

Question #57373, Physics / Mechanics | Relativity

a bike accelerates uniformly from rest to a speed of 7.10 m/s over a distance of 35.4 m. determine the acceleration of the bike.

Solution:

Displacement during the uniformly accelerated motion:

$$d = \frac{at^2}{2}; \quad (1)$$

Speed reached during the uniformly accelerated motion (if object started from rest):

$$v = at; \quad (2)$$

Solving (1) and (2) for t^2 :

$$t^2 = \frac{2d}{a}; \quad (3)$$

$$t^2 = \frac{v^2}{a^2}; \quad (4)$$

Combining (3) and (4):

$$\frac{2d}{a} = \frac{v^2}{a^2};$$

$$2d = \frac{v^2}{a};$$

And solving for a :

$$a = \frac{v^2}{2d};$$

$$a = \frac{7.10^2}{2 \times 35.4} = 0.712 \text{ m/s}^2$$

Answer: the bike's acceleration is 0.712 m/s²