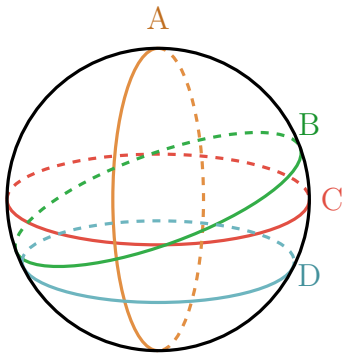
Exercise 1. Can you draw a triangle with three right angles?

Exercise 2. What should count as a line on a sphere?

Definition 0.1. Great circles: Circles dividing sphere in two equal parts

Exercise 3. Which of these are great circles?



Definition 0.2. The lines on a sphere are great circles.

Exercise 4. True or false: in the plane or on a sphere:

(i) Suppose we have two points, there exist a unique line thought the points.

(ii) Suppose we have a line and a point not on the line. There is a unique parallel line through the point.

(iii) Two distinct lines meet in at most one point.

(iv) Any three distinct lines form a triangle.

(v) Any three distinct lines that do not meet in a single point form a triangle.

Exercise 5. What can you say about the sum of the angles of a triangle on a sphere?

(i) What is the smallest this sum can be?

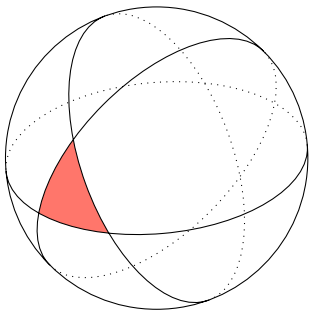
(ii) What is the biggest this sum can be?

Definition 0.3. Biangle: A two-sided polygon

Lemma 0.4. **(i)** Both angles in the biangle are the same.

(ii) Consider a biangle with angles θ (in degrees), then the area of the biangle is $4\pi\frac{\theta}{360}$

Exercise 6. Let T be a triangle on a sphere with angles α, β, γ. Show that the area of T is $\frac{2\pi}{360}(\alpha + \beta + \gamma) - \pi$



Exercise 7. Can you think of an object where there is a triangle with the angles summing to $< 180°$?