Connecting the Dots

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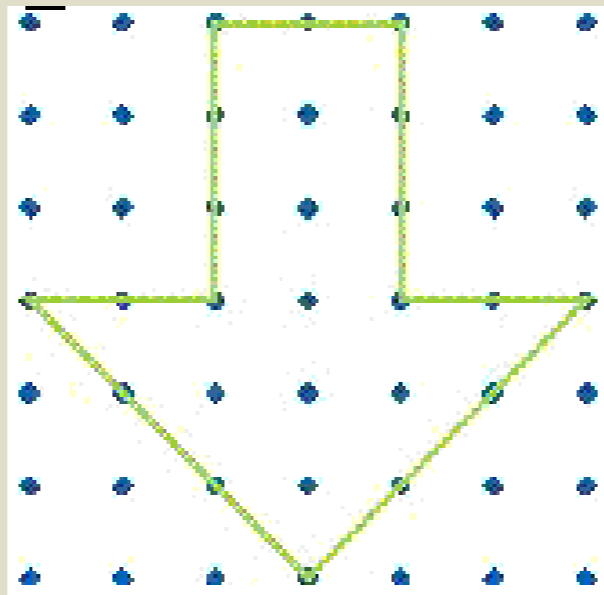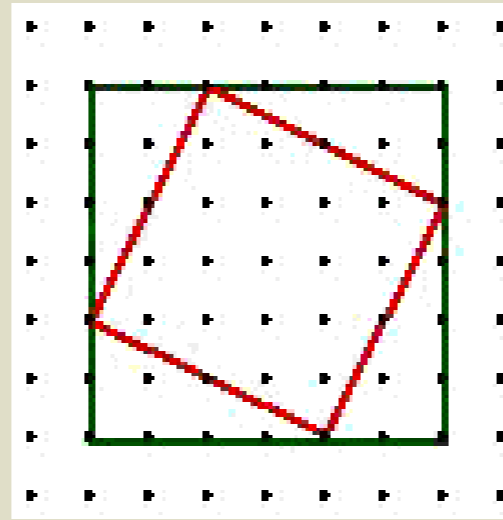
Lessons from

Geometry Labs
Henri Picciotto
(free download at www.MathEducationPage.org)

Find geoboard shapes
with area 15

Find as many geoboard squares
of different sizes (and their areas)
as you can.
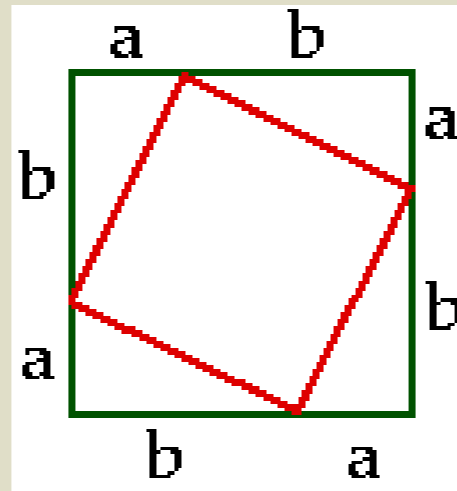
Hint: there are more than 10

What is the area of the red square?

outer square: 6^2

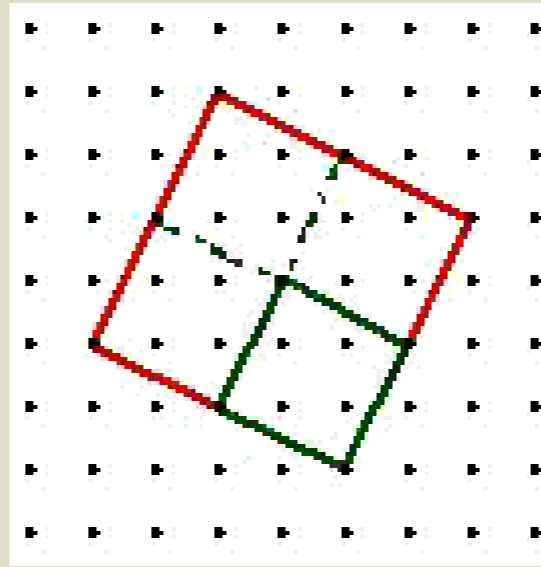each triangle: $\dfrac{2 \cdot 4}{2} = 4$

