Spherical Geometry

Windsor Charter Academy

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Question

What do we know about geometry?

Question

Which is the shortest path between the two points?

Question

Which is the shortest path between the two points?

Draw your answer on a white board.

Answer

Straight line!

Question

What if instead of drawing on rectangular board, we draw on a ball?

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Think of it this way:

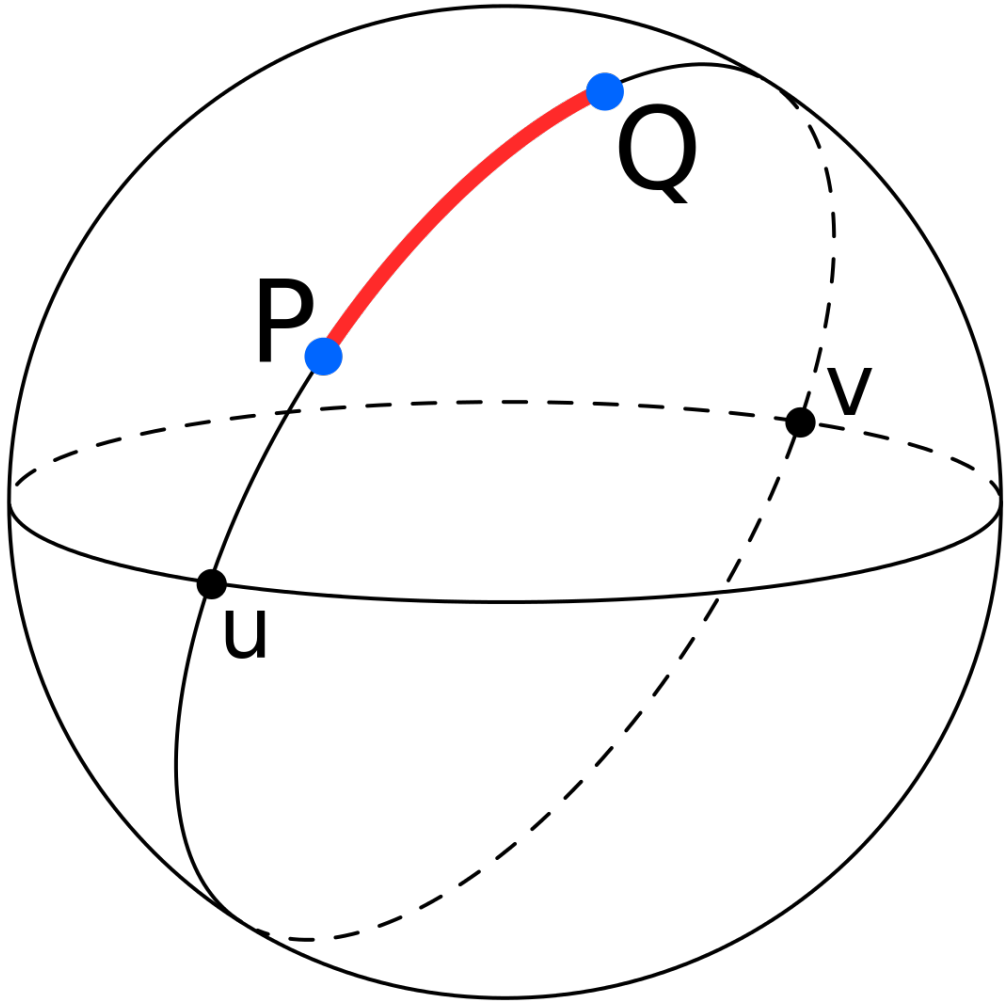
Question

What if instead of drawing on rectangular board, we draw on a ball?

Think of it this way:
What is the shortest path between two cities on Earth?

Answer

Great circles!



Activity

Draw the shortest paths on spheres!

1. Pick two points on your sphere and draw what you think is the shortest path between the two points.
2. Check if you're right by putting your rubber band around the sphere on the line that you drew.

Question

Can you draw a triangle with all 90° angles on paper?

Question

Can you draw a triangle with all 90° angles on paper?
Give this a try on your white board.

