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Discrete and Computational Geometry

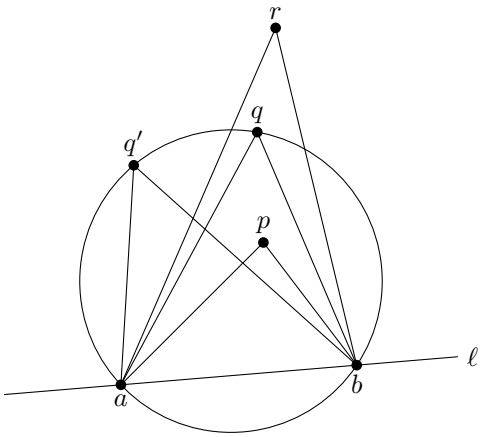
Exercise Sheet 07

Winter Semester
2024-2025

Exercise 1 (Thales)

Consider a line ℓ through a circle C, and let $\ell \cap C = \{a, b\}$ be the two intersection points. Let p be a point inside C, q and q' points in C, and r a point outside C, all of them on the same side of the line ℓ. Show that

$$\measuredangle apb > \measuredangle aqb = \measuredangle aq'b > \measuredangle arb$$



Exercise 2

Find a point set with 4 points with two different legal triangulations (i.e. with no illegal edges), but only one of them being angle optimal.

Exercise 3

We say that a finite point set $S \subseteq \mathbb{R}^2$ is in *general position* if no four points lie on the same circle. Show that in this case, S has a unique legal triangulation, and and thus a unique angle optimal triangulation.

Exercise 4

(i) Show that the smallest angle of any triangulation of a convex polygon whose vertices lie on a circle is the same for each triangulation.

(ii) Which triangulations are legal in this case?