inner square: $36 - 4 \cdot 4 = 20$

Generalize

outer square: $(a + b)^2$

each triangle: $\dfrac{a \cdot b}{2}$

inner square: $(a + b)^2 - 2ab = a^2 + b^2$

Area of squares		
Small	Medium	Large

Area of the red square: 20
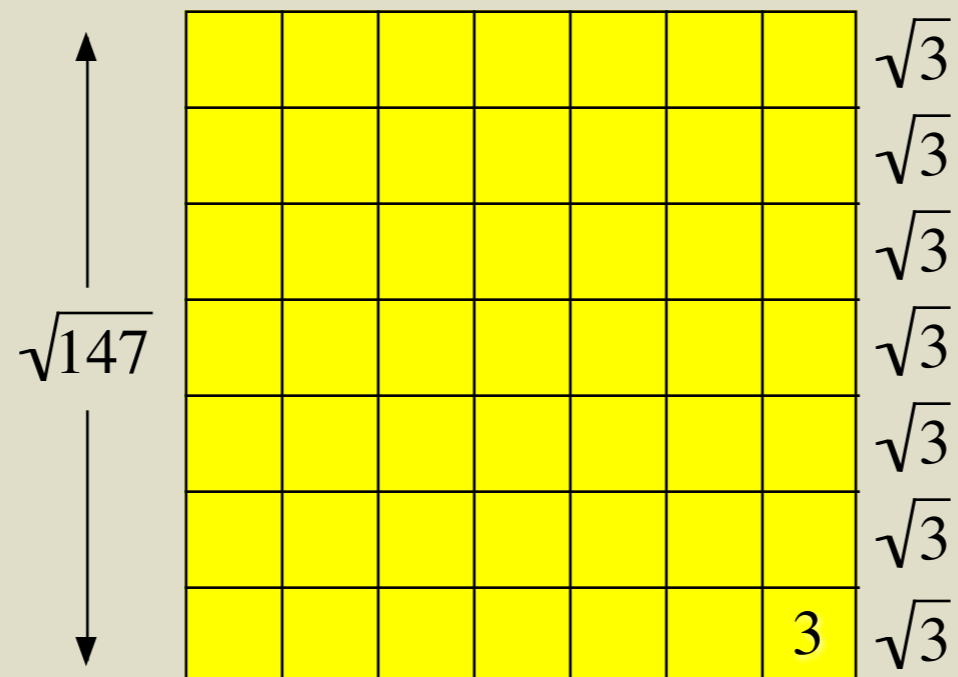
Area of the green square: 5

