# Math 6a/b: Constructions with ruler and compass, origami

Today we discussed a quite different approach to geometric constructions: paper folding, or origami. Instead of using ruler and compass, we folded pieces of paper, starting with a square (or a rectangle). Attached pictures show how one can construct various figures such as equilateral triangles.

Homework 10 (*December 9, 2018*)

*All constructions below (problem 1-5) are to be done using ruler and compass only!*

1. How can you find the point on the railroad (line l in the figure below) which would be at equal distance from two villages (points A, B in the figure below)? [Hint: if this point is at equal distance from A,B, then one can draw a circle with center at this point which would go through A,B...)

   A•

   •B

   _____
            l
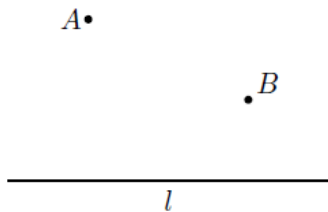
2. Given an angle ∠ABC and a line l intersecting both sides of this angle, find a point P on l which would be at equal distance from the two sides of the angle (i.e., the two perpendiculars dropped from P to the sides of the angle would have the same length)

   C

   B   A
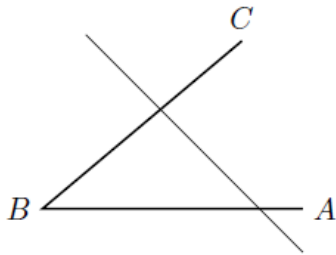
3. Given a triangle ABC, construct inside it a point which would be at equal distance from all three vertices of the triangle.

4. The figure below shows two villages A and B. A horseman starts at village A, goes to the river (line l in the figure) to let the horse drink, then goes to village B. How should he choose the point P on the river to make his trip as short as possible?

   A•

   •B

   P   *l*
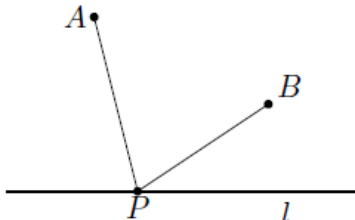
The following problems do not have to be submitted with the homework. Be sure to do them!

5. (a) Let ABC be a right triangle in which one of the legs is exactly 1/2 of the hypotenuse: BC = 1/2AB. What are the angles of such a triangle? (Hint: if you put two such triangles together, as indicated by the dotted line, what triangle do we get?)
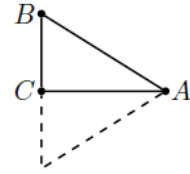

b) The attached figure shows how you constructed in class an equilateral triangle from a square by folding. Can you explain why it does indeed give an equilateral triangle? Construct one again and check.
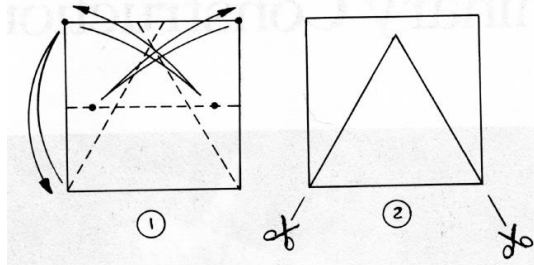
c) How you can construct an equilateral triangle from a rectangle (by folding)?

6. The figure to the right shows a rectangle divided into several pieces. Which of the two rectangles, A or B, has larger area? (Fold a rectangle and check!)
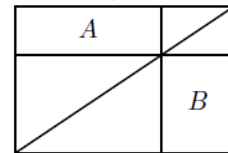
7. The attached figure shows how one can make a regular hexagon from a rectangular piece of paper (we did similar folding in class). Can you explain why this does give a regular hexagon? Make one and check that it is indeed regular.
    (funny double arrow below the first figure means "turn over and repeat step 1")