NAME _____ DATE _____ PERIOD _____

3-1 Enrichment

Spherical Geometry

On a map, longitude and latitude appear to be lines. However, longitude and latitude exist on a sphere rather than on a flat surface. In order to accurately apply geometry to longitude and latitude, we must consider spherical geometry.

The first four axioms in spherical geometry are the same as those in the Euclidean Geometry you have studied. However, in spherical geometry, the meanings of lines and angles are different.

1. A straight line can be drawn between any two points.

However, a straight line in spherical geometry is a **great circle**. A great circle is a circle that goes around the sphere and contains the diameter of the sphere.

2. A finite line segment can be extended infinitely in both directions.

A line of infinite length in spherical geometry will go around itself an infinite number of times.

3. A circle can be drawn with any center or radius.

So, in spherical geometry, a great circle is both a line and a circle.

4. Right angles can be found on the sphere.

Latitude and longitude meet at right angles on a sphere.

The fifth axiom of Euclidean Geometry states that given any straight line and a point not on it, there exists one and only one straight line that passes through that point and never intersects the first line. The fifth axiom is also known as the Parallel Postulate.

Exercises

1. Get a ball. Wrap two rubber bands around the ball to represent two lines (great circles) on the sphere. How many points of intersection are there? **2**

2. Try to draw two lines (great circles) or wrap two rubber bands around a ball that do not intersect. Is it possible? **no**

3. Make a conjecture about the number of points of intersection of any two lines (great circles) in spherical geometry.

Two lines (great circles) will always intersect in two points in spherical geometry.

4. Does the fifth axiom, or Parallel Postulate, hold for spherical geometry? Explain.

No, because the Parallel Postulates states that the line will never intersect and that is not possible in spherical geometry because two lines (great circles) always intersect in two points.