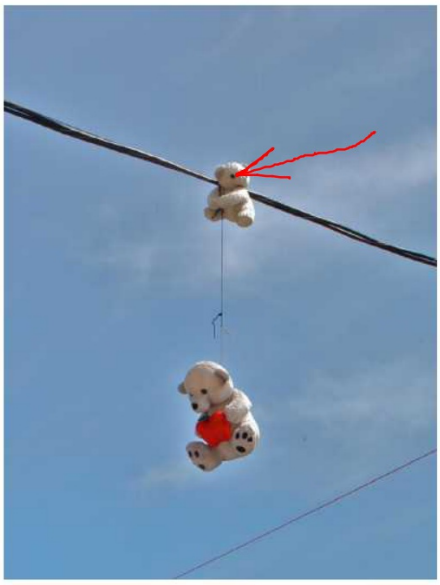
Do Now: Draw the FBD



Forces

Balancing Forces

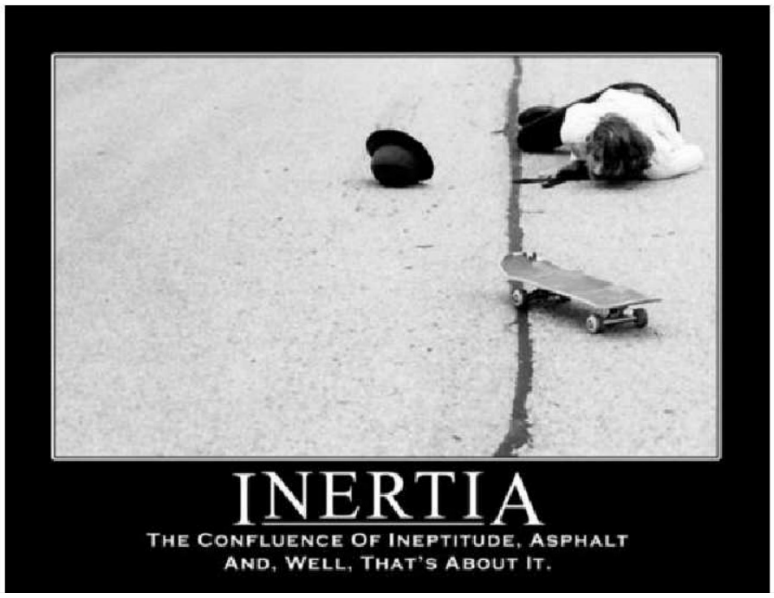
- What happens when you have unbalanced forces?

  acceleration

- What happens when you have balanced forces?

  No acceleration, but can move @ const 

Inertia: What is it?



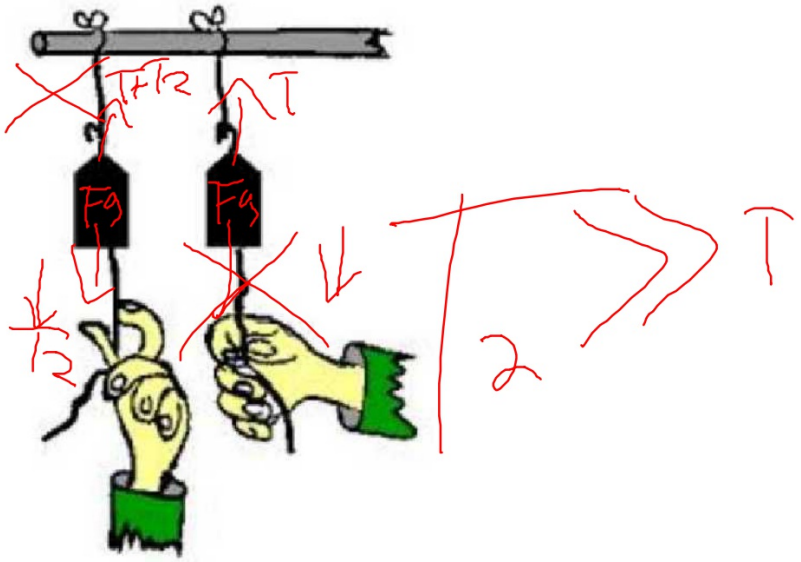
What Happened?

