Math 6: Homework 8

HW#8 is due November 18th; submit to Google Classroom 15 minutes before class.

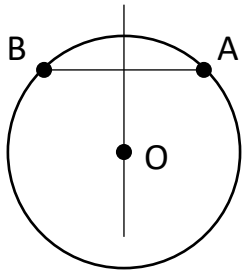
Please write clearly which problem you are solving and show all steps of your solution.

Summary from the classwork

❖ **Operations** we can do using a ruler and a 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 the line l through A.
4. Given a line l and a point P outside of l, construct a perpendicular to the line l through P.

❖ **Perpendicular bisector** (symmetry line)



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

❖ **Solution format** for every problem (*what we need to include):*

A) Give a recipe (the construction procedure) for constructing the required figure using only a ruler and compass. We can use only the following operations:
   - Draw a line through two given points
   - Draw a circle with a center at a given point and a given radius
   - Find and label on the figure the intersection points of already constructed lines and circles.

B) Analysis. Prove or explain why our recipe gives the correct answer

Homework questions

All construction problems should be solved using only a ruler and a compass. If the problem states "given a side b", then draw a segment with some length first, label it b, and then use your compass.

1. Given a line $\boldsymbol{l}$ and a point A on $\boldsymbol{l}$, construct a perpendicular to $\boldsymbol{l}$ through A.
2. Given a line $\boldsymbol{l}$ and a point P outside of $\boldsymbol{l}$, construct a perpendicular to $\boldsymbol{l}$ through P.
3. Construct a rectangle with one side $\boldsymbol{a}$ and diagonal $\boldsymbol{d}$.
4. Construct a rhombus with one side $\boldsymbol{a}$ and diagonal $\boldsymbol{d}$.
5. Given a segment with length $\boldsymbol{a}$, construct a square with side $\boldsymbol{a}$.
6. Construct a regular 12-gon (dodecagon).
7. Construct a right triangle, given a hypotenuse $\boldsymbol{h}$ and one of the legs $\boldsymbol{a}$.
8. You have two fuses (specially treated cords, which burn slowly and reliably). Each would burn completely in one minute if lit from one end. Using this, can you measure 30 seconds? or 45 seconds? **Note:** Some parts of the fuses may burn faster than others, so you cannot just measure half of the fuse and assume it will burn for exactly 30 seconds.