Why radians when measuring angles?

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Acknowledgements

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How do I measure an angle?

Most of us first hear of an angle when we encounter triangles. When two lines that are not parallel meet, they enclose an angle. So, is an angle a measure of lack of alignment? If a string is fixed to two points, and you put your finger somewhere in between, the string will make an angle. Can lines be used to measure angles?

If you chased angles by chasing lines, it is likely that your pursuit of a robust definition of angle would hit some roadblocks. But f you introduced the idea of *rotation* on the plane, then you would discover that two lines that are aligned, i.e., that are parallel, do not make any angle, each with the other.

But the moment they move out of alignment or out of being parallel, you would notice that one line *turned* with respect to the other. Turning is rotation. And angles measure this rotation. How do you rotate your body? By moving in a circle, turning east, north, west, and south, for example. Rotation implies movement in a circle.

So, we measure angles using the circle as the basis. And the largest angle we can make is one full circle. After that, any further rotation gives us more of the same. So, angles may be measured from zero to one full circle, before everything starts repeating itself.

Why are radians used?

Radians are an angular measure in which the size of the angle is expressed as a ratio of two lengths. These ratios are familiar to us from trigonometry where the sin, cos, and tan functions are expressed as the ratios of lengths in a right-angled triangle.

But if you think carefully, an angle involves *rotation* and the simplest and most symmetrical figure in two-dimensions involving a rotation is a circle. So, angles are best measured using a circle as the basis for denoting angular size rather than from a triangle, even if triangles are the first time when you encountered angles.

All circles are similar. As are all squares, all equilateral triangles, all regular n-gons. What exactly does similarity mean? It means that the shape remains the same.Imagine a square or a circle. If you zoomed the figure to enlarge or diminish it without distortion, and you could not see a change pf shape, that figure exhibits similarity to every other figure in that class.

When we attempt to define a standardized angular measure we require the following:

1. the measure should be based on a circle or its arc
2. the measure should be independent of the radius of the circle

