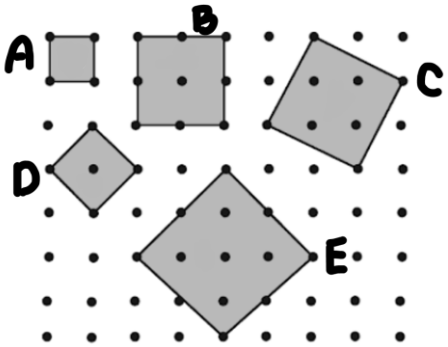
QUARTER 4 PROJECT, Mr. Peralta, Class 622 and 623

TASK 1: Finding the Area of Squares

The image below contains 5 squares, each set in a grid. The space between any two adjacent dots is 1 unit. Each vertex of each square lies on a dot.



Find the area of each square, showing all work and/or explaining your reasoning. For squares B, C, D, and E, show **two different methods** for finding the area. Feel free to recopy the squares onto one or more new sheets of dot paper.

TASK 2: Drawing Integer Squares

It is also possible to use grid paper to draw squares of areas 9, 10, 13, 16, 17, and 20. Do so on one or more new sheets of dot paper. The conditions are that the figures must be squares **and every vertex of every square must lie on a dot**.

Then, explain your thought process for finding these new integer squares. Use full sentences in your explanation.

TASK 3: Drawing the Final Integer Square

In Task 1 and 2, you saw squares with certain integer areas. There is one other number N less than 20 for which there is a square of area N. Which number did I skip? Draw it on dot paper and show two different methods for finding this area.

TASK 4: Interior and Boundary Dots

Fill out the table below showing the value of *I*, *B*, and *A* for each square. *I* is the number of dots in the interior of the square. *B* is the number of dots on the border of the square (including the square's vertices). *A* is the area of the square. The first few values of *I* and *B* have been done for you.

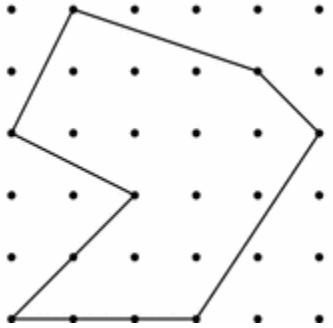
Square	A	B	C	D	E	F	G	H	I	J	K	L
I	0	1	4	1	5							
B	4	8	4	4	8							
A												

TASK 5: Creating an Equation

Use patterns in the table above to create an equation that allows you to figure out *A* using the values of *I* and *B*. In other words, it will be an equation with *A* on one side and *I* and *B* on the other side.

To clarify, the equation $A = I + B$ doesn't work since you can pick a shape in the table from Task 4 and see that the equation fails. Find a single equation that *does* work for every shape in the table.

TASK 6: Applying Your Equation



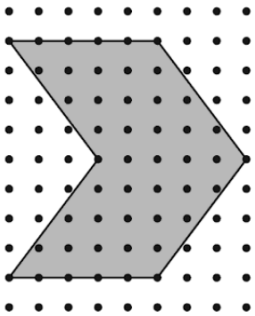
Use your equation from Task 5 to find the area of the polygon. Show all work.

Then, find the area of the polygon *without* using your equation from Task 5. Show all work.

**** Put together a neat and creative product of the information you completed above. Math work and explanations should be included. It could be a stapled packet, a poster, or some other medium ****

EXTENSION 1:
In this project, you analyzed and created squares which had integer areas, and which had vertices exactly on the dots. State a rule for when it is possible to create such a square. Is it possible to create a square on dot paper with an area of 2450? Explain.

EXTENSION 2:
This is an equilateral hexagon because all six sides are the same length.



Create an equilateral octagon.

Explain how you could construct an equilateral lattice polygon with 628 sides.

EXTENSION 3:
Prove that if a square on dot paper has an area of N and another square on dot paper has an area of M, then it is possible to create a square on dot paper with an area of $N \times M$.