

Degrees and Radians

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All circles are similar. The only difference is their size.

If you stand in one place and turn in one complete circle, your view will sweep through 360 degrees. Or, equivalently, your view will sweep through 6.28319 radians. This means that 360 degrees = 6.28319 radians.

Note that this equality seems to be a sticking point for many people. To help become “un-stuck,” consider the length known as a meter. In one meter there are 100 centimeters. This is fairly common knowledge, and it is easy to visualize: centimeters are what you get when you chop a meter into 100 equal-sized pieces. But it’s also true that a meter can be chopped into 3.281 feet. This isn’t as easy to visualize, but so it goes.

Now lets compare the circle with the meter.

$$\text{One circle} = 360 \text{ degrees} = 6.28319 \text{ radians}$$

$$\text{One meter} = 100 \text{ centimeters} = 3.281 \text{ feet}$$

Notice the similarity? Yes, it might be easier if radians had never been invented and everything was done in degrees. But this isn’t how it is.

So where do radians come from and why are they used? As it turns out, if a circle has a radius of 1 foot, then its circumference (distance around the edge) is 6.28319 feet. In other words, 6.28319 is the conversion factor between the radius and the circumference. As it turns out, if we divide 6.28319 by 2, we get 3.14159, and this number is referred to as π (pronounced “pie”). If you’re not familiar with π , then it’s easiest if you simply regard it as a sacred number. It is one-half of the distance around a circle, relative to its radius. For example, if a circle has a radius of one mile, then it is π miles halfway around the edge of the circle. And it is $2*\pi$ miles all the way around the edge of the circle.

So π traverses a half-circle, and $2*\pi$ traverses a full circle. When referring to the arc swept out as we turn in a circle, we simply add the units tag of “radians.” As shown to the right, a quarter circle is 90 degrees (90°). It is also $\pi/2$ radians.

It is also common to refer to degrees and radians, generally, as “arc.” For example, the arc swept out in a quarter circle is 90° .

