Linear and Angular Velocity Word Problems

(1) A bike tire has a diameter of 2.4 feet. If it completed 700 revolutions in 15 minutes, find its angular velocity and linear velocity(in mph).

$v =$
$r =$
$\omega =$
$\theta =$
$t =$

(2) As Jeff Gordon exits turn 4 at the Daytona 500 on February 18th, his tires are turning at a rate of 2100 rpm (revolutions per minute). If his tires are 30 inches in diameter, how fast is he traveling in miles per hour?

(3) Find the velocity, in mph, of a truck whose tires are turning at 10 rps (revolutions per second) and have a radius of 20 inches.

$\omega = \frac{2\pi \text{ rad}}{1 \text{ sec.}} \cdot \frac{1 \text{ rev}}{2\pi \text{ rad}}$ $2\pi \div (2\cdot\pi)$

(4) A car travels at 45 mph. If the tires have a diameter of 32 inches, how fast are the tires turning in revolutions per second?

$v = \frac{45 \text{ mi}}{1 \text{ hr.}} \cdot \frac{5280 \text{ ft}}{1 \text{ mi}} \cdot \frac{1 \text{ hr.}}{3600 \text{ sec}} = 66 \text{ ft/sec.}$

$r = 16 \text{ in.} \cdot \frac{1 \text{ ft}}{12 \text{ in}} = 1.\overline{3} \text{ ft.}$

$v = r \cdot \omega$

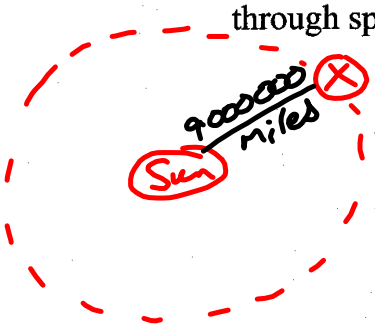
$\frac{66 \text{ ft/sec}}{1.\overline{3}} = \frac{(1.\overline{3} \text{ ft})\omega}{1.\overline{3}}$

$49.5 \text{ rad/sec.} = \omega$

$\omega =$

$\omega = \frac{49.5 \text{ rad}}{1 \text{ sec.}} \cdot \frac{1 \text{ rev}}{(2\pi) \text{ rad}} \approx 7.88 \text{ rps}$

(5) Planet "X" is 9,000,000 miles from the sun. Its year consists of 200 days. How fast is planet "X" moving through space in miles per hour?



(one revolution) $\frac{\theta}{t}$

$v = r \cdot \omega$

$9{,}000{,}000 \text{ mi} \left(\frac{2\pi \text{ rad.}}{200 \text{ days}}\right)$

$\frac{18000000\pi \text{ miles}}{(200 \text{ days}} \cdot \frac{1 \text{ day}}{24 \text{ hrs}}) \approx 11780.97 \text{ mph}$

(6) Planet "M" has a diameter of 8000 miles. How fast is the planet spinning on its axis, in mph, if its day is 16 hours?

1570.80 mph

HW Pg. 356 35-37, 39

① $v \approx 4$ mph

② $v \approx 187.42$ mph

③ $v \approx 71.40$ mph