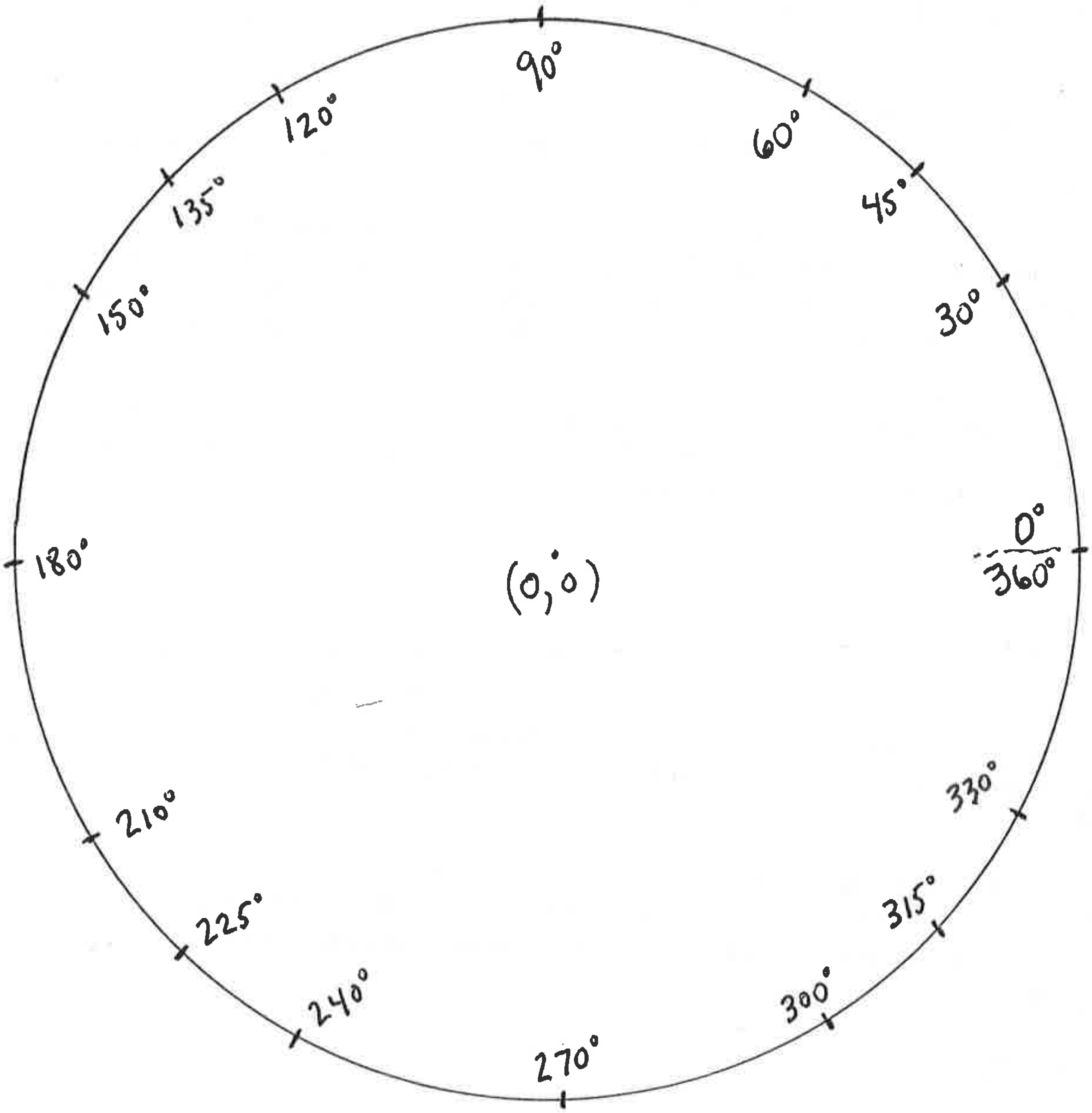
The Unit Circle ; r = 1



Radian Measure

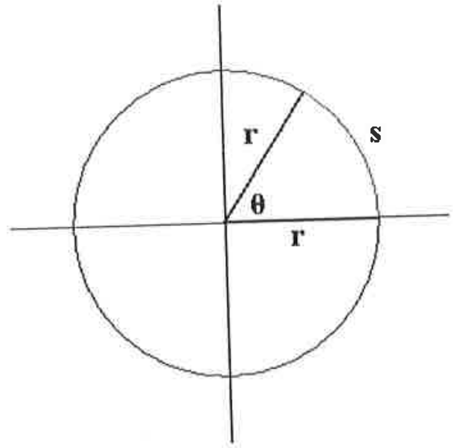
I. Radian Measure

A. Terminology

When a central angle (θ) intercepts the circumference of a circle, the length of the piece subtended (cut off) is called the **arc length** (s).

B. The **radian** measure of an angle (θ) is the ratio of the arc length (s) to the radius of the circle (r), i.e. $\theta = \frac{s}{r}$

C. If the arc length subtended by angle θ is equal to the radius (i.e., when s = r), then θ has a measure of 1 radian.



When s = r, θ = 1 radian.

D. Since a radian is defined as a ratio of two lengths, the units cancel and the measure is considered unit-less. Therefore, if an angle measure is written with no degree symbol, it is assumed to be in radians. Though it is not essential, it is often customary to write radians or rads after an input measured in radians, especially when doing conversions and canceling units.

E. In many applications of trigonometry, radian measure is preferred over degree measure because it simplifies calculation and allows us to use the set of real numbers as the domain of the trig functions rather than just angles.

Degrees: one degree (1°) is a rotation of 1/360 of a complete revolution about the vertex. We can think of this as going all the way around the circle. There are 360 degrees in one full rotation.

Radian: One **Radian** is the measure of a central angle θ that intercepts an arc s equal in length to the radius r of the circle. Since the radian is measured in terms one r on the arc of a circle and the complete circumference of the circle is $2\pi r$ then there are 2π radians in one full rotation.

This gives us a way to convert between degrees and radians:

$360° = 2\pi$ rad

To convert from degrees → radians we multiply degrees by $\frac{\pi \text{ rad}}{180°}$

To convert from radians → degrees we multiply radians by $\frac{180°}{\pi \text{ rad}}$