

MAT 360
Homework 4

Please do construction questions **121bc, 123bc, 131, 133**. (In 131 and 133, "find" means construct with compass and straightedge.) Use the scheme we followed in class (see also section 69, although we skipped the last part):

1) Think about your question. What geometric properties of the required figures you know? How can you use those properties to pinpoint the data for the construction?

2) Describe how to carry out the actual construction.

3) Prove that the construction give the desired result.

In 121, 123 think about properties of the isosceles triangle. In 131, recall what you know about points equidistant to sides of the angle. In 133, you'll need an additional construction (use a symmetry flip).

Do question **109** (careful with the geometric locus!) and one more question below.

Problem 1. Recall that a **circle** of radius $R = AB$ centered at a point O is defined as a geometric locus of points X such that $OX = AB$. (Here, AB is a given segment.) A **chord** of a circle is any segment connecting two points on the circle. A chord is called a **diameter** if it passes through the center of the circle.

Prove:

(a) Any diameter of a circle is an axis of symmetry for this circle. (In other words, the circle gets superimposed with itself if you fold along a diameter.)

(b) Conversely, any axis of symmetry for a circle must pass through its center. In other words, a circle can be symmetric about its chord only if this chord is a diameter.

(c) Suppose CD is a diameter, XY is a chord perpendicular to CD . Show that the diameter CD bisects the chord XY , ie CD intersects XY at the midpoint of this chord.

Even though this question is about circles, you do not need any theorems about circles (except the definitions given above). The goal is to practice with symmetries.