

Law of Sines

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Activity overview

Students will investigate all the cases in which the Law of Sines can be used to solve a triangle. An animation is provided in the lesson which will help students to gain a better understanding of the ambiguous case SSA.

Concepts

- Solving a right triangle using trigonometry
 - Solving an oblique triangle using the Law of Sines
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Teacher preparation

Students should recognize equal ratios and use them to solve a proportion.

Students should know what is meant by AAS, ASA, SSA.

The screenshots on pages 2-4 demonstrate expected student results. Refer to the screenshots on page 5-6 for a preview of the student .tns file.

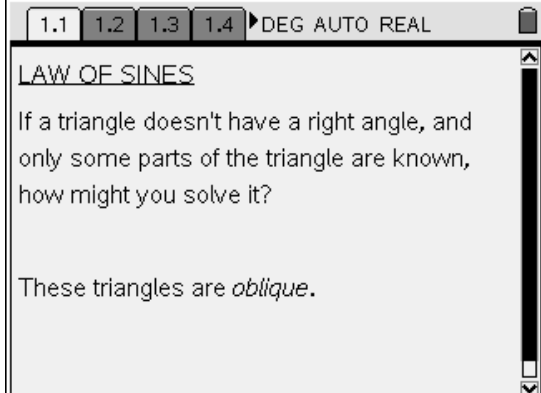
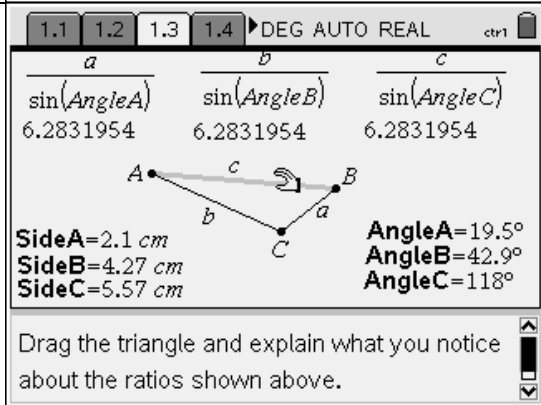
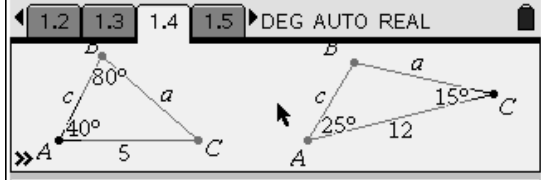
Classroom management tips

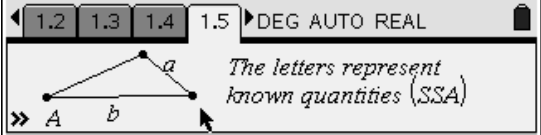
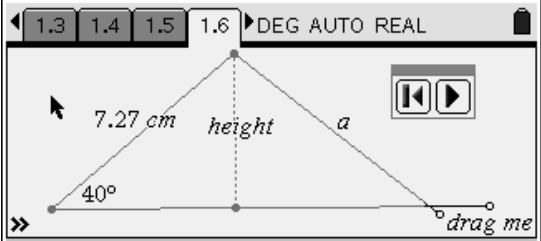
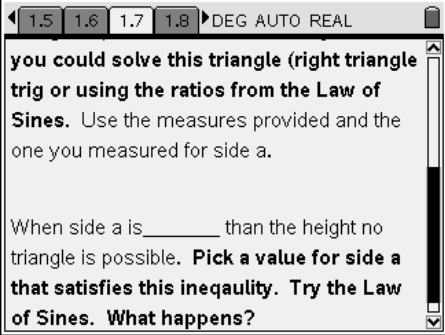
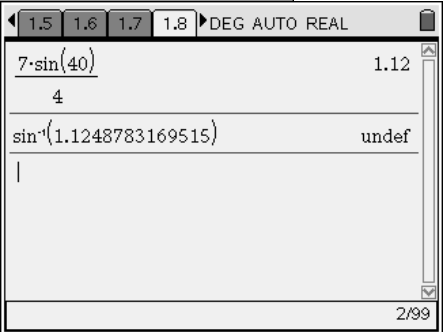
This activity is designed to be student-centered with the teacher acting as a facilitator while students work cooperatively. The student worksheet is provided for students to record their answers to the questions asked in the activity. Students will be required to do calculations either on a separate calculator or by inserting a new calculator page into the provided file.

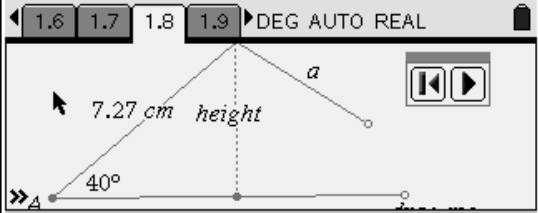
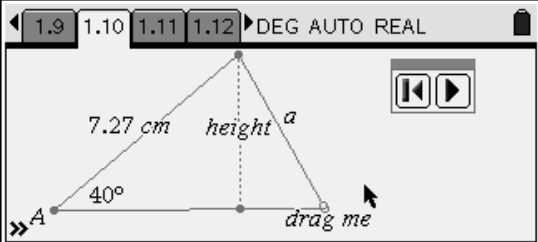
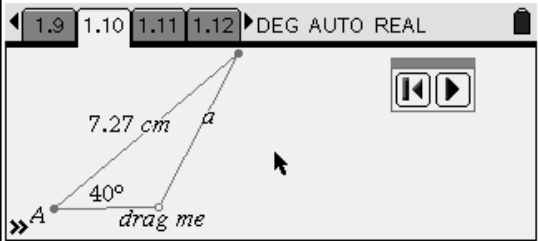
You may choose to do the last “Summarize” page as a whole-class discussion.

