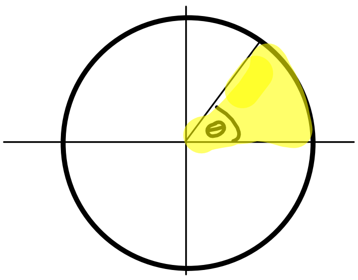
Review:

Arc Length $s = r\theta$, when θ is in radians

s = arc length, r = radius, θ = angle in radians. $2\pi r$

Area



$A = \frac{1}{2} r^2 \theta$

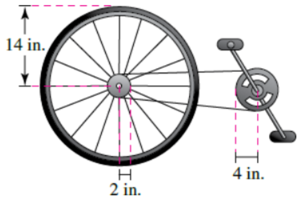
πr^2

$\frac{1}{2}(2\pi) r^2$

Angular Velocity $\frac{\Delta\theta}{\Delta t}$

24. 0/6 points LarTrig10 1.1.068. [38815

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, respectiv
A cyclist pedals at a rate of 1 revolution per second.



1 step / second — Dad

2 steps / second — Son

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

$\frac{14\pi}{3}$ feet per second

$\frac{35\pi}{11}$ mph

(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

(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

Compare this function with the function from part (b).

The function from (b) is ---Select--- linear .

The function from (c) is ---Select--- linear .

Rear wheel $r_r = 14$ in

Front Sprocket $r_{sf} = 4$ in

Rear Sprocket $r_{sr} = 2$ in

Both rotate at same rev/sec

Pedal rate: $\frac{1 \text{ rev}}{\text{sec}}$

Want arc length per second in ft/second.

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

This is now in $\frac{\text{Radians}}{\text{sec}}$ on the rear wheel

$$(1)(2)(2\pi) = 4\pi$$

$$\left(4\pi \frac{\text{rad}}{\text{sec}}\right)(14 \text{ in}) = \left(\frac{56\pi \text{ in}}{\text{sec}}\right)\left(\frac{1 \text{ ft}}{12 \text{ in}}\right) = \frac{56\pi}{12} \frac{\text{ft}}{\text{sec}} = \frac{14\pi}{3} \frac{\text{ft}}{\text{sec}} \quad (a)$$

$\frac{\theta}{\text{sec}} \cdot r$

$\frac{r\theta}{\text{Sec}}$

14
~~28~~
~~56~~
~~12~~
~~6~~
3

$$\frac{88 \text{ ft}}{1 \text{ sec}} = \frac{60 \text{ mi}}{\text{hr}}$$

$$\left(\frac{14\pi}{3} \frac{\text{ft}}{\text{sec}}\right)\left(\frac{60 \text{ mi/hr}}{88 \text{ ft/sec}}\right)$$

PART A

$\left(\frac{15}{22}\right)\left(\frac{14\pi}{3}\right) = \boxed{\frac{35\pi}{11}\ \frac{mi}{hr}}$

Distance as a function of revolutions of the pedal

Want to know how far we go in ONE revolution

$$(1 \text{ rev front})\left(\frac{2 \text{ revs back}}{1 \text{ rev front}}\right)\left(2\pi(14\text{in})\left(\frac{1\text{ft}}{12\text{in}}\right)\right)\left(\frac{1 \text{ mile}}{5280 \text{ ft}}\right) = \frac{7\pi}{7920}$$

$$\frac{(4\pi)(14)}{(12)(5280)} = \frac{56\pi}{63360} = \frac{14\pi}{15840}$$

$\boxed{\frac{7\pi}{7920}\ \frac{mi}{rev}}$ rate

52800 + 10560 = 63360

5280 · 2 = 10560

$\frac{56\pi}{63360}$

Linear in n!

$\boxed{\frac{7\pi}{7920} n = \text{Miles}}$ Answer to b.

n = # of revs on front sprocket

$$\left(\frac{7\pi}{7920}\ \frac{mi}{rev}\right)(n \text{ rev})$$

c) $\left(\frac{7\pi}{7920}\ \frac{mi}{\text{rev front}}\right)\left(\frac{1 \text{ rev front}}{1 \text{ sec}}\right) t \text{ sec} = \frac{7\pi}{7920} t$

t = time in seconds

§1.1
#12 B

$-\frac{7\pi}{3}$ is coterminal with

"in" or "an element of"

$-\frac{7\pi}{3} + 2n\pi \quad \forall \; n \in \mathbb{N} \longleftarrow \{1, 2, 3, \ldots\} =$ natural/counting.

$\forall$: For all, for each, for every

$-\frac{7\pi}{3} + 2\pi$

$= \frac{-7\pi + 6\pi}{3} = \frac{-\pi}{3}$

$-\frac{7\pi}{3} - \frac{6\pi}{3} = \frac{-13\pi}{3}$

$\frac{-7\pi}{3} + \frac{12\pi}{3} = \frac{5\pi}{3}$

These are good b/c they're between -2π & $+2\pi$

34. 0/2 points

Convert each degree measure to radian measure as a multiple of π. Do not use a calculator.

