Short legs. More steps.

Sprocket Size

4-in front

2-in rear

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

$$\left(\frac{2\pi \text{ radians}}{1 \text{ rev rear}}\right)(14 \text{ in})\left(\frac{1 \text{ foot}}{12 \text{ inch}}\right) = \frac{14 \cdot 2 \cdot 2}{12}\pi \frac{\text{ft}}{\text{sec}}$$

(a) $= \boxed{\frac{14\pi}{3} \frac{\text{ft}}{\text{sec}}}$

Shooting for: $\frac{\text{feet}}{\text{sec}}$

Main tool! $\frac{\text{Arc length}}{\text{sec}} = \frac{r\theta}{\text{sec}}$

(b) Miles per hour?

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

$$\left(\frac{14\pi}{3} \frac{\text{ft}}{\text{sec}}\right)\left(\frac{60 \text{ mi/hr}}{88 \text{ ft/sec}}\right) = \frac{35\pi}{11} \frac{\text{mi}}{\text{hr}}$$

$$\left(\frac{14\pi}{3} \frac{\text{ft}}{\text{sec}}\right)\left(\frac{60 \text{ sec}}{1 \text{ min}}\right)\left(\frac{60 \text{ min}}{1 \text{ hr}}\right)\left(\frac{1 \text{ mi}}{5280 \text{ ft}}\right)$$

14pi/3*60/88

NATURAL LANGUAGE

Calculation done on wolframalpha.org

Input

$$14 \times \frac{\pi}{3} \times \frac{60}{88}$$

Result

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

https://www.wolframalpha.com/input?i=14pi%2F3*60%2F88

Distance as a function of the number of revolutions.

We have the rate in ft/s

Distance = rate · time

$\left(\frac{35\pi}{11}\ \frac{mi}{hr}\right)$

$\frac{1\ rev}{sec}$ in part 2.

$(n\ rev)\left(\frac{2\pi\ radians}{1\ rev}\right)(14\ in)\left(\frac{1\ ft}{12\ in}\right)\left(\frac{1\ mi}{5280\ ft}\right)$

n revs front

$\theta \cdot r$

$\frac{(2\pi)(14)}{(12)(5280)}n = (2(14)\pi/12/5280)n$

$\frac{7\pi}{7920}$ BOOK $\frac{7\pi}{15840}$ us

off by factor of 2!

$\frac{7\pi}{7920}n$

We forgot the ratio of revolutions between front and rear!!!

The rear sprocket turns twice for every revolution of the front sprocket!

Multiply by 2 and we get the book answer.

$(n \text{ rev})\left(\frac{2\pi \text{ radians}}{1 \text{ rev}}\right)(14 \text{ in})\ 12 \text{ in}\left)\left(\frac{1 \text{ mi}}{5280 \text{ ft}}\right)\right.$

$(n \text{ rev front})\left(\frac{2 \text{ rev rear}}{1 \text{ rev front}}\right)\left(\frac{2\pi \text{ radians}}{1 \text{ rev rear}}\right)(14 \text{ in})\left(\frac{1 \text{ ft}}{12 \text{ in}}\right)\left(\frac{1 \text{ mi}}{5280 \text{ ft}}\right)$

The missing factor of 2.

$\frac{\pi}{3}$ complement & supplement.

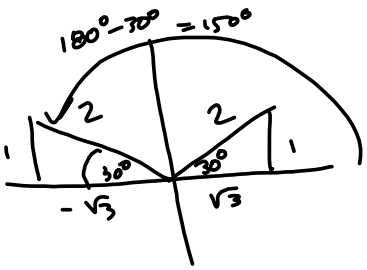
must be between $0°$ & $90°$ for complement.
0 & $\frac{\pi}{2}$

" " " $0°$ & $180°$ " supplement.
0 & π

Comp:
$$\frac{\pi}{2} - \frac{\pi}{3} = \frac{3\pi - 2\pi}{6} = \frac{\pi}{6}$$

Supp:
$$\pi - \frac{\pi}{3} = \frac{3\pi - \pi}{3} = \frac{2\pi}{3}$$

$\sin(x) = \frac{1}{2}$



$c^2 = a^2 + b^2$

2

$c^2 - a^2 = b^2$

$2^2 - 1^2 = b^2$

$4 - 1 = 3 = b^2$

$\pm\sqrt{3} = b.$

we want + to the right

" " − " " left

$x = 30^\circ, 150^\circ$

$\frac{\pi}{6}, \frac{5\pi}{6}$

$(150^\circ)\left(\frac{\pi}{180^\circ}\right) = \frac{5\pi}{6}$