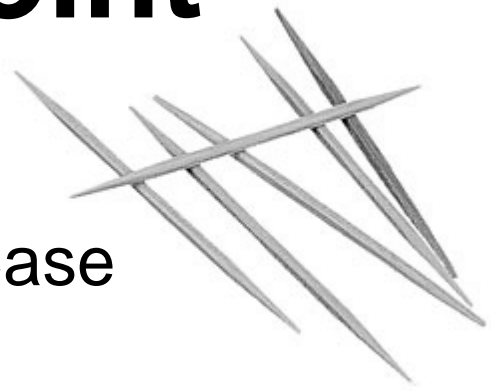




Toothpicks and PowerPoint

Ambiguous Case
of the
Law of Sines



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NOTES TO TEACHERS:

- ◆ The lesson presented in this session models discovery learning for students on what is sometimes a difficult trigonometry concept for them to grasp. The lesson provides a "handle" to help students take the next step in a progression from basic trig concepts to more complicated problem-solving situations. Having a model to look at as they then practice the problem solving makes the concept less abstract for the students. The discussion and interaction that goes on between the teacher and students as the lesson progresses gives an excellent opportunity for both students and teachers to monitor student understanding and review and re-teach as needed.

- ◆ The lesson addresses the following standards.

Missouri Show-Me Standards:

- ✓ MA 2 – “geometric and spatial sense involving . . . trigonometry”
- ✓ MA 4 – “patterns and relationships . . . among . . . trigonometric concepts”
- ✓ 1.6 – “discover and evaluate patterns and relationships in information, ideas and structures”
- ✓ 1.10 – “apply acquired information, ideas and skills to different contexts”
- ✓ 3.6 – “examine problems and proposed solutions from multiple perspectives”

Missouri Mathematics Grade-Level Expectations:

- ✓ G1A grades 11 and 12 – “Use trigonometric relationships to determine lengths and angle measures in all types of triangles”

- ◆ If you use this activity in your classroom, I would like to hear about your results and any changes or improvements you might make to the lesson

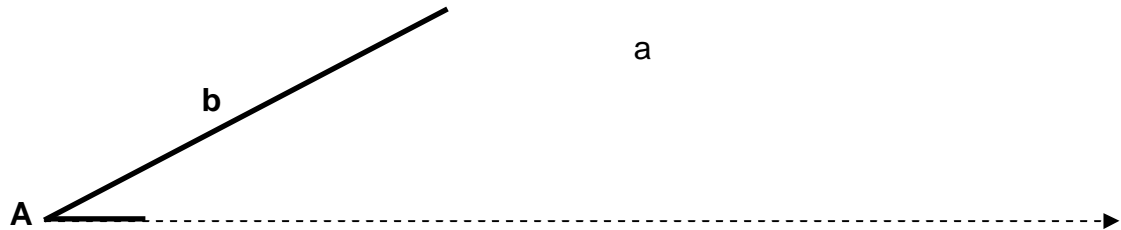
LESSON PLAN:

- ◆ This lesson is taught assuming that students are already familiar with the Law of Sines and have used it to solve oblique triangles given information in other forms – AAS and ASA.
- ◆ Each student will need the following materials for the lesson:
 - ✍ The 3-page worksheet at the end of this handout
 - ✍ Several toothpicks (probably 10-12)
 - ✍ Clear tape (a roll can be shared among a few students)
 - ✍ A piece of patty paper
- ◆ You can lead the discovery lesson by working through a PowerPoint presentation, allowing time and opportunity for students to make their own discoveries as you go. If you do not have access to a projector for displaying PowerPoint, you can make transparencies of the student worksheet and guide the lesson from the overhead projector.
- ◆ In each triangle, side ***b*** and angle ***A*** have fixed measures and are labeled. The worksheet gives the students instructions about the length of side ***a***. A lower case ***a*** is printed in the general area where side ***a*** will be located. Side ***c*** will be the part of the dashed line between vertex ***A*** and one end of the toothpick. Once the toothpick is taped in place, the other sides and vertices of the triangle can be labeled.
- ◆ When my students get to the case where $a \geq b$, some of them complain that their toothpicks are not long enough. With a little encouragement, they will decide that they can tape toothpicks together to get a piece that is long enough to meet the requirement.

