Unit #4 Lesson #3: Linear + Angular Speed

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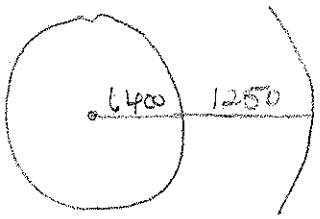
93. a) $\theta = 1\frac{1}{2}(2\pi) = 3\pi$ $\quad 540^\circ \approx 9.42$ rad

b) $\theta = 2\frac{1}{2}(2\pi) = 5\pi$ $\quad 1080^\circ \approx 15.71$ rad

c) $\theta = 3\frac{1}{2}(2\pi) = 7\pi$ $\quad 1260^\circ \approx 21.99$ rad

94. 

$s = (6400 + 1250)(2\pi) = 2\pi(7650)$
$= 15300\pi$ km

$LS = \frac{15300\pi \text{ km}}{90 \text{ min}} = 534.07$ km/min

95. a) $s = 1.25(2\pi)$
$= 2.5\pi$ ft

1.25

$\frac{40 \text{ miles}}{1 \text{ hr}} \cdot \frac{1 \text{ hr}}{60 \text{ minutes}} \cdot \frac{5280 \text{ ft}}{1 \text{ mile}}$

$= \frac{3520 \text{ ft}}{\text{minute}}$

$AS = \frac{3520 \text{ ft/min}}{2.5\pi \text{ ft}} = 448.18$ rev/min

b) $AS = (448.18 \text{ rev/min})(2\pi) = 2815.99$
2816 rad/min

96. a) $s = 3.75(2\pi)$
$= 7.5\pi$ in

3.75

$AS = (40)(2\pi) = 80\pi$ rad/sec

$\frac{\text{Rev}}{\text{Sec}} = \frac{2400}{60} = 40$ rev/sec

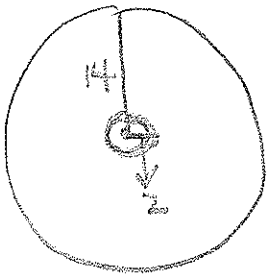
b) $LS = \frac{s}{t} = \frac{(7.5\pi)(2400) \text{ in}}{60 \text{ sec}} = \frac{942.48 \text{ in}}{\text{sec}} = \frac{78.54 \text{ ft}}{\text{sec}}$

97. $LS = \frac{\Delta}{t} = \frac{r(\theta)}{t} = \frac{(1.68)(2\pi)}{\text{rev}} = \frac{3.36\pi \text{ in}}{\text{rev}}$

$= \left(\frac{3.36\pi}{\text{rev}}\right)\left(\frac{360 \text{ rev}}{1 \text{ min}}\right) \text{in} = 1209.6\pi \text{ in/min}$

$= 20.16\pi \text{ in/sec}$

98.



$LS = \frac{4(2\pi)}{1 \text{ rev}} = \frac{8\pi \text{ in}}{\text{rev}} = \frac{2\pi}{3} \text{ in}$

$\text{smaller } \theta = \frac{\Delta}{r} = \frac{8\pi \text{ in}}{2 \text{ in}} = 4\pi$

Arc length of this $\Delta = r\theta$

$= 14(4\pi) = 56\pi \text{ in} =$

a) $\text{Speed} = \frac{\theta}{t} = \frac{56\pi \text{ in}}{\text{sec}} \cdot \frac{1 \text{ ft}}{12 \text{ in}} = \frac{14\pi}{3} \text{ ft/sec}$

b) $\frac{\frac{14\pi}{3} \text{ ft}}{\text{sec}} \cdot \frac{3600 \text{ sec}}{1 \text{ hr}} \cdot \frac{1 \text{ mile}}{5280 \text{ ft}} = 9.996 \text{ mph} \approx 10 \text{ mph}$