or Assessment Tool

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

Students will use a mini white board with a 10x10 grid in which they will draw a shape then trace it using patty paper. They will then go through  $90^\circ$ ,  $180^\circ$ ,  $270^\circ$  and  $360^\circ$  to see how the shape and its coordinates change.

### **Lab Plan**

Lab Title: **Patty Paper for Burgers? Nah! Patty Paper for Transformations!**

Prerequisite skills: **Coordinate geometry**

Lab objective:

- **Students will be able to identify a  $90^\circ$ ,  $180^\circ$ ,  $270^\circ$  or  $360^\circ$  rotation.**
- **Students will be able to create mathematical expressions to define  $90^\circ$ ,  $180^\circ$ ,  $270^\circ$  and  $360^\circ$  rotations. They will also be able to describe these expressions in their own words.**

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

Mathematics K–12 Learning Standards:

- **G-CO.5:** Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

Standards for Mathematical Practice:

- **MP1:** Make sense of problems and persevere in solving them; **MP2:** Reason abstractly and quantitatively; **MP4:** Model with mathematics; **MP5:** Use appropriate tools strategically; **MP8:** Look for and express regularity in repeated reasoning

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

- **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 the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics

- **RST 9-10.7:** Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

K-12 Science Standards

- **HS-ETS1-2:** Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Technology

- Use graphing software to create a shape and be able to go the full 360° range of rotation.

Engineering

- Constructing new shapes

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 checked="" 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.)			
<b>LEARNING AND INNOVATION</b>	<b>INFORMATION, MEDIA &amp; TECHNOLOGY SKILLS</b>	<b>LIFE &amp; CAREER SKILLS</b>	<b>Productivity and Accountability</b>
<u>Creativity and Innovation</u>	<u>Information Literacy</u>	<u>Flexibility and Adaptability</u>	<input type="checkbox"/> Manage Projects
<input checked="" type="checkbox"/> Think Creatively	<input checked="" type="checkbox"/> Access and Evaluate Information	<input type="checkbox"/> Adapt to Change	<input checked="" type="checkbox"/> Produce Results
<input type="checkbox"/> Work Creatively with Others	<input checked="" type="checkbox"/> Use and manage Information	<input type="checkbox"/> Be Flexible	<u>Leadership and Responsibility</u>
<input type="checkbox"/> Implement Innovations	<u>Media Literacy</u>	<u>Initiative and Self-Direction</u>	<input checked="" type="checkbox"/> Guide and Lead Others
<u>Critical Thinking and Problem Solving</u>	<input type="checkbox"/> Analyze Media	<input checked="" type="checkbox"/> Manage Goals and Time	<input checked="" type="checkbox"/> Be Responsible to Others
<input checked="" type="checkbox"/> Reason Effectively	<input type="checkbox"/> Create Media Products	<input checked="" type="checkbox"/> Work Independently	
<input type="checkbox"/> Use Systems Thinking	<u>Information, Communications and Technology (ICT Literacy)</u>	<input checked="" type="checkbox"/> Be Self-Directed Learners	
<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 checked="" type="checkbox"/> Interact Effectively with Others	
<u>Communication and Collaboration</u>		<input checked="" type="checkbox"/> Work Effectively in Diverse Teams	
<input checked="" type="checkbox"/> Communicate Clearly			
<input type="checkbox"/> Collaborate with Others			

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

### Materials

- **Patty Paper**
- **Dry erase board with 10x10 grid**
- **Dry erase marker/eraser**
- **Paper and pencil**

### Set-Up Required:

- **None required**

### Lab Organization Strategies:

#### Leadership (Connect to 21<sup>st</sup> Century Skills selected):

- **During guided practice or after an assessment, if a student is grasping a concept well, they will have the opportunity to present to the whole class what they did to successfully understand the concept.**

#### Cooperative Learning:

- **This will take some time because you need to identify your stronger students and your weaker students. From here I will pull the more capable students aside and discuss with them the idea of being a kind of teacher assistant to a group if they are willing. If so, they will be able present their understanding in their words. Then I will rearrange my class so the struggling students are in the same group with students who understanding the material to give them a better chance at succeeding.**

#### Expectations:

- **Students will be able to identify a 90°, 180°, 270° or 360° rotation.**
- **Students will be able to create mathematical expressions to define 90°, 180°, 270° and 360° rotations. They will also be able to describe these expressions in their own words.**

#### Timeline:

- **45-60 minutes**

### Post Lab Follow-Up/Conclusions:

#### Discuss real world application of learning from lab

- **In photography, how does the photographer go about creating a rotational effect without out have to turning their bodies?**

#### Career Applications

- **Artist, Architect, Photographer**

#### Optional or Extension Activities

- **Continue this when developing relationship for Geometric Reflections.**
- **How are transformations utilized in architecture?**

## Transformations: Rotations – Instructions

### Instructions:

1. On your grid, draw a shape made up **three** points. Record these coordinates on the Transformation Handout. These will be your original shape.
2. Trace the following on your patty paper:
  - Your shape
  - The intersecting lines at the origin
3. Rotate you the patty  $90^\circ$  which is represented by one quarter turn. **IMPORTANT:** Make sure to align the origin for every rotation.
4. Record the new coordinates in the handout and answer the accompanying questions.
5. Repeat steps 3 and 4 for rotations of  $180^\circ$ ,  $270^\circ$  and  $360^\circ$ . **IMPORTANT:** Make sure to return to your original shape after completing the previous rotations.

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Original Points	New point after 90° rotation

1. What do you notice about the relationship between the x-value and y-value of each point?
2. What do you notice about the signs (positive/negative) of the numbers?
3. Express these relationships in your own words and with a transformation of an ordered pair?

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**Patty Paper for Burgers? Nah! Patty Paper for Transformations! - Rubric**

Level 4	Able to accurately express the pattern that develops for each kind of rotation into a mathematical rule. Able to draw a rotation without using patty paper.
Level 3	Able to accurately express the pattern that develops for each kind of rotation into their own words.
Level 2	Able to draw all rotations without help.
Level 1	Even with help, struggled to draw a rotation of a geometric figure.

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