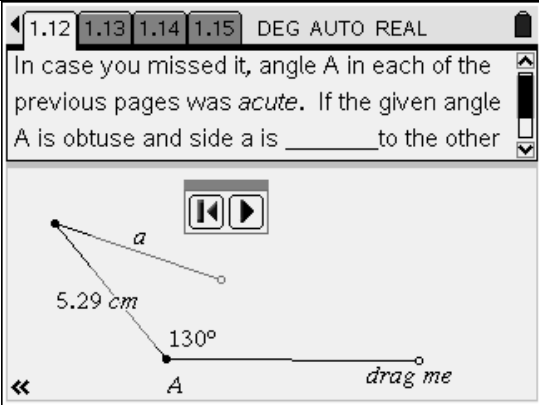
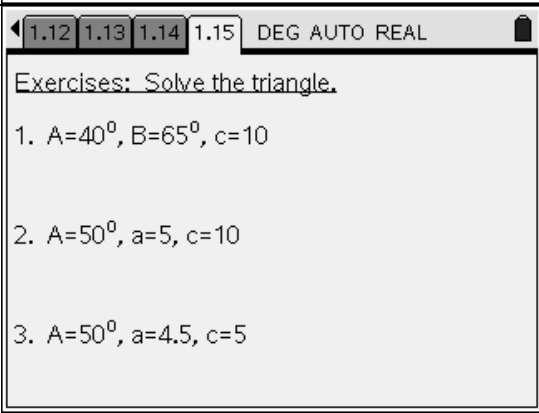
TI-Nspire Applications

Graphs & Geometry, Notes, Calculator

<p>Discuss with students how to solve a triangle that <i>does contain a right angle</i>. The key to using the sine, cosine, and tangent ratios when finding parts of a triangle was the right angle.</p>	
<p>Encourage students to drag all vertices of the triangle and observe the results.</p>	
<p>Students may need to toggle $\langle \text{ctrl} \rangle \langle \text{tab} \rangle$ to the Notes portion of this screen so that the entire note is visible.</p> <p>Remind students why these two cases are identified as AAS and ASA.</p>	 <p>Write the 3 equal ratios from the previous page $\frac{\square}{\square} = \frac{\square}{\square} = \frac{\square}{\square}$. This is the Law of Sines!</p> <p>The first triangle shown above has 3 known quantities (AAS). Find side "a" using two of</p>

<p>When students begin to solve the case AAS they will begin with $\frac{a}{\sin A} = \frac{b}{\sin B}$. To use the ratio $\frac{c}{\sin C}$, they need to be reminded that $\angle A, \angle B,$ and $\angle C$ are supplementary.</p>	 <p>The letters represent known quantities (SSA)</p> <p>It might first appear the case SSA is just like the two you just looked at.</p> <p>What proportion would you use to find angle B?</p> <p>BUT, remember SSA gave us trouble before....</p>
<p>The endpoint of segment a can also be grabbed and moved to a new location independent from the animation button. Student may need to do this to make the triangle as exactly as possible.</p>	 <p>7.27 cm height a</p> <p>40° drag me</p> <p>The trouble is... in the case of SSA, first you must know if the construction of the triangle is even possible. Do you see why the triangle above is the SSA case? Side "a" is</p>
<p>Students should show on the student worksheet that the calculator gives an undef answer if side a is less than the height of the triangle.</p> <p><i>Note:</i> This page was added to the file temporarily to show what happens in this case, it is not part of the student file.</p>	 <p>you could solve this triangle (right triangle trig or using the ratios from the Law of Sines. Use the measures provided and the one you measured for side a.</p> <p>When side a is _____ than the height no triangle is possible. Pick a value for side a that satisfies this inequality. Try the Law of Sines. What happens?</p>  <p>7·sin(40) 1.12</p> <p>4</p> <p>sin⁻¹(1.1248783169515) undef</p> <p>2/99</p>

<p>Encourage students to sketch the resulting triangle on their student worksheet.</p>	 <p>Measure side <i>a</i> and the height. Press play, pause, or reset when needed, and use the "drag me" point to make a triangle.</p>
<p>Students should allow the animation to play all the way through to see both triangles.</p> <p>The height disappears when the second triangle is made so students need to measure it from the first triangle.</p>	 <p>Press play, pause, or reset when needed, and use the "drag me" point to make two triangles.</p>  <p>Press play, pause, or reset when needed, and use the "drag me" point to make two triangles.</p>

<p>Last, an exploration of the obtuse case.</p>	 <p>In case you missed it, angle A in each of the previous pages was <i>acute</i>. If the given angle A is obtuse and side a is _____ to the other</p> <p>5.29 cm</p> <p>130°</p> <p>A</p> <p>drag me</p>
<p>End with some practice to apply what was learned!</p>	 <p>Exercises: Solve the triangle.</p> <ol style="list-style-type: none"> 1. $A=40^\circ$, $B=65^\circ$, $c=10$ 2. $A=50^\circ$, $a=5$, $c=10$ 3. $A=50^\circ$, $a=4.5$, $c=5$