

TOPIC 9: Combinatorics II (Combinatorial Geometry)
(Homework Problems):

1)

Ten points are marked on a circle. How many distinct convex polygons of three or more sides can be drawn using some (or all) of the ten points as vertices?

2)

Each of the faces of a cube is colored by a different color. How many of the colorings are distinct (two colorings are the same if they differ only by rotations of the cube)?

3)

How many different squares of sizes $k \times k$ (for k running from 1 to n) can be formed on an $n \times n$ chessboard? What percentage of rectangles on a regular chessboard are squares then?

4)

A convex polyhedron has 26 vertices and 36 faces, 24 of which are triangles and 12 of which are quadrilaterals. A space diagonal is a line segment connecting two non-adjacent vertices that do not belong to the same face. How many space diagonals are there?