Place Your Bets

- You can only touch the bill.
- Get the bill out without disturbing the quarters and you can keep it.
- Volunteers???

Demo

Predict



Graphing Force

- Lets assume that we have an object with balances forces.
- Graph the opposing forces.
- Left is positive, right is negative.
- One graph for vertical forces, one for horizontal forces.

10,000kg = m

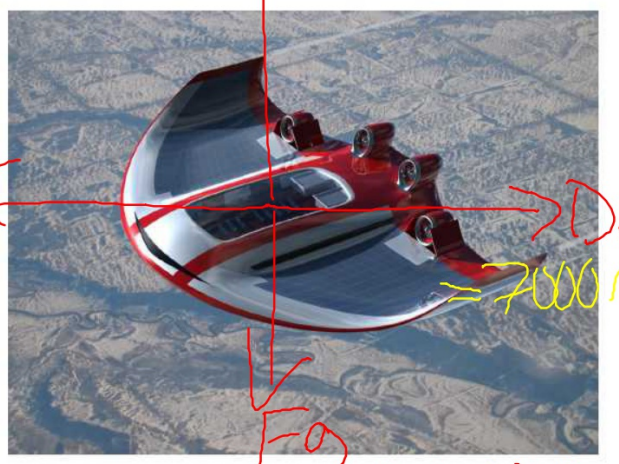
F = ma

Cruising Plane

Lift = 98000N

$F_g = mg = 10{,}000\,kg \cdot 9.8\,m/s^2$

7000N = Thrust



Drag = 7000N

F_g = 98000N

Demo

Tension on a Book

Egg Drop

Inertia

The tendency of an object to resist changes in velocity.

The more mass something has, the more inertia it has.

- This means that more force is required to accelerate it.

Falling Objects

- In reality, we know that there is air resistance (friction) acting on objects.
- The acceleration due to gravity is constant, right?
- So why do some objects hit the ground before others?

Misconceptions About Falling Objects

Inertia is Proportional to Mass

- The more mass that something has, the more resistant it is to changes in motion.
- It take large forces to change the velocity of heavy objects.
- How can we measure these forces?

Units of Force

- Newtons-kgm/s^2
- Based on the units, what is multiplies together to get to Newtons?
- Write it on your whiteboard.

F=ma

- F-force on an object is equal to
  - M-the mass of the object kg
  - X-times
  - a-an acceleration. m/s^2

Force of Gravity or Weight

- We know what the acceleration due to gravity.
- If we assume a mass, we can calculate an approximate force acting on an object.
- If the object is not accelerating, we can conclude the opposing force.

Force on a bowling ball

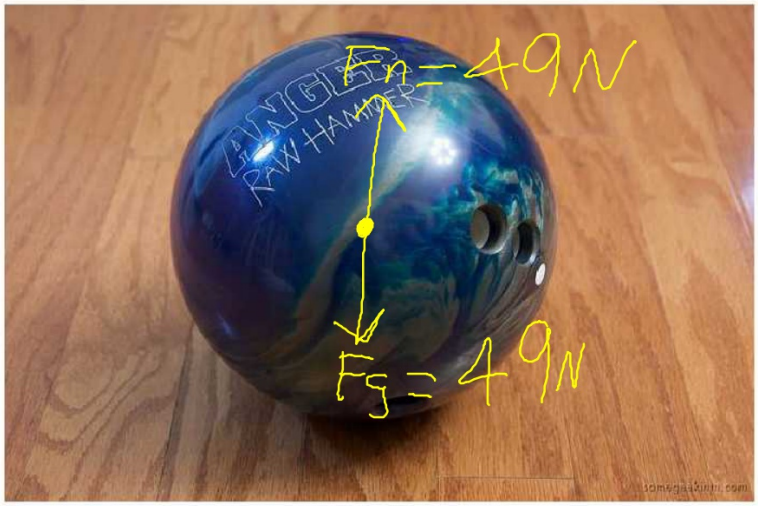
- A 5kg bowling ball is rolling along at a constant speed.
- What is the “weight” of the bowling ball?
- What are magnitudes of the other forces acting on the bowling ball?

