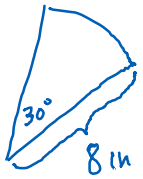
Lecture 7

Friday, May 17, 2024 9:26 AM



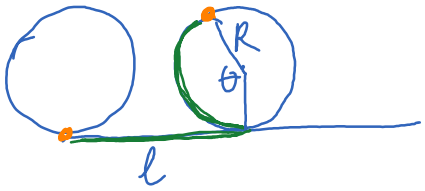
What is the area of this piece of pizza?

$30° = \frac{\pi}{6}$

$\text{Area} = \frac{1}{2}\left(\frac{\pi}{6}\right)8^2 = \frac{64\pi}{12} \approx \ldots \ (\text{in}^2)$

Angular speed = w = number of radians in a unit of time

Linear speed = distance travelled in a unit of time



$\ell = R\theta$

Therefore, $v = Rw$

(v: linear speed; w: angular speed)

Ex A car is running. It is calculated that the wheel rotates two and a half rounds each second. What is the speed of the car?

2.5 rounds = $(2.5)2\pi$ radians

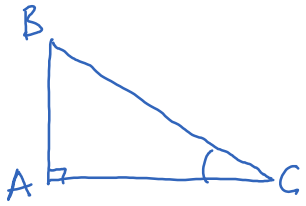
$= 5\pi$ radians

Suppose the radius of the wheel is 15 in. Then the (linear) speed of the car is $v = 15(5\pi) = 75\pi$ (in/s) $\approx$ 13 miles/hour.

Trigonometry in right triangles

trigonometry

triangle measure



$$\sin C = \frac{\text{opposite}}{\text{hypothenuse}} = \frac{AB}{BC}$$

$$\cos C = \frac{\text{adjacent}}{\text{hypothenuse}} = \frac{AC}{BC}$$

$$\tan C = \frac{\text{opposite}}{\text{adjacent}} = \frac{AB}{AC}$$

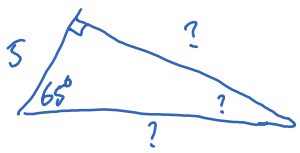
Notice: $\sin C = \cos B$ $\quad \cot C = \tan B$

$\cos C = \sin B$ $\quad \sec C = \csc B$

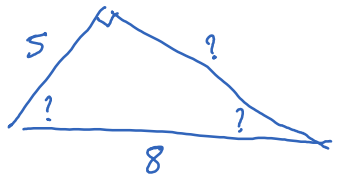
$\tan C = \cot B$ $\quad \csc C = \sec B$

To solve a triangle is to find all the side lengths and the angles of that circle.

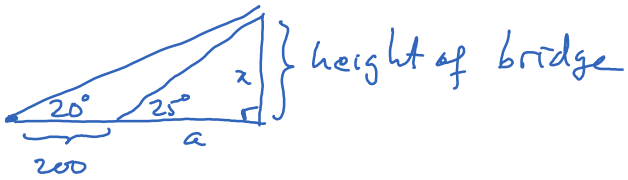
Ex

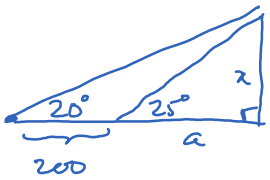


Ex



Ex How to measure the height of a bridge?





$$\tan 20^\circ = \frac{x}{200+a}$$

$$\tan 25^\circ = \frac{x}{a}$$

$$\frac{\tan 20^\circ}{\tan 25^\circ} = \frac{a}{200+a}$$

$$\rightsquigarrow (200+a)\tan 20^\circ = a \tan 25^\circ$$

$$\rightsquigarrow a = \frac{200 \tan 20^\circ}{\tan 25^\circ - \tan 20^\circ} \approx 711$$

Then the height of the bridge is $x = a \tan 25^\circ \approx 332$ (feet)