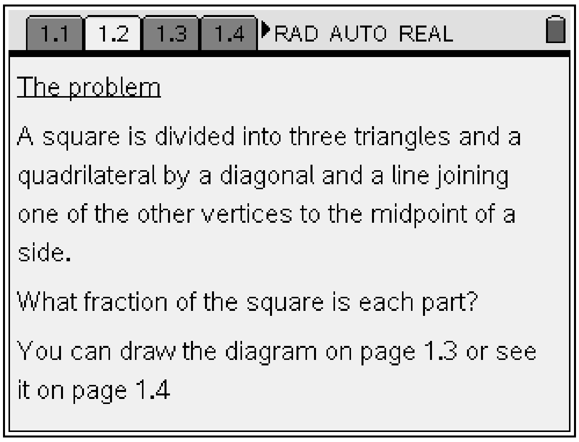
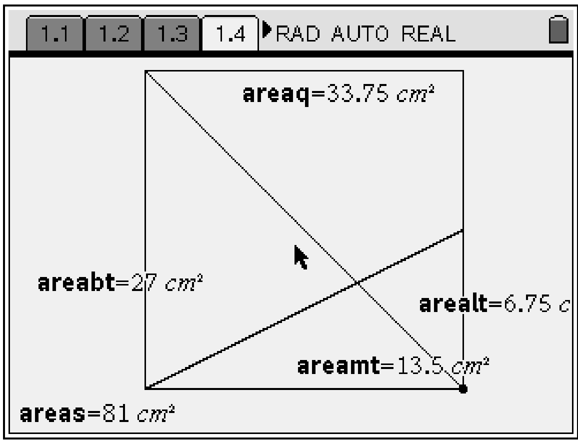
# Square Triangles
# Teacher Notes

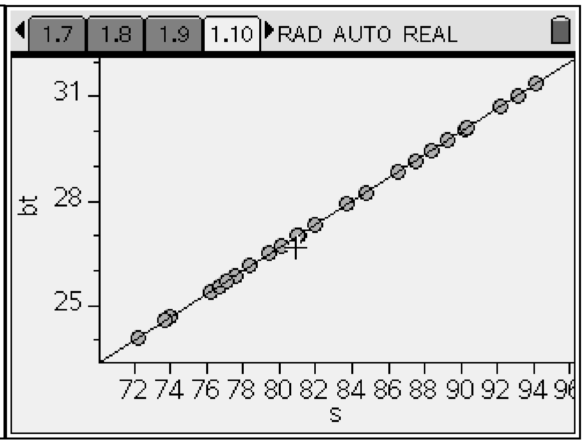
## Introduction

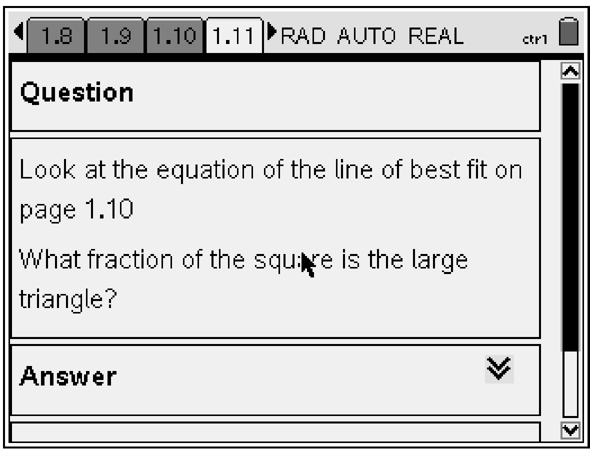
This is an activity that uses all of the applications available within TI-Nspire and is very rich in mathematics across geometry, algebra and statistics. It will take a minimum of three one-hour lessons to do and is worth revisiting in subsequent years.

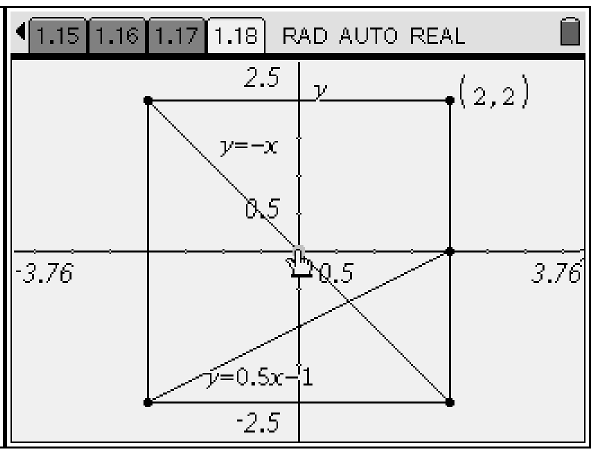



By looking at a simple geometric construction, learners can gather data and put it into lists that can then be analysed. Learners who wish to develop their skills using dynamic geometry can construct the diagram themselves, though it is provided for use if that skill is not to be developed at the time.



