

MATH 6: HOMEWORK 23

RULER AND COMPASS

CONSTRUCTIONS WITH RULER AND COMPASS

For the next couple of classes we will be mostly interested in doing the geometric constructions with ruler and compass. Note that the ruler can only be used for drawing straight lines through two points, not for measuring distances!

When doing these problems, we need:

- Give a recipe for constructing the required figure using only ruler and compass
- **Explain why our recipe does give the correct answer**

For the second part, we will frequently use the congruence tests for triangles.

CONGRUENCE TESTS FOR TRIANGLES

Recall that by definition, to check that two triangles are congruent, we need to check that corresponding angles are equal and corresponding sides are equal; thus, we need to check 6 equalities. However, it turns out that in fact, we can do with fewer checks.

Axiom 1 (SSS Rule). *If $AB = A'B'$, $BC = B'C'$ and $AC = A'C'$ then $\triangle ABC \cong \triangle A'B'C'$.*

Axiom 2 (ASA Rule). *If $\angle A = \angle A'$, $\angle B = \angle B'$ and $AB = A'B'$, then $\triangle ABC \cong \triangle A'B'C'$.*

Axiom 3 (SAS Rule). *If $AB = A'B'$, $AC = A'C'$ and $\angle A = \angle A'$, then $\triangle ABC \cong \triangle A'B'C'$.*

HOMEWORK

1. Given two points A, B , construct the midpoint M of the segment AB .
2. Given two points A, B , construct the perpendicular to segment AB through its midpoint M .
3. Given a line l and a point A on l , construct a perpendicular to l through A .
4. Given a line l and a point P outside of l , construct a perpendicular to l through P .
5. Given an angle AOB , construct the angle bisector (i.e., a ray OM such that $\angle AOM \cong \angle BOM$).
6. Given length a , construct an equilateral triangle with side a .
7. Given length a , construct a square with side a .
8. Given length a , construct a regular hexagon with side a .
9. Given three lengths a, b, c , construct a triangle with sides a, b, c .
10. Construct an isosceles triangle, given a base b and altitude h .
11. Construct a right triangle, given a hypotenuse h and one of the legs a .
12. Given a circle, find its center.
13. Given a circle and a point P outside this circle, construct the line through P which would be tangent to this circle (i.e., would touch it at exactly one point).
14. You have two fuses (specially treated cords, which burn slowly and reliably). Each of them would burn completely for one minute if lighted from one end. Using this, can you measure the time of 30 seconds? of 45 seconds? Note: some parts of the fuses may burn faster than others - so you can not just measure half of the fuse and say that it will burn for exactly 30 seconds.