1420 Week1 Assignment Mills, Harry

(1) **The ratio of the change in the central angle θ to the elapsed time t is**

$\frac{d\theta}{dt}$ = angular speed.

(2) The arc length s corresponding to a radius r and a central angle θ is

$s = r\theta$, provided θ is in radians.

(3) The area A of a sector of a circle with radius r and central angle θ (in radians) is

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

(4) Two angles coterminal with $\frac{2\pi}{3}$ are

$\frac{2\pi}{3} + 2\pi = \frac{2\pi + 6\pi}{3} = \boxed{\frac{8\pi}{3} = \theta_1}$ and

$\frac{2\pi}{3} - 2\pi = \frac{2\pi - 6\pi}{3} = \boxed{-\frac{4\pi}{3} = \theta_2}$

(5) The complement of $\theta = \frac{\pi}{3}$ is $\boxed{\frac{\pi}{6}}$ b/c $\frac{\pi}{2} - \frac{\pi}{3} = \frac{(3-2)\pi}{6} = \frac{\pi}{6}$

" " " $\theta = \frac{3\pi}{4}$ $\boxed{\text{DNE}}$.

The supplement of $\theta = \frac{\pi}{6}$ is $\pi - \frac{\pi}{6} = \boxed{\frac{5\pi}{6}}$.

" " " " " $\frac{3\pi}{4}$ is $\pi - \frac{3\pi}{4} = \boxed{\frac{\pi}{4}}$

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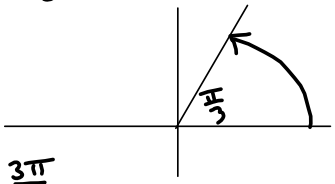
(6) we sketch & state the quadrant of each angle:

(a) $\theta = \frac{\pi}{3}$



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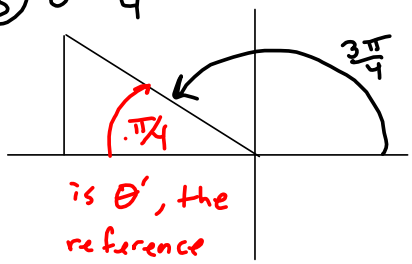
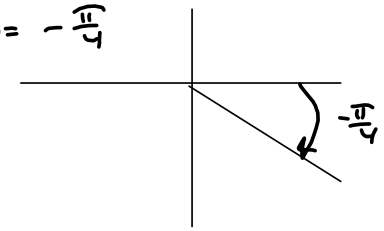
(b) $\theta = \frac{3\pi}{4}$



QII

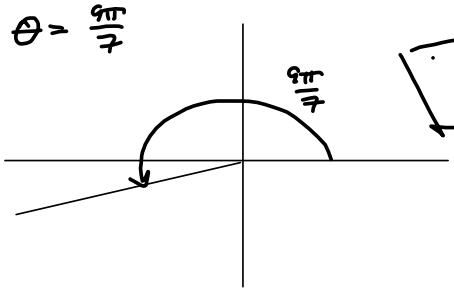
is θ', the reference angle.

(c) $\theta = -\frac{\pi}{4}$



QIV

(d) $\theta = \frac{9\pi}{7}$



QIII

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(7)

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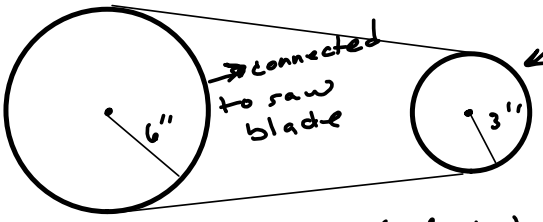

(a) We find angular speed (velocity) in radians per minute of each per minute powered pulley: $\left(\frac{1000 \text{ rev}}{\text{min}}\right)\left(\frac{2\pi \text{ radians}}{\text{min}}\right) = \boxed{2000\pi \frac{\text{radians}}{\text{min}}}$

$\approx 6283.185308 \frac{\text{radians}}{\text{min}}$

saw pulley: $\left(\frac{1000 \text{ rev. powered wheel}}{\text{min}}\right)\left(\frac{3 \text{ revs saw}}{6 \text{ revs power}}\right)\left(\frac{2\pi \text{ rad}}{\text{rev}}\right)$

$= \boxed{1000\pi \frac{\text{radians}}{\text{min}}}$

(b) Revolutions/min of saw is $\left(\frac{1000 \text{ revs power}}{\text{min}}\right)\left(\frac{3 \text{ revs saw}}{6 \text{ .. power}}\right)$

$= \boxed{500 \text{ rpm}}$

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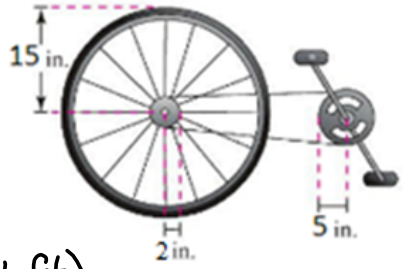
8. The radii of the pedal sprocket, wheel sprocket, and the wheel of the bicycle i the figure are 5", 2", and 15", respectively.



If a cyclist is pedaling at a rate of 1.4 revolutions per second, ..,

(a) The speed of the bicycle in ft/sec is

$$\left(\frac{1.4 \text{ revs front}}{\text{sec}}\right)\left(\frac{5 \text{ revs rear}}{2 \text{ revs front}}\right)\left(\frac{2\pi \text{ radians}}{1 \text{ rev}}\right)(15 \text{ in})\left(\frac{1 \text{ ft}}{12 \text{ in}}\right)$$

$$= \left(\frac{14}{10}\right)\left(\frac{5}{2}\right)(2\pi)(15)\left(\frac{1}{12}\right)\frac{\text{ft}}{\text{sec}} = \boxed{\frac{35\pi}{4}\ \frac{\text{ft}}{\text{s}}} \approx 27.48893572$$

$$\left(\frac{\cancel{14}^{7}}{\cancel{10}_{\cancel{2}_{1}}}\right)\left(\frac{\cancel{5}^{1}}{\cancel{2}_{1}}\right)\left(\cancel{2}^{1}\pi\right)\left(\frac{\cancel{15}^{5}}{\cancel{12}_{4}}\right) \text{ (scratch)}$$

$$\approx \boxed{27.5\ \frac{\text{ft}}{\text{s}}}$$

(b) The above is $\left(\frac{35\pi}{4}\ \frac{\text{ft}}{\text{se}}\right)\left(\frac{1 \text{ mi}}{5280 \text{ ft}}\right)\left(\frac{3600 \text{ sec}}{1 \text{ hr}}\right) \approx 18.74245617$

$$\approx \boxed{18.7\ \frac{\text{mi.}}{\text{hr}}}$$

Reference: 1 radian is about 57.29577950° .

Looks like 60° when just eyeballing it.