4.1 Day 1 — Angles and Their Measure

Wednesday, February 6, 2019 7:58 AM

Degree - symbol $^\circ$

DMS - Degree - Minute - second

System of angular measure, each degree is sub divided into 60 minutes ($'$) each minute is sub divided into 60 seconds ($''$).

Q: How many seconds are in a degree?

60 min = 1 degree

60 secs = 1 min

3600 secs = 1 degree

Convert 37.475° to DMS

$.475^\circ \left(\frac{60'}{1^\circ}\right) = 28.5'$

$.5' \left(\frac{60''}{1'}\right) = 30''$

$37^\circ 28' 30''$

Convert $42^\circ 24' 36''$ to degrees

$42^\circ + \left(\frac{24}{60}\right)^\circ + \left(\frac{36}{3600}\right)^\circ = 42.41^\circ$

Radian: A central angle of a circle has measure 1 radian (rad) if it intercepts

an arc w/ the same length as the radius.

Converting radians to degrees

x = angle measured in radians

$x\left(\frac{180^\circ}{\pi}\right)$ = angle in degrees

ex: a. $\frac{\pi}{8}$ 22.5°

b. $\frac{2\pi}{5}$ 72°

c. $\frac{3\pi}{4}$ 135°

d. 2 $\left(\frac{360}{\pi}\right)^\circ \approx 114.59^\circ$

Convert degrees → radians

θ = angle measured in degrees

$\theta\left(\frac{\pi}{180}\right)$ = radian measure

a. 110° $\frac{11\pi}{18}$

b. 80° $\frac{4\pi}{9}$

c. π° $\approx .055$ rad

Angular and Linear Velocity

Jessica's truck has wheels 36 in. in diameter. If the wheels are rotating 630 rpm (revolutions per min),

find the truck's speed in miles per hour.

- convert rpm ⇒ mph
  - $\frac{2\pi \text{ rad}}{1 \text{ rev}}$ $\quad \frac{18 \text{ inches}}{1 \text{ rad}}$

$$\frac{630 \text{ rev}}{1 \text{ m/h}} \times \frac{60 \text{ m/h}}{1 \text{ hr}} = \frac{37800 \text{ rev}}{1 \text{ hr}}$$

$$\frac{37800 \text{ rev}}{1 \text{ hr}} \times \frac{2\pi \text{ rad}}{1 \text{ rev}} = \frac{75600\pi \text{ rad}}{1 \text{ hr}}$$

$$\frac{75600\pi \text{ rad}}{1 \text{ hr}} \times \frac{18 \text{ inches}}{1 \text{ rad}} = \frac{1{,}360{,}800\pi \text{ inches}}{1 \text{ hour}} \times \frac{1 \text{ ft}}{12 \text{ inches}}$$

$$\frac{113400\pi \text{ ft}}{1 \text{ hr}} \times \frac{1 \text{ mile}}{5280 \text{ ft}} \approx 67.473 \text{ mph}$$

Circular Arc length

$$S = \theta r$$

S = arc length
θ = angle (radians)
r = radius

what if θ = degrees

$$S = \theta r \cdot \frac{\pi}{180}$$

converting

Example Find the perimeter of 60° slice of pizza w/ a 7in radius.

$P = 7 + 7 + \frac{7\pi}{3} = \left(14 + \frac{7\pi}{3}\right)$ inches

or 21.3 inches approx.