

Theorem 14

Segment construction [3.6.C-2] Given a segment \overline{AB} and a ray \overrightarrow{CD} , there is exactly one point E on \overrightarrow{CD} such that $\overline{AB} \cong \overline{CE}$.

Theorem 15

Segment Addition [3.6.C-3] If $A - B - C$ and $D - E - F$ and $\overline{AB} \cong \overline{DE}$ and $\overline{BC} \cong \overline{EF}$ then $\overline{AC} \cong \overline{DF}$.

Definition 22

Convex A set G is convex if for any two points $P, Q \in G$ then $\overline{PQ} \subset G$.

A line separates a plane into two pieces called half-planes. Each half-plane is convex. Each half-plane is bounded on one side by the line that separates them. The line is not part of either half-plane.

Theorem 16

The postulate of Pasch [4.1.T-1] Given $\triangle ABC$, and a line l in the same plane. If l contains a point E between A and C then l intersects either \overline{AB} or \overline{BC} .

It turns out that this theorem can be used in place of the sidedness definition. But then the sidedness definition becomes a theorem. So two statements play the same role in geometry. The following homework follows very nicely from the betweenness theorems. Most of them are very short.

Notation. H_1 and H_2 are half-planes.

Homework 5

1. The half-planes are not both empty. (or one of the half planes has something in it)
2. Neither of the half-planes is empty. (if there is something in one then there is something in the other)
3. H_1 contains at least two points.
4. H_1 contains at least three non-collinear points.
5. E the plane that contains H_1 is unique.
6. If A and B are convex then so is $A \cap B$.

7. If G is a collection of convex sets then the intersection of all of the sets is convex.
8. Every ray is convex.
9. $H_1 \cap l$ is convex.
10. The interior of a triangle is convex. (this one might be impossible with what we know)

These are in the order they ought to be proven. So if you get stuck on one go to the next and assume the one you got stuck on is proved.