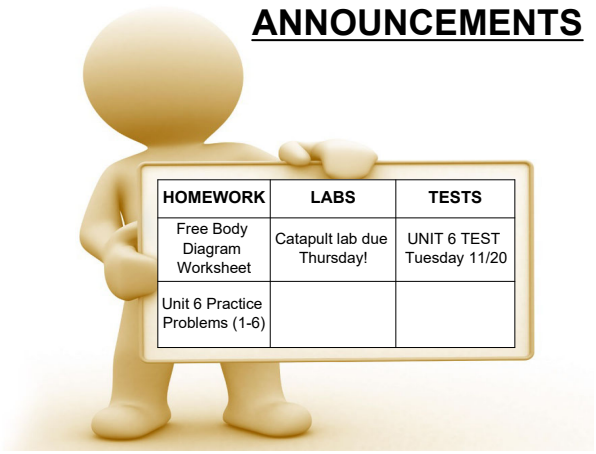
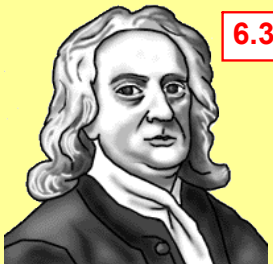
ANNOUNCEMENTS



HOMEWORK	LABS	TESTS
Free Body Diagram Worksheet	Catapult lab due Thursday!	UNIT 6 TEST Tuesday 11/20
Unit 6 Practice Problems (1-6)		

6.4 Newton's 3rd Law

LEARNING TARGETS



6.3 I can define, explain, and apply Newton's third law to solve problems.

Newton's Laws of Motion

1. Newton's First Law of Motion
   - Every object will continue in a state of rest or with constant speed in a straight line unless acted upon by an external force.

2. **Newton's Second Law of Motion**
   - When a net force act on an object, the object accelerates in the direction of the net force. The acceleration is directly proportional to the net force and inversely proportional to the mass. Thus, $a \sim F/m$ or, $a \propto F/m$

Mass vs. Weight

Mass	Weight
• a measure of how much matter an object is made of • does not change, regardless of where something or someone is	• the force of gravity on an object • equal to the mass of the body times the local acceleration of gravity

Mass = 59 kg
Weight = 579 N

Why do you think the person's weight is less on the moon?

Mass = 59 kg
Weight = 96 N

http://www.exploratorium.edu/ronh/weight/index.html

Force?

A force is an interaction between two objects.

Newton's 3rd Law

Forces come in "pairs"

An **interaction pair** is two forces that are in opposite directions and have equal magnitude.

Newton's 3rd Law

For every force that acts on an object, there is a reaction force acting on a different object that is equal in magnitude and opposite in direction.

ACTION = -REACTION

Simple Formula

ACTION

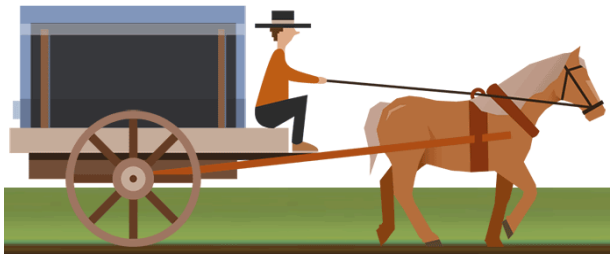
A acts on B

REACTION

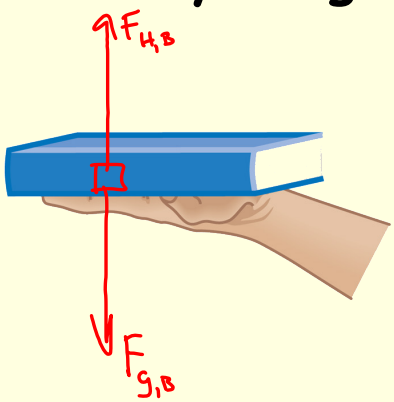
B acts on A

Motion

The Horse and The Carriage

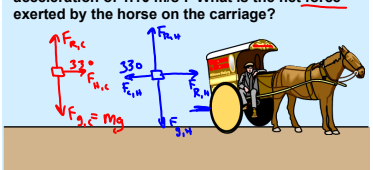


Free-Body Diagram



Horse and Carriage

A 500 kg horse pulls a 300 kg carriage with an acceleration of 1.10 m/s^2. What is the net force exerted by the horse on the carriage?



$F_{net,C} = F_{H,C}$

$m_C a_C = F_{H,C}$

$(300\,kg)(1.10\,m/s^2)\hat{i} = F_{H,C}$

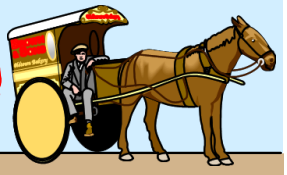
$330\,N = F_{H,C}$

Horse and Carriage

What force does the carriage exert on the horse?

$F_{H,C} = -F_{C,H}$

$F_{C,H} = -330\,N$



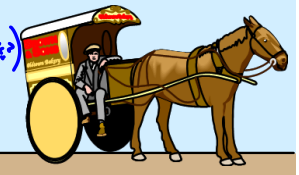
Horse and Carriage

What is the net force acting on the horse?

$F_{net,H} = m_H a_H$

$= (500\,kg)(1.10\,m/s^2)$

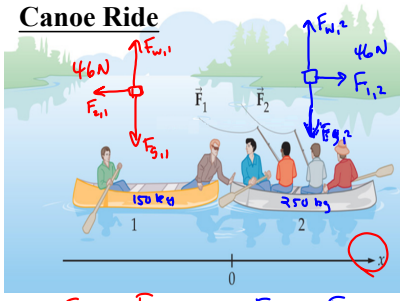
$F_{net,H} = 550\,N$



Canoe Ride

Two groups of canoeists meet in the middle of a lake. After a brief visit, a person in canoe 1 pushes on canoe 2 with a force of 46 N to separate the canoes. If the mass of canoe 1 and its occupants is m_1=150 kg, and the mass of canoe 2 and its occupants is m_2=250 kg, find the acceleration the push gives to each canoe.

Canoe Ride



$F_{net,1} = F_{2,1}$ $F_{net,2} = F_{1,2}$

$m_1 a_1 = F_{2,1}$ $m_2 a_2 = F_{1,2}$

$(150\,kg)a_1 = -46\,N$ $(250\,kg)a_2 = 46\,N$

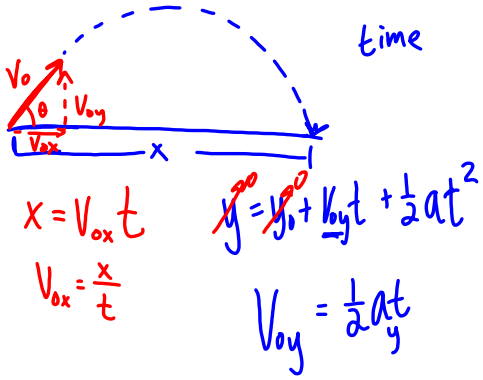
$a_1 = -0.31\,m/s^2$ $a_2 = 0.18\,m/s^2$

HOMEWORK

Practice Problems

(7-9)

Catapult Labs



$x = v_{ox} t$ $y = y_0 + v_{oy} t + \frac{1}{2} a t^2$

$v_{ox} = \frac{x}{t}$ $v_{oy} = \frac{1}{2} a t_y$