1. A quadrilateral $\square ABCD$ is called a *Saccheri quadrilateral* if $AB \cong CD$ and if the angles $\angle B$ and $\angle C$ are right angles, see figure 1. Show that in a Saccheri quadrilateral the congruency relation $\angle A \cong \angle D$ holds.

![Figure 1](image1.png)

**Figure 1.** A Saccheri quadrilateral.

2. Show that any model of neutral geometry has to have infinitely many points.

3. Show that in neutral geometry there is an equivalence between the two statements:
   (a) Hilbert’s parallel postulate holds.
   (b) The angle sum in every triangle is $180^\circ$.

4. Prove that in neutral geometry, a line cannot be contained in the interior of an angle.

5. Prove that in neutral geometry every angle has a unique bisector. This is the content of proposition 4.4a.

6. Prove that in neutral geometry, the diagonals of a convex quadrilateral intersect.

7. Prove that nonisoceles triangles exist? Which axioms of neutral geometry do you need to use to prove this existence?

8. Let $\triangle ABC$ be a right triangle with the right angle at $C$ and with the angle $\angle A$ being acute. Create a new right triangle $\triangle AB'C'$ whose angle $\angle A$ coincides with $\angle A$ of the first triangle but whose hypotenuse has been double in length i.e. $AB' = 2 \cdot AB$, see figure 2.

![Figure 2](image2.png)

(a) Show that $B'C' \geq 2 \cdot BC$.

(b) Show that $AC' \leq 2 \cdot AC$. 