

Newton's 1st Law – Guided Notes

A force is a _____ . Forces are measured in _____ .

Two types of forces:

1. _____

2. _____

Examples of long range forces:

1. _____

2. _____

Examples of Forces:

Demo

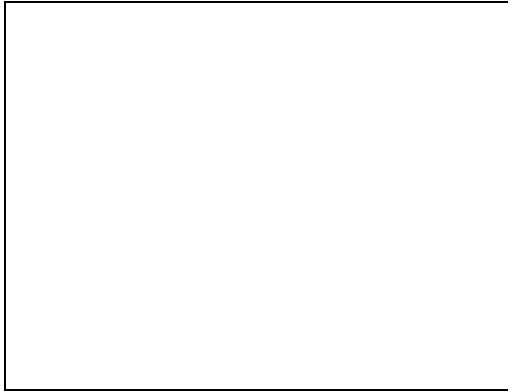
What happened when the index card was flicked?

Balanced Forces

A shopping cart stops after being pushed once because the forces become unbalanced. This happens because of the force of _____ .

Newton's 1st Law says:

FBD of Coin on the Index Card:



FBD of Coin Without the Index Card:



A net force is _____.

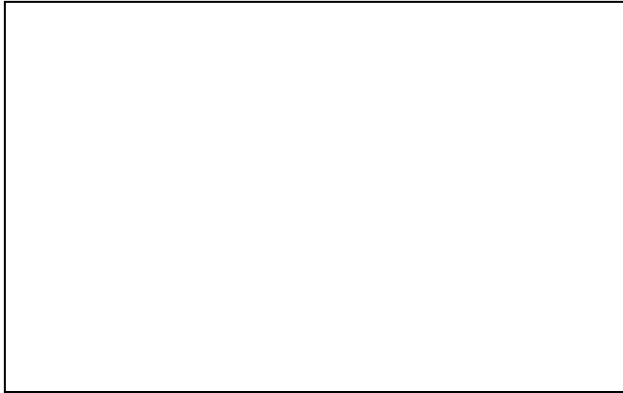
Net force is otherwise known as _____ or _____.

Tug of War Diagram:



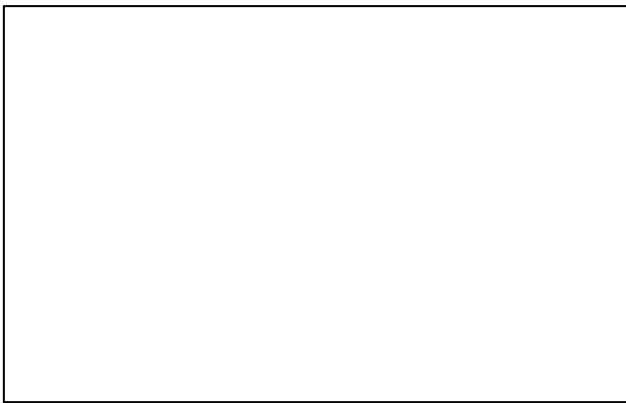
The net force in this situation will be _____ N to the _____ (right/left).

Forces Box Diagram:



The net force in this situation will be _____ N to the _____ (up/down/right/left).

FBD of Table:



FBD of a Brick/Ball on a Slope:

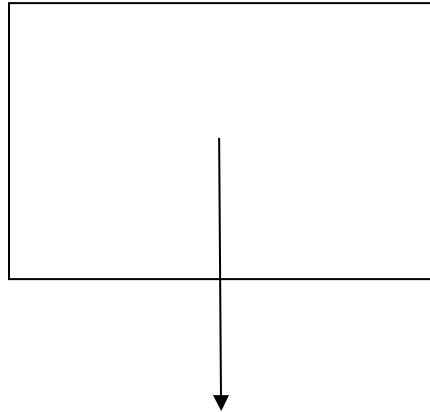


Mass vs Weight – Guided Notes

Weight is measured in _____ .

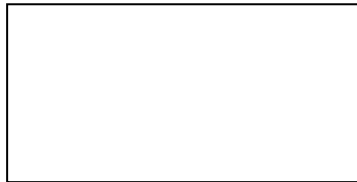
Mass is measured in _____ .

Ways to label the force of gravity:



If you went to the moon, your _____ would change, but your _____ would stay the same.

Equation for the force of gravity:



$m =$ _____

$g =$ _____

$F_g =$ _____

Example:

If you weigh 55 kg...

Earth: $F_g =$ $=$ N

Moon: $F_g =$ $=$ N

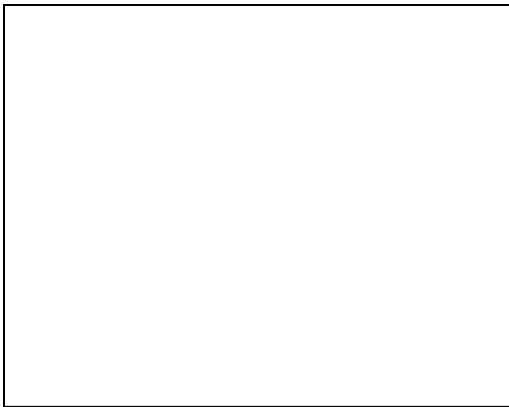
Balanced Forces – Guided Notes

If the forces on an object are balanced (meaning there is no acceleration -- a constant velocity), we can write a balanced forces equation.

