Eureka Episodes Forces and Energy Notes

Episode 1 Inertia

Inertia

- “Laziness”
- Is the resistance of a physical object to any change in its state of motion.

Newton’s First Law

- ·Things like to keep on doing what they are already doing.

At rest

- not moving

Constant speed

- The speed stays the same--driving at a constant 100 km/h on the highway.

To start or stop an object

- requires a force F measured in Newtons (N) be applied

A force

- Is a push or a pull

Episode 2 Mass

Mass

- The tendency of an object to resist changes in its state of motion **varies** with mass.
- **Mass** is a measure of the amount of matter in an object.
- Mass is that quantity that is solely dependent upon the **inertia** of an object.
- **Inertia** is the resistance of a physical object to any change in its state of motion.
- The more **inertia** that an object has, the more **mass** that it has.
- A more massive object has a greater tendency to resist changes in its state of motion.
- Measured on a balance -- match up the number of 1 kg cylinders

  e.g. The cube of lead (Pb) vs the cube of Styrofoam

Massive

- In Science class **does not mean size as in volume**
- masses and masses of stuff

Episode 3 Speed

Speed

- Distance traveled per unit time.
- Measured in m/s.

e.g. Red 2 kg ball vs blue 1 kg ball

Double the mass

- double the force to start or stop the object

Double the mass

- double the force needed to get the 2 kg red ball up to the same speed as the 1 kg blue ball

Double the change of speed

- double the force required to change the speed from

Newton's Second Law

- Force varies with the mass and the **rate of** change of speed
- The greater the rate of change of speed required the

_____

Stopping

- Changing the speed of an object to _____

Starting

- Changing the speed of an object from _____

Episode 4 Acceleration Part 1

Light racing bike

- less mass
- easier to change the speed
- less **time** required to change the speed

Think acceleration times for my Golf versus a Porsche!!!

Golf	from rest 0 - 100 km/h	5.6 s	Mass 1850 kg
Porsche 911	from rest 0 km/h - 100 km/h	3.5 s	Mass 1120 kg

There is a **time** component when you change the speed!

Force varies with mass AND rate of change of speed.

Equation (equal signs!!)

F = ma

Acceleration

- **Rate** of change of speed
- If speed is measured in m/s then the rate of change of speed is measured in m/s/s.

Baseball pitchers are really baseball “accelerators”!

The baseball starts at zero speed and reaches its final speed **as it leaves the pitcher’s hand--**wind up to get the ball up to its release speed.

Episode 5 Acceleration Part 1

Train

- Accelerating to 36 km/h in 10 seconds.

Dimensional Analysis:

Max. Speed _____

So at max speed it travels _____.

Acceleration _____

Episode 6 Gravity

Free Body Diagram of an Apple on a Tree

Gravity

- Pulls everything straight down
- Is a force--Fg
- Fg = force of gravity = WEIGHT

All objects in the Universe attract all other objects in the Universe.

- The more mass the object has the more the attractive force.
- The Earth is Massive therefore its Fatt is high.
- Everything on Earth is attracted towards the Earth by the **Force of gravity =**

Everything falls towards Earth at a rate of 10 m/s^2.

This is the **ACCELERATION DUE TO GRAVITY** -- not the Force of gravity

Acceleration due to gravity is written as _____

Force of gravity = mass x acceleration due to gravity

Free Body Diagram of an Apple in my Hand:

Difference btw the Moon and the Earth? _____

Therefore the acceleration due to gravity on the Moon is _____

Mass on the Moon _____

Weight on the Moon _____