**TRIG—Worksheet on the Ambiguous Case
of the Law of Sines – SSA (Given: a , b , and A)**

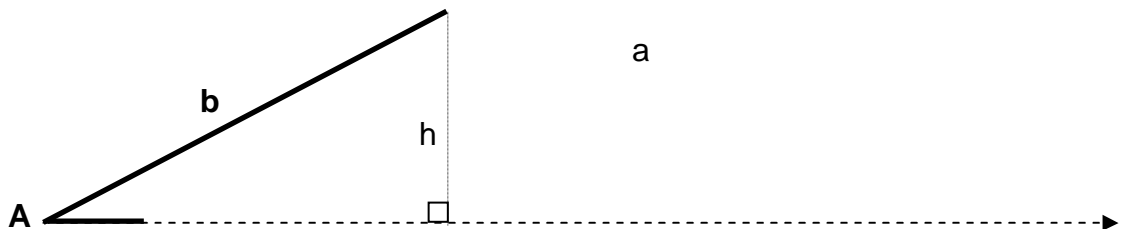
I. A is acute.

A. $a \geq b$

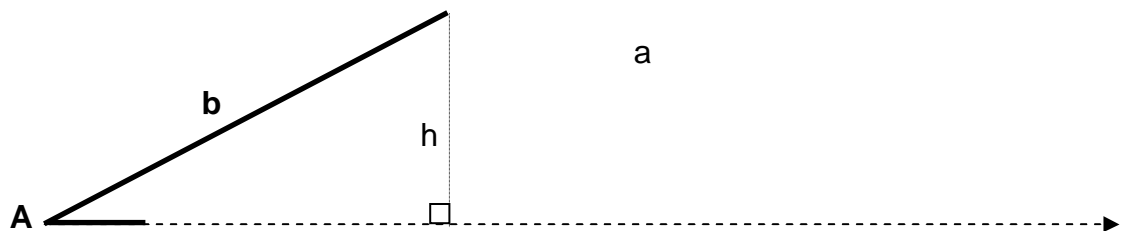


B. $a < b$

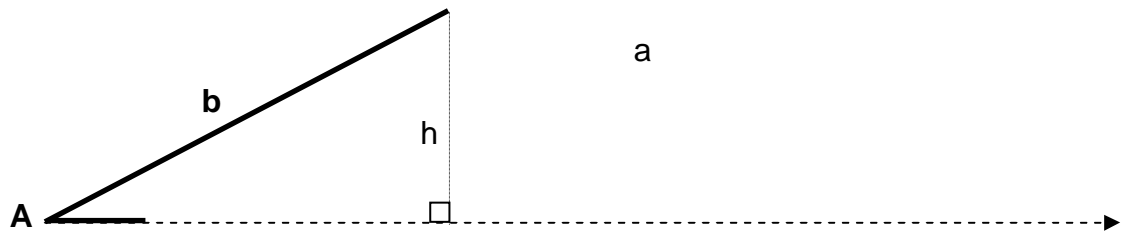
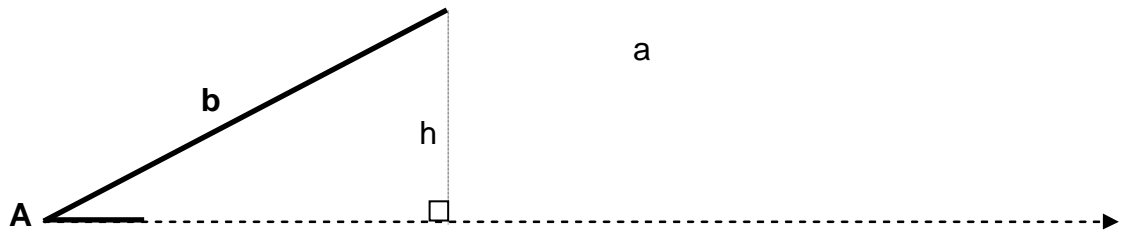
1. $a < h$



2. $a = h$



3. $a > h$



II. A is obtuse.

A. $a \leq b$



B. $a > b$

