Today: Odds and ends from 1.1, preferably from student questions.

Pythagorean Theorem (Scarecrow!)

$r = \sqrt{a^2+b^2}$

FORMAT : sqrt(a^2+b^2)

Area of a sector of a circle:

§1.1 #13?

Questions: 1.1 #25,

25. 0/2 points LarTrig10 1.1.503.XP.MI. [38

A car is moving at a rate of 58 miles per hour, and the diameter of its wheels is 2.3 feet. (Round your answers to three decimal places.)

(a) Find the number of revolutions per minute the wheels are rotating.

✗ 706.371 revolutions per minute

(b) Find the angular speed of the wheels in radians per minute.

✗ 4438.261 radians per minute

27 in my notes & videos.

$\frac{58 \text{ miles}}{\text{hr}}$

(a) $s = r\theta$ Distance

Rate $\frac{s}{t} = \frac{r\theta}{t} = \frac{58 \text{ mi}}{\text{hr}}$

WANT $\frac{\text{rev}}{\text{min}}$

Diameter $= 2.3$ ft $\Longrightarrow r = \frac{2.3}{2}$

$\left(\frac{58 \text{ mi}}{\text{hr}}\right)\left(\frac{1 \text{ hr}}{60 \text{ min}}\right)$

$58 \text{ mi} = r\theta = \frac{2.3}{2}\theta \longrightarrow$

$\frac{(58)(2)}{2.3} = \theta$

$\left(\frac{58 \text{ mi}}{\text{hr}}\right)$

$\left(\frac{(58 \text{ mi})(2)}{2.3 \text{ ft}}\right)\left(\frac{5280 \text{ ft}}{\text{mi}}\right) = \theta$

$\theta \cdot \frac{1 \text{ rev}}{2\pi}$

So $\frac{(58)(2)(5280)}{2.3}$ = RADIANS

$\frac{\frac{(58)(2)(5280)}{2.3}}{\text{hr}}$ is the rate in $\frac{\text{RADIANS}}{\text{hr}}$

We want $\frac{\text{RADIANS}}{\text{min}}$, so $\left(\frac{(58)(2)(5280)}{2.3}\right)\left(\frac{\text{rev}}{\text{hr}}\right)\left(\frac{1 \text{ hr}}{60 \text{ min}}\right)\frac{\text{RADIANS}}{\text{min}}$

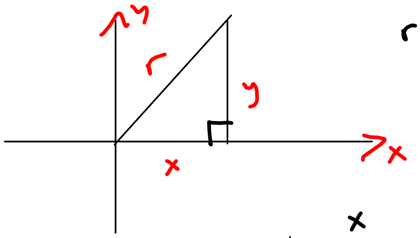
$\approx \boxed{4438.260870 \ \frac{\text{RADIANS}}{\text{MIN}} \text{ is part (b)}}$ $\approx \boxed{4438.261 \ \frac{\text{RADIANS}}{\text{MIN}} \text{ FINAL ANS}}$

(a) $\left(4438.260870 \frac{\text{RADIANS}}{\text{MIN}}\right)\left(\frac{1 \text{ rev}}{2\pi \text{ RADIANS}}\right) \approx 706.3711561$

FINAL ANS

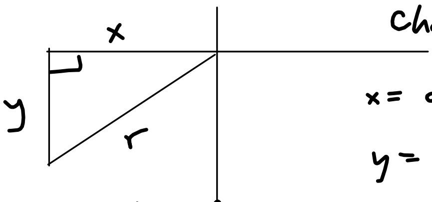
$\approx \boxed{706.371 \ \frac{\text{rev}}{\text{min}}}$

Pythagorean Theorem (Scarecrow!)



$r^2 = x^2 + y^2$ Wizard of Oz.

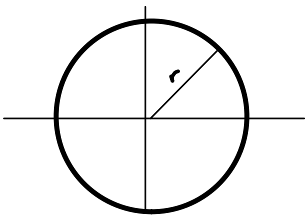
r = radius = hypotenuse
Always positive until
Chapter 6.



x = adjacent side = Horizontal
y = opposite side = vertical

Always drop a perpendicular from hypotenuse to x-axis.

Area of a Sector of a circle goes back to area of the circle



Area of circle is $A = \pi r^2$
What's the radian measure of an angle going all the way around the circle?
What's radian measure of one full revolution.
2π. So
$A = \pi r^2 = \frac{1}{2}(2\pi) r^2 = \frac{1}{2} r^2 (2\pi) = \frac{1}{2} r^2 \theta$,
where $\theta = 2\pi$.

In general, area of a sector swept by an angle θ is $\frac{1}{2} r^2 \theta$, WHERE θ is in RADIANS (NOT DEGREES!)

