

Investigating ratios in triangles – the Sine Rule

Student Handout

Introduction

The aim of this activity is to investigate ratios in triangles that are not right-angled— an extension of the trigonometry you have already studied with right-angled triangles.

You are going to change the sides and angles of a triangle, and then get the software to do a calculation to check out a ratio.

The activity

Download and open the file **SineRulev4.tns**.
 Read the instructions on Page 1.1 and then press **(ctrl) ▶** to move to Page 1.2.

With the Touchpad, move the cursor until a hand appears over point A— the hand is then labelled. Press **(ctrl) [hand icon]** and the hand will close. You can then move point A.

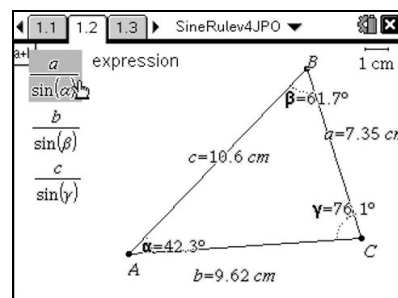
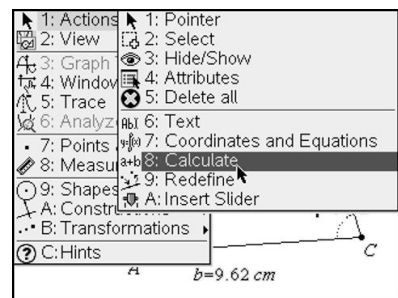
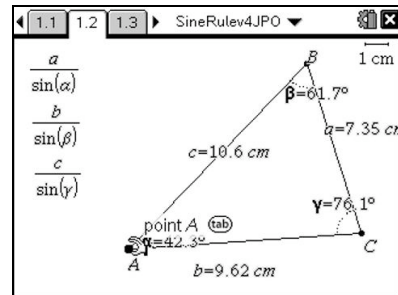
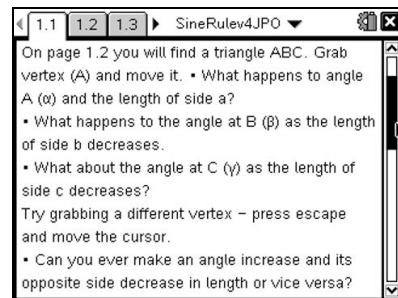
- What happens to the angle at A (α) and the length of side a?
- What happens to the angle at B (β) as the length of side b decreases.
- What about the angle at C (γ) as the length of side c decreases?
- Can you make an angle increase and its opposite side decrease in length or vice versa?

Now you are going to check the three ratios listed on the left hand side of the page.

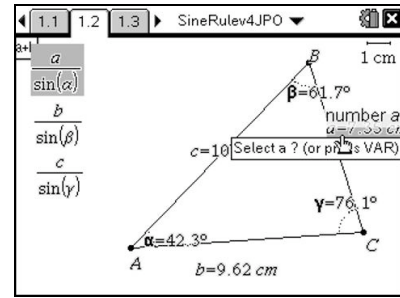
Select **(menu)** and choose **1. Actions, 8. Calculate.**

Now hover over the first ratio—it is highlighted, and the word ‘expression’ appears on the screen.

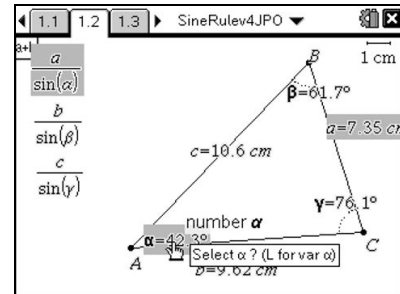
Press **(enter)**



Now the prompt ‘Select a? (or press VAR)’ appears—move the cursor to side a and press **enter**.



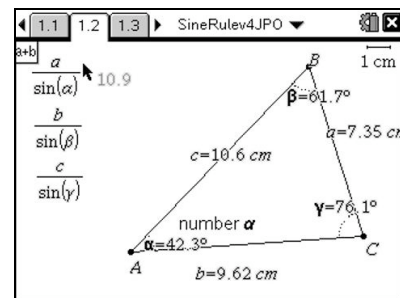
You are prompted to choose the next variable, the angle at A (α), so move the cursor to highlight this measurement, and press **enter** again.



Now the calculation is complete, and using the Touchpad the answer can be moved alongside the first ratio.

Do exactly the same, choosing the relevant variables, for the next two expressions.

- What do you notice?



Press **esc** to come out of ‘Calculate’ mode.

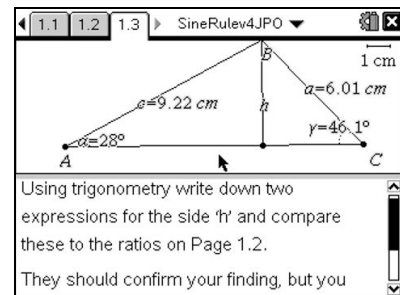
Grab any of the vertices as you did before and move it around.

- What happens to the three ratios as you change the angles and sides in the triangle?
- What happens if you make one of the angles 90°?

Repeat with different vertices.

On page 1.3, a non-right-angled triangle has been split by dropping a perpendicular from one vertex to the opposite side.

Using trigonometry you should be able to write down two expressions for the side ‘h’ and compare these to the ratios on Page 1.2. They should confirm your finding, but you need to go on to produce a proof, based on this construction.



The Sine Rule can be used to find missing sides and angles in the same way as the trigonometry of right angled triangles.