This activity is suitable for middle to high attainers in Year 9 or above.

Instructions are given within the TI-Nspire document, and the objectives are listed below.

<u>Objectives:</u>

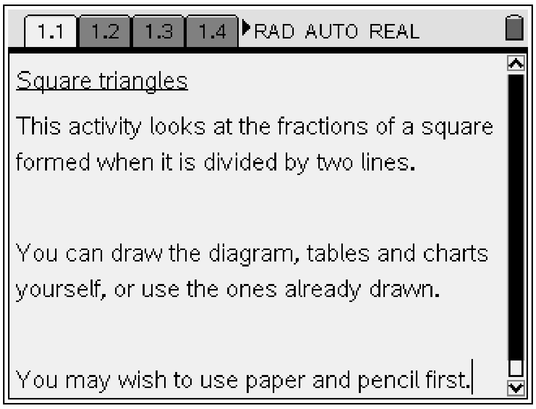
- Interpret a written statement using dynamic geometry
- Calculate fractions of a square empirically or theoretically
- Collect data in lists
- Use a scattergraph and line of best fit to compare two data sets
- Prove two triangles are similar
- Use similarity to find the linear ratio of two triangles
- Extend a problem
- Explore the links between geometry and algebra
- Solve simultaneous equations graphically

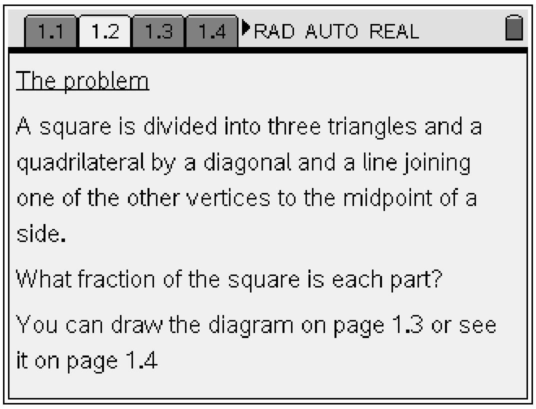
This activity shows how powerful the links between geometry and algebra can be. It also links geometry, algebra and statistics with some number work (learners need to be able to recognise fraction equivalents of decimals).

<u>Teaching notes</u>

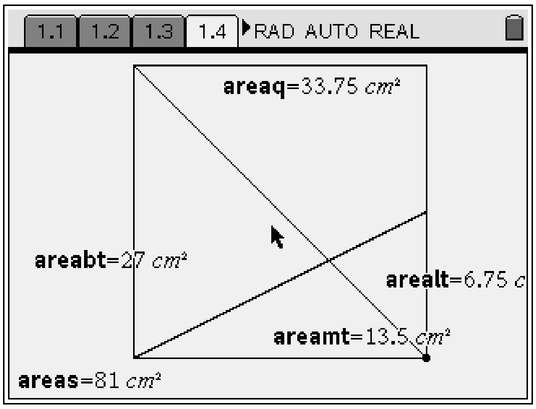
Learners may have to be shown how to use the dynamic geometry to construct the shape, but you may wish to skip that. However the time investment is well worth the effort since it helps them in the future. It was a steep learning curve for the author, but one that helped consolidate his knowledge of TI-Nspire!

