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):

The lab will be used to introduce the Pythagorean Theorem unit. Students will use different lengths of rope to attempt to form right triangles. Students will record their findings.

Lab Plan

Lab Title: Right Triangle Ropes

Prerequisite skills: Ability to: 1. Estimate a right triangle.
2. Work collaboratively.

Lab objective: Introduce the connection between right triangles and the Pythagorean Theorem.

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

Mathematics K–12 Learning Standards:

- CCSS.MATH.CONTENT.8.G.B.6: Explain a proof of the Pythagorean Theorem and its converse.

Standards for Mathematical Practice:

- MP 2: Reason abstractly and quantitatively.
- MP 3: Construct viable arguments and critique the reasoning of others.
- 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.8.1: Engage effectively in a range of collaborative discussions

Engineering

- MS-ETS1-2 Engineering Design: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

Leadership/21st Century Skills:

21st Century Interdisciplinary themes (Check those that apply to the above activity.)

☐ Global Awareness ☐ Financial/Economic/Business/Entrepreneurial Literacy ☐ Civic Literacy
☐ Health/Safety Literacy ☐ Environmental Literacy

21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION
Creativity and Innovation
x Think Creatively
x Work Creatively with Others
☐ Implement Innovations
Critical Thinking and Problem Solving
x Reason Effectively
☐ Use Systems Thinking
x Make Judgments and Decisions
☐ Solve Problems
Communication and Collaboration
x Communicate Clearly
x Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS
Information Literacy
☐ Access and Evaluate Information
x Use and manage Information
Media Literacy
☐ Analyze Media
☐ Create Media Products
Information, Communications and Technology (ICT Literacy)
☐ Apply Technology Effectively

LIFE & CAREER SKILLS
Flexibility and Adaptability
☐ Adapt to Change
x Be Flexible
Initiative and Self-Direction
x Manage Goals and Time
☐ Work Independently
☐ Be Self-Directed Learners
Social and Cross-Cultural
x Interact Effectively with Others
x Work Effectively in Diverse Teams

Productivity and Accountability
x Manage Projects
x Produce Results
Leadership and Responsibility
☐ Guide and Lead Others
x Be Responsible to Others

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

Materials

- Poly cord or rope
- Scissors
- Duct tape
- Fine point Sharpie
- Measuring tape.

Set-Up Required:

- Cut the cord into the following lengths and wrap the ends with duct tape: 3", 4", 5", 8" , 9" , 12", 13", 15". Label the lengths with the sharpie on the duct as you go.
- This is **one** set. You need one set per group of 4 or 5.
- Place each set in a sandwich bag to store. Number the bags so you can hold groups accountable for returning full sets.

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

Students will have the opportunity to:

- display creative thinking
- work creatively and collaborate with a team
- be responsible to others

Cooperative Learning:

- Students will work as a team to discover right triangles.
- Students will listen to others input and express their own ideas.

Expectations:

- All members of the group will be respected.
- Teams should only interact with their members during the activity.
- One paper will be turned in for each group

Timeline:

- 50-55 minutes.

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- Pythagorean Theorem can be used to ensure a football field forms a rectangle. What if the angle was off on one end of the field? How would that impact the other end?

Career Applications

- There are many aspects of engineering and construction trade work that utilizes the theorem to ensure right angles including carpentry, tile work, architecture, etc.

Optional or Extension Activities

- Check the number sets with the Pythagorean Theorem to verify students results.

Right Angle Ropes Lab Instructions

1. Students will be divided into groups of 4 or 5.
2. Each group will be given a handout and needs to assign a scribe.
3. Each group will receive a bag with the set of cords/ropes.

Initial instructions are that groups need to attempt to create right triangles using combinations of the given ropes. The vague instruction is intentional to allow teams to think creatively and for you to observe their ideas pertaining to right angles; some may use a notebook or piece of paper, other the corner of their desk/table as a guide.

Students are to record combinations of lengths that seemed to form a right triangle and those combinations that definitely do not. Inform the teams that some rope lengths may be used in more than one right triangle.

After a few minutes you may need to ask questions to those that are simply eyeballing the angle, “are there any right angles in the room that can help you be more accurate”.

Give 15-20 minutes for teams to explore the possibilities and discuss outcomes.

Next give 5 minutes for teams to discuss and record their ideas/strategies used.

Each group will share with the whole class one idea/strategy and one set of numbers, either a possible right angle or a definite no. If there are any disagreements have a group demonstrate their findings using the ropes.

Correct answers can now be verified and group papers collected.

3, 4, 5 5, 12, 13

9, 12, 15 8, 15, 17

***The team paper is to be used as a formative assessment. Check the ideas and strategies used to create right triangles and look for vocabulary that you can build on.**

Washington Applied Math Council

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Right Angle Ropes ___ Team Members:

Forming a Right Triangle

Sets that possibly worked

Sets that did not work

Ideas/Strategies used