MATH 302
Homework 2 (due on Friday Feb. 6)

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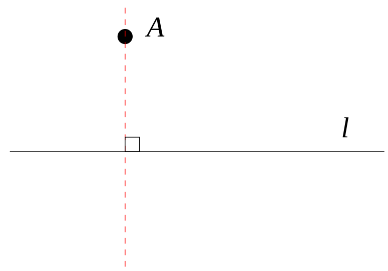
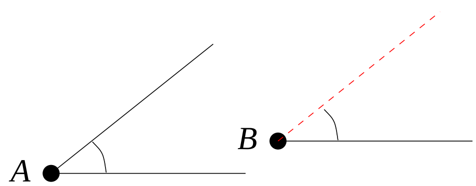
For each of the following problems, carry out a ruler and compass construction as accurately as you can. Number and label each of your steps as in the text. Feel free to use abbreviations such as "AB" for "draw a line AB"; "$\odot AB$" to draw a circle with center A and radius AB; or "$\odot cArBC$" do draw a circle with center A and radius BC. Label each new point as it is constructed and mention it (e.g., "get F") in the appropriate step. For the time being, we are not concerned with the proofs. Just do the construction. You should, however, be able to give an informal proof (convincing argument) of why it works, if asked.

After you make your construction, locate the corresponding proposition in Euclid (Book I, II, or IV) and compare. How many steps does his method require? What do you think is the least number of steps possible? I will sometimes give a *par value* for a construction, which is the typical number of steps in experienced constructor would need. By trying harder, you can sometimes succeed with fewer steps.

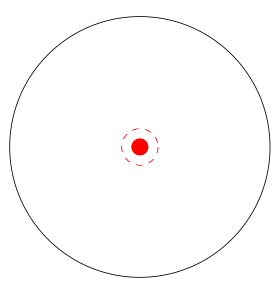
2.4. Given a line l and a point A not on l, construct a line perpenedicular to l passing through A (par = 4, possible in 3).



2.5. Given an angle at a point A, and given a ray emanating from a point B, construct an angle at B equal to the angle at A (par = 4).



2.7. Given a circumference of a circle, find the center of the circle (par = 5).



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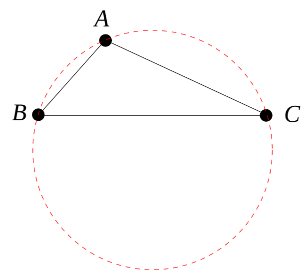
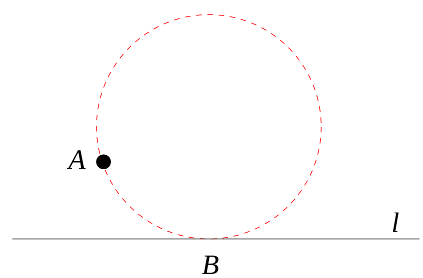
2.10. Construct a circle circumcribed about a given triangle ABC (par = 7).



2.12. Given a point A, a line l, and a point B on l, construct a circle that passes through A and is tangent to the line l at B (par = 8).



2.14. Given a line segment AB, divide it into three equal pieces (par = 6)

2.22. Given a segment AB, given a circle with center O, and given a point P inside O, construct (if possible) a line through P on which the circle cuts off a segment congruent to AB (par = 5).