Project GRASP – geometry 1

Adam Kurkiewicz
Univeristy of Glasgow
adam@kurkiewicz.pl

November 27, 2017

1 Administrative Stuff

1.1 Google Classroom

Per popular request I've set up a google classroom: https://tinyurl.com/y9nojnfm

The classroom code is: s8xlovo. There isn't much there yet, but from now on I'll be putting all the materials there as opposed to the mailing list.

1.2 Olympiad problems

1. Figure 1 shows two regular heptagons $ABCDEFG$ and $APQRSTU$. The vertex P lies on the side AB (and hence U lies on the side GA). Also, Q lies on OB, where O is the centre of the larger heptagon. Prove that $AB = 2AP$.

2. Figure 2 shows an equilateral triangle ABC and two squares $AWXB$ and $AYZC$. Prove that the triangle AYB is equilateral.

3. Figure 3 shows two squares $APQR$ and $ASTU$, which have vertex A in common. The point M is the midpoint of PU. Prove that $AM = \frac{1}{2}RS$.

4. A square piece of toast $ABCD$ of side length 1 and centre O is cut in half to form two equal pieces ABC and CDA. If the triangle ABC has to be cut into two parts of equal area, one would usually cut along the line of symmetry BO. However, there are other ways of doing this. Find, with justification, the length and location of the shortest straight cut which divides the triangle ABC into two parts of equal area.

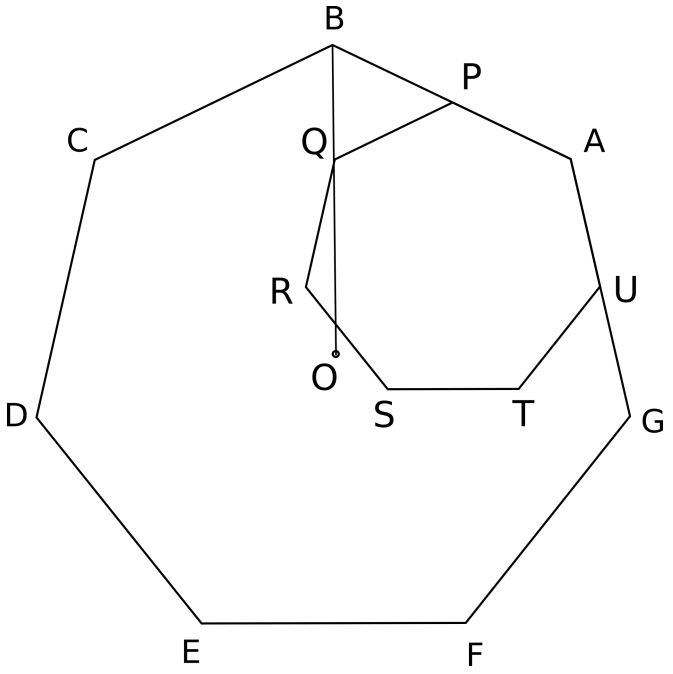

Figure 1: Task 1

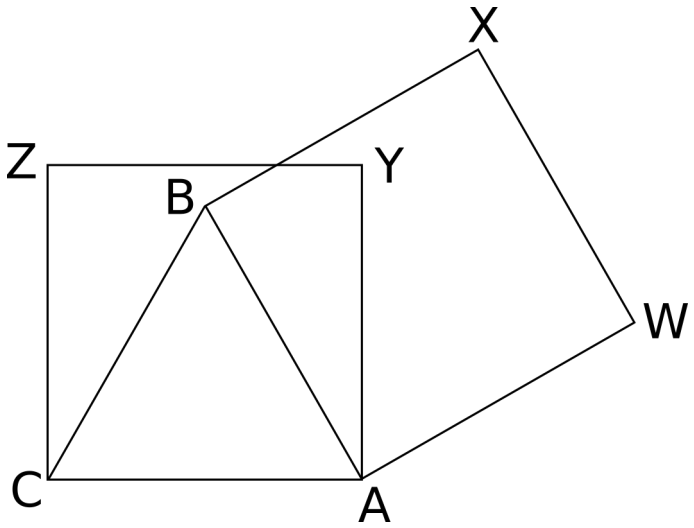

Figure 2: Task 2

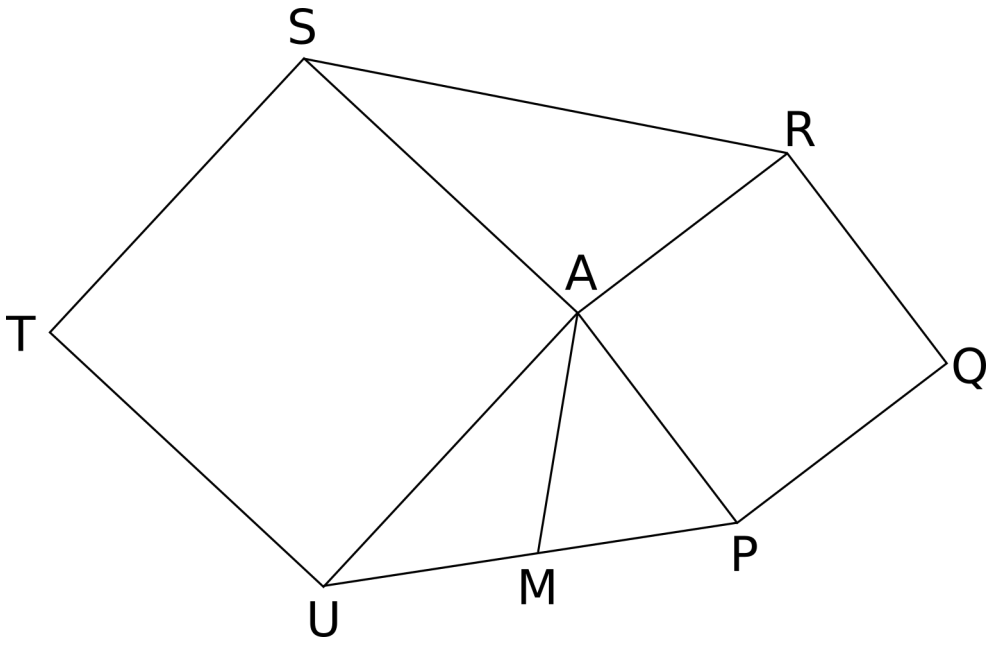

Figure 3: Task 3