§ 1.1 #27

$r = 12$ feet = radius in feet

$s = 8$ ft = arc length.

Find θ in radians

$s = r\theta \implies$

$\theta = \frac{s}{r} = \frac{8}{12} = \frac{2}{3}$ Radians

#29 Like #27

$r = 7$ m, $\theta = 135°$. Find s = arc length

$s = r\theta = (7)(135°)\left(\frac{\pi}{180°}\right)$ m $\approx$ 16.49336143

$\approx \boxed{16.49 \text{ m}}$ to 2 places.

#31 Convert -3.3π to degrees

~~$\left(-3.3\pi \text{ Radians}\right)\left(\frac{180^\circ}{2\pi \text{ Radians}}\right) = \frac{(-3.3)(180^\circ)}{2} = (-90)(3.3)^\circ$~~ NO

$= -$

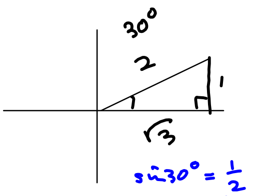
No. π radians, Steve, not 2π radians

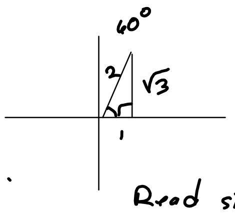
No

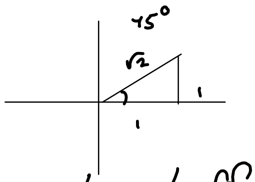
Re-do $(-3.3\pi)\left(\frac{180^\circ}{\pi}\right) \approx \boxed{-594^\circ}$

No. This is exact!
so "=" is correct.

Section 1.2 Stuff

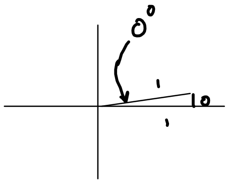


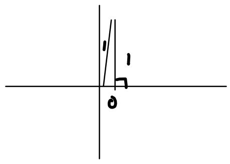




$\sin 30° = \frac{1}{2}$
$\cos 30° = \frac{\sqrt{3}}{2}$

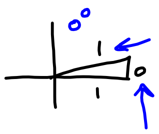
Read sine, cosine, tangent off of these.



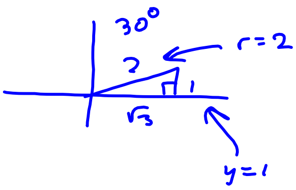


1.2 says $r = 1$ & $\sin(t) = y$, $\cos(t) = x$
& then has you memorize a ton.

	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{4}$
$\sin(t)$	$\frac{0}{1} = 0$	$\frac{\sqrt{3}}{2}$		



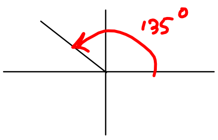
$\left(\frac{\pi}{6}\right)\left(\frac{180°}{\pi}\right) = 30°$

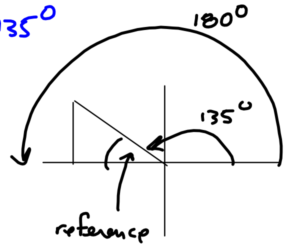


$\sin(30°) = \frac{1}{2}$

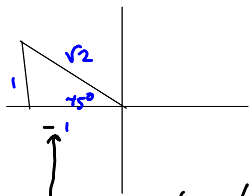
$\cos(30°) = \frac{x}{r} = \frac{\sqrt{3}}{2}$

$t = \left(\frac{3\pi}{4}\right)\left(\frac{180°}{\pi}\right) = 135°$





reference angle
$180° - 135° = 45°$



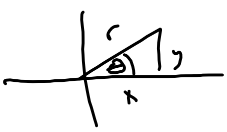
x is negative!

$\sin(135°) = \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$

ok 4 me

WebAssign doesn't want radicals in the denominator, so we rationalize $\frac{1}{\sqrt{2}}$

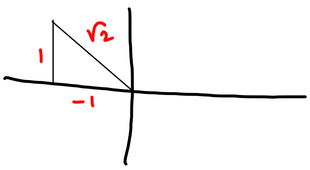
$\cos(135°) = \frac{x}{r} = -\frac{1}{\sqrt{2}} = -\frac{\sqrt{2}}{2}$



$\tan\theta = \frac{y}{x}$ = slope of the hypotenuse!

