Algorithms Division **Winter 2021**
TU Braunschweig

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Question Sheet
Quiz 6 for Dec 14, 2021

Which is the correct answer?

Question 1:

What was the name of the physician who had the pump handle removed to fight cholera, what was the name of the street?

- Ned Stark and Board Street
- Ned Stark and Broad Street
- John Snow and Board Street
- John Snow and Broad Street

Question 2:

For Euclidean distances, is it possible that precisely two (not more, not less) different bisectors meet in a point?

- Yes, and both can be bounded.
- Yes, but at least one of them has to be a ray.
- Yes, but both have to be rays.
- No.

Question 3:

Consider two distinct points in a unit square. What is smallest upper bound for the area of the bisector between these points under Manhattan distances?

- 0
- 0.25
- 0.5
- 1

Question 4:

Consider two distinct points in a unit square. What is smallest upper bound for the area of the bisector between these points under Euclidean distances?

- 0
- 0.25
- 0.5
- 1

Question 5:

Consider a planar graph with n vertices and m edges, drawn in the plane without intersecting edges. What is the tightest characterization of the number of *bounded* faces?

- At most $m - n + 1$, possibly less.
- Precisely $m - n + 1$.
- At least $m - n + 1$, possibly more.
- Precisely $m - n + 2$.
- That depends.

Question 6:

Consider a connected planar graph with n vertices, m edges, f faces. How many *pointers* does its DCEL have?

- $m - n + f + 2$.
- $m + n + f$.
- $5m + n + f$.
- $6m + n + f$.
- $10m + n + f$.
- $12m + n + f$.

Question 7:

For a set $\mathcal{P}$ of n points in the plane, let $\nu(p)$ be the number of nearest neighbors of $p \in \mathcal{P}$, according to Euclidean distances. What is the tightest upper bound for the average number $\frac{1}{n} \sum_{p \in \mathcal{P}} \nu(n)$ of nearest neighbors?

- At most $2 - \frac{4}{n}$.
- At most 2.
- At most $3 - \frac{6}{n}$.
- At most 3.
- At most $6 - \frac{12}{n}$.
- At most 6.

Question 8:

Consider a set of n points in the plane. What is the tightest upper bound for the number of circles that contain at least three of the points on their boundary, but none in their interior?

- $n - 1$.
- n.
- $2n - 6$.
- $2n - 5$.
- $3n - 6$.
- n^3