Answer

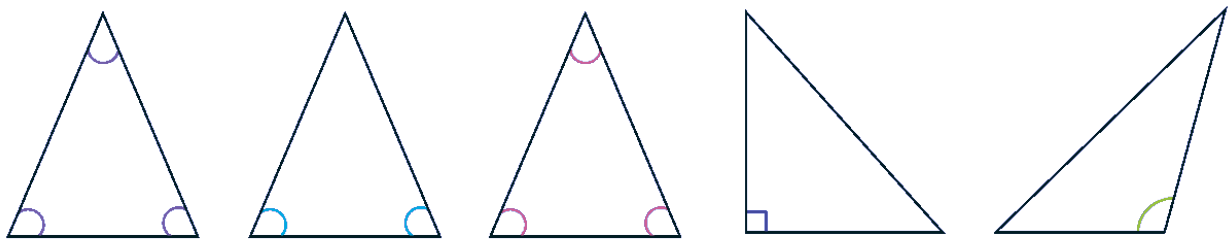
No!

Answer

No! There must be 3 angles that have a total of 180°!

Triangles in the Plane

We have these types of triangles in the plane.



Equiangular
(3 $\cong$ angles)

Isosceles
(2 $\cong$ angles)

Acute
(3 acute angles)

Right
(1 right angle)

Obtuse
(1 obtuse angle)

Question

What if we tried this on a sphere?

Activity

Draw triangles using great circles on the sphere, and add up their total angles!

Can you draw a triangle with three 90° angles on the sphere?

Shortest path

How do planes fly over Earth?

Shortest path

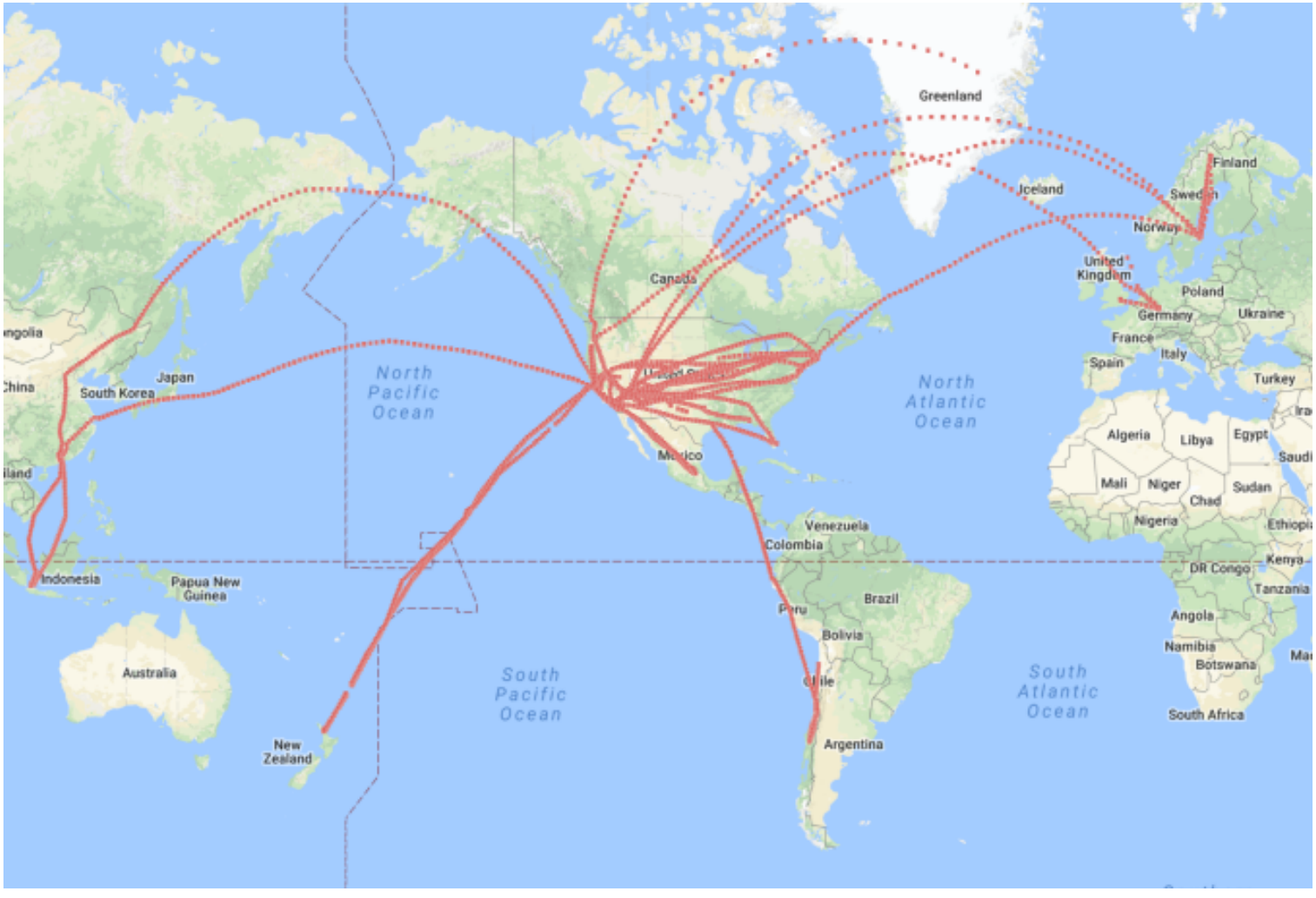
How do planes fly over Earth?