Side of the red square: $\sqrt{20}$

Side of the green square: $\sqrt{5}$

Conclusion: $\sqrt{20} = 2\sqrt{5}$!
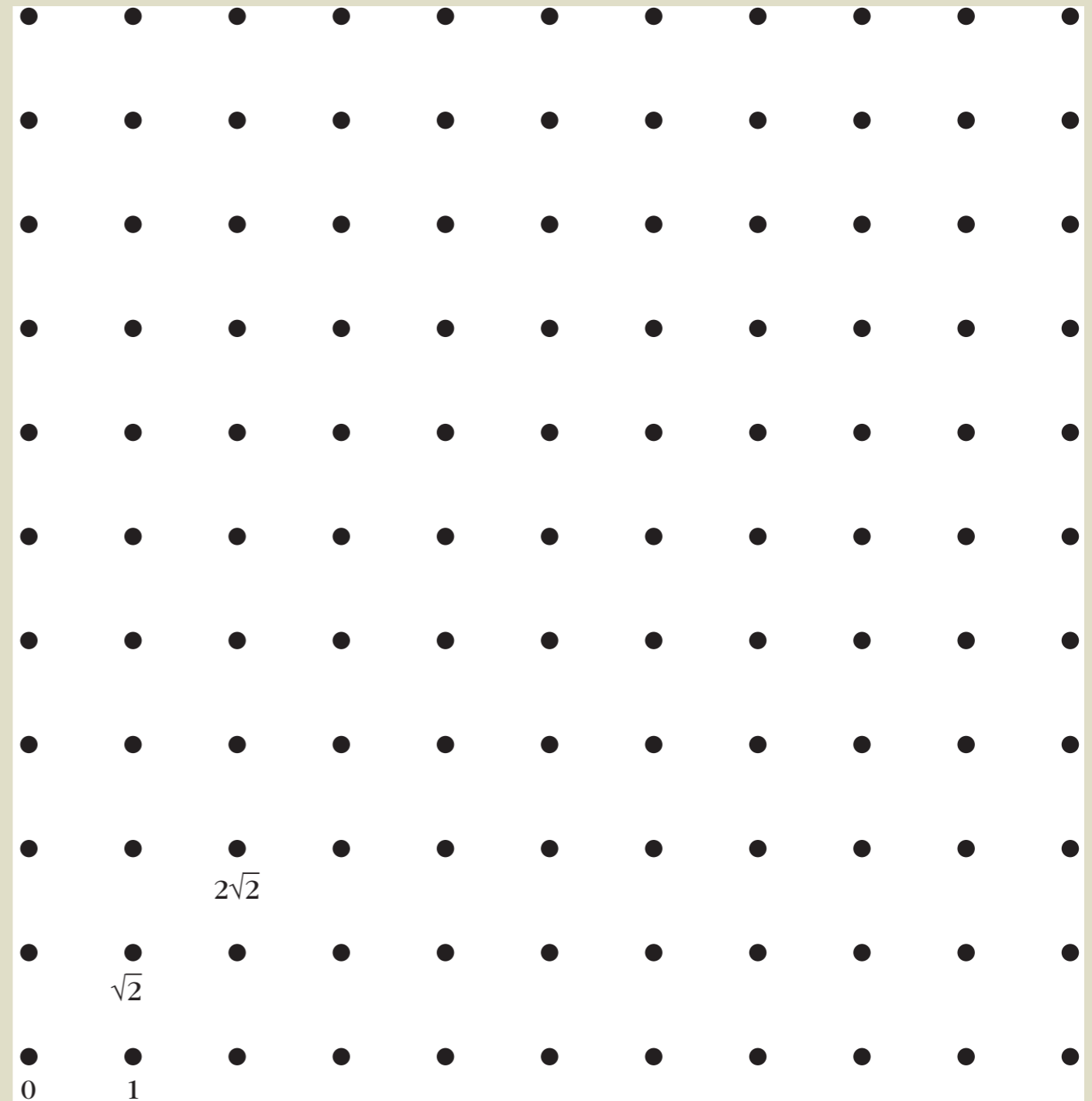
Simplify: $\sqrt{147}$

Area: 147

$\sqrt{3}$
$\sqrt{3}$
$\sqrt{3}$
$\sqrt{3}$
$\sqrt{3}$
$\sqrt{3}$
3 $\sqrt{3}$

$\sqrt{147}$

$$\sqrt{147} = \sqrt{49 \cdot 3} = 7\sqrt{3}$$

Distance to the origin

