WAMC Lab Template

Math Concept(s): Triangle Congruence Theorems

Source / Text: Holt Geometry

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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 be given information about a triangle (SAS, SSS, AAS, ASA, or SSA) and they will have to use that information to draw a triangle. They will then match up their drawing with a master triangle once everyone is done and complete a table to put together the triangle congruence theorems.
- This lesson is an introduction to the triangle congruence theorems.

Lab Plan

Lab Title: Straw Triangles

Prerequisite skills: Students will need to be able to use a ruler and a protractor. They should also recognize how triangles and their parts are named (i.e. angle A is between sides AB and AC).

Lab objective: To discover the triangle congruence theorems.

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

Mathematics K–12 Learning Standards:

- HSG-CO.B.8 – Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow the definition of congruence in terms of rigid motions.
- HSG-CO.C.10 – Prove theorems about triangles.

Standards for Mathematical Practice:

- 2. Reason abstractly and quantitatively.
- 3. Construct viable arguments and critique the reasoning of others.
- 5. Use appropriate tools strategically.
- 6. Attend to precision.
- 8. Look for and express regularity in repeated reasoning.

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

- Reading for Literacy in Science and Technical Subjects Grades 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.

K-12 Science Standards

- SEP Practice 1 – Asking Question and Defining Problems
- SEP Practice 3 – Planning and Carrying out Investigations
- SEP Practice 4 – Analyzing and Interpreting Data
- SEP Practice 5 – Using Mathematics and Computational Thinking

Technology

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Engineering

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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

- 1 piece of graph paper
- protractor
- ruler
- scissors
- 3 straws or dowels or other solid straight lengths
- glue or tape

Set-Up Required:

- Have copies of worksheet for each pair of students ready.
- Print and cut out sets of data. Have enough for 1 set per pair.
- Have a master triangle ready for comparison.

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

- Students will work collaboratively to build a triangle based on given information. Then they will need to reason effectively and make judgments while comparing their triangle with other pairs' triangles.

Cooperative Learning:

- Students will work in pairs to make their triangle based on the provided information.

Expectations:

- Students are expected to create triangles and then compare their triangle with others to discover the triangle congruence theorems.

Timeline:

- 1 class period

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- Manufacturers use triangle congruence to make sure that all the pieces of a triangle-based object are the same.
- Construction workers use triangle congruence to ensure a roof made of triangular trusses are the same.

Career Applications

- Construction workers, manufacturers, architects

Optional or Extension Activities

- Have students create a triangle and provide different sets of measurements to another pair to have them build it and then they can check to see if they have the same triangles.

Straw Triangles

Materials: 1 piece of graph paper, protractor, ruler, scissors, 3 straws, glue or tape, information for a triangle

Directions:

1. Get all your materials listed above.

2. Cut the straw(s) to match the side length(s) provided for you. If no side length is provided, then wait to cut the straw(s) until you have build the angles. Then you can cut what you need to get a complete triangle. Be sure to measure the angles and lengths accurately.

3. Tape or glue your triangle to the graph paper.

4. Label the vertices and the given information on your triangle.

5. Measure the other angles and side lengths and label these on your triangle.

6. When your triangle is finished, find the appropriate chart around the room and tape your triangle to it face up. Return to your seat until the other groups are finished.

7. Walk around the room and look at all the different categories and triangles. Fill out the table on the back of this sheet as completely possible.

8. When finished return to your seat and write down a conjecture for each category. Be prepared to share with the class what you found.

Comparison Sheet

Given	2 sides & angle between (SAS)	2 angles & a side between (ASA)	An angle & a side (AS)	3 sides (SSS)	2 angles & a side NOT between (AAS)	2 sides (SS)	2 sides & an angle NOT between (SSA)	2 sides & a right angle (HL)
$\measuredangle A$'s the same?								
$\measuredangle B$'s the same?								
$\measuredangle C$'s the same?								
AB's the same?								
BC's the same?								
AC's the same?								

SAS Conjecture (If…then…):

_____

ASA Conjecture (If…then…):

_____

AS Conjecture (If…then…):

_____

SSS Conjecture (If…then…):

_____

AAS Conjecture (If…then…):

_____

SS Conjecture (If…then…):

_____

SSA Conjecture (If…then…):

_____

HL Conjecture (If…then…):

_____

Triangle Straw Information

Have enough sets to give one set of information to each pair.

SAS $CA = 15.2\ cm$ $m\measuredangle A = 36°$ $AB = 18.9\ cm$	ASA $m\measuredangle A = 36°$ $AB = 18.9\ cm$ $m\measuredangle B = 53°$
AS $m\measuredangle A = 36°$ $AB = 18.9\ cm$	SS $BC = 11.1\ cm$ $AC = 15.2\ cm$
SSS $AC = 15.2\ cm$ $AB = 18.9\ cm$ $BC = 11.1\ cm$	AAS $m\measuredangle A = 36°$ $m\measuredangle B = 53°$ $BC = 11.1\ cm$
SSA $CA = 15.2\ cm$ $BC = 11.1\ cm$ $m\measuredangle B = 53°$	HL $AC = 15.2\ cm$ $m\measuredangle C = 90°$ $AB = 18.9\ cm$

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