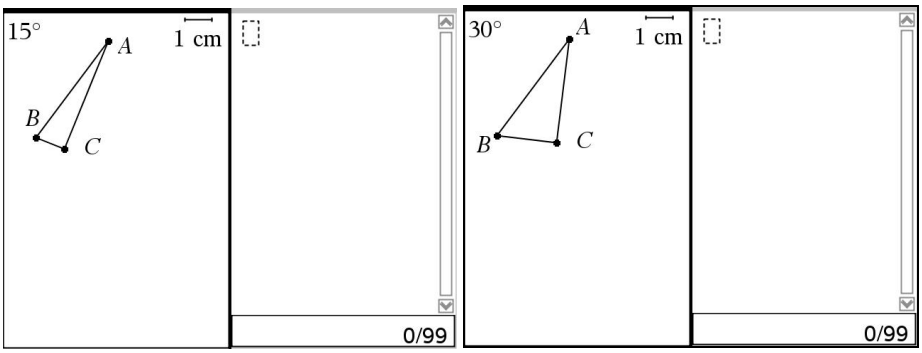
Using TI-Nspire to introduce trigonometric ratios

Following on from his success with the Circle theorem lesson, Mike had been inspired by the activity to think about how he could set up a similar style of lesson to enable the same class of Year 9 students to find out about the important relationships between the side lengths of right angled triangles. Essentially, he wanted to introduce his students to the trigonometric ratios, but wanted them to discover them in the hope that this would be a more memorable way of learning for them.

Mike wanted to set up a group activity whereby each group would gather data relating to a given dynamic right angled triangle but, unknown to them, each group of students would be exploring a different situation.

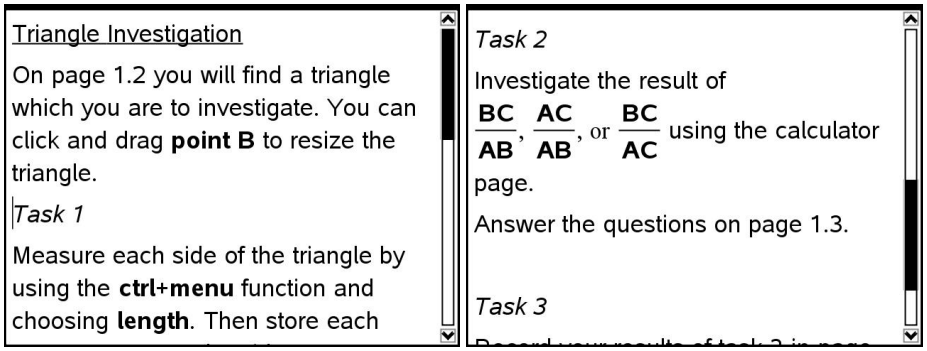
He enlisted his project mentor's help in designing this lesson as he knew the construction that he wanted to produce but wasn't quite sure how to do it! Carol Knights worked with Mike to develop a dynamic right angled triangle that had been defined by an angle measurement that would later be hidden from the students, but would enable one file to be "tweaked" to produce the six different scenarios.
This is what they came up with...

By starting with a line segment defined by AB and adding the "text" 60° to the screen, this angle can be used as an angle of rotation to rotate the segment about one of its ends (in this case the point A) to produce a new segment AA'. By constructing the perpendicular bisector of AA', the point C can be constructed. By adding the segments through the three vertices, A, B and C, the construction lines can then be hidden leaving just the right angled triangle and a mysterious number on the screen. As this number represents an important variable in this exploration, by editing it, Mike and Carol were able to efficiently produce the different starting points for each group. They had also measured and saved the lengths of the three sides as ***a***, ***b*** and ***c*** and added a Calculator window to the right hand side of each page.



Mike and Carol decided to set this lesson up as a rainbow activity in which each group would all have a handheld each with the same preloaded file. Each group would then explore how the calculated ratios of the measurements of pairs of sides changed as they dragged the only movable point on the shape. (The students had to find out which one this was). They would then use the Calculator window to conjecture and test their findings and record these on a Notes page in the document. The group would then discuss their findings such that each person in the group could explain them to someone else and then the whole class was rearranged so that they were in a new group consisting of one person from each of the original groups.

Mike and Carol decided to use coloured stickers on the handhelds to assist this process! The students were quickly engaged with the task and found different ways of recording the values that they were calculating. The task instructions were included in the file,



Mike then held a lesson plenary where he asked each student to “notice” the number on the screen and make suggestions as to what it might represent. By displaying the different initial files the students were able to make the connection to the angle between side *AB* and side *BC*. He then asked the students to feedback the ratios they had discovered to produce a summary table of angles and the related ratios.

After the lesson, Mike commented about how the students expected to find patterns within the lists of ratios they calculated. Some students thought they had found a pattern and so generated other “results” based on the pattern they had perceived... this was noticed by the class when their results did not concur with everyone else’s.