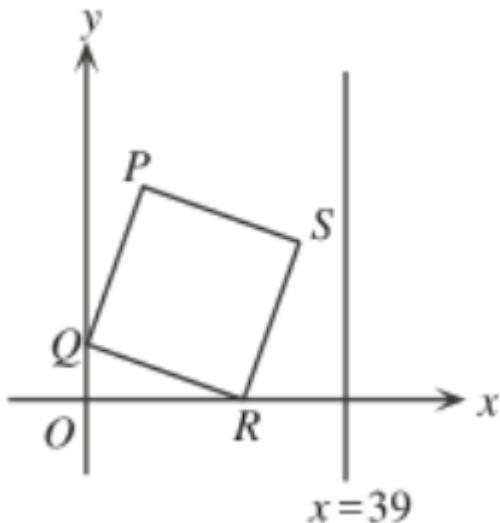


# GEOMETRY (GEOMETRI)

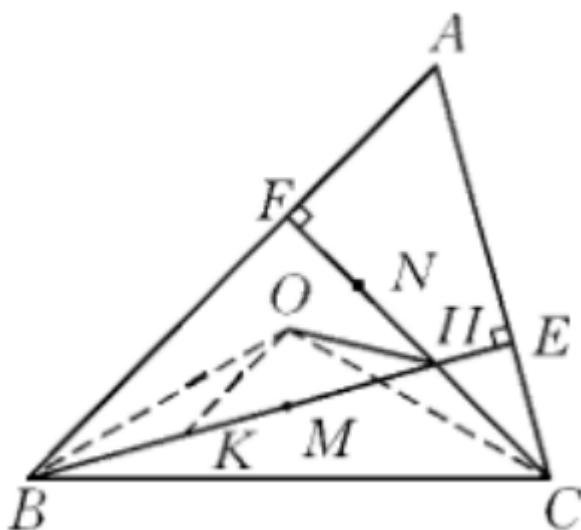
Wardaya College Winter Camp Olympiad 2017

1. Consider the following figure



In the figure above, square  $PQRS$  has side length 25,  $Q$  is located at  $(0, 7)$  and  $R$  is on the  $x$ -axis. The square is rotated clockwise about  $R$  until  $S$  lies above the  $x$ -axis on the line with equation  $x = 39$ . What are the new coordinates of  $P$  after this rotation?

2. Let  $P$  be a point inside a square  $ABCD$  such that  $PA : PB : PC$  is  $1 : 2 : 3$ . Determine the angle  $\angle BPA$
3. Cube  $ABCDEFGH$  labeled as shown above, has edge length 1 and is cut by a plane passing through vertex  $D$  and the midpoint  $M$  and  $N$  of  $\overline{AB}$  and  $\overline{CG}$  respectively. The plane divides the cube into two solids. The volume of the larger of the two solids can be written in the form  $\frac{p}{q}$  where  $p$  and  $q$  are relatively prime positive integers. Find  $p + q$
4. As shown in the diagram in  $\triangle ABC$ ,  $\angle A = 60^\circ$ ,  $AB > AC$ , point  $O$  is circumcenter and  $H$  is the intersection point of two altitudes  $BE$  and  $CF$ . Point  $M$  and  $N$  are on the line segment  $BH$  and  $HF$  respectively and satisfy  $BM = CN$



Determine the value of  $\frac{MH+NH}{OH}$

5. In an acute triangle  $ABC$ , point  $H$  is the intersection point of altitude  $CE$  to  $AB$  and altitude  $BD$  to  $AC$ . A circle with  $DE$  as its diameter intersect  $AB$  and  $AC$  at point  $F$  and  $G$ , respectively.  $FG$  and  $AH$  intersect at point  $K$ . If  $BC = 25$ ,  $BD = 20$  and  $BE = 7$ , find the length of  $AK$
6. Three co-planar squares, BAHT, CAIN, and BCGY have areas 16, 16, and 32, respectively. If the squares only intersect pairwise at the vertices A, B, and C, compute the area of the convex hexagon THINGY.
7. Let D be the footpoint of the altitude from B in the triangle ABC, where  $AB = 1$ . The incentre of triangle BCD coincides with the centroid of triangle ABC. Find the lengths of AC and BC.
8. In triangle ABC, the interior and exterior angle bisectors of  $\angle BAC$  intersect the line BC in D and E, respectively. Let F be the second point of intersection of the line AD with the circumcircle of the triangle ABC. Let O be the circumcentre of the triangle ABC and let D' be the reflection of D in O. Find the measure of angle  $\angle D'FE$ .
9. Let P be a point inside a square ABCD such that  $PA : PB : PC = 1 : 2 : 3$ . Determine the angle  $\angle BPA$ .
10. All faces of tetrahedron are right-angled triangles. It is known that three of its edges have the same length  $s$ . Find the volume of the tetrahedron.