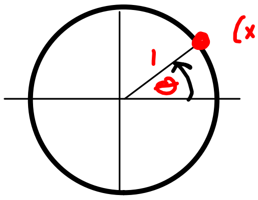
$\tan(135°) = \frac{y}{x} = \frac{1}{-1} = -1 = \tan(135°) = \tan\left(\frac{3\pi}{4}\right)$

"π radians version of 135°"



It is important to know that

$(x,y) = (\cos\theta, \sin\theta)$ for (x,y) on the unit circle



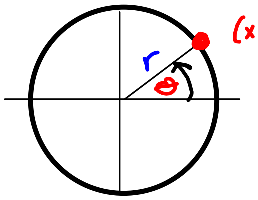
$(x,y) = (\cos\theta, \sin\theta)$

Note: on the unit circle,

$s = r\theta = \theta$, so arc length & radian measure of the angle are identical.

It is important to know that, in general,

$(x,y) = (r\cos\theta, r\sin\theta)$ for (x,y) on the



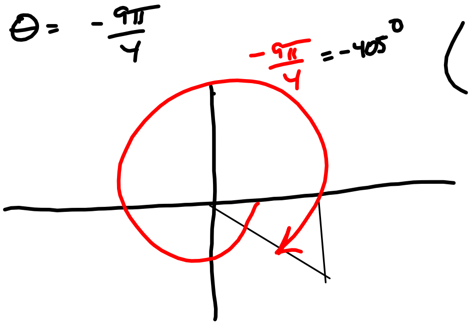
$(x,y) = (r\cos\theta, r\sin\theta)$, from

$\cos\theta = \frac{x}{r} \Rightarrow x = r\cos\theta$

$\sin\theta = \frac{y}{r} \Rightarrow y = r\sin\theta$

§ 1.1 # 12

$\theta = -\frac{9\pi}{4}$

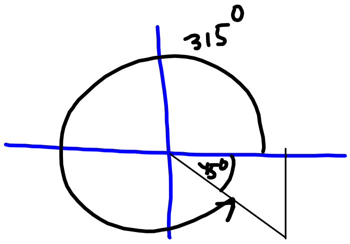


$\left(-\frac{9\pi}{4}\right)\left(\frac{180^0}{\pi}\right) = -405^0$

$-\frac{9\pi}{4} + (2\pi)\left(\frac{4}{4}\right) = -\frac{\pi}{4}$

$-\frac{9\pi}{4} - (2\pi)\left(\frac{4}{4}\right) = -\frac{17\pi}{4}$

Both negative. want one that's positive:



$360^0 - 45^0 = 315^0$

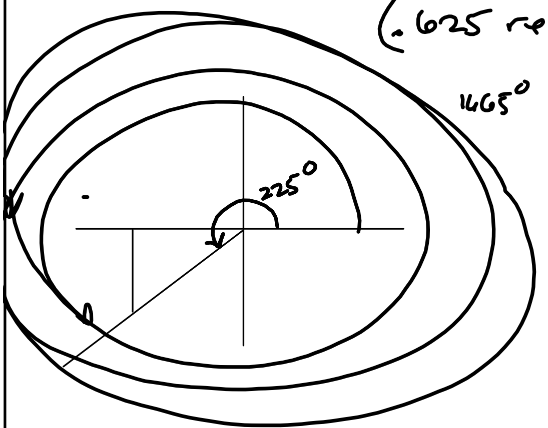
$\left(-\frac{9\pi}{4}\right)\left(\frac{180^0}{\pi}\right) = -405^0$

$-\frac{405}{360} = -1.125$, so 1 time around + .125 times around

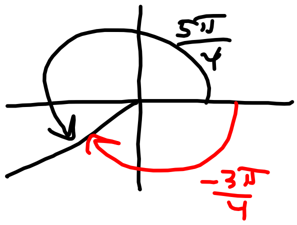
$\left(-\frac{37\pi}{4}\right)\left(\frac{180^0}{\pi}\right) = 1665^0$

$\frac{1665^0}{360^0} = 4.625$ revs

$(.625 \text{ revs})\left(\frac{360^0}{1 \text{ rev}}\right) = 225^0 = \boxed{\frac{5\pi}{4}}$



$\frac{5\pi}{4} - 2\pi = \boxed{-\frac{3\pi}{4}}$



$$\frac{-\frac{9\pi}{4}}{2\pi} = -\frac{9}{8} = -1.125 \quad \text{coterminal with}$$

$$(-.125)(2\pi) = \boxed{-\frac{\pi}{4}}$$

$$(-.125)(2\pi) + 2\pi = \boxed{+\frac{7\pi}{4}}$$

$$-\frac{\pi}{4} + \frac{8\pi}{4} = +\frac{7\pi}{4}$$

We're modding out the full revolutions.

$7 \bmod 5 = 2$ $\qquad$ $22 \bmod 5 = 2$

$\frac{7}{5} = 1 \text{ r } 2$

$5\overline{)22}$ = 4 r 2; $22 - 20 = 2$ (written as 20, 20)

Modular Arithmetic

$$\frac{22}{5} = 4 + \frac{2}{5}$$