PREPARING FOR THE PROOF OF PYTHAGORAS' THEOREM BY EUCLID
Euclid's Elements. Book 1

Preparing Geogebra

a) In the menu "Options" or "Vaihtoehdot" choose "Kieli" and then "English(UK)".

b) In the menu "Options" — "Labelling", check "New points only".

c) In the menu "View" uncheck "Axes", verify that "Algebra window" is checked.

Exercise 1.

Choose two points A and B. Use the tool "regular polygon" to draw squares : $ABCD$, $ADEF$, $AFGH$, $AHIJ$ where $J = B$ and $BDKL$ where $K = H$ and $H = L$.

The sketch you have got can be thought of as an illustration of $AC = \sqrt{2}\,AB$.
Clear the plane.

Exercise 2.

a) Choose three points A, B and C.

b) Draw the line a through A and B.

c) Draw the line b parallel to a going through C.

d) Choose two points D and E on b and one point F on a.

e) Using the tools "parallel line" and "intersecting point" construct the point G such that $DEGF$ is a parallelogram.

f) Use the tool "Polygon" to draw the surface of the parallelogram $DEGF$ and get its area (in some unknown unit) in the algebra window.

g) Choose an other point H on the line a and construct the parallelogram $DEIH$. Check that $DEGF$ and $DEIH$ have the same area.

h) Let the point F move on a and check that the area of $DEGF$ does not change.

i) Put the points F, G, H and I on the line a in the order $FGHI$. Call J the intersection of DH and EG. Note the areas of the parallelograms $DEGF$ and $DEIH$ and of the triangles DHF, GEI, GJH and DEJ. Check that:

$$\begin{aligned} \text{area}\, DEGF &= \text{area}\, DHF - \text{area}\, GJH + \text{area}\, DEJ \\ &= \text{area}\, EIG - \text{area}\, GJH + \text{area}\, DEJ = \text{area}\, DEIH \end{aligned}$$

Exercise 3.

a) Construct a triangle ABC with a right angle at A.

b) Construct three squares outside the triangle ABC. Let these squares be $BADE$, $ACFG$ and $CBHI$.

c) Draw the segments EC and AH. Why are the triangles BEC and BAH equal ?

d) Draw the parallelogram $EBCJ$. Why is the area of the triangle BEC half the area of the square $BADE$?

e) Draw through A the parallel to BH and let it intersect HI in the point K.

f) Construct the parallelogram $ABHL$. Why is the area of $ABHL$ equal to that of the square $BADE$?

g) Let M be the intersection point of AK and BC. Why is the area of $BHKM$ equal to that of the square $BADE$?

h) Show Pythagoras' theorem and use colors to illustrate the proof.