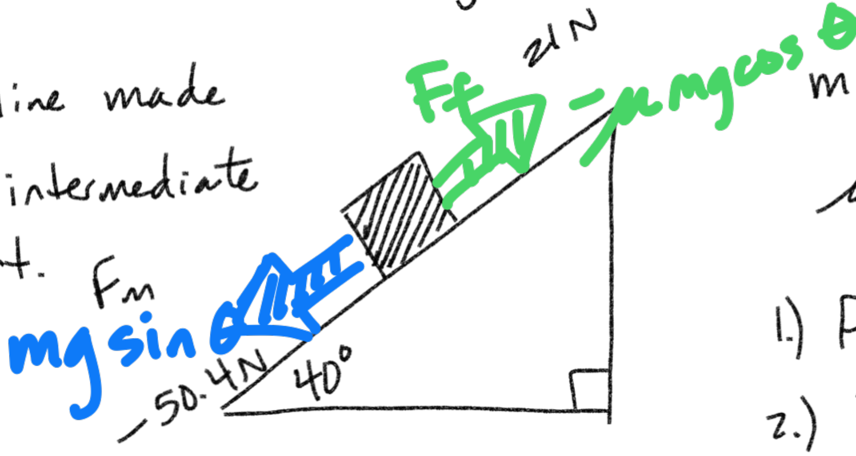
TH-GP General Physics Week 27 4/11

Incline made of intermediate dirt.



mass = 8 kg

$\mu = 0.35$

1.) Find F_{net} $\boxed{-29.4\,N}$

2.) Does it move? $F_m > F_f$ yaw!

3.) If so, what is its acceleration?

$F = ma$

$a = \frac{F_{net}}{m}$

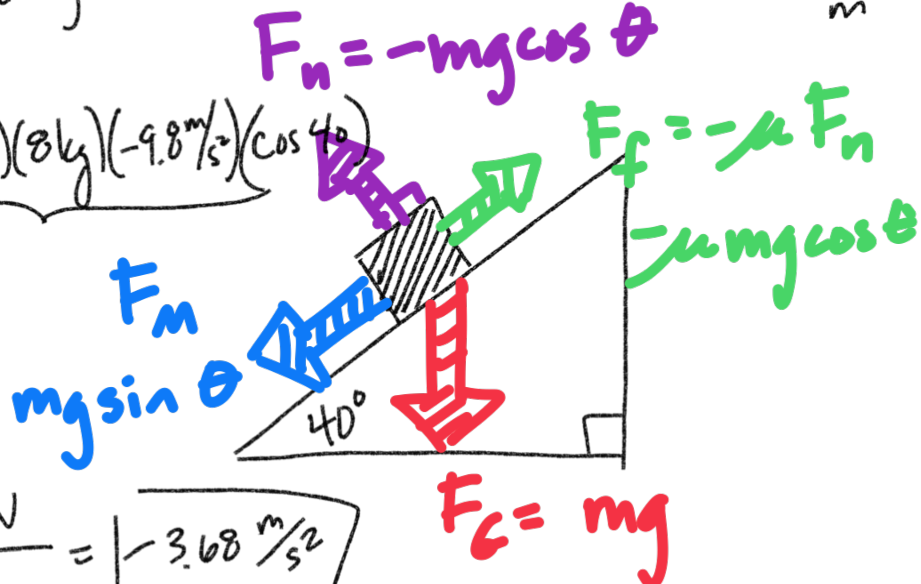
$F_{net} = F_m + F_f$

$mg\sin\theta + -\mu mg\cos\theta$

$(8\,kg)(-9.8\,\frac{m}{s^2})(\sin 40) + (-)(0.35)(8\,kg)(-9.8\,\frac{m}{s^2})(\cos 40)$

$-50.4\,N + 21.\,N$

$\boxed{-29.4\,N}$



$\frac{F}{m} = \frac{ma}{m}$ $\quad a = \frac{F_{net}}{m} = \frac{-29.4\,N}{8\,kg} = \boxed{-3.68\,\frac{m}{s^2}}$

Linear Momentum and Collisions

Newton's 1st: inertia

Newton's 2nd $F = ma$

Newton's 3rd equal & opposite reactions

momentum is conserved.

