

Problem 55

The arc length formula says the length s of arc subtended by angle θ in a circle of radius r is given by the equation $s = r\theta$. What are the dimensions of (a) s , (b) r , and (c) θ ?

Solution

Since s is a length,

$$[s] = \text{L}.$$

r is the radius of the circle, so it's a length too.

$$[r] = \text{L}$$

Consider the dimensions of the given equation.

$$s = r\theta$$

$$[s] = [r\theta]$$

$$[s] = [r][\theta]$$

$$\text{L} = \text{L} \cdot [\theta]$$

In order for it to be dimensionally consistent, θ must be dimensionless, that is,

$$[\theta] = 1.$$