

# Constructions with Euclidean Tools

Mathematics 308—Modern Geometry

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**Directions:** Upon request, you should be able to construct the following objects using only Euclidean tools (i.e. a straight-edge and modern compass).

## 1. Basic Constructions

- (a) perpendicular bisector, given a segment
- (b) bisector, given an angle
- (c) copy an angle
- (d) midpoint, given a segment
- (e) perpendicular to a given line from a given point on the line
- (f) perpendicular to a given line from a point not on the line
- (g) parallel line, given a line and a point not on the line
- (h) tangent to a given point on a given circle
- (i) two circles tangent to one another, given their radii
- (j) two circles orthogonal to one another, given their radii
- (k) divide a given segment into  $n$  congruent pieces
- (l) tangent to a given circle, given a point not on the circle

## 2. Common Geometric Shapes

- (a) equilateral triangle
- (b) square inscribed in a circle
- (c) regular pentagon inscribed in a circle
- (d) regular hexagon inscribed in a circle
- (e) circle, given three points
- (f) a golden rectangle, given a unit segment
- (g) a golden spiral, given a unit segment

## 3. Constructible Numbers

- (a)  $a \cdot b$ , given segments of length  $a$ ,  $b$ , and 1
- (b)  $\frac{a}{b}$ , given segments of length  $a$ ,  $b$ , and 1
- (c)  $a + b$ , given segments of length  $a$  and  $b$
- (d)  $a - b$ , given segments of length  $a$  and  $b$
- (e)  $\sqrt{a}$ , given segments of length  $a$ ,  $b$ , and 1