Answer on Question #37715, Physics, Mechanics

Question:

The coefficient of friction between a truck's tires and the road is 0.75. A 1400 kg truck is moving at 100.0 km/h when a black bear jumps onto the highway 80.0 meters ahead. The driver has a reaction time of 0.55 seconds before the brakes are applied. Will he be able to avoid the accident? Justify your answer by showing calculations.

Answer:

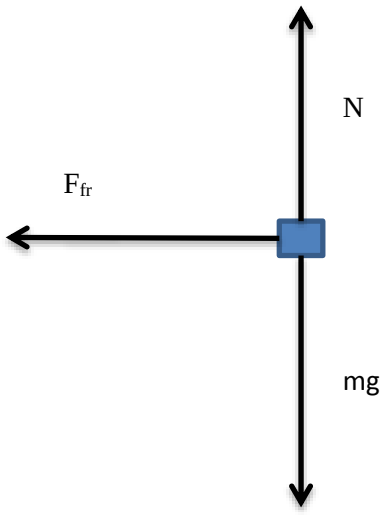
Distance before stopping will be

$$s = s_r + s_b$$

where s_r – distance during reaction time, s_b – distance after brakes are applied

$$s_r = vt_r$$

$$s_b = \frac{v^2}{2a}$$



Newton's laws of motion:

$$x: \quad ma = F_{fr}$$

$$y: \quad N = mg$$

Friction force equals $F_{fr} = \mu N = \mu mg$, μ - coefficient of friction.

Therefore:

$$a = \frac{\mu m g}{m} = \mu g$$

$$s = v t_r + \frac{v^2}{2\mu g} = 67.7\ m$$

So, we have $s < 80\ m$, therefore driver will be able to avoid the accident.

Answer: driver will be able to avoid the accident