**Abteilung Algorithmik**
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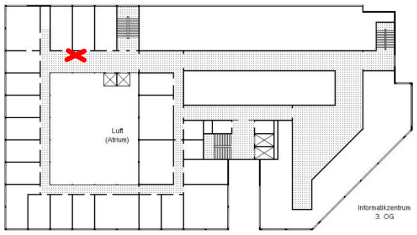
**WS 11/12**

# Computational Geometry
# Homework Set 1, 07. 11. 2011

Solutions are due Wednesday, November 23rd, 2011, until 11:25 in the cupboard for handing in practice sheets. **Please put your name on all pages!**




**Exercise 1 ( Number of Triangulations):** Find the number of distinct triangulations for the polygon in Figure 1.

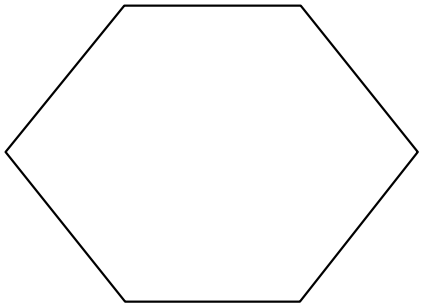


Figure 1: A polygon.

(10 points)

**Exercise 2 (Number of Triangles):** Prove theorem 1.5 from the lecture: Every polygon with $n$ vertices and $h$ holes may be triangulated. The triangulation has $n + 2h - 2$ triangles.

(15 points)

**Exercise 3 ( Number of Reflex Vertices):** Prove the following theorem: In an orthogonal polygon of $n$ vertices, $r$ of which are reflex, $n = 2r + 4$. Advice: First, show that the sum of the interior angles of a polygon is $(n-2)\pi$.
(10 points)

**Exercise 4 (Third Vertex):** Construct a polygon with $n = 3k$ vertices such that placing a guard at every third vertex fails to protect the gallery.
(10 points)

**Exercise 5 (Exterior Point Guards):** Prove the following statement: $\lceil \frac{n+1}{3} \rceil$ point guards suffice to cover the exterior of an $n$-vertex polygon $P$.
(15 points)