

Newton's Laws

9/23/2009

Opening Discussion

- <http://www.youtube.com/watch?v=1rnCjUZ4mgA>
- Have you seen anything in the news? What did we talk about last class?
- Minute essay comments
 - Lighting a match on Titan.
 - They did skip a number of days at the beginning of the Gregorian calendar.
 - Inaccuracies in the Gregorian calendar.
 - Can pseudoscience be correct by luck?
 - Sol and Luna

More Intro

- Humans to Venus instead of Mars.
- Religion/creationism, pseudoscience?
 - Much of religion doesn't deal with explaining the working of the Universe.
 - What does jumps straight to the supernatural.
 - Can't be proved or disproved.
- <http://www.nytimes.com/2009/09/22/science/space/>

Describing Motion

- Speed – this is a measure of the amount of distance an object will move in a given period of time. (m/s)
- Velocity – This is both the speed and direction of an object. (vector m/s)
- Acceleration – This is a change in velocity over time. (m/s²)

$$d = vt + \frac{1}{2}at^2$$

Acceleration of Gravity

- You are constantly feeling the acceleration due to gravity.
- All objects feel the same acceleration.
- At Earth's surface it is 9.8 m/s^2 . (or 32 ft/s^2)
- Air resistance is what slows the fall of low density objects.

Momentum and Force

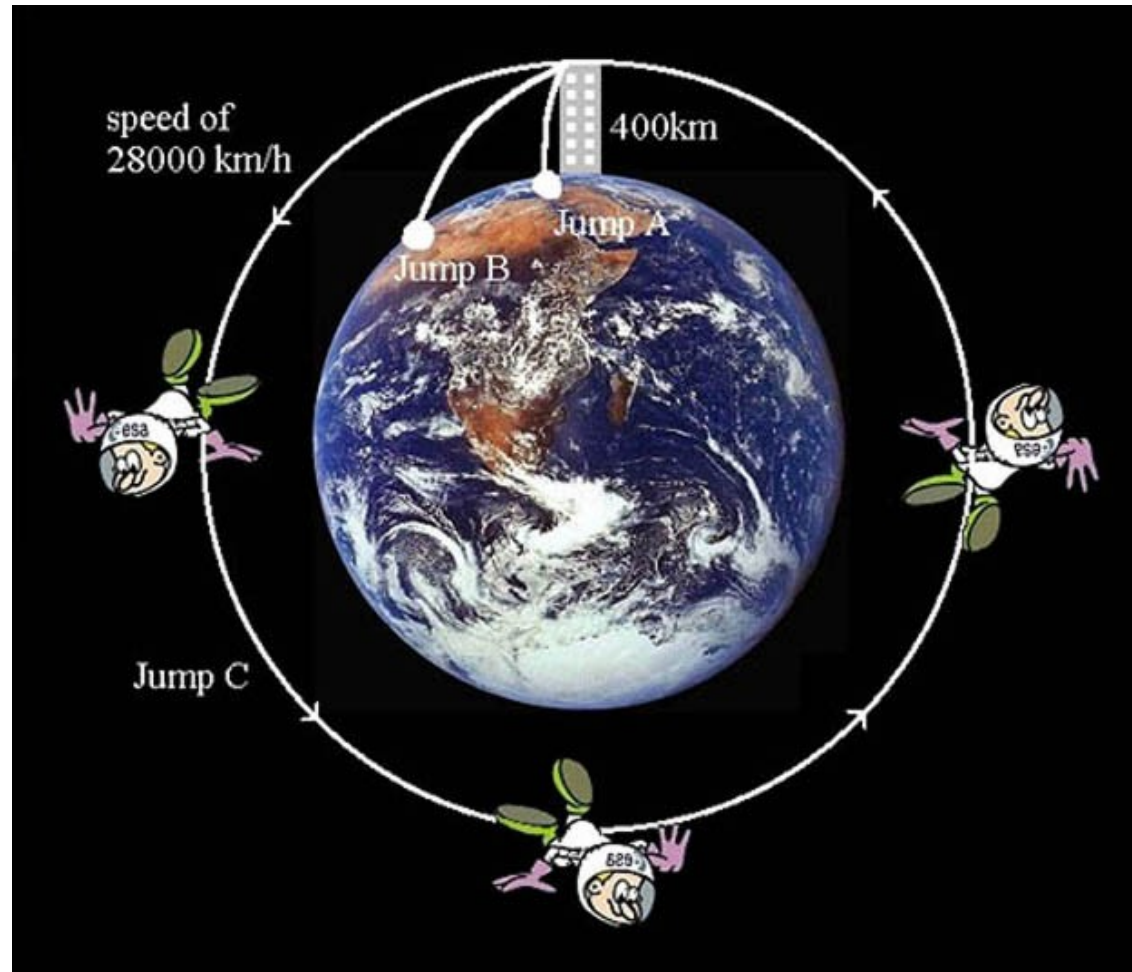
- Momentum = mass * velocity ($\mathbf{p=mv}$)
- Force = change in momentum
- Things with a lot of mass have more momentum at the same speed than things with a small mass.
- You would rather be hit by a 15 m/s volleyball than bowling ball.
- If force is fixed, you can get a small mass moving a lot faster than a large mass.

Weight vs. Mass

- Mass is a measure of the amount of material.
- Weight is a measure of force, generally the force of gravity on your mass.
- Weight changes on the surfaces of different bodies or as you accelerate up or down. Mass doesn't.

Free-fall and Orbits

- Weightlessness isn't caused by no gravity, it is generally an effect of being in free-fall.



The Impact of Newton

- Realized that gravity was attraction between bodies and what held the Moon to the Earth and the planets to the Sun.
- Codified laws of motion and gravity. Also ran significant experiments.
- Revolutionized science and math.
- Image of clockwork Universe had a huge impact on society making him one of the most significant figures in human history.

Newton's Laws

- Newton's three laws of motion
 - An object in motion will remain in motion unless acted upon by an outside force.
 - The acceleration of a body depends on the force exerted on it and its mass. $\mathbf{f}=\mathbf{ma}$ (or for those who like calculus, $\mathbf{f}=\mathbf{dp}/\mathbf{dt}$)
 - For any force there is an equal and opposite reaction force.
- In MKS units force is measured in newtons. 1 newton=1 kg*m/s².

Minute Essay

- How much physics have you taken previously? How much do you remember? What topics from today would you want to see again?