

*Euclidean Geometry:  
An Introduction to Mathematical Work*

Math 3600

Fall 2016

*More Advanced Constructions*

**Definition.** A circle is said to be *circumscribed* about a figure if the figure lies in the interior of the circle, except for the vertices which lie on the circle.

A circle is said to be *inscribed* in a figure if the circle lies in the interior of the figure and is tangent to each of the sides of the figure.

**12.1 Challenge.** Construct a circle inscribed in a given triangle  $ABC$ . (par 13)

**12.2 Challenge.** Construct a circle circumscribed about a given triangle  $ABC$ . (par 7)

**12.3 Challenge.** Given a line  $\ell$ , a line segment  $d$  and a point  $O$ , construct a circle with center  $O$  that cuts off a segment from line  $\ell$  which is congruent to  $d$ .

**12.4 Challenge.** Construct three circles such that each pair meets at right angles. (par 10)

**12.5 Challenge.** Given a segment  $d$ , a circle with center  $O$  and a point  $P$  inside the circle, construct a line through  $P$  on which the circle cuts off a segment congruent to  $d$ .

When exactly is this construction possible?

**12.6 Challenge.** Given a segment  $AB$  and an angle  $\alpha$  and given another segment  $d$ , construct a triangle  $ABC$  with base equal to  $AB$ , angle  $\alpha$  at  $C$  and such that  $AC + CB = d$ .

Exactly how often is this construction possible? How many ways can the conditions be met?

**12.7 Challenge.** Given two circles  $\Gamma$  and  $\Gamma'$  with centers  $O, O'$ , respectively, construct a line tangent to both circles.

How many such lines are there?

