Answer on Question #44615 – Physics - Mechanics | Kinematics | Dynamics

A motorcycle has a velocity of 40 m/s when the brakes are applied to bring it to rest in 3 s. If the road wheels have a radius of 0.45 m determine the number of revolutions made by the wheels in that time.

Solution:

$v = 40\frac{m}{s} - $ initial velocity of the wheels;

$t = 3s - $ deceletarion time;

$r = 0.45\ m - $ radius of the wheel;

$N - $ number of revolutions made by the wheels in deceleration time;

$a - $ deceleration of the wheel;

Initial angular velocity of the wheel:

$$\omega = \frac{v}{r} \quad (1)$$

Rate equation for the wheel:

$$0 = \omega - at$$

$$a = \frac{\omega}{t} \quad (2)$$

Equation of angular motion for the wheel ($2\pi - $complete revolution):

$$2\pi \cdot N = \omega t - \frac{at^2}{2} \quad (3)$$

(2)in (3):

$$2\pi \cdot N = \omega t - \frac{\omega}{t}\frac{t^2}{2} = \omega t - \frac{\omega t}{2} = \frac{\omega t}{2} \quad (4)$$

(1)in (4):

$$2\pi \cdot N = \frac{vt}{2r}$$

$$N = \frac{vt}{4\pi r^2} = \frac{40\frac{m}{s} \cdot 3s}{4 \cdot 3.14 \cdot 0.45\ m} = 21.2$$

Answer: number of revolutions made by the wheels is equal to 21.2.