MATH 6: ASSIGNMENT 17
RULER AND COMPASS

Constructions with ruler and compass

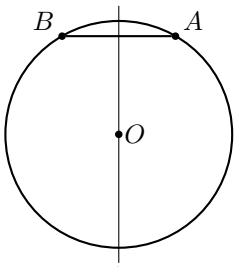
Here is a summary of operations we can do using a ruler and compass. You can freely use any of them in the problems below.

1. Construct the midpoint of a given segment AB
2. Construct the perpendicular bisector of segment AB, i.e. a line that goes through the midpoint of AB and is perpendicular to AB.
3. Given a line l and a point A on l, construct a perpendicular to l through A.
4. Given a line l and a point P outside of l, construct a perpendicular to l through P.
5. Given an angle AOB, construct the angle bisector (i.e., a ray OM such that $\angle AOM \cong \angle BOM$)

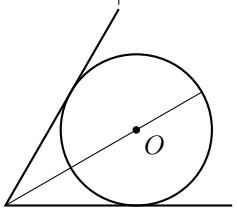
The following section explains the importance of these constructions.

Perpendicular bisector and angle bisector

1. If two points A, B are on a circle, then the center of this circle lies on perpendicular bisector to AB (i.e., a line that goes through the midpoint of AB and is perpendicular to AB).



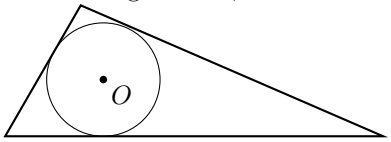
2. If a circle is inscribed in the angle ABC, then the center of this circle lies on the angle bisector.



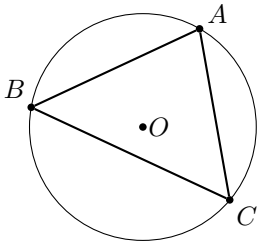
Homework

All constructions below are to be done using ruler and compass only!

1. Construct a rectangle with one side a and diagonal d.
2. Construct a rhombus with one side a and diagonal d.
3. Given length a, construct a square with side a
4. Construct a regular 12-gon.
5. Given a circle, find its center.
6. Given a triangle ABC, construct a circle inscribed in the triangle:



7. Given a triangle ABC, construct a circle circumcribed around the triangle:



8. Six grasshoppers sit on a road. Every minute one grasshopper jumps 1 foot in one direction (along the road), and another grasshopper jumps 1 foot in the **opposite** direction. If initially the grasshoppers were at positions 1 ft, 2 ft, ..., 6ft (measured from some point on the road), is it possible that after some time they all will all gather at the same place on the road?