momentum = mass * velocity

$p = mv$

$m \rightarrow kg$, $v \rightarrow m/s$

$kg\, m/s$

$F = ma \rightarrow kg \cdot m/s^2$

$p = Ft$

$F * t$

Momentum is the duration of a force

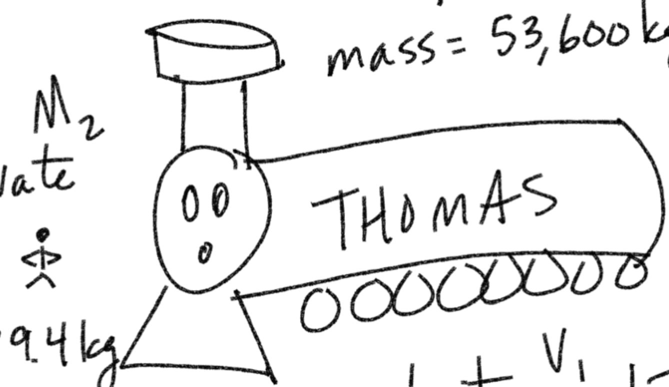
$kg\, m/\cancel{s^2} * \cancel{s} = kg\, m/s$

$p = mv$

<u>Conserved</u>

M_1 mass = 53,600 kg

M_2 Nate



mass = 79.4 kg

velocity V_1 = 17.8 m/s (max constant)

$$\frac{m_1 v_1}{m_2} = \frac{m_2 v_2}{m_2}$$

$$V_2 = \frac{m_1 v_1}{m_2} = \frac{(53{,}600\ \cancel{kg})(17.8\ m/s)}{79.4\ \cancel{kg}} = 12{,}016\ m/s$$

26,879 mi/hr

Force of impact: ØN

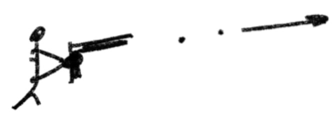
0.050 kg bullet travels at 1500 m/s

What is the momentum?

$$p = mv = (0.050\,kg)(1500\,m/s)$$

$$\boxed{75\,kg\,m/s}$$

Momentum must be conserved



Will = 77.1 kg

what is the speed of his recoil?

$$\frac{m_1 V_1}{m_2} = \frac{m_2 V_2}{m_2}$$

$$V_2 = \frac{m_1 V_1}{m_2} = \frac{75\,\cancel{kg}\,m/s}{77.1\,\cancel{kg}}$$

$$= \boxed{0.97\,m/s}$$

Mike Tyson's 4 kg fist travels at 40 m/s. What is Nate's resulting velocity if Tyson punches him in his stupid, stupid face?

Nate's mass = 78.6 kg

Nate Fist

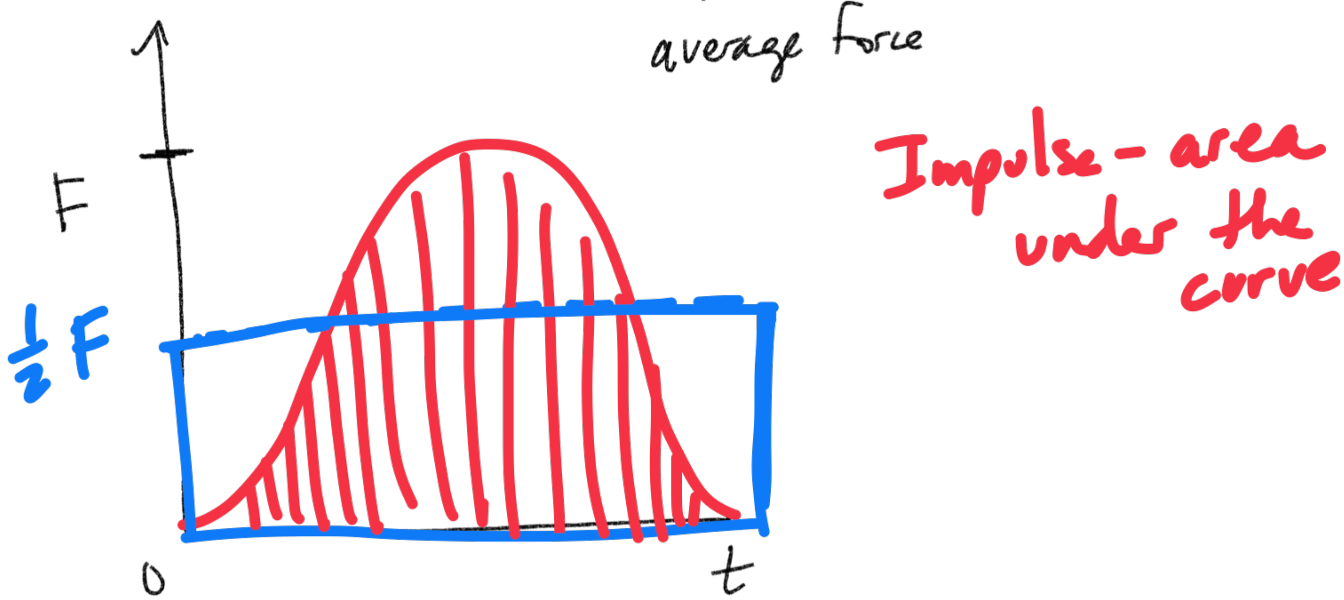
$$\frac{m_1 V_1}{m_1} = \frac{m_2 V_2}{m_1}$$

