NAME _____ DATE _____

Sea Cities

Hampton Roads, Virginia is experiencing sea level rise at a rate of one inch per year and represents the highest sea level change along the coast. There are many causes of sea level rise to include sinking lands and high tides. There are also solutions such as filling underground voids by pumping ground water. One innovative solution to address the damage of property and the relocation of residents is to build on water. The company SeaCitagon has a goal of developing a floating city that can house over 1,500 residents. They will use a regular hexagon, the most efficient packing shape, as the base of their floating city.

1. What mathematical reason could SeaCitagon have to justify using a regular hexagon as its base shape for the city?

2. A regular hexagon can be divided into many other polygons. Sketch 2 regular hexagons that have been divided into other polygons. Measure each side length for the hexagons, and then label each angle measure and side length of the subdivided polygons.

3. Design a mini city for Seacitagon using at least 4 different *regular* polygons as building shapes and 16 polygons total. You may make your design on a poster, graph paper, geogebra, or any other form of display. For each polygon, label the building name, side lengths and each interior and exterior angle measure.

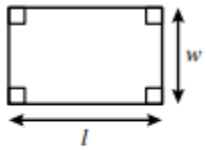
4. City officials want three buildings adjacent to each other in order to accommodate an office suite for the city. Which polygon(s) could be used to accommodate these three buildings so that each building is adjacent to the other two buildings? Why? Show and explain your mathematical reasoning.

5. The medical director wants the health center to be created with four congruent buildings such that they share a vertex to include a pediatrics center, a disease control center, an emergency center, and a general medical center. Which polygon could be used so that all four buildings are congruent and share a vertex? Show and explain your mathematical reasoning.

Extension --

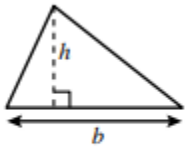
I. If one inch of your drawing in prompt 3 equals 5 feet, what is the area of each of your buildings on your floating city?

You may use these formulas to guide you:

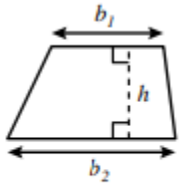


$p = 2l + 2w$

$A = lw$



$A = \frac{1}{2}bh$



$A = \frac{1}{2}h(b_1 + b_2)$

II. Once you have calculated the areas of your buildings, calculate the cost of flooring for each building. You can find the cost of a particular price for flooring if one below is not the type of flooring you would like for your building.

- Laminate -- $3 per square foot
- Hardwood -- $9 per square foot
- Carpet -- $7 per square foot
- Linoleum -- $5 per square foot

III. The hospital needs to measure at least 10,000 square feet to accommodate enough rooms and the equipment necessary. With a scale of 1in: 5ft what area will the hospital have in the drawing?

IV. Using your city map, create the roads that connect the buildings. Identify angle measures, where transversals exist, and use angle relationships to identify 2-3 locations on your map.