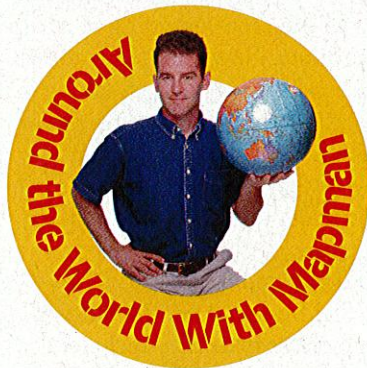


# The Flat Earth Problem

Why world maps distort shapes and sizes



If you search on Google for a world map, how accurate will it be? Because the Earth is round, any map on a flat sheet of paper or computer screen is going to have some distortions.

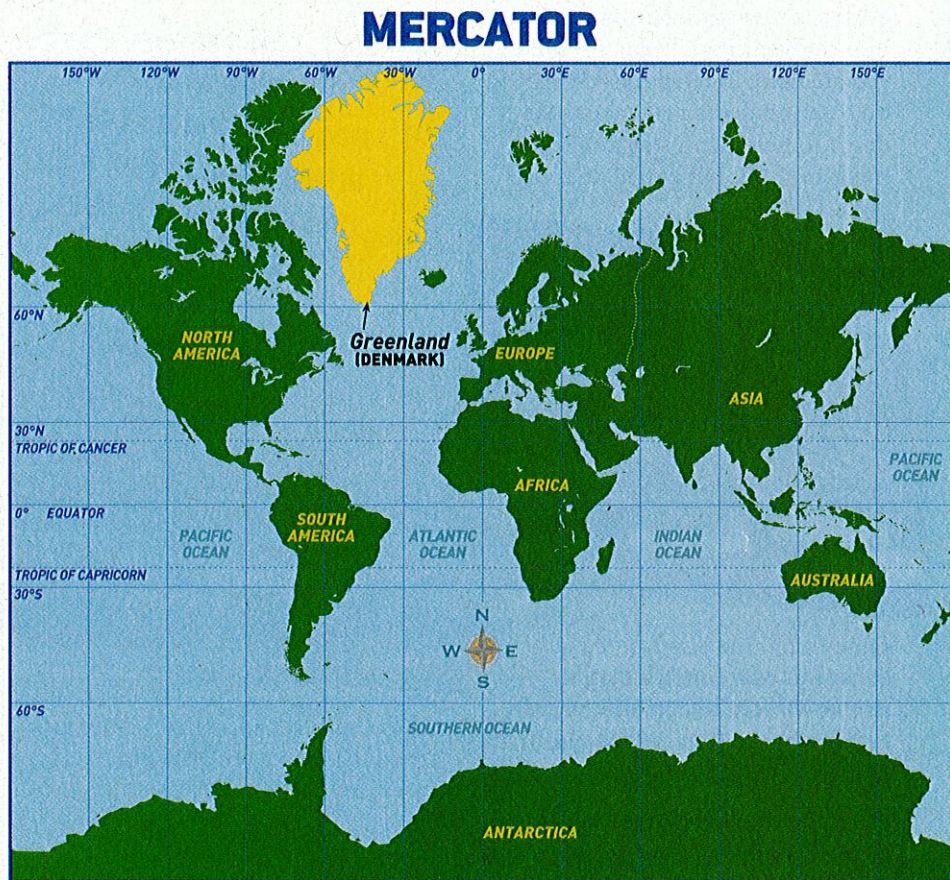
The easiest way to see this is to draw a square and a triangle on the surface of an orange. Peel the orange, and flatten the peel on a table. As you press down, you'll see how the shapes get distorted. That's exactly what happens to entire continents when you create a world map on paper or on a computer screen.

### Miles Versus Maps

Compare the areas (in millions of square miles) of these major landmasses with their relative size on each projection.

Africa	11.7
Antarctica	5.4
Asia	17.0
Australia	3.0
Europe	4.0
Greenland	0.8
North America	9.4
South America	6.9

