

Ruler and compass constructions

Greek geometers in the days of Euclid (about 300 BC) thought a lot about the problem of constructing geometric figures in the plane. Their procedure is usually called construction with ruler and compass, but a more exact terminology would be construction with straightedge and compass, since they didn't allow using the markings on a ruler. (Greek constructions didn't involve measurement.)

The Greek rules of construction are as follows:

Start with two points A and B in the plane. We want to determine which points, lines, and circles can be "constructed" (from A and B).

1. If two points C and D can be constructed, then the line through C and D can be constructed. (This is the ruler or straightedge rule.)
2. If two points C and D can be constructed, then the circle with center C that passes through D can be constructed. (This is the compass rule.)
- 3a. If two lines m and n can be constructed, and they have a point in common, then the intersection point of m and n can be constructed. (This is the line intersection rule.)
- 3b. If two circles c and d can be constructed, and they have one or two points in common, then the points of intersection of c and d can be constructed. (This is the circle intersection rule.)
- 3c. If a line m and a circle c can be constructed, and they have one or two points in common, then the points of intersection of m and c can be constructed. (This is the line-circle intersection rule.)

For example: To construct a regular pentagon means to start with two points A and B and to construct three more points X, Y, Z, so that the polygon ABXYZ is a regular pentagon.

References:

Compass and Straightedge Constructions, Wikipedia,
http://en.wikipedia.org/wiki/Compass_and_straightedge

Famous Problems of Geometry and How to Solve Them, by Benjamin Bold,
Dover Publications.

Euclid's Elements, web version by David Joyce,
<http://aleph0.clarku.edu/~djoyce/java/elements/elements.html>