

5-th German Federal Mathematical Competition 1974/75

First Round

1. In a coordinate plane, the points with nonnegative coordinates are numbered as follows:

15	20
10	14	19
6	9	13	18
3	5	8	12	17	...
1	2	4	7	11	16

For example, the point $(3, 1)$ is assigned number 12. Which number is assigned to point (x, y) ?

2. Prove that every convex polyhedron has two faces with the same number of sides.
3. Describe all quadrilaterals with perpendicular diagonals which are both inscribed and circumscribed.
4. In the country of Sikinia there are finitely many cities. From each city exactly three roads go out, and each road goes to another Sikinian city. A tourist starts a trip from city A and drives according to the following rule: he turns at the first left turn, then at the first right turn, and so on, alternately. Show that he will eventually return to A .