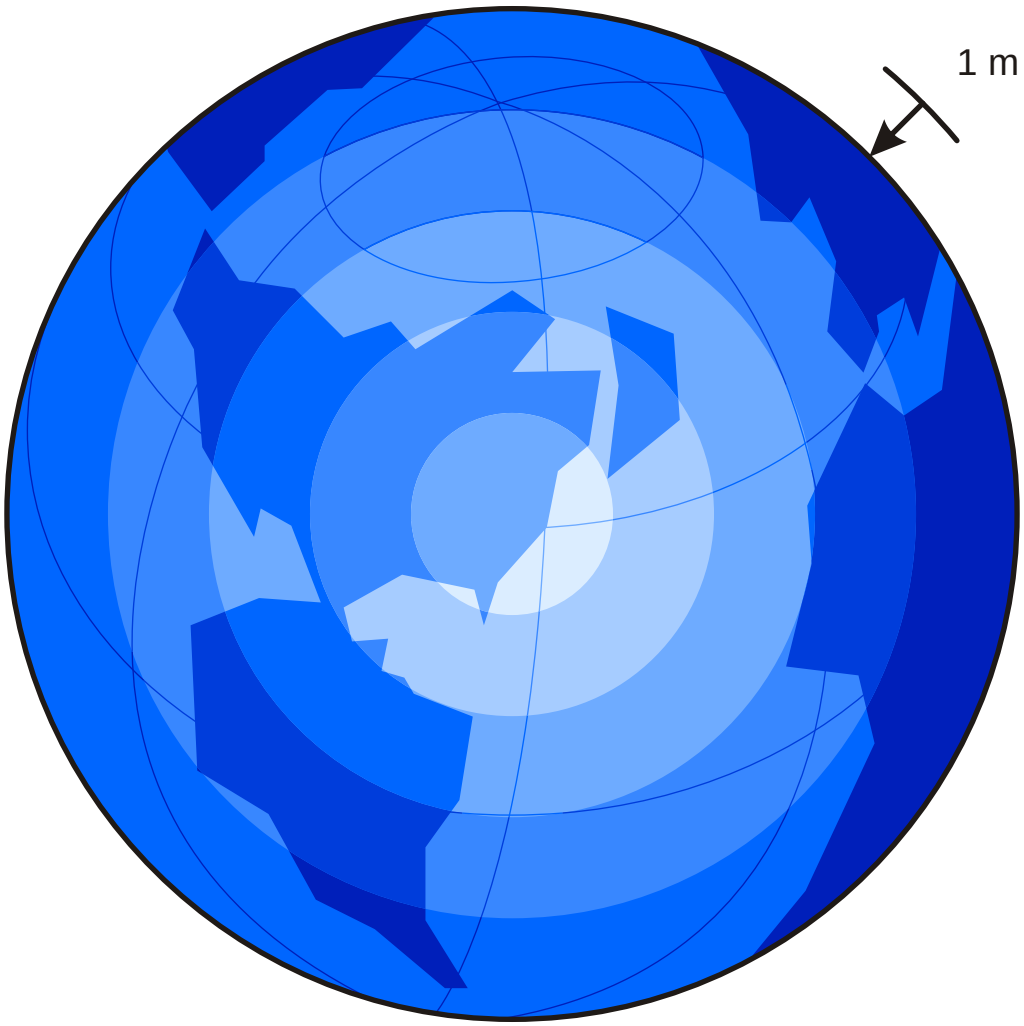
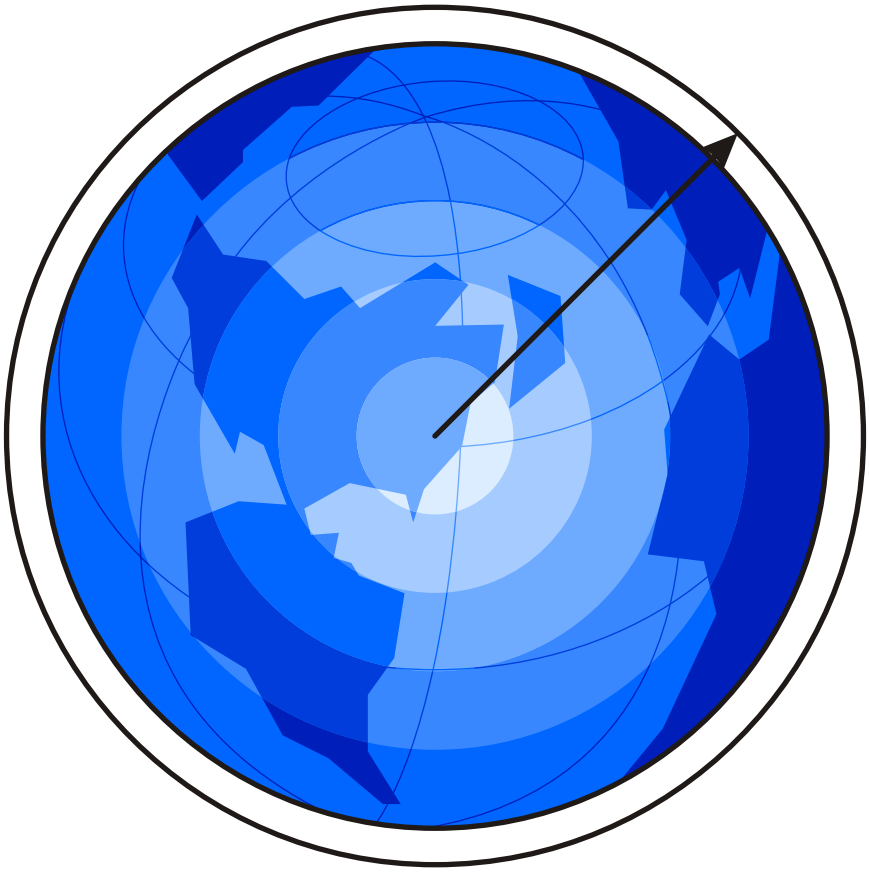
The Earth Belt

by Martin Gardner



Imagine that you are on a perfectly smooth sphere as big as the earth. A steel belt is stretched tightly around one of its equators.

One meter of steel (a little bit more than a yard) is added to this belt so that it is raised off the surface of the sphere by the same distance all the way around. Will this lift the belt high enough so that you can:
1) Slip a playing card under it?
2) Slip your hand under it?
3) Slip a baseball under it?



It seems surprising, but that steel belt, after a meter is added to it (approximately a yard and four inches), will be raised 15+ centimeters (approximately six inches) all the way around! This is certainly high enough for a baseball to pass underneath.

Actually, the height the belt is raised on, is the same regardless of how large the sphere is. It is easy to see why. When the belt is tight around the sphere, it makes the circumference of a circle with a radius that is the same as the radius of the sphere. As it is known from plane geometry the circumference of a circle is equal to its diameter (which is twice its radius) times pi. Pi is 3.14+. Therefore, if the circumference of any circle is increased by one meter, the diameter of the circle is increased by a trifle less than one-third of a meter, or 31+ centimeters (a trifle more than a foot). This means, of course, that the radius will increase by almost 15+ centimeters (approximately six inches).

As it is shown in the illustration, this increase in radius is the height that the belt will be raised from the sphere's surface. It will be exactly the same, 15+ centimeters (almost six inches), regardless of whether the sphere be the size of the sun, of the earth or of an orange!