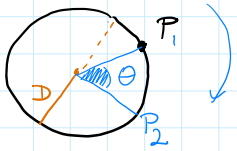
p 218 q6

Short Answer

6. A vehicle has tires that are 75 cm in diameter. A point is marked on the edge of the tire.

a) Determine the measure of the angle through which the point turns every second if the vehicle is travelling at 110 km/h. Give your answer in degrees and in radians, to the nearest tenth.

b) What is the answer in radians if the diameter of the tire is 66 cm? Do you think that tire diameter affects tire life? Explain.



$D = 75\,cm$

$R = \frac{D}{2} = \frac{75}{2}\,cm.$

$v = 110\,km/h = 110\times10^3\,m/h = 110\times10^3\times10^2\,\frac{cm}{h} = 110\times10^5\,cm/h = \frac{110\times10^5\,cm}{60\,min \times 60\,sec}$

$= \frac{110\times10^5}{60\times60}\,cm/s = \frac{110\times10^5}{36\times10^2} = \frac{110}{36}\times10^{5-2} = \frac{110}{36}\times10^3\,cm = \frac{11}{36}\times10^4\,cm/s.$

3055.55... cm/s

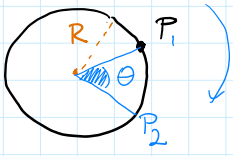
Length of the circle is $2\pi R = 2\pi\cdot\frac{75}{2} = 75\pi$ → 3.1415

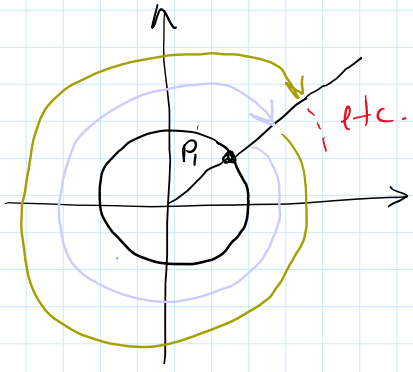
$R = \frac{D}{2}$

235.619 cm.

(*)

in one sec. this moves several full rotations





$v = \frac{11}{36}\times10^4\,\frac{cm}{s}$

in one second the speed make a distance of $\frac{11}{36}\times10^4$ cm.

how many cycles (i.e. full circle lengths) can we fit in this?

$\frac{\text{the dist.}}{\text{the circle length}} = \frac{\frac{11}{36}\times10^4}{2\pi R} = \frac{\frac{11}{36}\times10^4}{75\times\pi} = \frac{11}{36}\times10^4 * \frac{1}{75\,\pi}$

↖ see (*)

full

$= 12.9681$ lengths $= 12$ full rotations $+ 0.9681\ldots$ partial rotation

(calculator)

$12 \times 2\pi$ radians $\quad 12 \times (360^\circ) \quad 12 \times (2\pi R)\,cm \quad 12 \times (75\pi)\,cm$

$?\ cm \quad x\ cm$

$$\Rightarrow \frac{11}{36} \times 10^4\ cm = 12 \times 75\pi\ cm + x\ cm$$

$$x = \frac{11}{36} \times 10^4 - 12.75\pi = \frac{11}{36} \times 10^4 - \frac{12.75 \cdot 36 \cdot \pi}{36}$$ (calculator)

$$= \frac{1}{36}\left[11 \times 10^4 - 32400\pi\right]$$

360° ---- 75π = one full circle length = a rotation

$?^\circ$ .... $\frac{110000 - 32400\pi}{36}$ = partial rotation

$$? = \frac{\overset{10}{\cancel{360}^\circ}}{} \cdot \frac{110000 - 32400\pi}{36_1} \cdot \frac{1}{75\pi} = 348.\overset{\text{tenth}}{5}49973 = 348.5^\circ$$

preceeded by 12 rotations

$360^\circ \times 12 + 348.5 = 4668.5^\circ$

In radians?

$180^\circ \longrightarrow \pi$ rads

$4668.5^\circ \longrightarrow ?$ rads

$$? = \frac{4668.5^\circ \times \pi}{180^\circ} = 81.481\ldots = 81.5\ \text{rads}$$

(calculator) (tenth: rounding)