

## Problems – Geometric constructions

Hint: Symmetry is useful in problems 1-3. Similarity can (sometimes) be used to solve problems 4-5.

Discuss these problems in small groups.

1. Two points  $A$  and  $C$  and a line are given. Find a point  $B$  on the line such that  $|AB| + |BC|$  is as small as possible.
2. A circle, a line, and a point  $C$  are given. The circle does not intersect the line. Find a point  $A$  on the circle and a point  $B$  on the line such that  $|AB| + |BC|$  is as small as possible.
3. Two circles and a line are given. None of them intersect. Find a point  $A$  on one circle, a point  $B$  on the line, and a point  $C$  on the second circle such that  $|AB| + |BC|$  is as small as possible.
4. Two lines and a point are given. The point does not lie on either of the lines. Draw a circle that is tangent to the given lines and passes through the given point. (Is this always possible?)
5. Three lines are given. Find three points on these lines, one point on each line, that are vertices of an equilateral triangle. (Is this always possible?)

More problems in the problem solving book:

<http://zimmer.csufresno.edu/mnogin/math149spring09/nogin-problem-solving-book.pdf>