WebAssign access is thru D2L to get registered.

After you're registered, you can don't need the D2L. Just go to webassign.net and log in directly.

D2L will be our "home base" for e-mail, announcements.

But you should be able to do EVERYTHING ELSE with

webassign.net

and

harryzaims.com

https://harryzaims.com/

Remind me to hit "Record!"

If you're doing math 'right,' you'll always feel kinda dumb.

You won't instantly grasp everything.

Then when you DO figure something out, you'll be mad it took so long.

Radian Measure:

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

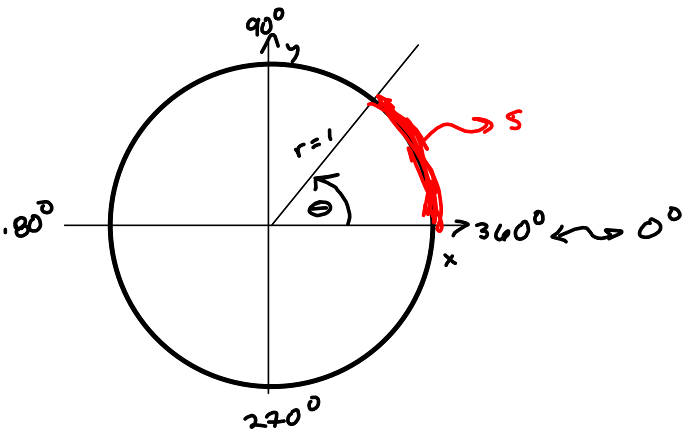
θ = Angle

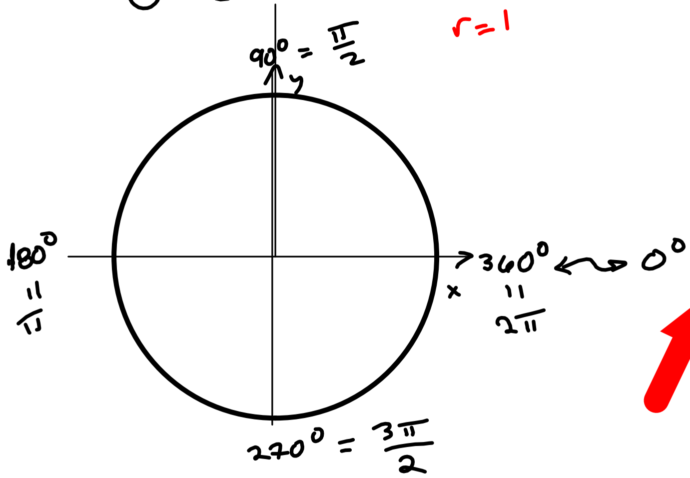
s = arc length

r = radius

Use radius = 1, so

$\theta = s$





Arc Length for going full circle is circumference of the circle:

$C = 2\pi r = 2\pi$

$\theta = \frac{s}{r} \Rightarrow s = r\theta$, where θ is in radians

Converting DEGREES to RADIANS:

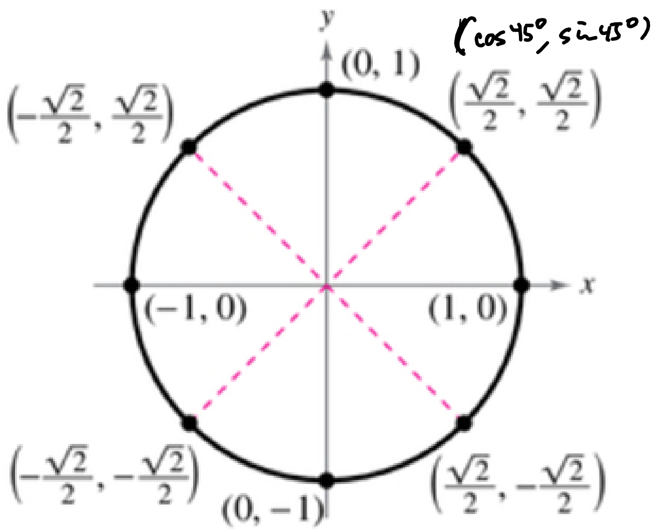
$\frac{2\pi}{360^\circ} = \frac{\pi}{180^\circ} \frac{\text{radians}}{\text{degree}}$

