

Mathematics 2260H – Geometry I: Euclidean Geometry

TRENT UNIVERSITY, Winter 2023

Assignment #2

Triangles in Flatland and Sphereland[†]

*Due on Friday, 3 February.**

We didn't do Proposition I-17 in class. Here it is:

PROPOSITION I-17. The sum of any two internal angles of a triangle is less than the sum of two right angles.

1. Prove Proposition I-17, without (again) looking up any proof of it. (You are still allowed to work together.) [4]

Spherical geometry is geometry on the surface of a sphere instead of in the Euclidean plane. The “lines” of this geometry are the great circles of the sphere, *i.e.* the circles that are the intersections of the surface of the sphere with planes passing through the centre of the sphere. (Like the equator of the earth.) Spherical geometry is one of the mathematical topics that had been studied by Greek mathematicians by Euclid's time, but which Euclid did not include in the *Elements*.

2. Show that any two points on the surface of a sphere are connected by a unique great circle. [1]
3. Which of Euclid's five Postulates are true in spherical geometry. [3]
4. Give an example to show that Proposition I-17 is not true in spherical geometry. [2]

[†] With apologies to Edwin A. Abbott, who wrote *Flatland*, and Dionys Burger, who wrote *Sphereland*.

* If submitting on paper or on Blackboard isn't feasible, please email your solutions to the instructor at: sbilaniuk@trentu.ca