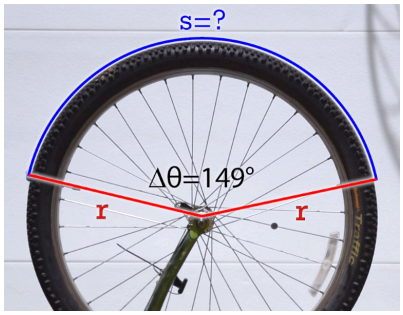
Flipping Physics Lecture Notes:

Introductory Arc Length Problem
Gum on a Bike Tire

Example Problem: How far does a piece of gum stuck to the outside of a 67 cm diameter wheel travel while the wheel rotates through 149°?

Knowns: $D = 67cm;\ r = \frac{D}{2} = \frac{67cm}{2} = 33.5cm;\ \Delta\theta = 149°\left(\frac{2\pi\ radians}{360°}\right) = 2.6005\ radians;\ s = ?$

Suggestion: Whenever the diameter is given in a physics problem, immediately determine the radius as well. Too often I have seen students use the diameter as the radius.



$$s = r\Delta\theta = (33.5)(2.6005) = 87.118 \approx \boxed{87cm}$$

Units: $s = r\Delta\theta \Rightarrow cm \bullet rad = cm$

Radians have no units and are just a placeholder. The radians drop out because we no longer need them as a placeholder. If we had left the angular displacement in degrees, the units for arc length would work out to be in $cm \bullet °$ which makes no sense.