MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 3 - DECEMBER 2014
ROUND 6 PLANE GEOMETRY: POLYGONS (no areas)

ANSWERS

A) _____

B) _____

C) (_____ , _____ , _____)

A) O is the center of a regular heptagon (7-gon). P and Q are two vertices for which diagonal $\overline{PQ}$ has a maximum length. If $a° < m\angle POQ < (a+1)°$, compute a.

B) A regular hexagon is partitioned into triangles by the diagonals from a single vertex. The length of a side is $\frac{4}{5}$.
Compute the positive <u>difference</u> between the perimeters of the triangle with the largest perimeter and the triangle with the smallest perimeter.

C) A tangram is a puzzle made up of 7 pieces – a square, a parallelogram and 5 isosceles right triangles, formed by dissecting two larger congruent squares, as indicated in the diagram at the right. These pieces can be assembled to form a myriad number of shapes; for example, the cat below. If $CD = 1$, then, as a simplified fraction, $AB = \frac{a\sqrt{2}+b}{c}$, where a, b and c are integers. Compute the ordered triple (a,b,c).