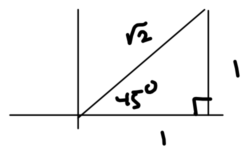
$(60^\circ)\left(\frac{\pi \text{ radians}}{180^\circ}\right) = \frac{60\pi}{180}\text{radians} = \frac{\pi}{3}\text{ radians}$

& we Drop the word radians.

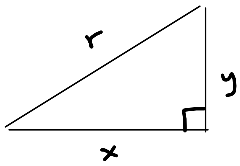
1.27 is automatically radians (assumed).

An alternate approach to Section 1.2, rather than a ton of rote memory.

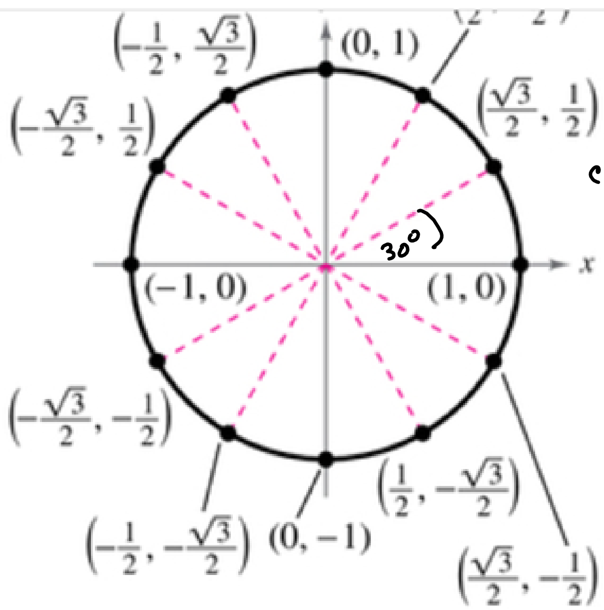




$$\sin 45^\circ = \frac{y}{r} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

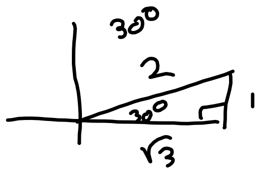


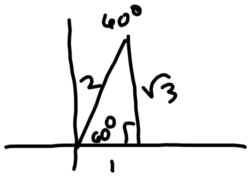
$$\cos 45^\circ = \frac{x}{r} = \frac{1}{\sqrt{2}}$$