Tug of War Equation



Car Force Diagram



Car Equations

Vertical:

Horizontal:

Pulled Cart Force Diagram



Cart Equations

X-Component of Pulling Equation:

Y-Component of Pulling Equation:

X-Direction Equation:

Y-Direction Equation:

Newton's 2nd Law – Guided Notes

Newton's 2nd Law says:

Or as an equation:

OR

F = _____

M = _____

a = _____

If the forces are unbalanced, there is a net force and so the object will accelerate.

Car Example:

$$F_{\text{net}} = ma$$

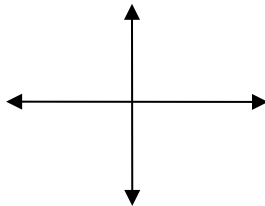
OR

$$\Sigma F = ma$$

Replace F_{net} with the forces acting:

Whatever direction the net force has, is the same direction the acceleration has.

Directions for Physics:



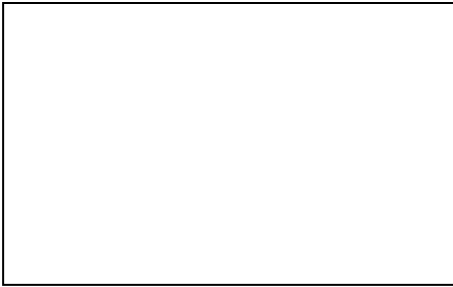
Elevator moving at constant velocity:

Force Diagram

Force Comparison Equation

Elevator accelerating up (JOLT UP):

Force Diagram

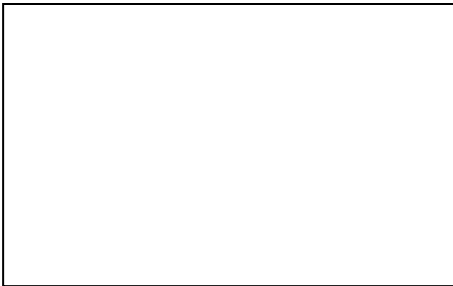


Force Comparison Equation

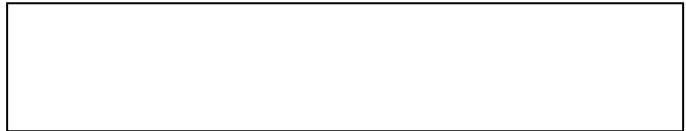


Elevator accelerating down (JOLT DOWN):

Force Diagram



Force Comparison Equation



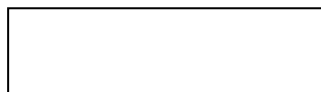
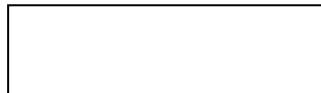
Elevator accelerating up (JOLT UP) – Full Equation and Calculation

$m =$ _____

$g =$ _____

$F_N =$ _____

$$F_{\text{net}} = ma$$



$a =$  $m/s/s$

Newton's 3rd Law – Guided Notes

Newton's 3rd Law says:

OR

If you push on a wall with a force of 50 N, then _____

_____.

When you jumped off your chair, the Earth applied an _____ but _____ force on you.

Why didn't the Earth move much?

Fly & Car

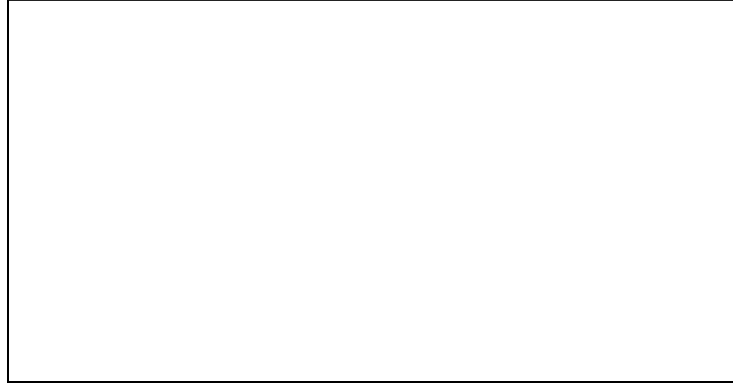
Picture:

Equation:

Inclined Planes – Guided Notes

When on an inclined plane, objects roll/slide down the slope because of the force of _____ .

To solve such problems we can rotate the axis. The final diagram will look like this:

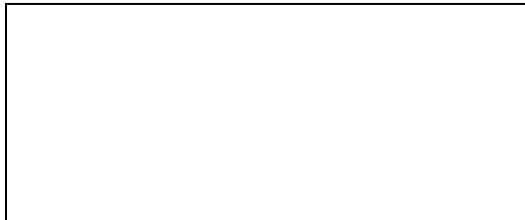


We can break the force of gravity into a component down the slope, and a component into the slope, which gives the following equations:

$$F_x = \boxed{}$$

$$F_y = \boxed{}$$

Final Free Body Force Diagram:



Balanced Forces Equations:

X-Direction Equation



Y-Direction Equation



X-Direction Acceleration Equation (for situations where the object on the plane is accelerating):



Friction – Guided Notes

What is friction?

If you looked at a smooth surface under a microscope, what would you see?

Is it easier to get a shopping cart moving, or keep it moving? Why?

Two types of friction:

1. _____ Symbol: _____
2. _____ Symbol: _____

Friction Graph

Applied Force (N)



Frictional Force (N)

Coefficient of Friction Equation

The coefficient of friction is:

Equation:

$$F_f = \underline{\hspace{15em}}$$

$$F_N = \underline{\hspace{15em}}$$

$$\mu = \underline{\hspace{15em}}$$

Slope Diagrams

Flat Surface Diagram:

Equation for Normal Force:

Slope Diagram:

Equation for Normal Force:

What happened when the phone books were interleaved, and why?

