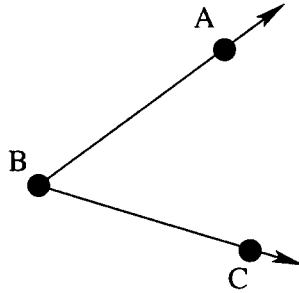


Math 131 Final

Name: _____

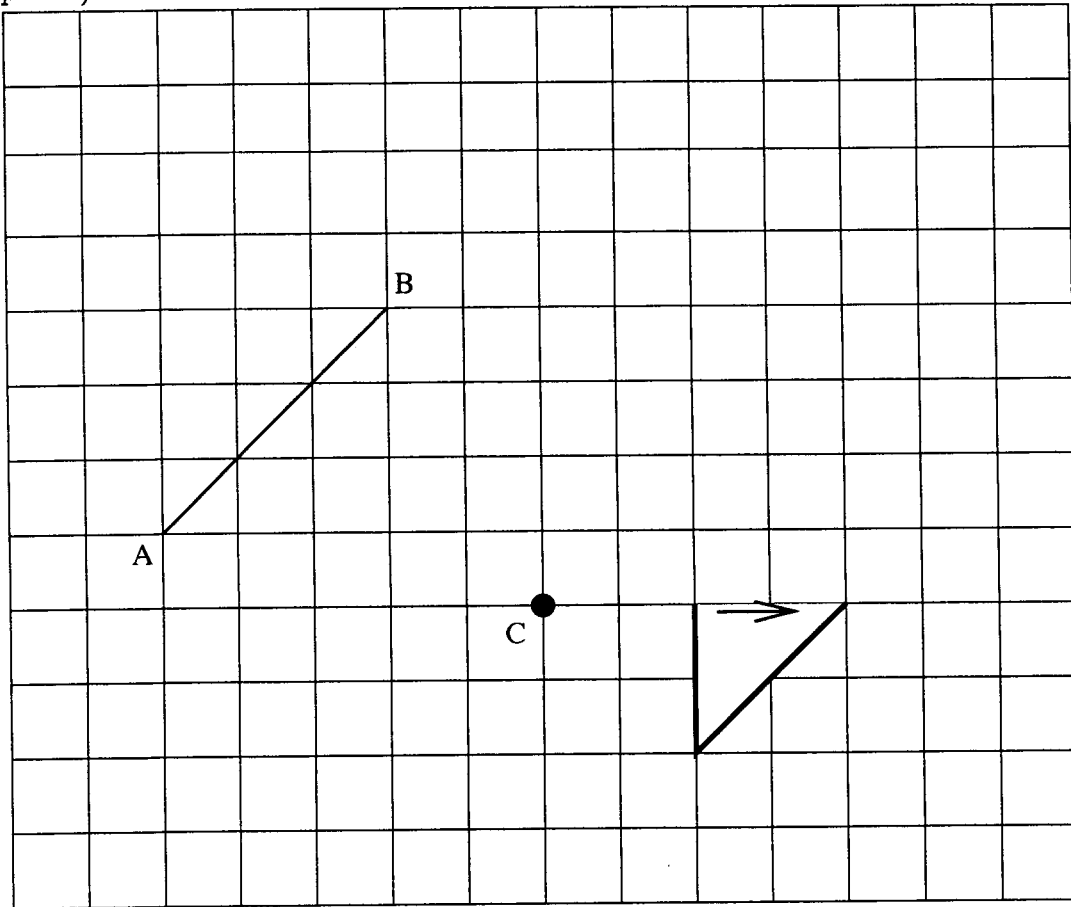
1. A student has the following method for bisecting an angle



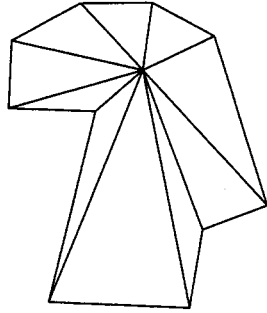
with compass and straightedge. Decide whether or not the method is valid (2 points) and explain why it does or doesn't work (8 points):

Open up your compass to any distance and, with the point on B make a mark along \overline{BC} ; call this D. Then change the opening of your compass, place the point on D and make a circle. Without changing your compass, put the point on B and make a mark along \overline{BA} ; call this E. Now open your compass to the length of \overline{BD} . With the compass point on E, make a circle. The circles intersect at a point inside the angle; the line that passes through this intersection and point B is the angle bisector.