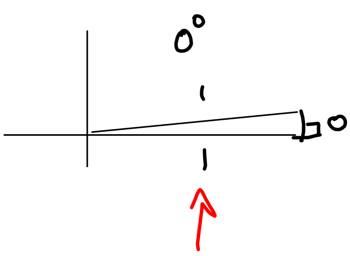


$$\cos 30^\circ = \cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$$

$$\sin 30^\circ = \frac{1}{2}$$

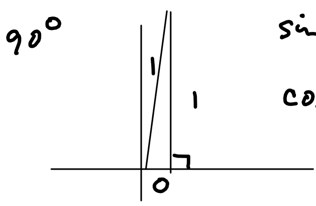






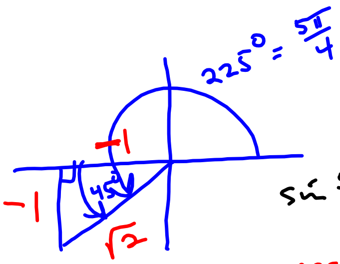
$$\sin 0^\circ = \frac{0}{1} = 0$$

$$\cos 0^\circ = \frac{1}{1} = 1$$



$$\sin 90^\circ = \frac{1}{1} = 1$$

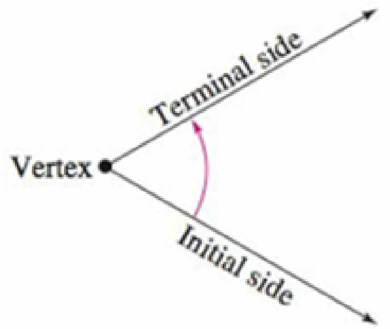
$$\cos 90^\circ = \frac{0}{1} = 0$$



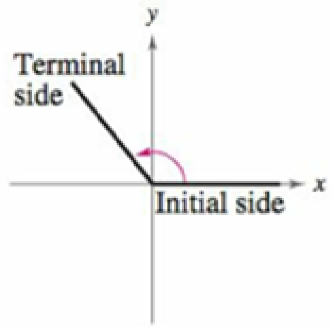
$$\sin\frac{5\pi}{4} = -\frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = -\frac{\sqrt{2}}{2}$$

$$\cos\frac{5\pi}{4} = -\frac{1}{\sqrt{2}} = -\frac{\sqrt{2}}{2}$$

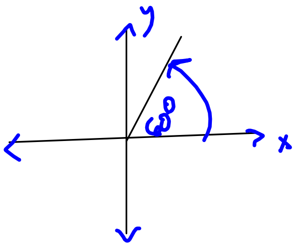
Section 1.1 - Radian and Degree Measure



Angle
Figure 1.1



Angle in standard position
Figure 1.2



360° to go full circle.

RADIAN MEASURE

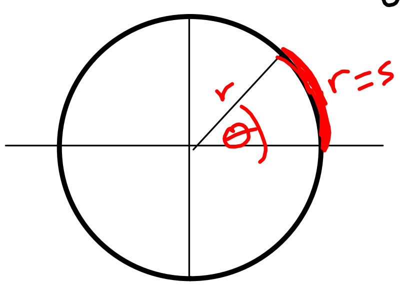
One Radian is the angle corresponding to an arc length (s) equal to the radius r

Radian measure is the ratio of arc length to radius

Theta = θ = Angle in radians = $\frac{s}{r}$

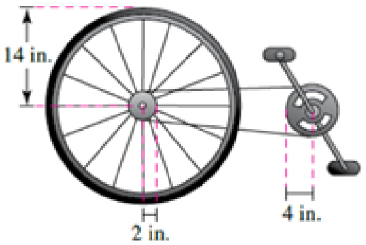
So when $s = r$, $\theta = 1$

$\theta = \frac{r}{r} = 1$ radian $\approx 57^\circ$



$\theta = 1$!

The radii of the pedal sprocket, the wheel sprocket, and the wheel of the bicycle in the figure are 4 inches, 2 inches, and 14 inches, respectively. A cyclist pedals at a rate of 1 revolution per second.



Dad: 3-foot-long stride
Son: 1-foot-long stride

$\left(\cancel{\text{Dad's one step}}\right)\left(\frac{3 \text{ boy steps}}{1\ \cancel{\text{dad step}}}\right)$

$= 3$ boy steps!

(a) Find the speed of the bicycle in feet per second and miles per hour.

$$\underbrace{\left(\frac{1 \text{ rev front}}{1 \text{ sec}}\right)\left(\frac{4 \text{ rev Rear}}{2 \text{ rev front}}\right)}_{\text{revs/sec on rear}}$$

$$\left(\frac{1 \text{ rev front}}{1 \text{ sec}}\right)\left(\frac{4 \text{ rev Rear}}{2 \text{ rev front}}\right)\left(\frac{2\pi \text{ (radians)}}{1 \text{ rev rear}}\right)$$

$\frac{\text{Radians}}{\text{sec}}$ on rear

$$\left(\frac{1 \text{ rev front}}{1 \text{ sec}}\right)\left(\frac{4 \text{ rev Rear}}{2 \text{ rev front}}\right)\left(\frac{2\pi \text{ (radians)}}{1 \text{ rev rear}}\right)\left(14 \text{ in radius}\right)$$

