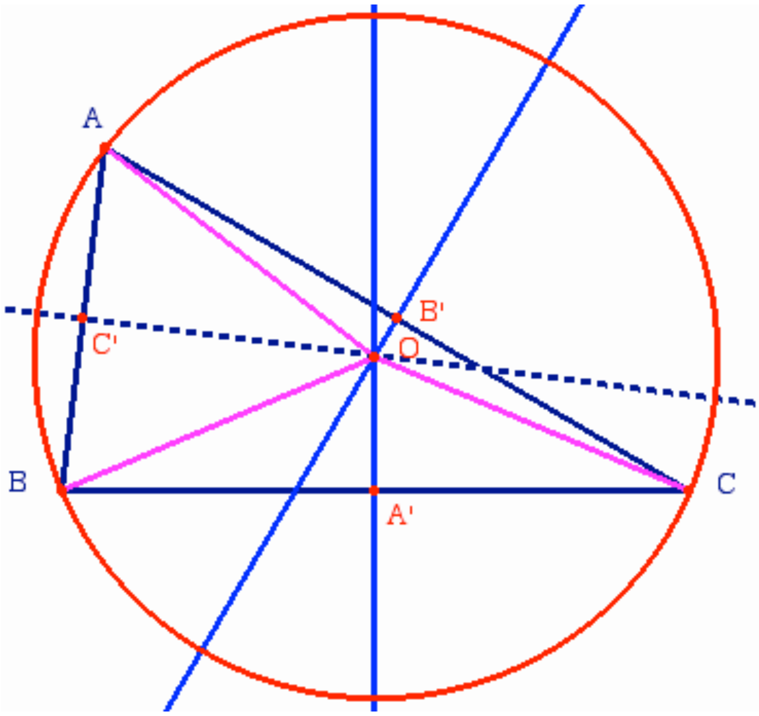
Problem 1 : use a compass and a ruler to carefully build the circle circumscribed to this triangle *(show the construction lines and explain your construction).*



Construction :

1. Draw the bisector of [BC] in the middle A' of [BC]
2. Draw the bisector of [CA] in the middle B' of [CA]
3. Let O be the intersection of the two bisectors.

   Then by definition of the bisector we have :

   $$[OB] = [OC] = [OA]$$

   Hence the circle of center O and radius R = OA is circumscribed to the triangle ABC.

Theorem :

The three bisectors of the sides of a triangle intersect in the same point O which is the center of the circle circumscribed to the triangle.

Problem 2 : given the triangle ABC, let H be the interception of its heights. Prove carefully *(on back of the page)* that the interception D of AH with the circle circumscribed to the triangle ABC is symmetrical to H with respect to (BC). *(prove that IH = ID).*

Solution I *(using the parallelograms)*

Let A'= Sym(A)/0 and U = middle of BC

⇒ (A'C) // (B H)

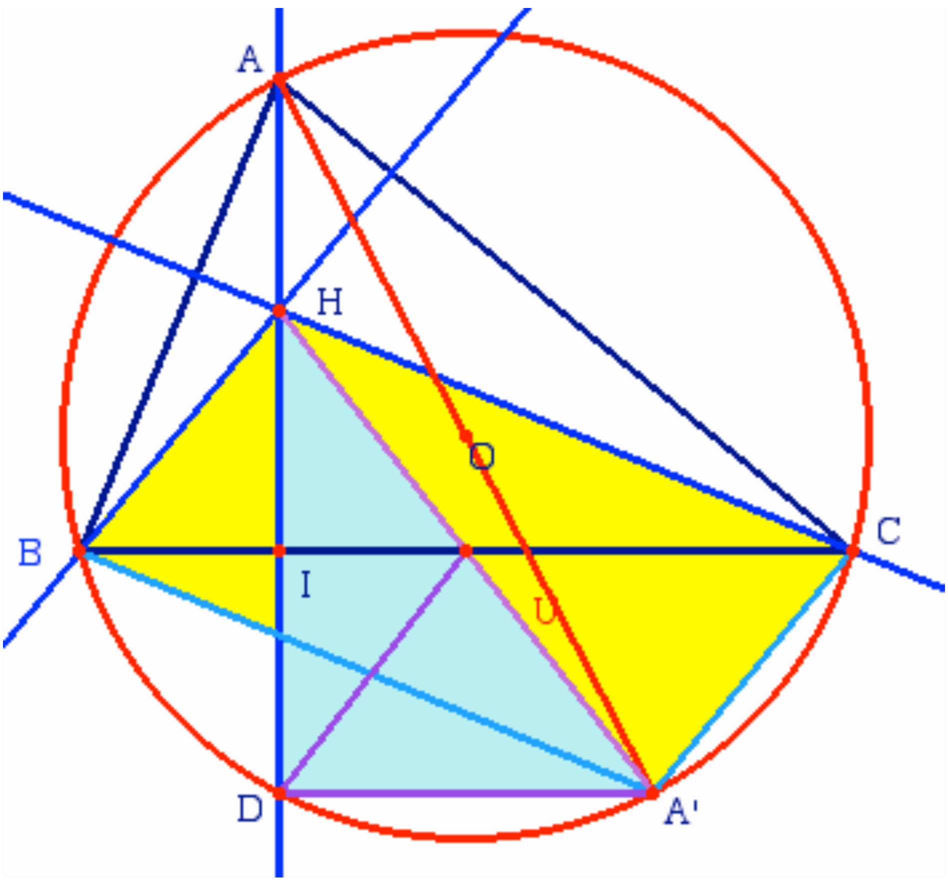
and (A'B) // (C H)

∴ (A'BHC) is a parallelogram

⇒ U = middle of [A'H]

(AD) ⊥ (DA') ⇒ HDA' rectangle triangle

then UD = UH which implies that IH = ID.



Problem 2 : given the triangle ABC, let H be the interception of its heights. Prove carefully *(on back of the page)* that the interception D of AH with the circle circumscribed to the triangle ABC is symmetrical to H with respect to (BC). *(prove that IH = ID).*

Solution II *(using the inscribed angles)*

Lets draw the segment CD

Lets prove that the *Rectangle* triangles $\triangle(\mathrm{HCI}) = \triangle(D\mathrm{CI})$.

The *inscribed* angles $B\hat{C}D = B\hat{A}D$ because they intercept the same arc $\overset{\frown}{BD}$

and the two angles $B\hat{A}D = B\hat{H}D$ because their sides are perpendicular.

Therefore $B\hat{C}D = B\hat{H}D$

and the two rectangle triangles having one common side CI

and one acute angle equal are equal triangles

Hence the the other sides are equal : IH = ID.