Activity

Name two cities and we can the plane flight between them and see what this looks like on the map!

On a Map

Here is what a bunch of flights look like on a map.

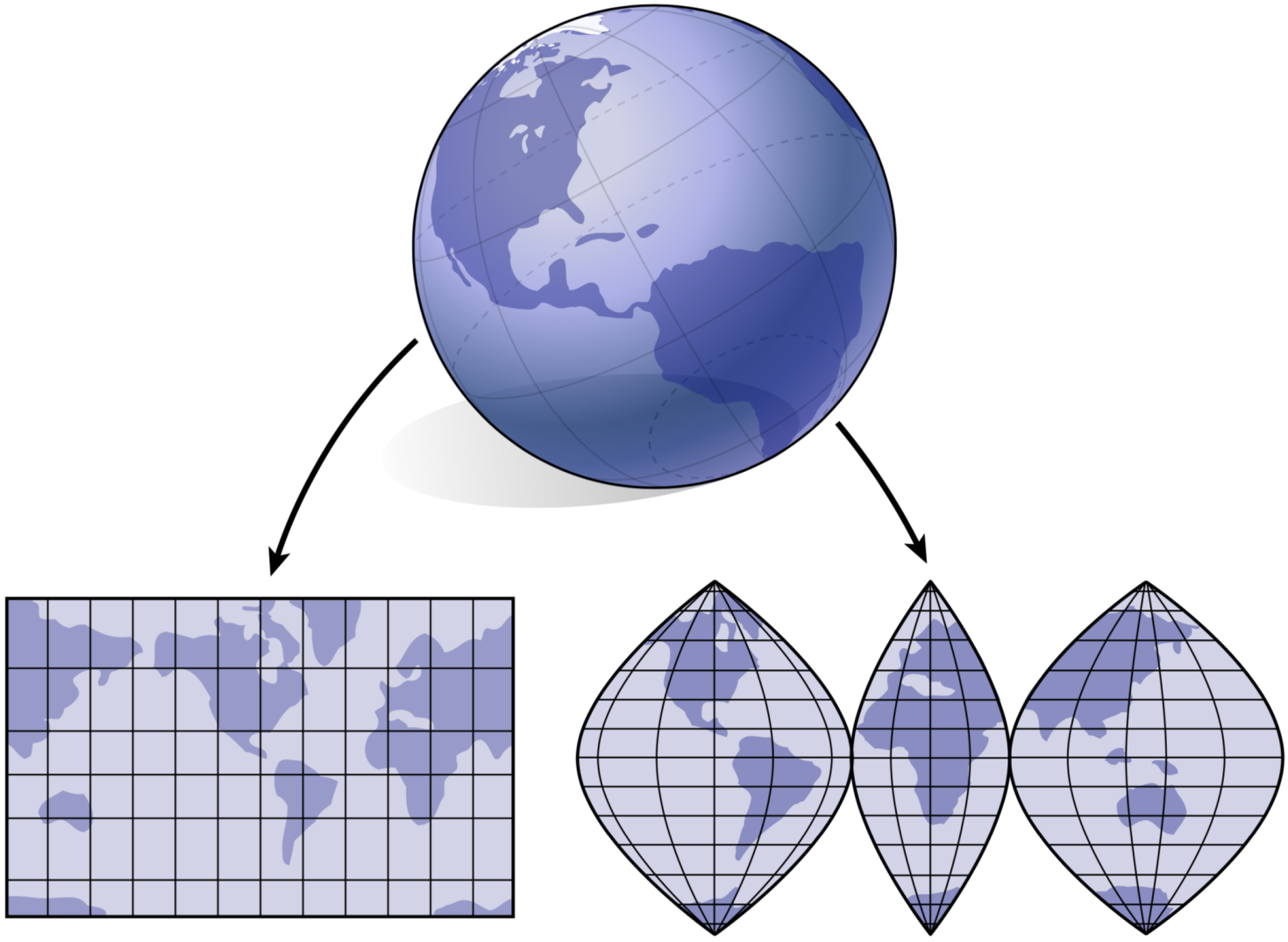


On a Map

Why do these lines not look straight on a map?

