Exercises for Week 02

1. Suppose that L is a line in P (plane) and A, B, C ∈ P satisfy (i) A + B on opposite sides of L, (ii) B + C on opposite sides of L. Prove that A + C on the same side of L.

2. Consider the analogous question if we replace "opposite sides" by "the same side". What conclusion, if any, can be drawn?

3. L and P as above with L = CD. If A + B are on the same side of CD, are C + D on the same side of AB? The options are always yes, always no, or either is possible. Either prove this (options 1 + 2) or give examples (option 3).

4. In the definition of a triangle's interior, show $\mathrm{Int}\,\triangle ABC = \mathrm{Int}\,\measuredangle ABC \cap \mathrm{Int}\,\measuredangle BCA$.

Postpone till after L4

5. Why is $\triangle ABC$ equilateral $\Leftrightarrow |\measuredangle BAC| = |\measuredangle ABC| = |\measuredangle ACB|$?

6. Suppose $D \in \text{Int } \measuredangle ABC$. Prove that $\text{Int } \measuredangle DBC \subseteq \text{Int } ABC$.

7. Suppose that $L \subseteq P$ and $A, B \in P$ are such that $AB \cap L = \phi$. Prove that all points of ~~AB~~ $[AB]$ lie on the same side of L.

8. If $AB \cap CD = \phi$ (in plane) and $AD \cap BC = \phi$ why do A, B, C, D form the vertices of a convex quadrilateral?

9. Suppose D & C on same side AB but $BD \neq BC$ and $D \notin \text{Int } \measuredangle CBA$. Prove that $C \in \text{Int } \measuredangle ABD$. (Compare with material in L4)

10. Suppose $A, B, C, D \in P$, no 3 collinear with $CA \perp AB$ and $DB \perp AB$. Prove that $CA \cap BD = \phi$ (i.e., parallel)