(a) $-60°$

$-\frac{\pi}{3}$ radians

(b) $108°$

$\frac{3\pi}{5}$ radians

$2\pi = 360° \longrightarrow$

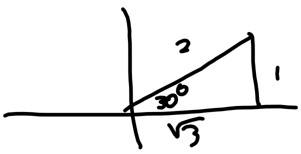
$\frac{2\pi}{360°} = \frac{\pi}{180°} = 1$

$-60° = (-60°)\left(\frac{\pi}{180°}\right) = -\frac{\pi}{3}$

$(108°)\left(\frac{\pi}{180°}\right) = \frac{3\pi}{5}$

$$\sin\left(\frac{25\pi}{6}\right) = \sin\left(\frac{24\pi}{6} + \frac{\pi}{6}\right) = \sin\left(4\pi + \frac{\pi}{6}\right) = \sin\left(\frac{\pi}{6}\right) \boxed{= \frac{1}{2}}$$

$\frac{25\pi}{6}$ is coterminal w/ an angle between 0 & 2π



Modular Arithmetic

$$\frac{25}{6} = 4 + \frac{1}{6} = \frac{24}{6} + \frac{1}{6}$$

so $\frac{25\pi}{6} \longleftrightarrow \frac{\pi}{6}$

$$\frac{\frac{25\pi}{6}}{2\pi} = \frac{25\pi}{6} \cdot \frac{1}{2\pi} = \frac{25}{12} \text{ revolutions}$$

$= \frac{24}{12} + \frac{1}{12}$ revs

$= 2 + \frac{1}{12}$ rev is coterminal to

"=" $\left(\frac{1}{12} \text{ rev}\right)\left(\frac{2\pi \text{ radians}}{1 \text{ rev}}\right) = \frac{2\pi}{12} = \frac{\pi}{6}$

21. 0/1 points

Find the point (x, y) on the unit circle that corresponds to the real number t.

$t = 4\pi/3$

$(x, y) = \left(\quad \right)$ ✗ $-\frac{1}{2}, -\frac{\sqrt{3}}{2}$

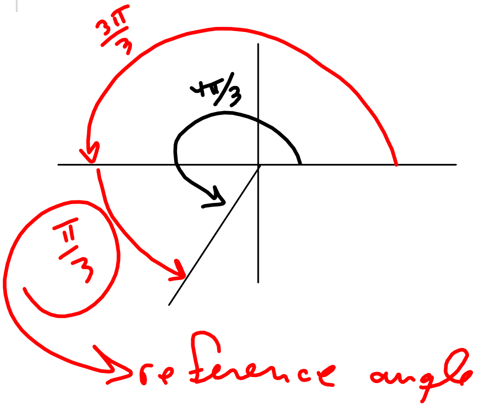
BIG FACT:

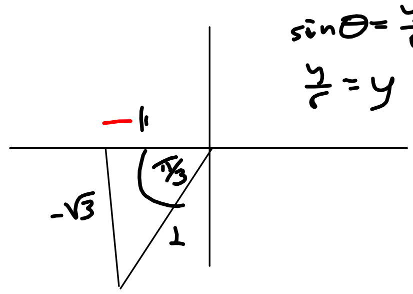
$(x,y) = (\cos\theta, \sin\theta)$

on the unit circle.

$\sin\theta = \frac{y}{r}$ & when $r=1$

$\frac{y}{r} = y$

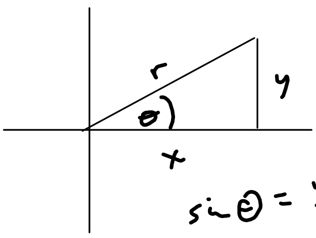




$\cos\left(\frac{4\pi}{3}\right) = -\frac{1}{2}$

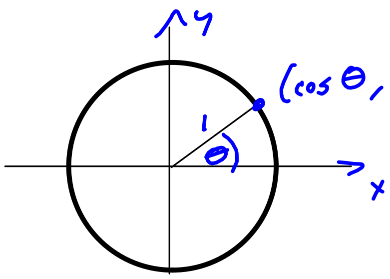
$\sin\left(\frac{4\pi}{3}\right) = -\frac{\sqrt{3}}{2}$

$$\boxed{(x,y) = \left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)}$$



$\sin\theta = \frac{y}{r}$, $\cos\theta = \frac{x}{r}$, $\tan\theta = \frac{y}{x}$

$r=1 \Rightarrow \sin\theta = y$, $\cos\theta = x$, $\tan\theta = \frac{y}{x}$



$(\cos\theta, \sin\theta) = (x,y)$

θ measured counter-clockwise from the positive x-axis.