## Answer on Question #65508, Physics / Mechanics | Relativity

An automobile travelling at 80 km hr–1 has tyres of radius 80 cm. On applying brakes, the car is brought to a stop in 30 complete turns of the tyres. What is the magnitude of the angular acceleration of the wheels? How far does the car move while the brakes are applied?

## Answer:

v= 80 km/h = 22.2 m/s r= 80 cm = 0.8 m

Initial angular velocity of wheels  $\omega_0 = v/r = 22.2 \text{ m/s} / 0.8 \text{ m} = 27.75 \text{ rad/s}$ 

The angular displacement of wheels  $\theta$ = 30 × 2 $\pi$  = 60 $\pi$  radian

Final angular velocity of wheel  $\omega = 0$ 

From equation of rotational motion  $\omega^{2}=\omega^{2}_{0}+2\alpha\times\theta$ 

Finally we get  $0^2 = (27.75)^2 + 2 \times \alpha \times 60\pi$ 

 $\alpha$ = - (27.75)<sup>2</sup> / 120  $\pi$  = -2.03 rad/s<sup>2</sup>

Since they turn 30 rev, the distance will be 30 times the circumference of the tires: d =  $(30 \text{ rev})(\pi \times 0.80 \text{ m}) = 75.4 \text{ m}.$ 

Answer: 27.75 rad/s; -2.03 rad/s<sup>2</sup>; 75.4 m Answer provided by <u>https://www.AssignmentExpert.com</u>