Question#18717

Maria is racing her bike down the cobblestone sidewalk. She is riding at a constant velocity of 10.2m/s. Suddenly a group of people step out in front of her. They are 6 meters in front and she needs to stop. The coefficient of friction between the ground and Maria's tire is 0.35. The mass of her + her bike is 130kg. She slams the brakes with 800N of force. Will she be able to stop in time? Or will she run over the people?

Solution:

Let:

$v = 10.2\ m/s$

$S = 6\ m$

$m = 150\ kg$

$F = 800\ N$

$k = 0.35$

The brake distance is:

$S_{brake} = vt - \frac{1}{2}at^2, v = at, t = \frac{v}{a}$

$S_{brake} = \frac{v^2}{a} - \frac{v^2}{2a} = \frac{v^2}{2a}$, were a is the brake acceleration

$a = \frac{F}{m}$

$\boldsymbol{S_{brake} = \frac{mv^2}{2F} = \frac{150*10.2^2}{2*800} = 9.75\ m}$

Such as the brake distance (without friction factor) is more then distance needs to stop, she will run over the people. With friction factor the brake way will be more.