Investigating ratios in triangles – the Sine Rule

Teacher Notes

Introduction

The aim of this activity is to allow students to discover the sine rule, and then look at a structured explanation of why it is true. It is left to the teacher to formalise the proof, and develop the techniques for finding missing sides and angles.

Students will use the calculate tool to calculate the required ratios, and then use a simple construction to check why the rule holds.

Resources

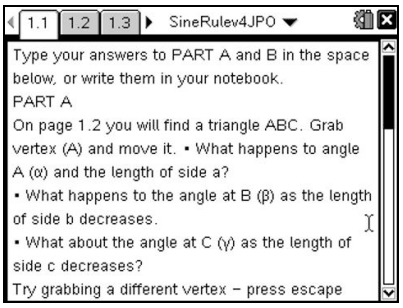
SineRulev4.tns
Student Handout

Skills required

- Open a document and move between pages.
- Grab and move a point.
- Use the 'Calculate' command on a Geometry page.

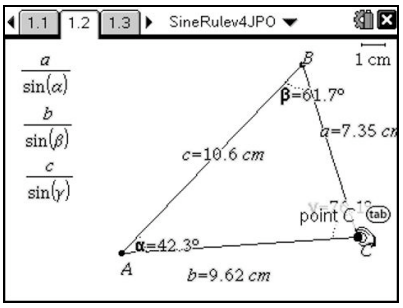
The activity

Students need to download and open the TI-Nspire document **SineRulev4.tns**.
The document starts with a page of instructions.

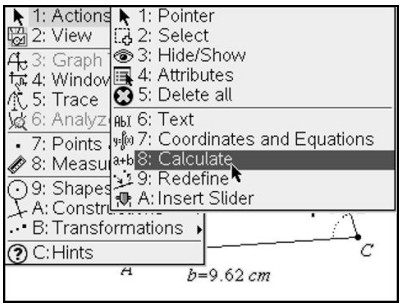


Details of the key presses needed are on the Student Handout.

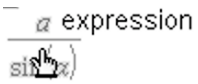
Students can grab any vertex of the triangle on Page 1.2 and move the point. They should look at what happens to the angles as the sides are changing, with a view to thinking about the ratios shown.
(Note: the file uses α, β and γ for the angles rather than A, B and C)



Having identified that opposite sides and angles increase and decrease together, students can now use **8. Calculate** from the **1. Actions** menu. This enables them to evaluate the ratios.

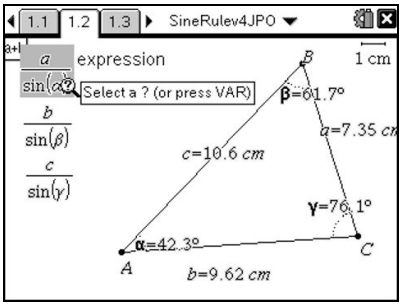


Having selected **8.Calculate,** they should hover over the first ratio, and press enter or ⬚



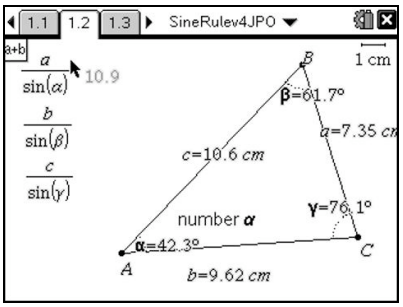
When the chosen ratio is highlighted, a message to select the first variable, **a**, will appear. Students should be reminded (told?) that the side opposite point A is called 'a' etc.

Once the first variable has been selected, students can go on to select the second variable, α.

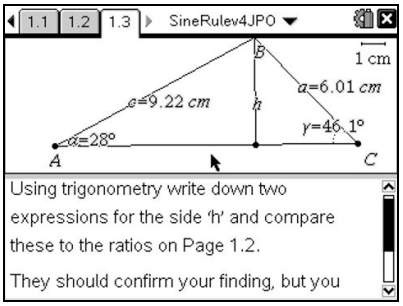


After the second variable is chosen, the answer to the calculation appears, and can be moved alongside the relevant ratio.

This procedure is repeated for each ratio, and students should notice that the ratio is the same each time. Grabbing and moving any vertex changes the values, but the three ratios are always equal.



The final page shows the usual dissection which can be used to lead into a proof of the Sine Rule.
This will need expanding to a generalisation using sin(A) and sin(C) for the angles, a and c for the corresponding sides.



Once the rule has been established, the various rearrangements can be shown so that missing sides and angles can be calculated.