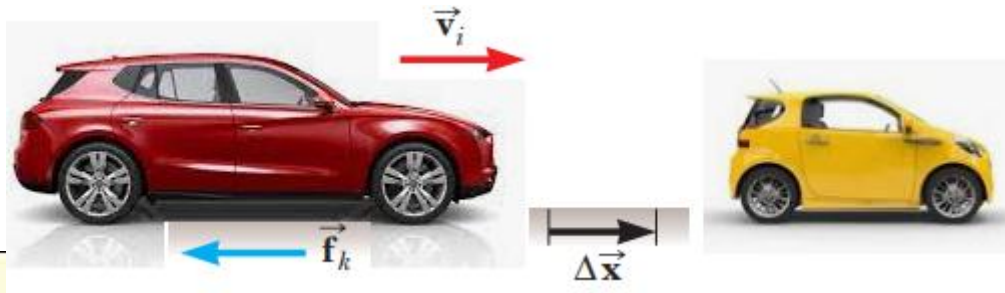


Orange monkey team
phy101 Assignment No.01 Solution Fall 2021

Question No. 1



The driver of a 2.0×10^3 kg red car traveling on the highway at 45m/s slams on his brakes to avoid striking a second yellow car in front of him, which had come to rest because of blocking ahead as shown in above Fig. After the brakes are applied, a constant friction force of 7.5×10^3 N acts on the car. Ignore air resistance.

- (a) Determine the least distance should the brakes be applied to avoid a collision with the other vehicle?
- (b) If the distance between the vehicles is initially only 40.0 m, at what speed would the collision occur?
- (c) Write your conclusive observations on the result obtained from this numerical. I.e. the importance of Physics in daily life.

Solution

Given data in this Question :

mass of the car is = 2.0×10^3 kg

velocity of the car is = $u = 45$ m / s

final velocity = $v = 0$

Friction force is = 7.5×10^3 kg

Questions :

(a) Determine the least distance should the brakes be applied to avoid a collision with the other vehicle?

Determine the least distance = $s = d = ?$

solve

we need acceleration now

$$\therefore F_{fr} = \mu_k \times N = \mu_k \cdot mg$$

friction force = Normal force in opposite direction

$$F_n = -F_{fr}$$

$$-\mu_k \cdot mg = m \cdot a$$

$$a = -\mu_k \cdot g$$

$$\therefore (g = 9.8 \text{ and } \mu = 7.5 \times 10^{-3})$$

$$a = 7.5 \times 10^{-3} \cdot 9.8$$

$$a = -73.5 \times 10^{-3}$$

Newton 3rd law

$$v^2 = u^2 + 2as \dots \dots \dots eq(1)$$

by using eq(1) value find out and putting value

$$0 = (45)^2 + 2(-73.5 \times 10^{-3})s$$

$$2(-73.5 \times 10^{-3})s = -(45)^2$$

$$\rightarrow s = 0.0137m$$

(b) If the distance between the vehicles is initially only 40.0 m at what speed would the collision occur?

What speed would the occur with velocity = 40.0 m/s ?