$$V_1 = \frac{m_2 V_2}{m_1} = \frac{(4\,kg)(40\,m/s)}{78.6\,kg} = 2.04\,m/s$$

Impulse → change in momentum

$$I = \bar{F}\Delta t$$

↑ average force



What is worse? (Impulse)

Hobbit

60 lbs → 27 kg

$(27kg)(10 m/s^2)$

If Hobbit sat on you for 20 minutes...

or

Andre the Giant

520 lbs → 236 kg

(236)(10)

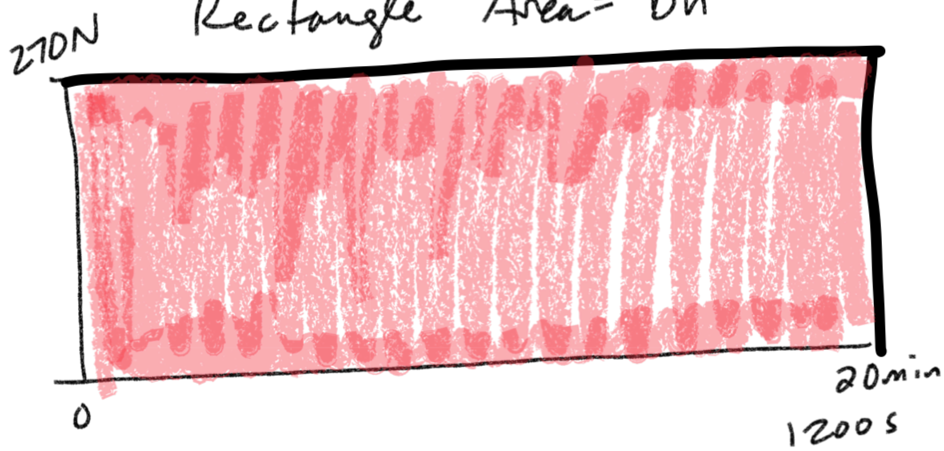
If Andre the Giant slowly sat on you and got up over 2 mins

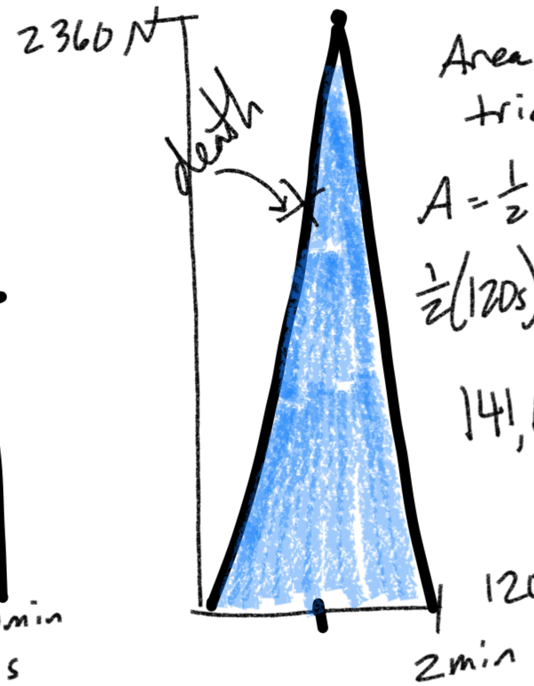
$F_W = mg$

$I = \bar{F}\Delta t$

$(270N)(1200s) = \boxed{324{,}000\ kg\ m/s}$

Rectangle Area = bh





Area of triangle

$A = \frac{1}{2}bh$

$\frac{1}{2}(120s)(2360N)$

$141{,}600\ kg\ \frac{m}{s}$