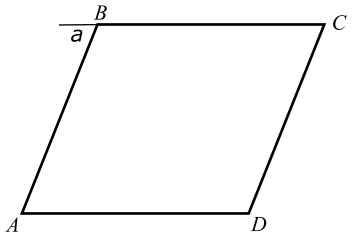
MATH 5: HOMEWORK 21
GEOMETRY 1.

1. Is it true that any rectangle is also a parallelogram? Is it true that any parallelogram is a rectangle? Try to argue as carefully as you can.

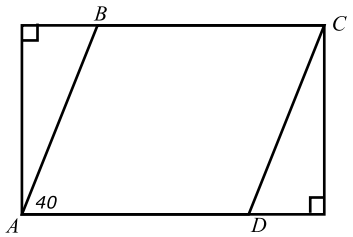
2. Show that in a parallelogram, diagonally opposite angles are equal $\angle A = \angle C$, $\angle B = \angle D$ [Hint: see figure below]



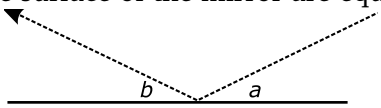
3. Show that the previous problem also works in the other direction: if in a quadrilateral, diagonally opposite angles are equal: $\angle A = \angle C$, $\angle B = \angle D$, then the quadrilateral must be a parallelogram.

4. Cut two identical paper triangles (the easiest way to do it is to fold a sheet of paper in two and then cut). Can you put these two triangles together so that they form a parallelogram? Will your method always work? Why?

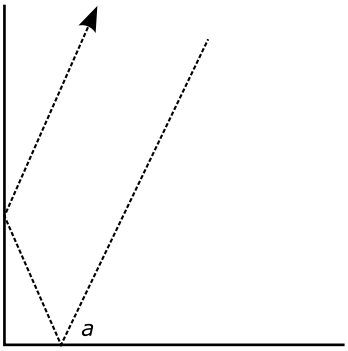
5. In the figure below, $ABCD$ is a parallelogram, and $\angle\angle DAB = 40°$. Can you find all other angles in:



6. The reflection law states that the angles formed by the incoming light ray and the reflected one with the surface of the mirror are equal: $\angle a = \angle b$



Using this law, show that a corner made of two perpendicular mirrors will reflect any light ray exactly back: the reflected ray is parallel to the incoming one:



[Hint: find the angle which each of these lines form with the horizontal]

This property – or rather, similar property of corners in three dimensions — is widely used: reflecting road signs, tail lights of a car, reflecting strips on clothing are all constructed out of many small reflecting corners so that they reflect the light of a car headlamp exactly back to the car.

7. Antonia and Gabi took a 9-mile trip in a rowboat. There was only one pair of oars, so they took turns rowing (however, they didn't time how long each of them was rowing, so it could happen that one had rowed longer than the other). Antonia could row at the speed of 3 miles per hour; Gabi could only do 2 miles per hour. It took them 3.5 hours to complete the trip. Can you find out how long each of them was rowing?