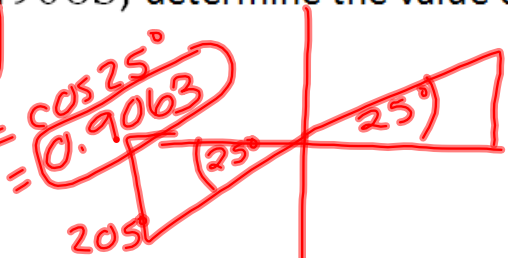


Review

1. Given that $\cos 25^\circ \approx 0.9063$, determine the value of

$\cos 205^\circ \approx -0.9063$

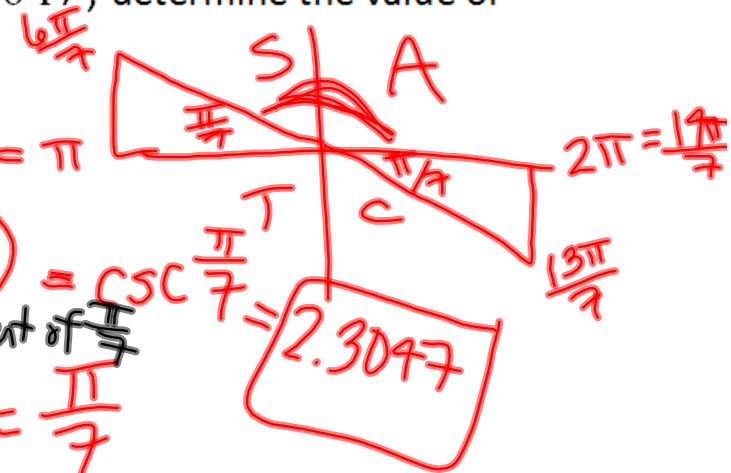
$\sin 65^\circ = \sin(90^\circ - 25^\circ) = \cos 25^\circ = 0.9063$



2. Given that $\csc \frac{6\pi}{7} \approx 2.3047$, determine the value of

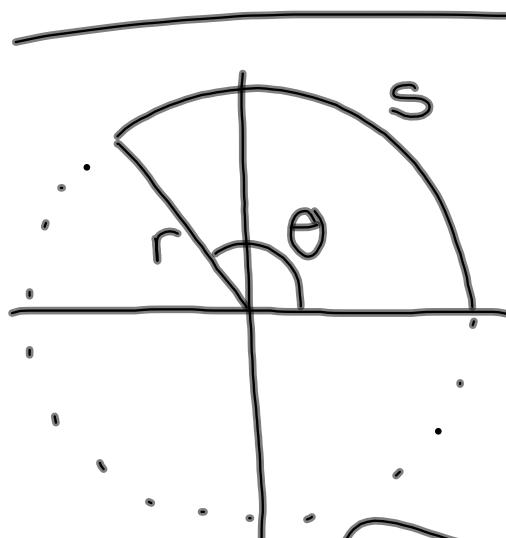
$\csc \frac{13\pi}{7} \approx -2.3047$

$\sec \frac{5\pi}{14} = \sec \left(\frac{\pi}{2} - \frac{\pi}{7} \right) = \csc \frac{\pi}{7} = 2.3047$



$\frac{7\pi}{7} - \frac{5\pi}{14} = \frac{2\pi}{14} = \frac{\pi}{7}$

5.4 Arc Length & Angular Speed



A diagram of a circle sector. A horizontal line represents the positive x-axis, and a vertical line represents the positive y-axis. A radius r is drawn from the origin into the first quadrant, forming an angle θ with the x-axis. An arc of length s connects the tip of the radius to the x-axis. Dotted lines indicate the continuation of the circle's circumference.

$r = \text{radius}$ in, cm, km

$\theta = \text{angle}$

$s = \text{arc length}$ ^{in, cm, km, mi}
(segment of circumference spanned by the angle)

$$s = r\theta$$

1. $r = 5 \text{ in}$; $\theta = 45^\circ$; $s = ? \text{ in}$

$$s = r\theta$$

$$s = 5 \text{ in} \cdot \cancel{45^\circ} \cdot \frac{\pi}{\cancel{180^\circ}} = \boxed{\frac{5\pi}{4} \text{ in}}$$

2. $s = 16 \text{ yd}$; $\theta = 5$; $r = ? \text{ yd}$

$$\frac{s}{\theta} = \frac{r\theta}{\theta}$$

$$r = \frac{s}{\theta} = \boxed{\frac{16 \text{ yd}}{5}} = \boxed{\frac{16}{5} \text{ yd}}$$

3. Find the measure of a rotation in radians when a point 2 m from the center of rotation travels 4m.

$$\theta = ? \text{ rad}; r = 2 \text{ m}; s = 4 \text{ m}$$

$$\frac{s}{r} = \frac{r\theta}{r}$$

$$\theta = \frac{s}{r} = \frac{4 \text{ m}}{2 \text{ m}} = \boxed{2}$$

Linear Speed

$$V = \frac{s}{t}$$

V = linear speed
km/s, mi/h

s = linear distance
cm, mi

t = time
(s, min, h)
years

Arc Length

$$s = r\theta$$

r = radius or
distance from
the center of
rotation

θ = angle or
amount of rotation

Angular Speed

$$\omega = \frac{\theta}{t}$$

"omega"
 ω = angular speed
rev/min, degrees/s

$$V = \frac{s}{t} = \frac{r\theta}{t} = r\omega$$

$$V = r\omega$$

7. A wheel with a 15-in diameter rotates at a rate of 6 radians per second. What is the linear speed of a point on its rim in feet per minute?

$$r = \frac{15 \text{ in}}{2} ; \omega = \frac{6 \text{ rad}}{\text{s}} ; v = ? \frac{\text{ft}}{\text{min}}$$

$$v = r\omega$$

$$= \frac{15 \text{ in}}{2} \cdot \frac{3 \text{ rad}}{\text{s}} \cdot \frac{1 \text{ ft}}{12 \text{ in}} \cdot \frac{60 \text{ s}}{1 \text{ min}} = 225 \frac{\text{ft}}{\text{min}}$$