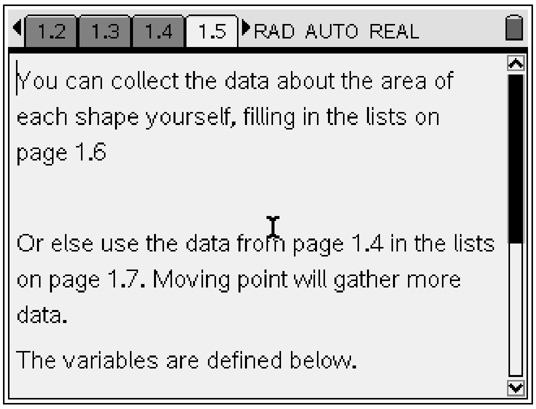
<u>Complete screen shots</u>



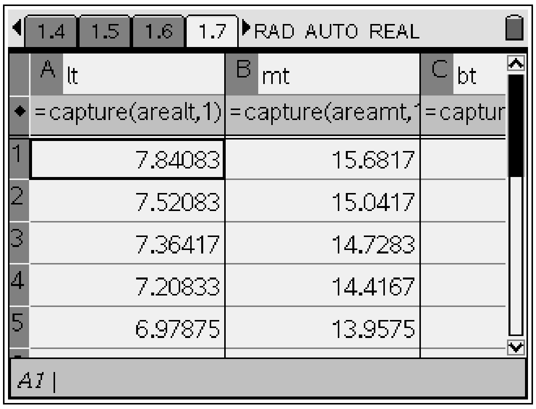



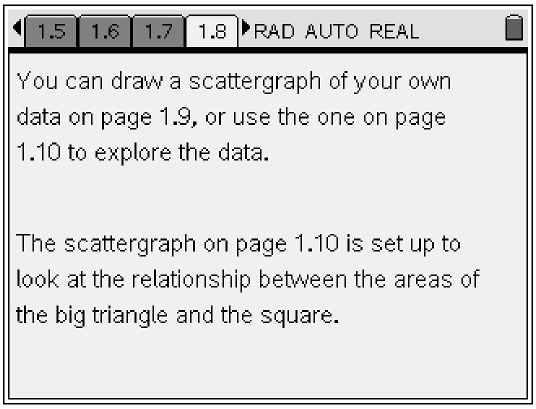

Page 1.3 is a blank geometry page for learners' own construction.



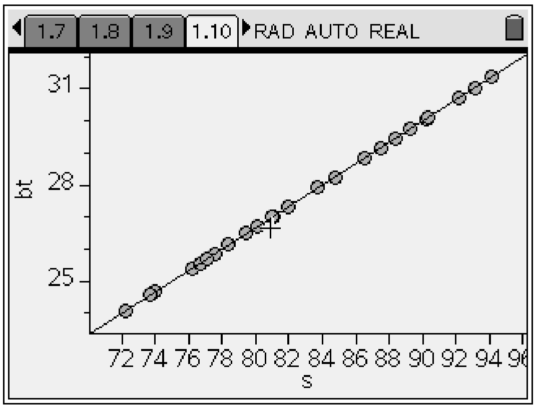



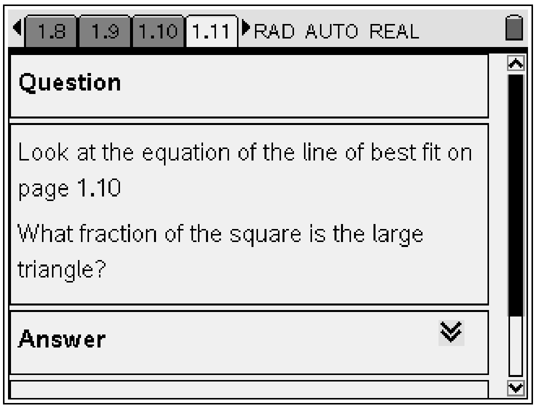

Page 1.6 is a blank lists page for learners' own data capture.

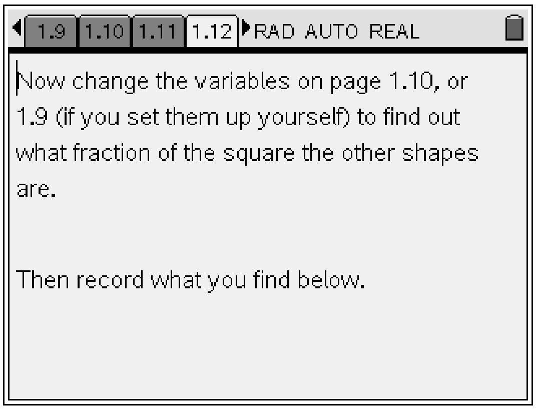


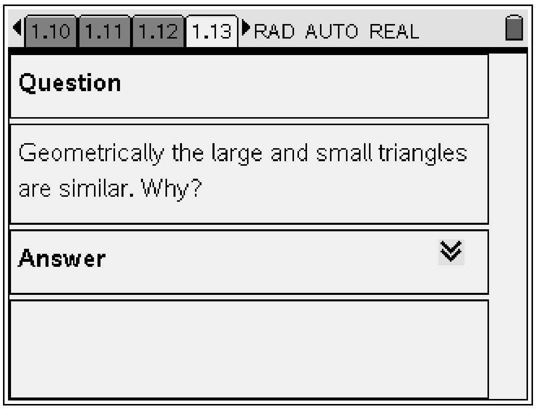



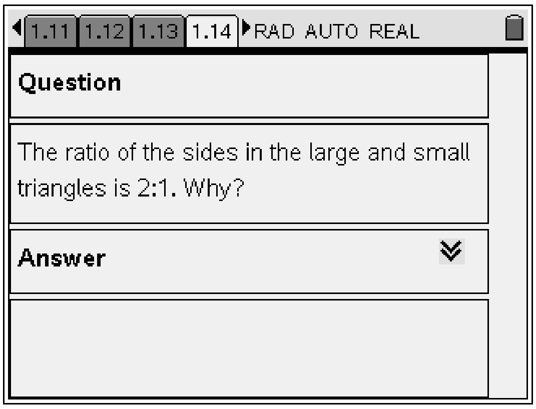

Page 1.9 is a blank scattergraph page for learners' own list data.