$\frac{\text{Distance}}{\text{sec}}$ on the ground. $\left(\frac{\text{inches}}{\text{sec}}\right)$

$$\left(\frac{1\ \cancel{\text{rev front}}}{1 \text{ sec}}\right)\left(\frac{4\ \cancel{\text{rev Rear}}}{2\ \cancel{\text{rev front}}}\right)\left(\frac{2\pi \text{ (radians)}}{\cancel{1 \text{ rev rear}}}\right)\left(14\ \cancel{\text{in}} \text{ (radius)}\right)\left(\frac{1 \text{ foot}}{12\ \cancel{\text{inches}}}\right)$$

$$= \frac{(\cancel{2})(\cancel{2}\pi)(14)}{\cancel{12}_{3}} = \frac{14\pi}{3}\ \frac{\text{ft}}{\text{sec}}$$

$60 \text{ mph} = 88 \frac{\text{ft}}{\text{sec}}$

$$\left(\frac{14\pi}{3}\ \frac{\text{ft}}{\text{sec}}\right)\left(\frac{60 \text{ mph}}{88\ \frac{\text{ft}}{\text{sec}}}\right) = \frac{14(15)\pi}{(3)(22)}\ \frac{\text{mi}}{\text{hr}} = \frac{7(15)\pi}{3(11)} \text{ mph}$$

$\frac{30}{44} = \frac{15}{22}$

$$= \frac{105\pi}{33} \text{ mph} = \boxed{\frac{35\pi}{11}\ \frac{\text{mi}}{\text{hr}}}$$

(b) Use your result from part (a) to write a function for the distance d (in miles) a cyclist travels in terms of the number n of revolutions of the pedal sprocket.

$d =$ ✗ $\frac{7\pi n}{7920}$ mi ugh

(c) Write a function for the distance d (in miles) a cyclist travels in terms of the time t (in seconds).

$d =$ ✗ $\frac{7\pi t}{7920}$ mi OK

(c) $D = \text{rate} \cdot \text{time}$

$$= \left(\frac{35\pi}{11}\ \frac{\text{miles}}{\text{hr}}\right)\left(\frac{1 \text{ hr}}{3600 \text{ sec}}\right)$$

(b)

An **angle** is determined by rotating a ray (half-line) about its endpoint. The starting position of the ray is the **initial side** of the angle, and the position after rotation is the **terminal side,** as shown in Figure 1.1. The endpoint of the ray is the **vertex** of the angle. This perception of an angle fits a coordinate system in which the origin is the vertex and the initial side coincides with the positive x-axis. Such an angle is in **standard position,** as shown in Figure 1.2. Counterclockwise rotation generates **positive angles** and clockwise rotation generates **negative angles,** as shown in Figure 1.3. Angles are labeled with Greek letters such as

α (alpha), β (beta), and θ (theta)

γ gamma

δ delta

ε epsilon

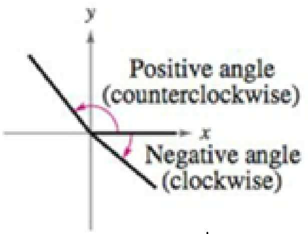
ω omega

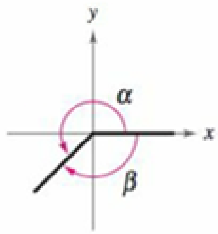
ξ xi

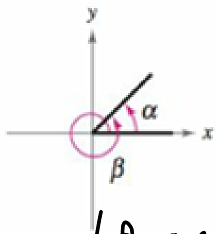
as well as uppercase letters such as

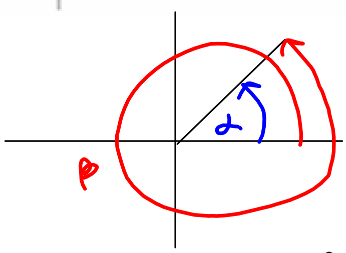
A, B, and C.

In Figure 1.4, note that angles α and β have the same initial and terminal sides. Such angles are **coterminal.**









α & β are coterminal

They end at the ray.