2. Perform a *taxicab* rotation of segment \overline{AB} around point C through the indicated angle (10 points):



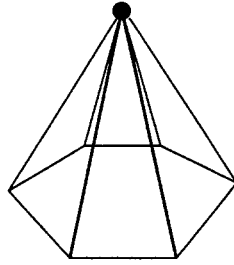
3. A student claims that the sum of the vertex angles of a 10-sided polygon is 1800° . Here is her proof:



There are 10 triangles
 $10 \times 180 = 1800$

Where is the flaw in her argument (5 points)? How can you correct the flaw (without changing her picture) (5 points)?

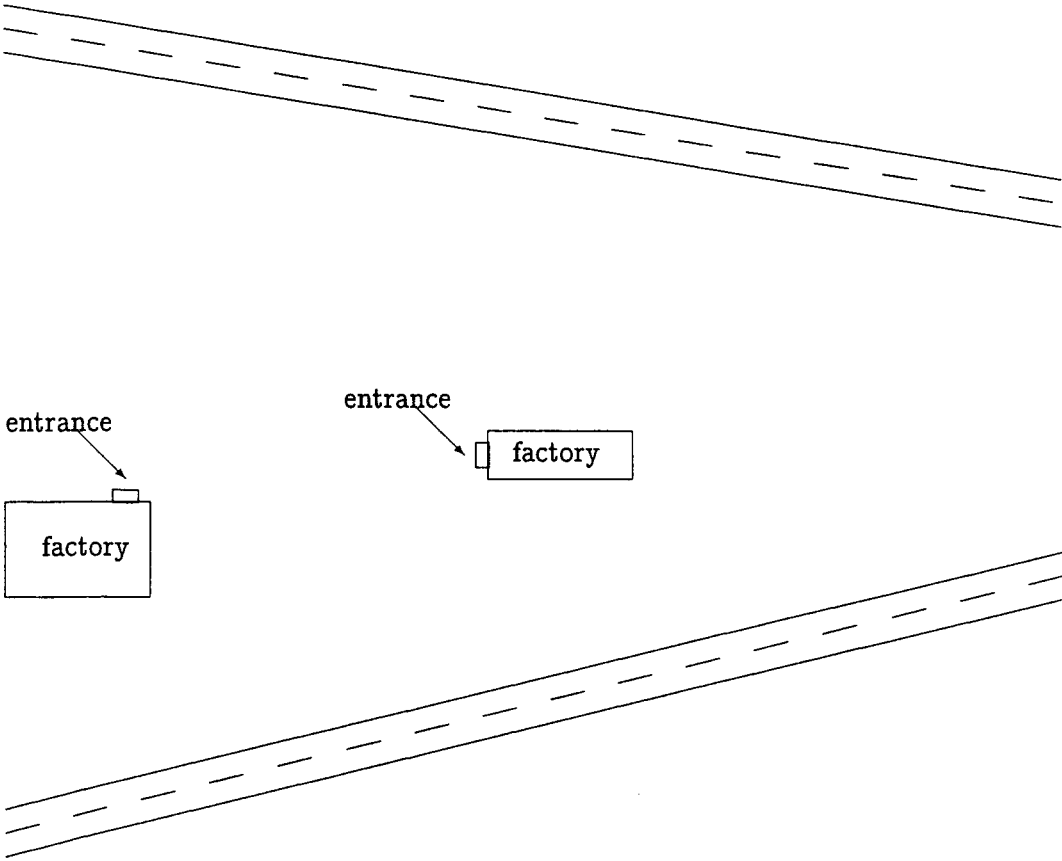
4. A *pyramid* is formed by taking a polygon and connecting all of its vertices to a point not in the plane of the polygon. For example, the following is a picture of a hexagonal pyramid:



