

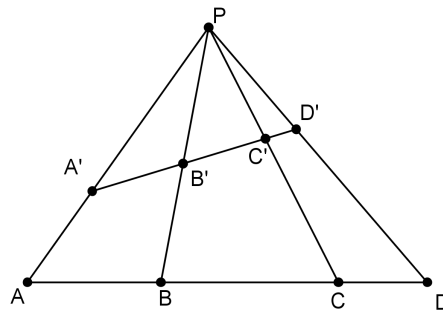
Math 340: Geometry

Homework 6

1. Exercises 5.7.1 and 5.7.2.
2. Exercises 5.7.3.
3. Exercises 5.8.1 and 5.8.2.
4. Exercise 5.8.3.
5. Exercises 5.8.4, 5.8.5 and 5.8.6.
6. We can define the cross-ratio in the plane as follows. Given four points A, B, C, D on a line, then we say that the cross-ratio $[A, B; C, D]$ is

$$[A, B; C, D] = \left(\frac{AC}{BC} \right) / \left(\frac{AD}{BD} \right).$$

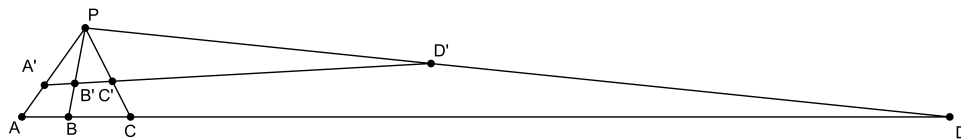
In the following diagram, prove that $[A, B; C, D] = [A', B'; C', D']$ (true whenever $AA', BB', CC',$ and DD' concur):



7. Suppose we have A, B, C three points aligned. Let D be the point at infinity. Then show

$$[A, B, C, D] = \frac{AC}{BC}.$$

In other words, as D goes farther and farther away, the cross ratio approaches AC/BC .



8. Let ABC be a triangle, let M be the midpoint of AC , and let N be a point on the line BM such that AN is parallel to BC . Let P be any point on the line AC , and let Q be the intersection of the line BP with the line AN . Prove that

$$\frac{AQ}{QN} = \frac{1}{2} \left(\frac{AP}{PM} \right).$$

Hint: Use cross ratios.