$m = 5\ kg$

$a = g = -9.8\ m/s^2$

$F = ma$

FBD



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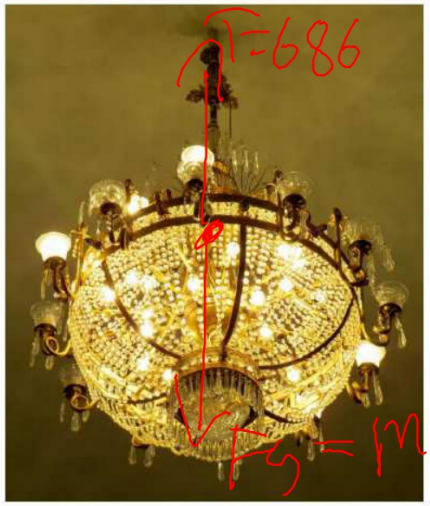
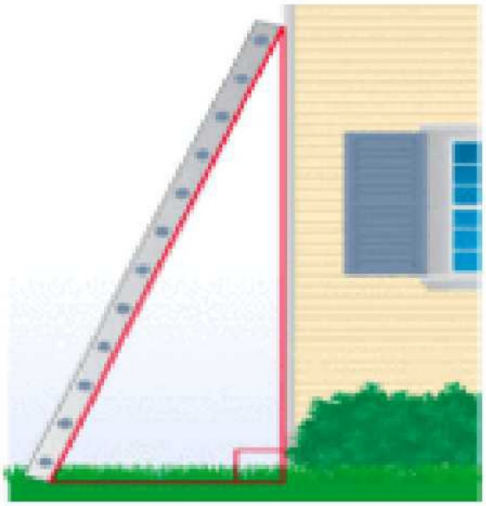
A 70kg chandelier hangs from the ceiling



An engine supplies 1200N of thrust to a 1000kg car. The car coasts at 45m/s.

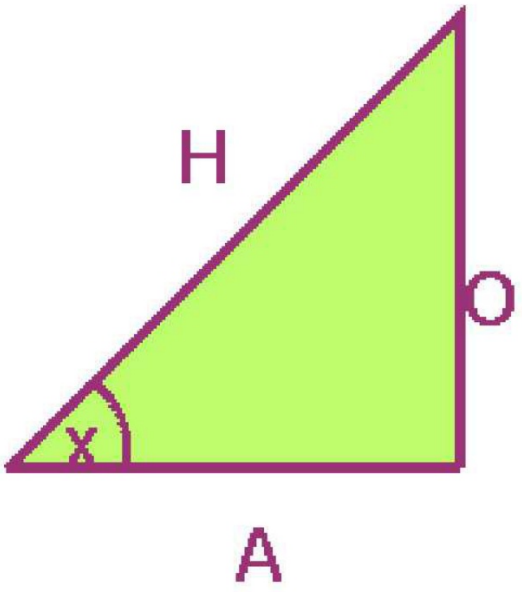
Ladder

- A 15kg ladder leans against a house.
- Where are the forces?



Skip ahead 2 slides for now

SOH CAH TOA



$$\text{SIN}(x) = \frac{O}{H}$$

$$\text{COS}(x) = \frac{A}{H}$$

$$\text{TAN}(x) = \frac{O}{A}$$

An 37 kg object slides at a constant speed across a field. The solder pulls with 100N at 30 degrees.