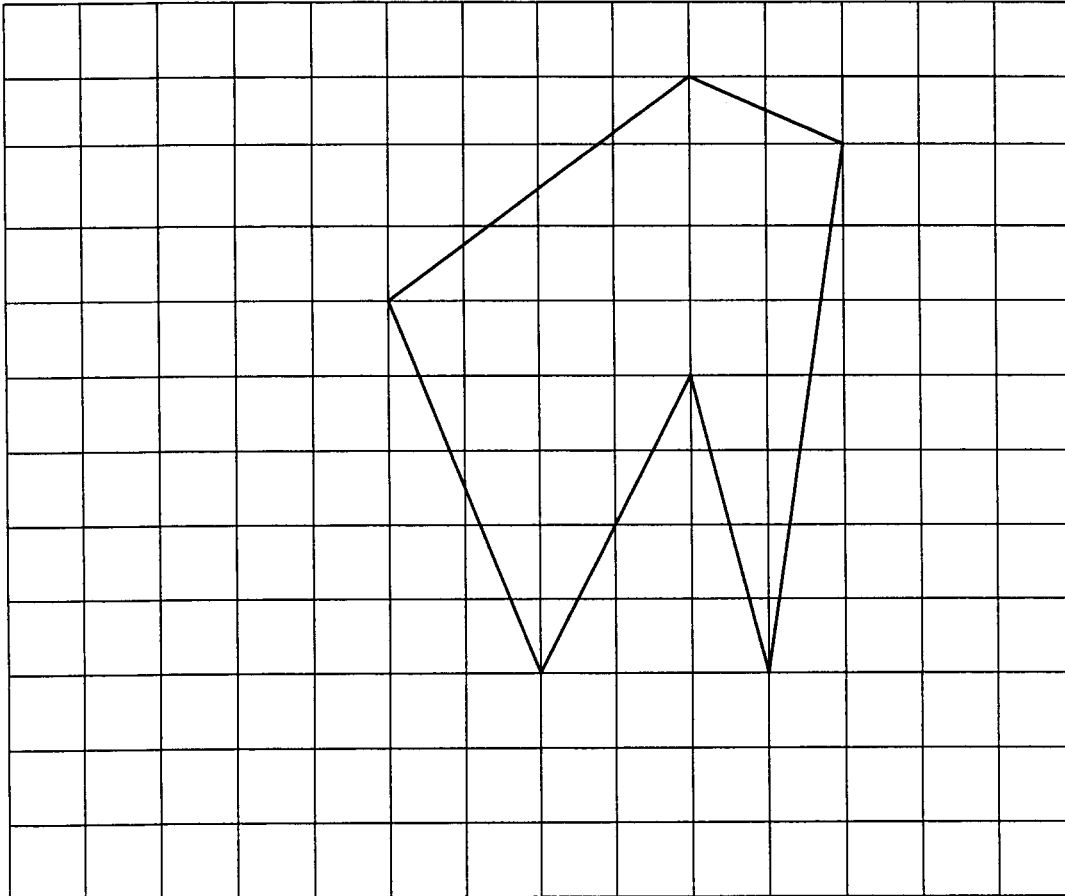
For now, we will only deal with pyramids in which the point “above” the base lies on a line that goes through the center of the base and is perpendicular to the base.

Describe all symmetries of pyramids which have bases that are regular polygons with an odd number of sides (6 points).

5. Two industries are located between two highways to which they both would like direct access. The companies have agreed to build an access ramp to each highway jointly. They want to locate the ramps so that each ramp is an equal distance from the buildings. The diagram of the situation is below. Explain how you would locate the ramps (3 points) for the companies and justify how you know the ramps will be equal distances from both buildings (7 points). (The ramps will be straight ones.)



7. Find the perimeter of the following shape in both Euclidean and taxicab geometry (4 points each):



8. Can we use a regular pentagon and regular triangle together to tessellate a plane (i.e. the tessellation has to involve both the triangle and pentagon)? Why or why not? (10 points)