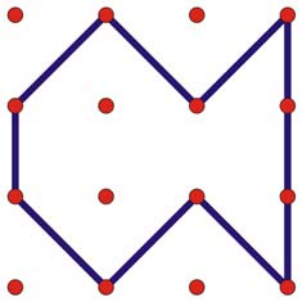
Discovering Pick's Theorem

NAME _____

You will need a geoboard and several rubber bands to perform this investigation. Place a rubber band around several pins to create the figure shown below.



1. How many pins are touching the rubber band? These are called *perimeter pins*.

The figure has ____ perimeter pins.

2. How many pins are completely inside the figure? These are called *interior pins*.

The figure has ____ interior pins.

3. Determine the area of the figure if a single square represents 1 square unit. (Hint: Divide the figure into squares, rectangles, trapezoids, and triangles to make the area calculations easier.)

The figure has an area of ____ square units.

4. Use your GeoBoard to construct at least three other figures. Record the number of perimeter pins, interior pins, and the area of the figure. Have a classmate check your work.

P = ___, I = ___, and A = ___ square units

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5. Share your results with other students in the class. As a group, can you determine a rule for the area (A) if you know the number of perimeter pins (P) and the number of interior pins (I)?

6. Construct a figure with $P = 4$ and $I = 0$. What is the area?

The area of the figure is ____ square units

7. Determine the areas for figures with $P = 6$ and $P = 8$ while $I = 0$.

The area of a figure is ____ square units when $P = 6$ and $I = 0$.

The area of a figure is ____ square units when $P = 8$ and $I = 0$.

8. Make a conjecture regarding the effect of perimeter pins on the area.

9. Share your conjecture with a classmate, and try to formalize a rule for the area. Write an equation using P for the number of perimeter pins and A for the area.

10. Create two figures with the same number of perimeter pins but with different numbers of interior pins. Sketch the figures below.

11. Determine the area of each of the figures, and make a conjecture regarding the effect of interior pins on the area.

12. Share your conjecture with a classmate, and expand the equation from Question 9 to create a new rule for the area. Use I for interior pins in your new equation.

13. Create a new figure with several perimeter and interior pins. Calculate its area and check your result with the equation you created in Question 12.

14. Pick arbitrary values for *P* and *I*. Construct two different figures with these values of *P* and *I*. Sketch the figures below, and determine their area. Do the figures have the same area?

P = ____ *I* = ____