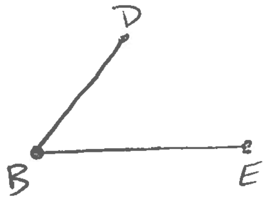
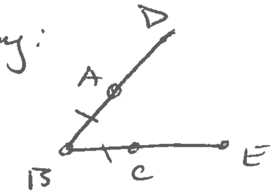
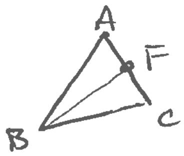
3010 HW 6

**Katz 3.2** Given 

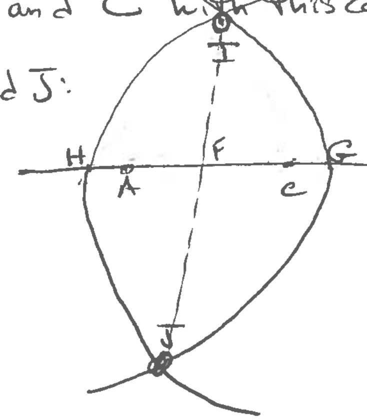
① With a compass, mark off an equal distance AB and BC along segments BD and BE, respectively:



② To bisect ∡ ABC, it suffices to construct the midpoint F of $\overline{AC}$. (Pf:  If F is the midpoint of AC, then △BAF is congruent to △BCF by SSS.)

③ To construct F,  (Note: OK to take C = G, A = H)

fix any radius, say of length $\geq$ AC, and construct circles centered at A and C with this common radius. These two circles intersect at two points; I and J:



Segment IJ intersects AC at the midpoint F

(Pf: △AIJ ≅ △CIJ by SSS, so ∡AIF = ∡CIF. Then △AIF ≅ △CIF by SAS, and thus AF = CF).

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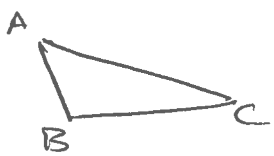
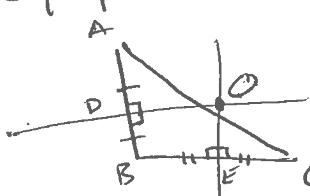
**Katz 3.15** Given 

① Construct the perpendicular bisectors of AB and BC. They intersect at a point O



② $\overline{OA} = \overline{OB} = \overline{OC}$, so O is the center of a circle circumscribing △ABC. (Pf of ② is two applications of SAS to (△OAB, △OBD) and (△OBE, △OCE) — they don't have to give the argument since the problem only asks to "construct".)

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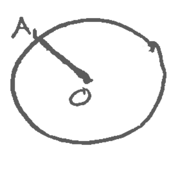
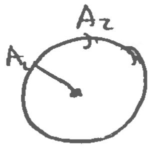
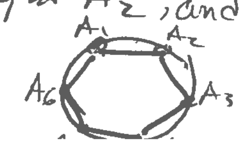
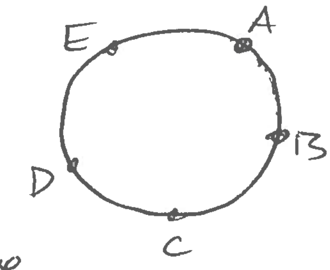
**Katz 3.16** Given a circle w/ radius $\overline{OA_1}$ . ① Draw arc centered at A with radius AO, intersecting the circle at $A_2$ . ② Repeat, starting at $A_2$, and in this way construct $A_3, A_4, A_5, A_6$.



③ Connect these points to form the regular

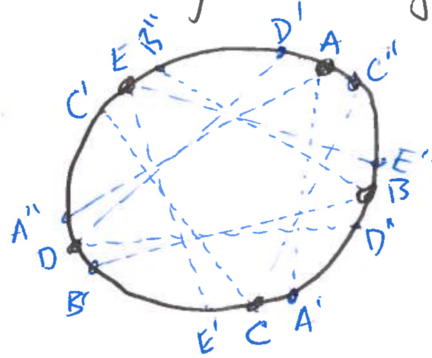
Katz 3.17 Given: knowledge of how to inscribe a regular pentagon and an equilateral triangle in a circle.

① Inscribe a regular pentagon: ABCDE




② For each of the 5 vertices (A, B, C, D, E) of the pentagon, inscribe an equilateral triangle having one of its vertices at the given point (A, B, C, D, E):

Note $\underbrace{144}_{\text{arc } AC} - \underbrace{120}_{\text{arc } AA'} = \underbrace{24}_{\text{arc } A'C}$




The picture is terrible, but the resulting 15 vertices give a regular 15-gon, since the angles between each of them are all 24°.