PYTHAGORAS' THEOREM
Teacher Notes

References

Foundation	
Foundation Plus	G7.3, G7.4 Pythagoras Theorem
Higher	G5.1 Pythagoras Theorem
Higher Plus	-

Introduction

In this activity students can discover and use Pythagoras' Theorem. By changing the shape of a triangle they learn that when it is right-angled, the sum of the areas of the squares on the two shorter sides equals the area of the square on the longest side. A famous dissection is used to further illustrate the theorem. Students go on to find missing areas and then missing side lengths of right-angled triangles. A feature of the activity is that every student can draw a different triangle, carry out the calculations and then check the answers.

Resources

The TI-Nspire document entitled ***Pythagoras.tns*** is needed for this activity.

A 3-page handout guides students through the activity and provides all the technical help they will need.

TI-Nspire skills students will need

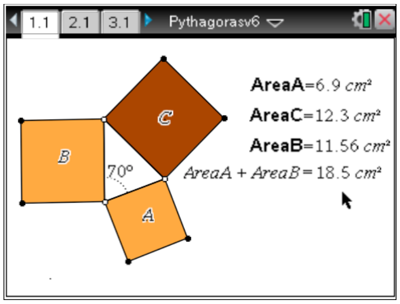
Transferring a document to the handheld
Opening a document on the handheld
Moving between pages of a document
Moving from one part of a split screen to another
Grabbing and moving points lines

The activity

The activity is designed for use by students working individually on TI-Nspire handhelds, but it can also be used with the TI-Nspire Teacher Software and projected onto a screen for class discussion or for demonstration.

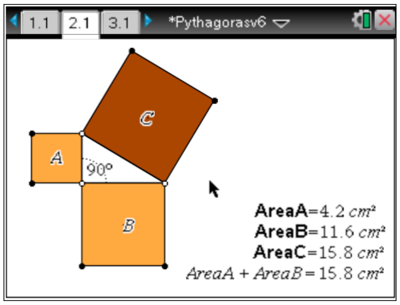
The student notes are divided into eight sections corresponding to the eight problems in the TI-Nspire document. There are notes on each of these eight sections below.

1) Three squares and a triangle



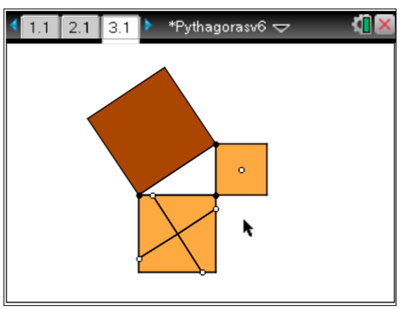
Students can grab and move the corners of the triangle and see how the areas of the squares change. The aim is to make the area of square C equal to the sum of the areas of squares A and B. When they succeed a message appears asking them to notice the angle.
If students are struggling to make the areas equal, you could ask them to try to make the angle 90°; they may find this easier to do. They will then see that when the angle is 90° then AreaA + AreaB = AreaC.

2) An ancient discovery



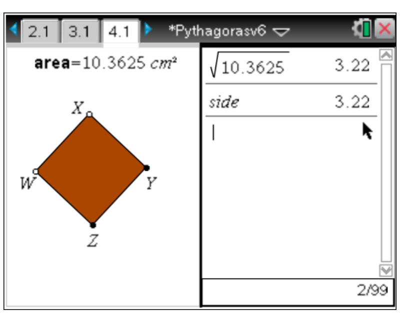
On page 2.1 students again grab and move a triangle but this time it has been constructed so that is remains right-angled, illustrating the validity of Pythagoras' Theorem.

3) It all fits together



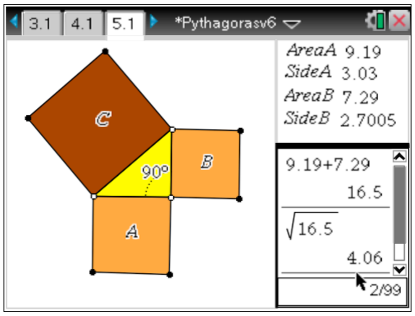
In this task students explore a dissection of the squares. They can grab and move the pieces of the smaller squares, fitting them together in the larger square. This is a convincing illustration that Pythagoras' Theorem holds true since students are able to see that the areas fit together, rather than relying on the more abstract calculation of areas.
Notice that the vertices of the triangle may also be moved and for many triangles the dissection still works. However, the small square must remain the smallest of the three squares for this dissection to remain valid.

4) A square's side



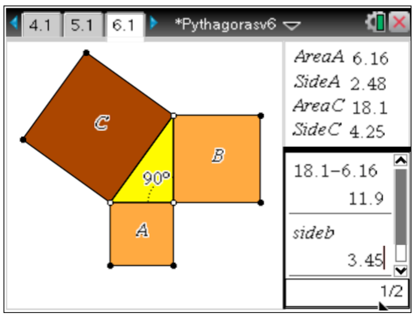
The aim of this task is to remind students of the relationship between the area of a square and its side length.
Students can grab and move the square and change its area. They are then asked to calculate the side length, which they can do on the right-hand side of the screen.
Press ctrl x^2 to obtain the square root sign.
By typing *side* students can see the current side length and so check their answers.

5) Something's missing!



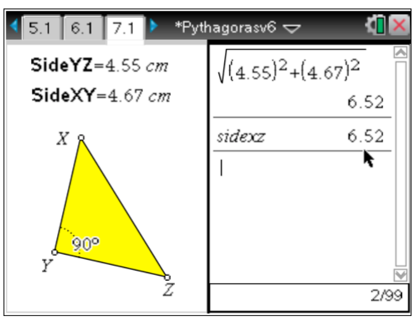
In this task, students begin to use Pythagoras' Theorem to calculate the third side of a right-angled triangle. They are again given a right-angled triangle that they can grab and move. The areas and side lengths of the two smaller squares are shown, but AreaC and SideC are missing. Students use Pythagoras' Theorem to work out the missing area and side length.

6) Something's different!



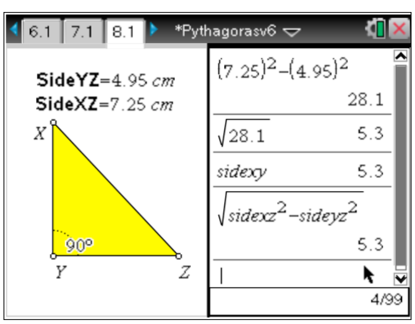
Students now find the area and side length of one of the smaller squares. They will need to do a subtraction to find the missing area.

7) Find the side



Students now find missing sides on right-angles triangles without the squares being drawn. The student notes ask them to 'imagine' the squares. In this section the hypotenuse is missing.
As the focus is now on side lengths rather than the squares, this task uses the traditional notation of XY, YZ and XZ for the lengths of the sides.

8) A shorter side



In this section one of the shorter sides is missing, so subtraction is needed in the calculation.

Notice that it is also possible to use a more generalised form in the calculation as shown here.