WAMC Lab Template
Math Concept(s): **Right Triangles**
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 protractor to draw multiple triangles whose legs have the same length. They will then use the Pythagorean Theorem to determine the length of the hypotenuse in exact form. Next they will determine the measure of the acute angles. Finally, they will (hopefully) see the pattern that occurs and be able to develop mathematical expressions or formulate (in their own words) what patterns are occurring for this particular special right triangle.

Lab Plan
Lab Title: **Right Triangles of the Special Kind**

Prerequisite skills: **Pythagorean Theorem, Simplifying Radicals**

Lab objective: **Students will be able to create a set of criteria to identify 45-45-90 Special Right Triangles.**

Standards: *(Note SPECIFIC relationship to Science, Technology, and/or Engineering)*
Mathematics K–12 Learning Standards:

- **G-SRT.4:** Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.

Standards for Mathematical Practice:

- **MP1:** Make sense of problems and preserver in solving them; **MP2:** Reason abstractly and quantitatively; **MP5:** Use appropriate tools strategically

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 calculate distance between points.

Engineering

- Constructing new shapes

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
☐ Think Creatively
☐ Work Creatively with Others
☐ Implement Innovations

Critical Thinking and Problem Solving
☐ Reason Effectively
☐ Use Systems Thinking
☒ Make Judgments and Decisions
☒ Solve Problems

Communication and Collaboration
☒ Communicate Clearly
☐ Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS

Information Literacy
☒ Access and Evaluate Information
☒ 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
☐ Be Flexible

Initiative and Self-Direction
☒ Manage Goals and Time
☒ Work Independently
☒ Be Self-Directed Learners

Social and Cross-Cultural
☒ Interact Effectively with Others
☒ Work Effectively in Diverse Teams

Productivity and Accountability
☐ Manage Projects
☒ Produce Results

Leadership and Responsibility
☒ Guide and Lead Others
☒ Be Responsible to Others

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

Materials

- **Protractors**
- **Blank piece of paper**
- **Handouts to record data**

Set-Up Required:

- **None required**

Lab Organization Strategies:

Leadership (Connect to 21st 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 create a set of criteria to identify 45-45-90 Special Right Triangles and solve for missing sides.**

Timeline:

- **45 minutes**

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- **In baseball, you can determine the length from 1st base to 3rd base since you know the distance from home plate to 1st base and home plate to 3rd base is 90ft.**

Career Applications

- **Surveyor, Urban Planner.**

Optional or Extension Activities

- **Continue this when developing relationship for 30-60-90 Special Right Triangles.**
- **Measure ramps at your school to see if any meet the criteria for a special right triangle.**

Right Triangles of the Special Kind – Instructions

Instructions:

1. **Use a protractor to draw five sets of right triangles whose legs (sides) have the same length. IMPORTANT: Draw each triangle precisely.**
2. **Use Pythagorean Theorem to solve for the hypotenuse.**
3. **Record data in "Leg and Hypotenuse Relationships" handout.**
4. **Measure the acute angles.**
5. **Record data in "Leg and Hypotenuse Relationships" handout.**
6. **Answer the questions in "Leg and Hypotenuse Relationships" handout.**

Leg and Hypotenuse Relationships

Leg (a)	Leg (b)	Hypotenuse (c)	Acute Angle ∠1	Acute Angle ∠2

What is the relationship between the sides of the triangle?

These relationships matter when the angles of a triangle are equal to what?

Put the three lengths of the right triangle into general terms.

Right Triangles of the Special Kind - Rubric

Level 4	Able to put accurately express the pattern that develops with 45-45-90 Special Right Triangles into general terms (e.g., legs = x, hypotenuse = $x\sqrt{2}$).
Level 3	Able to put accurately express the pattern that develops with 45-45-90 Special Right Triangles into their own words.
Level 2	Understood the Pythagorean Theorem and determines the hypotenuse for all right triangles.
Level 1	Struggled to understand the Pythagorean Theorem to determine the length of the hypotenuse.