

Year 4 Problem Set 101 (2008-2009 school year)

1. A line passes through an inner point of a convex figure. Prove that this line intersects with the boundary of this figure in not more than two points. Prove that if the figure is bounded, then the line intersects it in exactly two points.
2. Does there exist a number such that the sum of the digits of its square is more than 1000 times greater than the number itself.
3. Can you find a triangle with heights of length 1, 2 and 3?
4. A very long hallway is covered with pieces of carpet run of different lengths. If it knows that every two pieces of carpet run overlap. Prove that all pieces of carpet overlap at some point of the hallway.
5. Explain how to construct a shape of constant width that has 7 angles.
6. Explain how to smooth out the angles of the shape above preserving the constant width property.
7. Explain how to construct irregular (not based on a regular polygon) shape of constant width.

