IDEA

69

AREAS OF TRIANGLES ON SQUARE-DOT GRID PAPER

This idea is for students to explore triangles with a constant area and one side length constant. The intention is to help them construct an understanding of the formula for the area of a triangle: $A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$.

On 1 cm-square grid paper ask students to draw as many non-congruent triangles as possible, all of which have the same area of 6 cm^2 and a constant length of 4 cm.

Using A4 paper there will be more than a couple of dozen triangles that fit this criteria. Three of them, an isosceles, a scalene (acute angled) and a right-angled triangle will probably be the 'easiest' three to find. Students may need further encouragement to look for other triangles fitting the criteria, all of which have an obtuse angle.

Once a large collection of triangles have been found these can be made into an 'instant' display by sticking cut-outs of these triangles on a large sheet of sugar paper with each triangle orientated so the constant length (of 4 cm in this example) becomes the base of each triangle. This visual display is intended to reveal the observation that all the triangles have the same perpendicular height (of 3 cm).

By changing the length of the constant side to a different measure, such as 3cm, and keeping the constant area as 6 cm^2, then another display can be formed and this time the perpendicular height will always be 4 cm.

Students can explore what happens for triangles with different (constant) areas and constant base lengths.

IDEA

70

AREAS OF SQUARES ON THE SIDES OF TRIANGLES

This idea is based upon students exploring different types of triangles formed when surrounded by three squares. If the lengths of the squares provided measure from 3 cm to 17 cm, this will provide students with plenty of triangles to make.

Providing students with the resources (square pieces of card with lengths from 3 to 17 marked on) will obviously require careful preparation. However, once different size squares have been drawn on templates and these have been copied onto card, students can cut out squares, calculate the areas and write these on each square.

The idea is for students to choose three squares and use an edge of each square to form or 'surround' triangles. Because of the lengths chosen there will be many sets of three squares that will not form triangles; this can lead to students recognizing the condition of the total length of the two shorter sides needing be greater than the longest side in order to form a triangle.

The main point of the task is for students to explore lengths and, therefore, the areas of squares needed to make scalene triangles classified by:

- all acute angles;
- one obtuse angle;
- one right angle.

Because of the lengths used (from 3 to 17) between 200 and 250 scalene triangles can be formed; given just five of the triangles will be right-angled, students will have a substantial challenge to find these triangles. This lends itself to a whole class, working in groups, to systematically seek out the five right-angled solutions.

The main intention is to recognize the existence of following equations/inequalities based upon the areas of the squares and the following coding: S = smallest area, M = middle-size area and L = largest area.

- For all acute-angled triangles $S + M > L$.
- For obtuse-angled triangles $S + M < L$.
- For right-angled triangles $S + M = L$.