1. What is the distance from each geoboard peg to the origin? Write your answers in simple radical form on the figure below.

$2\sqrt{2}$

$\sqrt{2}$

0   1

Discussion

A. Discuss any patterns you notice in the distances. Use color to highlight them on the figure. In particular, refer to the following features.
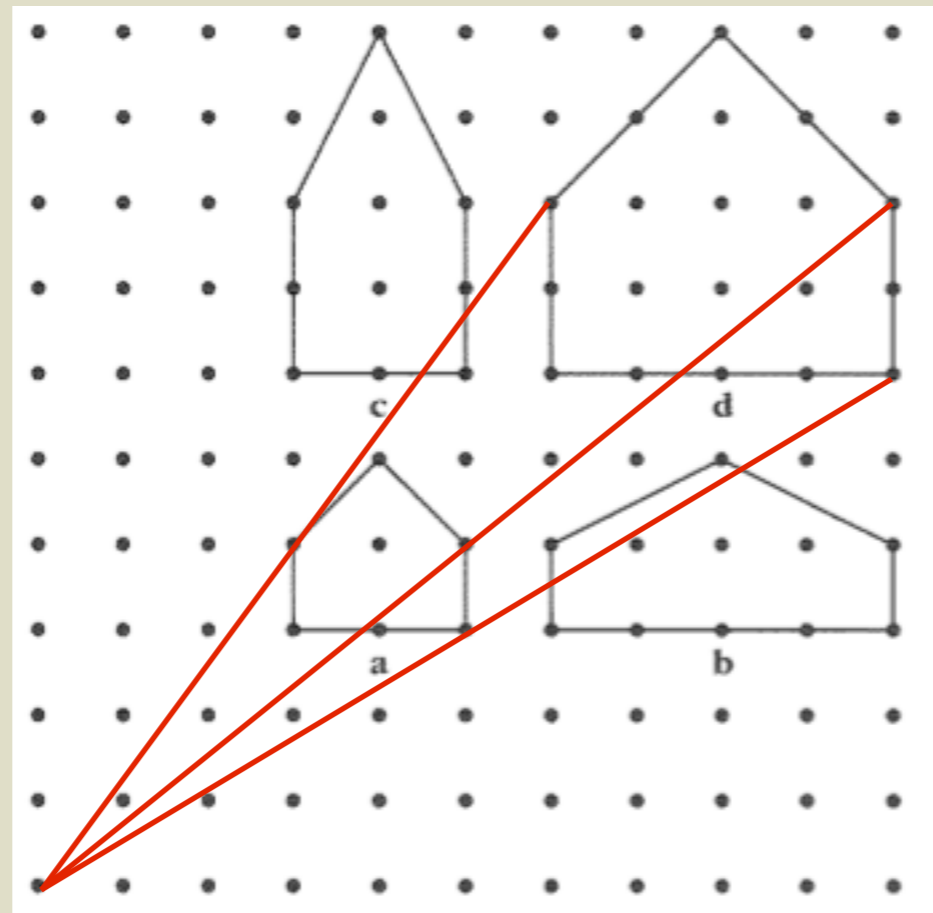
    a. Symmetry