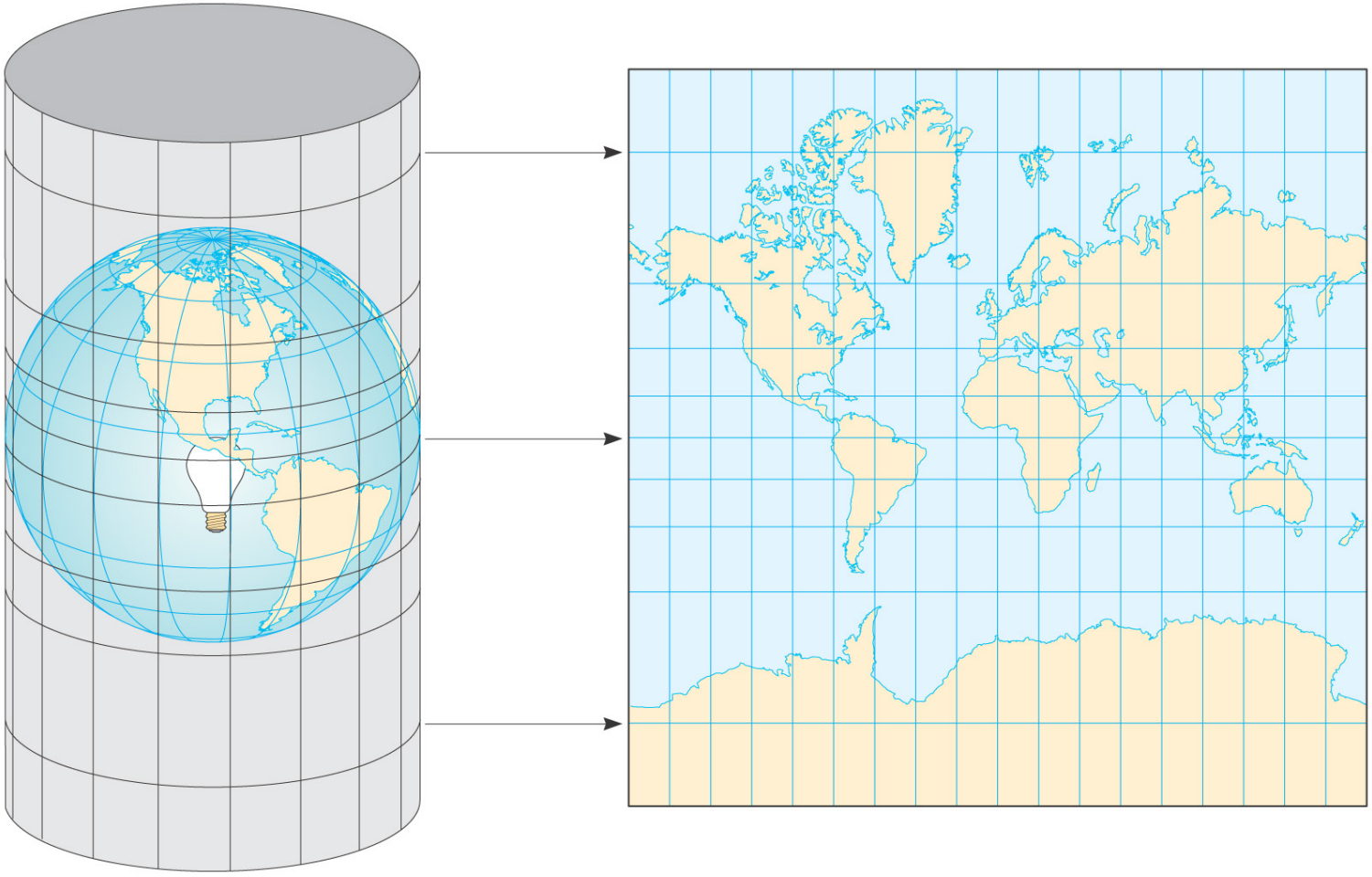
On a Map

Maps of Earth



Making a Map

How to make the Mercator map



(a) (b)