

WAMC Lab Template

Math Concept(s): Pythagorean Theorem

Source / Text:

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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):

- This lab will be used present the Pythagorean Theorem. The student will use skewer sticks, 2 at a time, cut into different lengths to find the missing length.

Lab Plan

Lab Title: Right Triangle Skewers

Prerequisite skills:

1. Work collaboratively.
2. Communicate effectively.
3. Time management.

Lab objective: This lab will be used to show students how we can use known information from real world scenarios and connect them to the Pythagorean Theorem to find the unknown distance or length.

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

[Mathematics K–12 Learning Standards:](#)

- 8.G.B.6 Explain a proof of the Pythagorean Theorem and its converse.
- 8.G.B.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
- 8.G.B.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

[Standards for Mathematical Practice:](#)

- MP 1: Make sense of problems and persevere in solving them.
- MP 5: Use appropriate tools strategically.
- MP 6: Attend to precision.
- MP 7: Look for and make use of structure.

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

- CCSS.ELA-LITERACY.SL.9-10.1 Initiate and participate effectively in collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners.

Engineering

- K-2-ETS1-1 Engineering Design: Ask questions, make observations, and gather information.

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>Accountability</u>
x Think Creatively	<input type="checkbox"/> Access and Evaluate Information	x Adapt to Change	x Manage Projects
x Work Creatively with Others	x Use and manage Information	x Be Flexible	x 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	x Manage Goals and Time	x Guide and Lead Others
x Reason Effectively	<input type="checkbox"/> Create Media Products	<input type="checkbox"/> Work Independently	Others
<input type="checkbox"/> Use Systems Thinking	<u>Information, Communications and Technology (ICT Literacy)</u>	<u>Social and Cross-Cultural</u>	x Be Responsible to Others
x Make Judgments and Decisions	<input type="checkbox"/> Apply Technology Effectively	x Interact Effectively with Others	
x Solve Problems		x Work Effectively in Diverse Teams	
<u>Communication and Collaboration</u>			
x Communicate Clearly			
x Collaborate with Others			

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

Materials

- Skewers
- Wire cutters
- Measuring tape or ruler
- Paper
- 2 different color writing utensil
- Calculator
- Masking tape

Set-Up Required:

- Organize yourself into groups of 3 to 4.
- Collect 8 skewers and cut each of them into different length of your choice.
- Fold tape around the skewer so that it leaves enough tape hanging.
- Write the measurement of each skewer on the hanging tape.

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected) - Students will be able to:

- Work collaboratively with a team.
- Display creative thinking.
- Be responsible to others.

Cooperative Learning:

- Students will discover right triangles through teamwork.

- Students will be able to communicate their own ideas and receive input from others.

Expectations:

- All team members will be respectful to each other.
- Team members will interact within their respective team.
- Problem solve as a team.
- Distribute the workload evenly and be accountable for the delegated task.

Timeline:

- 45 to 55 minutes for lab and presentation.

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab.

- The Pythagorean Theorem can be used in many real-world situations. Construction workers and Architect rely on the Pythagorean Theorem for accuracy. What would happen if the angle was off on the blueprint of a building?

Career Applications

- There is a wide range of careers that rely on the theorem. This includes engineers, architects, agriculture, aviation, physics, etc.

Optional or Extension Activities

- Check the data gathered with the Pythagorean Theorem to verify student results.

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Right Triangle Skewers Lab instructions

1. Students will be divided into 3 or 4 person groups.
2. Assign roles/tasks to the members on your team. You will need someone to take measurements, cut the supplies, make and apply labels, and a record keeper.

Each group needs to randomly select a pair of skewers at a time and attempt to connect any 2 sides of a right triangle. **Example:** connect the hypotenuse and the opposite side, or the hypotenuse and the adjacent side, or the opposite side and the adjacent side.

The record keeper will then record the measurement of each skewer in the combinations as well as the sides of the right triangle used. You must use all of your skewers provided and explore all connected sides of the triangle.

Note: Do not use the same pair of skewers and the same sides of the triangle more than once.

You will be given 15 minutes to record as many combinations as possible and discuss your strategy on how to solve for the length of each missing side using the Pythagorean Theorem. Complete the attached data sheet by filling in the two known sides. Then, solve for the missing side and use a different color writing utensil to write your answer on the data sheet.

Each group will then take part in a whole class discussion. They will discuss the ideas/strategies used and demonstrate their solution to one of their data sets. The audience should listen for similar data sets and compare or contrast their result.

The group results will be collected and verified.

Data Sheet

Note: Completed table including the missing side.

	Adjacent	Opposite	Hypotenuse
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
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