    b. Slope

Similarity

Dilation
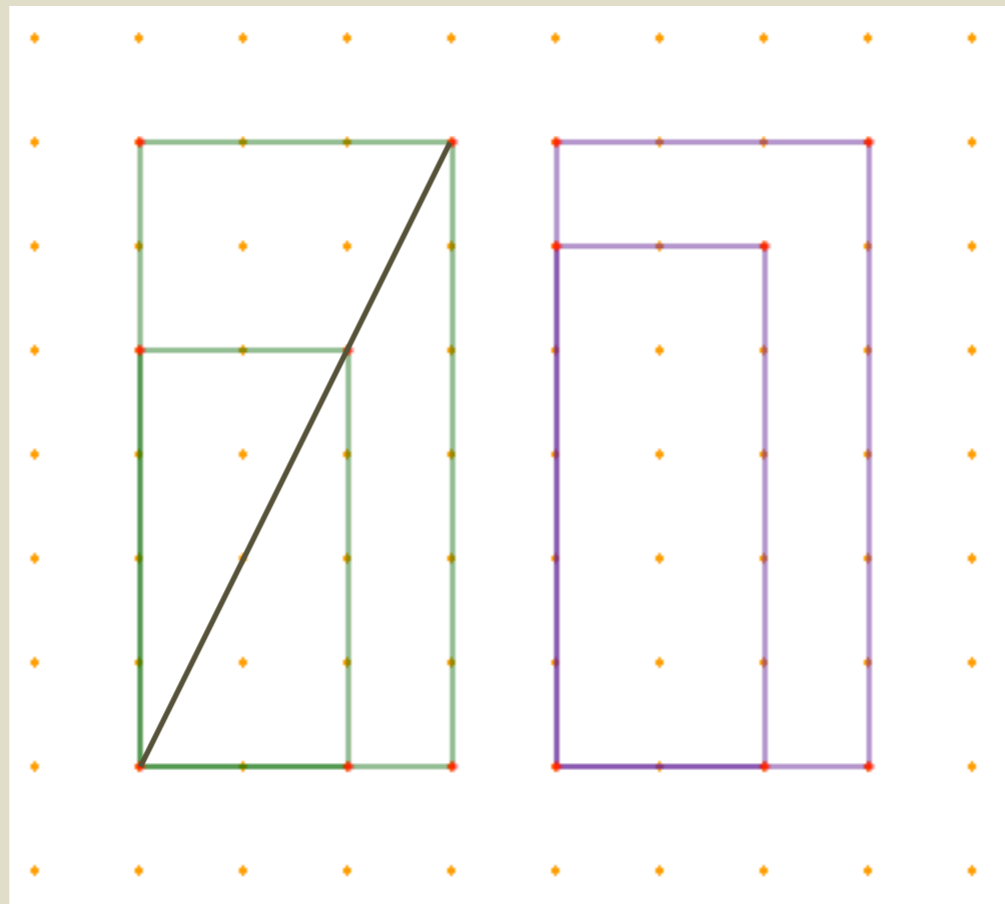
$(3,4) \rightarrow (6,8)$

$(5,3) \rightarrow (10,6)$

$(5,4) \rightarrow (10,8)$

Sides are proportional
Angles are equal

Similar Rectangles

Sides are proportional

The diagonal test

There are ten families
of similar rectangles
on the geoboard.
(with more than one
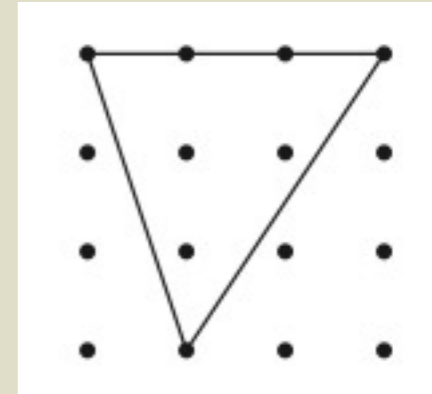rectangle per family)

Find them all.

Slope

Find all geoboard slopes between 1 and 2 (expressed as fractions and decimals).
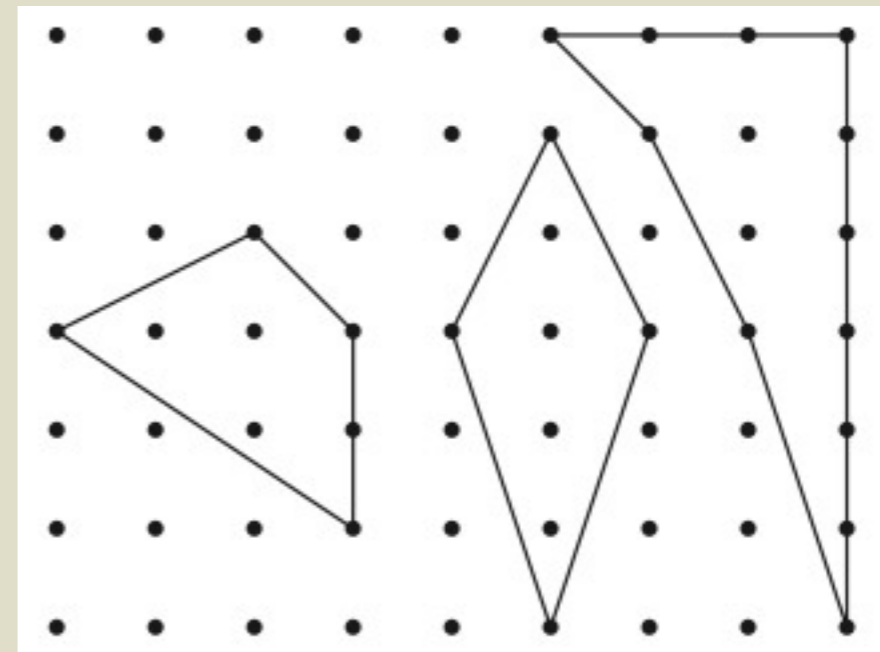
Find all geobard slopes between 0.5 and 1.
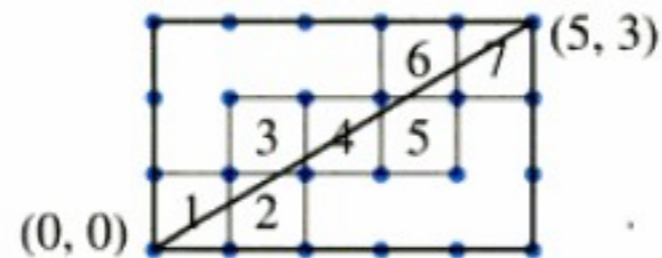
Extensions

Pick's Formula

Inside dots	Bound. dots	Area

If you connect (0, 0) to (5, 3) with a straight line, you go through seven unit squares.

14. **Exploration** If you connect (0, 0) to (p, q) with a straight line, how many unit squares do you go through? Experiment and look for patterns. (Assume p and q are positive whole numbers.) Keep a record of your work.

Using manipulatives does not guarantee the development of skills, but it can encourage reflection and discussion.

This makes difficult topics more accessible, and can lead to deeper understanding for all.

It is a useful complement to traditional and electronic approaches in all classes.

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