$2\pi + \frac{\pi}{4} = \frac{(8+1)\pi}{4}$

$\alpha = 45^\circ = \frac{\pi}{4}$

$\beta = 360^\circ + 45^\circ = 405^\circ = \frac{9\pi}{4}$

No symbol after? Means "Radians."

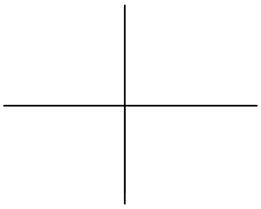
Definition of Radian

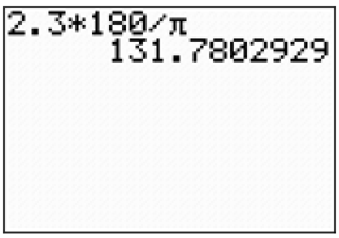
One **radian** is the measure of a central angle θ that intercepts an arc s equal in length to the radius r of the circle. See Figure 1.5. Algebraically, this means that

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

where θ is measured in radians. (Note that $\theta = 1$ when $s = r$.)

Buehler? Buehler?





= -vs- ≈

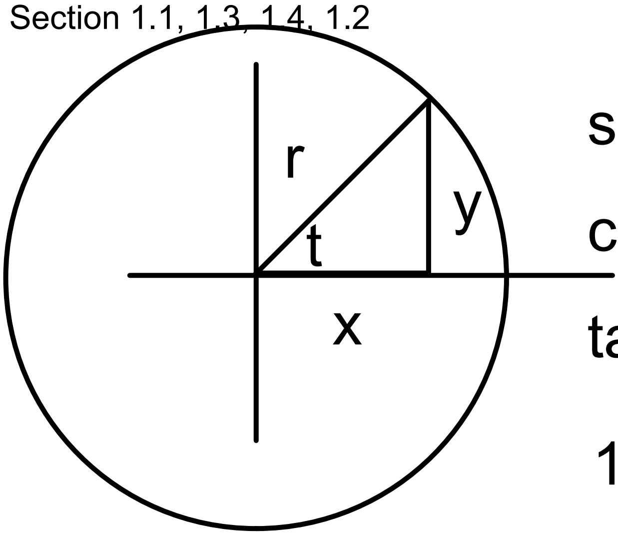
I'm a stickler!

My name is Steve Mills (Harry)

WebAssign!!!!

Did you find the WebAssign OK?

Section 1.1, 1.3, 1.4, 1.2



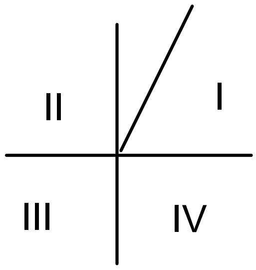
sin(t) = y/r

cos(t) = x/r

tan(t) = y/x

12-point unit circle is...

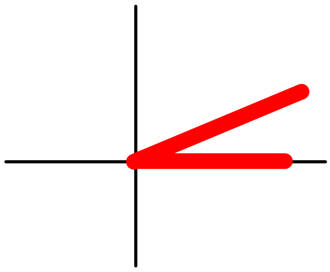
Bleah!



Heuristic learning is when you learn in the context of problem-solving.

Resources on harryzaims.com

When doing homework, have 2 harryzaims.com windows open, one for the notes to locate the exercise and the other for video. IF YOU NEED THAT KIND OF HELP ON AN EXERCISE.



s = rt

s = arc length

r = radius

t = angle in radians

t = s/r

t = s when radius = 1.

Circumference of a circle of radius r is 2 pi r

When r = 1, then circumference = 2 pi

and the number of RADIANS is ALSO 2 pi !!!

That's where s = rt comes from

and s = t, when r = 1, which is really cool!

One full revolution is 360 degrees

One full revolution is 2 pi radians

To convert radians to degrees, multiply by 180/pi

to do the reverse, multiply by pi/180 !

You can get dain bramage from the Cengage guy's talk about the bicycle and converting from rpm to linear speed.

Notes: https://harryzaims.com/122/122-fall-22/notes/

Lecture Recordings: https://harryzaims.com/122/122-fall-22/lectures/

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