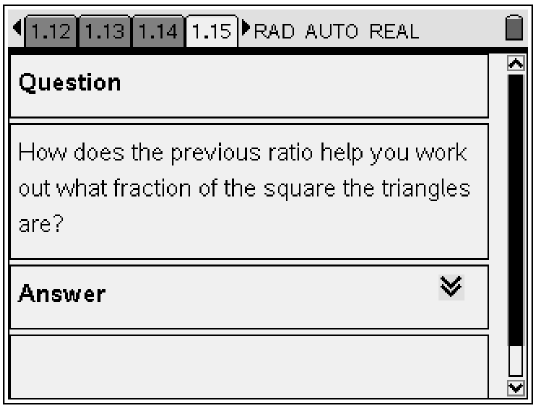


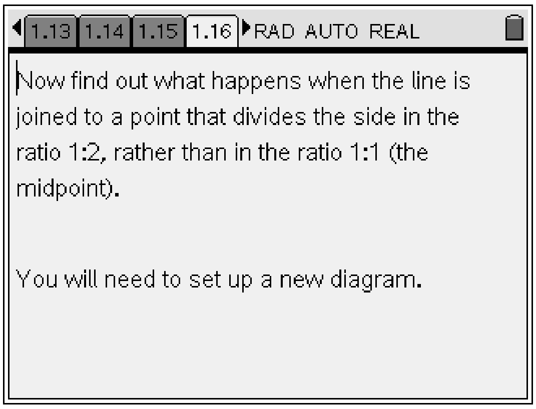



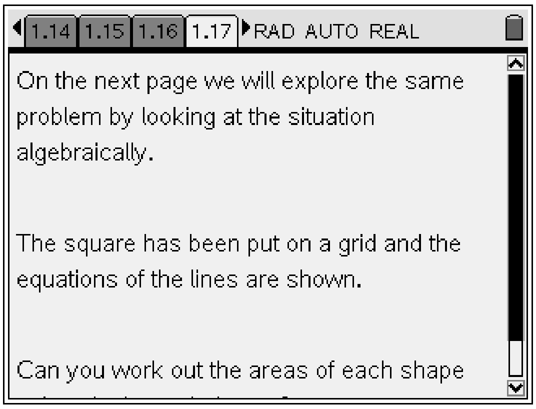



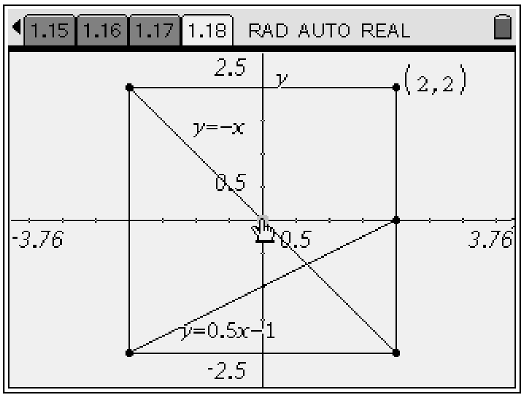




1.11 1.12 1.13 1.14 RAD AUTO REAL
Question
The ratio of the sides in the large and small triangles is 2:1. Why?
Answer


1.12 1.13 1.14 1.15 RAD AUTO REAL
Question
How does the previous ratio help you work out what fraction of the square the triangles are?
Answer


1.13 1.14 1.15 1.16 RAD AUTO REAL
Now find out what happens when the line is joined to a point that divides the side in the ratio 1:2, rather than in the ratio 1:1 (the midpoint).
You will need to set up a new diagram.


1.14 1.15 1.16 1.17 RAD AUTO REAL
On the next page we will explore the same problem by looking at the situation algebraically.
The square has been put on a grid and the equations of the lines are shown.
Can you work out the areas of each shape


1.15 1.16 1.17 1.18 RAD AUTO REAL
2.5
y
(2,2)
y=−x
0.5
-3.76
0.5
3.76
y=0.5x−1
-2.5