$$\vec{V}_i = u = 40 \text{ ms}^{-1}$$

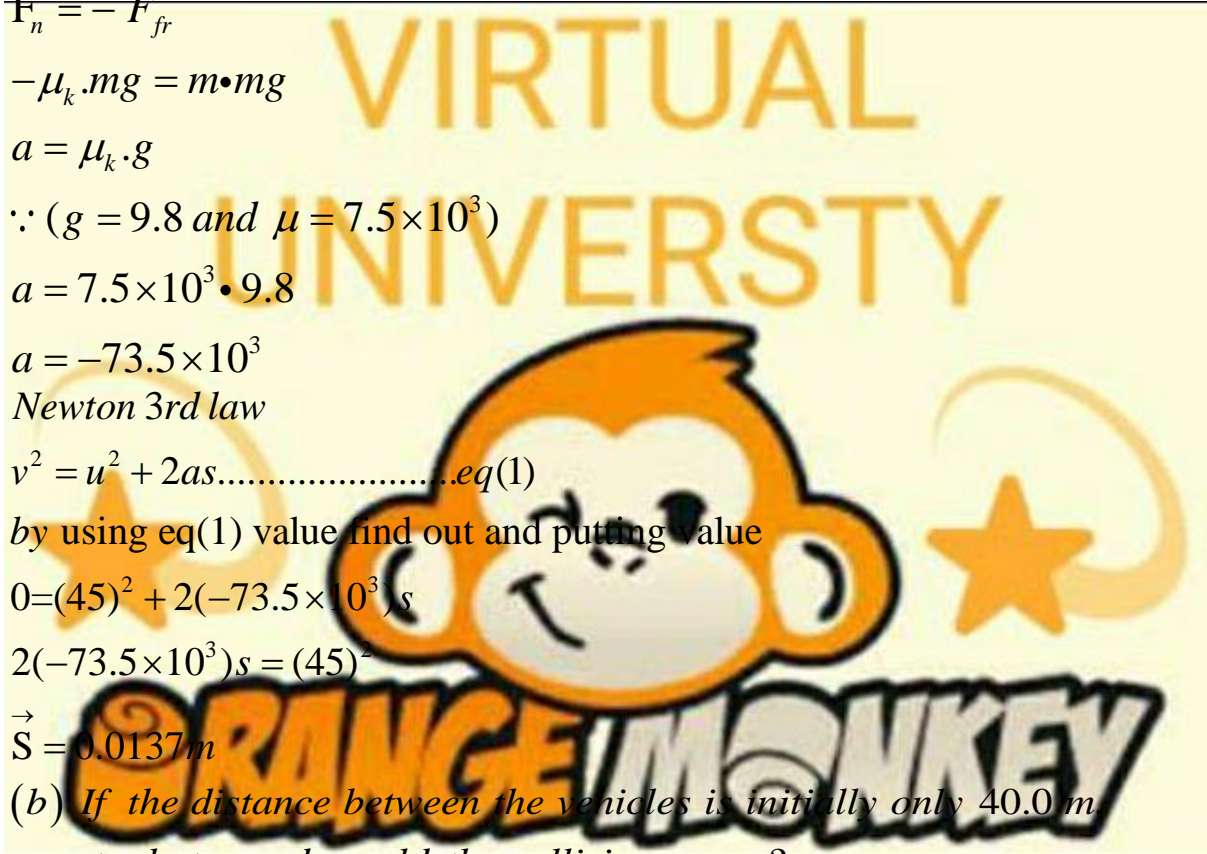
Newton 3rd law

$$v^2 = u^2 + 2as$$

$$v^2 = (40)^2 + (-2013.6)$$

$$v^2 = 1600 - 2013.9$$

$$\vec{V} = -20.34 \text{ m/s}$$



Question No. 2

Consider an automobile moving at v mph that skids d feet after its brakes lock. Calculate how far it would skid if it was moving at $2v$ and the brakes were locked.

Solution

$$V_i = V \text{ mph} \quad \because \text{mph} = (\text{mile per hour})$$

Convert mile per hour

$$V_i = 0.44704m / s$$

$s = d$ feet

Convert feet into meters

$$s = 0.30480$$

$$v_f^2 = v_i^2 + 2as$$

$$(0)^2 = (0.44704)^2 + 2a(0.30480)$$

$$0 = 0.1998 + 2(0.30480)(a)$$

$$a = \frac{-0.1998}{2(0.30480)}$$

$$a = -0.3278$$

velocity is $2v$ then

find the skid distance

$$v_f^2 - v_i^2 = 2as$$

$$0 - (2)^2 = 2(-0.3278)s$$

$$\frac{-4}{2(-0.3278)} = s$$

$$s = 6.101$$