Source: *World Book Encyclopedia*



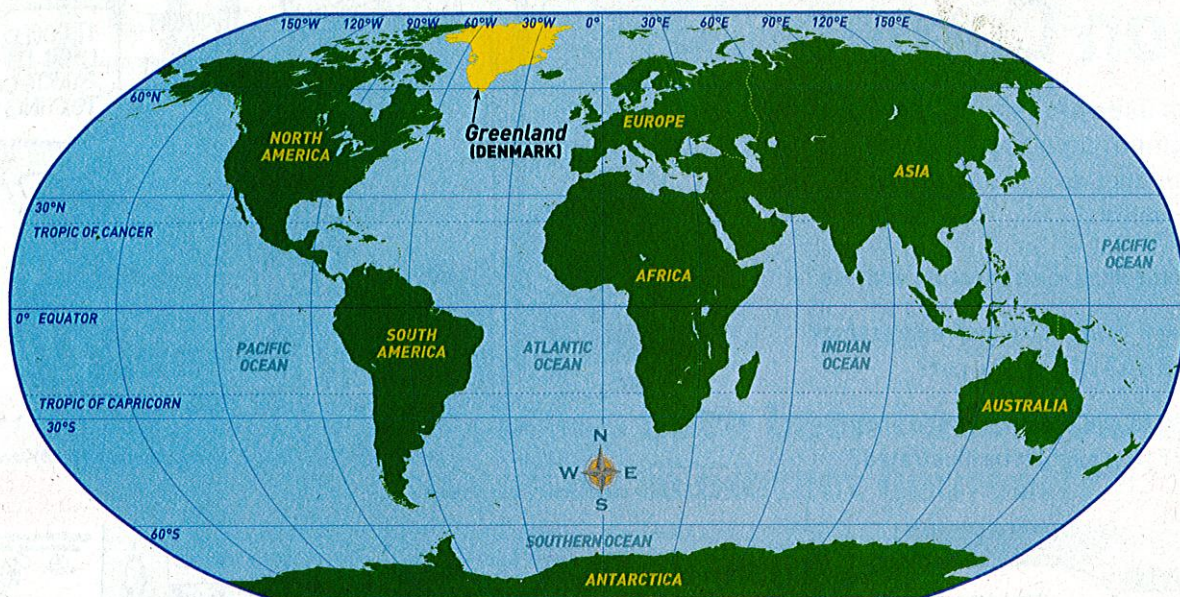
Cartographers have been aware of this problem for centuries. That's why they devised what are known as projections—maps that depict the Earth's surface as accurately as possible by taking into account the fact that they're drawing a round object on a flat surface.

There are thousands of map projections, each with its own set of compromises. Here are three widely used examples.

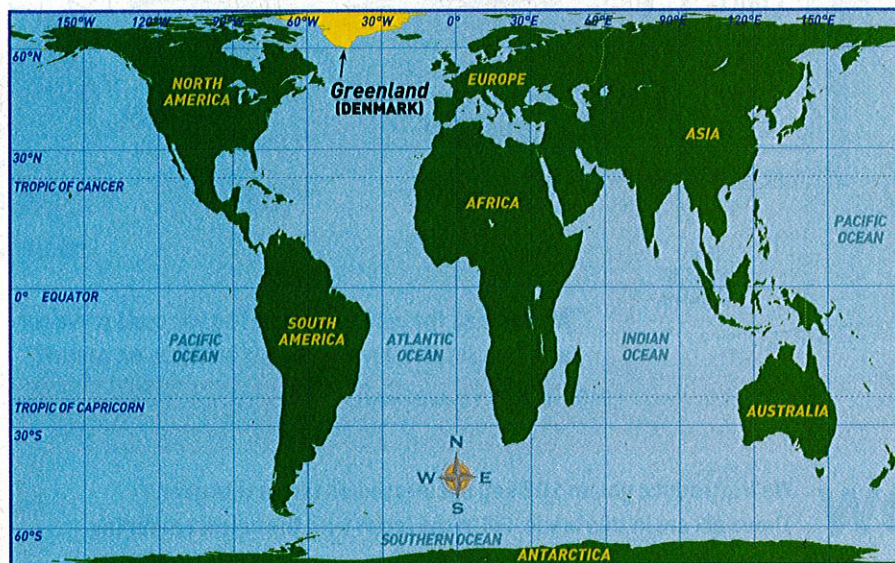
• **MERCATOR.** Created in 1569 by Gerardus Mercator in what is now Belgium, the Mercator is still the most widely used projection (including by Google). It shows the shapes of landmasses accurately, but distorts their sizes: The farther a landmass is from the equator, the larger it appears. That's why Greenland, which is much smaller than South America, appears so much larger (see chart for actual areas).



## ROBINSON



## PETERS



• **ROBINSON.** This projection is used by *Junior Scholastic* and many textbooks. It was created in 1963 by an American, Arthur H. Robinson. His elliptical (rounded) shape allows for greater accuracy in both the sizes and shapes of landmasses. But it also creates distortions at the North and South poles. That's why Antarctica appears much larger and more stretched out than it really is.

• **PETERS.** Arno Peters, a German historian and cartographer, developed his map projection in the 1970s. His focus was getting the sizes of the landmasses—especially in the equatorial regions—as accurate as possible. His compromise is evident in the warped shapes you see: Features near the equator are stretched vertically, while landmasses near the poles are flattened horizontally.

## QUESTIONS

Write your answers on a separate sheet of paper.

1. Why is it impossible to create an accurate world map on a flat sheet of paper?
2. Which projection distorts shapes the most?
3. Which projection depicts sizes and shapes the most accurately?
4. Which projection is the most widely used?
5. Which projection does *JS* use?
6. Which projection makes Greenland look the largest?
7. What's the biggest advantage of the Peters projection?
8. What is the biggest disadvantage of the Robinson projection?
9. How much larger is Africa than Greenland?
10. Why do you think Antarctica is the most distorted continent on each of the projections?