Do any five of the following problems. Do **not** hand in six answers.

You may use your own paper or use some of mine. Put each answer on a separate piece of paper and put your name on each sheet as I will separate your exam and grade each problem individually.

Do **not** answer two questions on the same piece of paper.

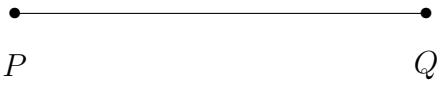
Keep this exam and hand in only your answers. Do not put answers on this exam.

To receive full credit you will need to write complete, clear, and understandable answers.

1. Sketch the eight different patterns made out of 5 unit squares that can be cut out and then folded into a 1 by 1 by 1 open-top cube. Two patterns are the same if they are congruent, i.e., when cut out one can be placed exactly on top of the other.

2. Sketch the following treasure map. Starting at the old well take 30 paces east. Turn 45 degrees clockwise and take 20 paces. Turn 135 degrees counterclockwise and take 10 paces. There is the treasure, dig it up. If you have a protractor and ruler, you may use them, otherwise, just do your best to estimate the angles and distances and label them correctly.

3. Trace the line segment PQ below on a piece of paper. Show how to construct the perpendicular bisector of PQ using only a straight edge and compass. The perpendicular bisector is the line perpendicular to PQ which divides it into two equal pieces.



Enumerate and explain each step. If you have a compass and straight edge, you may use them, otherwise, just sketch free hand and label what you are doing correctly.

4. Give the parallel line proof that the sum of the angles of a triangle is 180°. Explain each step of the proof and state each axiom of geometry you are using.

5. Give the walking and turning proof that the sum of the angles of a triangle is 180°. Explain each step of the proof.

6. Is there a triangle with sides of length 2, 3 and 4 respectively? If there is, show how to construct such a triangle using a ruler and compass.

7. Using that the sum of the angles of a triangle is 180, find a formula for the sum of the angles of a pentagon. Explain why your formula is true.

8. A hexagonal prism has how many faces, edges, and vertices? An octagonal pyramid has how many faces, edges, and vertices? Explain your answers.

9. Answer True or False. For some of these you may wish to (briefly) explain your answer, but you don't have to. Remember: do not hand this sheet in.

1. Every rectangle is a trapezoid.
2. A square is not a rectangle.
3. The (inner) angles of a quadrilateral sum up to 540 degrees.
4. A polygon can have 26 sides.
5. A circle and a disk are the same thing.
6. Perpendicular lines in a plane meet in an angle of 180 degrees.
7. Parallel lines do not meet.
8. The angles in an equilateral triangle are all 30 degrees.
9. There is a polyhedron with 6 edges, 4 vertices, and 4 faces.
10. There is a polyhedron with 6 edges, 8 vertices, and 6 faces.

10. Fill in the blanks. Remember: do not hand this sheet in.

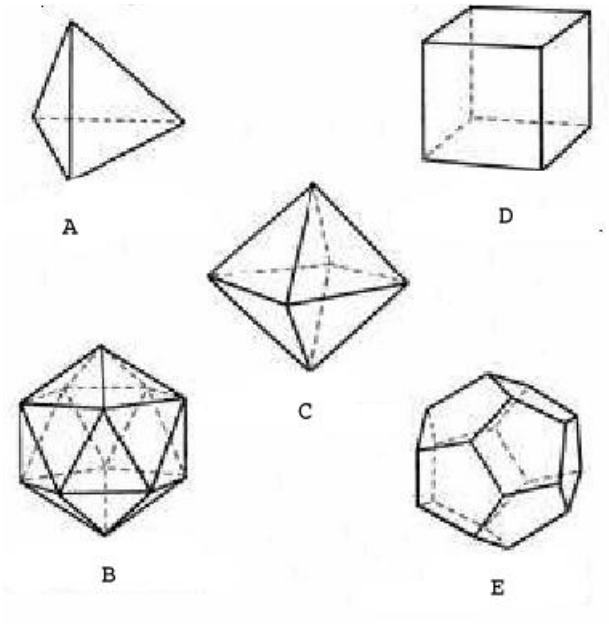
a The polyhedron A is a _____.

b The polyhedron B is a _____.

c The polyhedron C is a _____.

d The polyhedron D is a _____.

e The polyhedron E is a _____.



Explain why it is impossible to have a polyhedron all of whose faces are regular hexagons.