Please mute your microphones.
You may keep your video on if you wish.
We will begin shortly.

Thank you.

Introduction!

FYS

Pendulum

Physics

Materials

- *String*
- *Tape*
- *2-3 different weights/small objects (e.g. a key and a ball)*
- *Ruler/measuring tape*
- *Stopwatch/timer*

FYS

Let's Think:

What is a force?

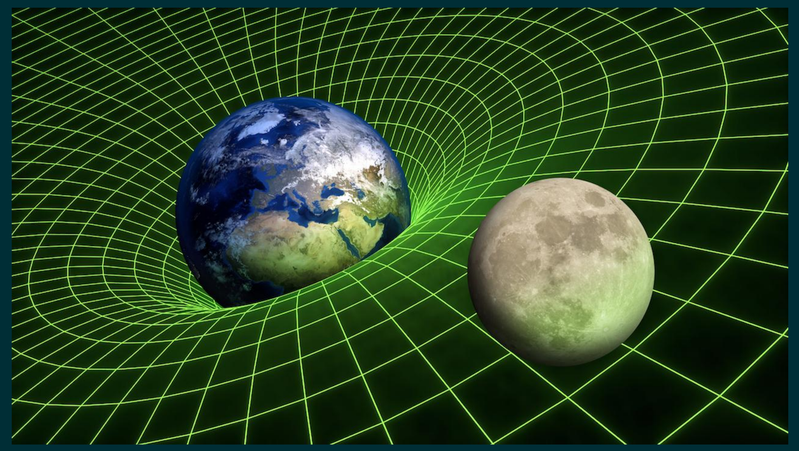
What is an important example of a force in nature?

Isaac Newton

- Born in the **17th century**, Newton developed a significant interest in the reasons why our world is how it is.
- He created the **laws of gravity and motion** which have heavily influenced modern scientific knowledge.

Gravity

- The universal law of attraction
- The reason why the Moon orbits the Earth, why we don’t float off into space, and why our Solar System is together
- Everything with mass exerts a gravitational force on everything else with mass; some factors make this force stronger



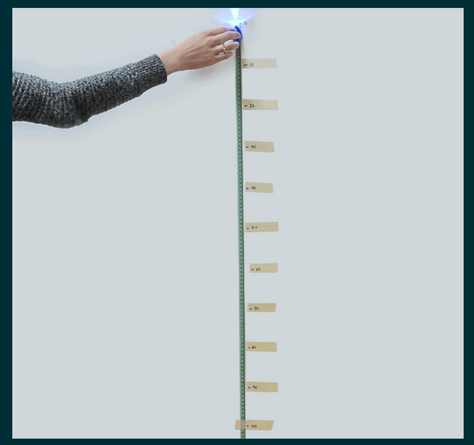
FYS

Let's Think:

If someone were to drop a basketball on your head, would it hurt more if they dropped it from a foot above, or from 20 feet above? Why?

Acceleration Due to Gravity

- *On our planet, the Earth has the largest mass, and so we are attracted to it the most.*
- *Anytime that a force is exerted on a person or object (and it isn't canceled out by other forces), it causes the object to accelerate.*
- ***All** falling objects accelerate downward at 9.8 m/s^2 (g).*



Inertia

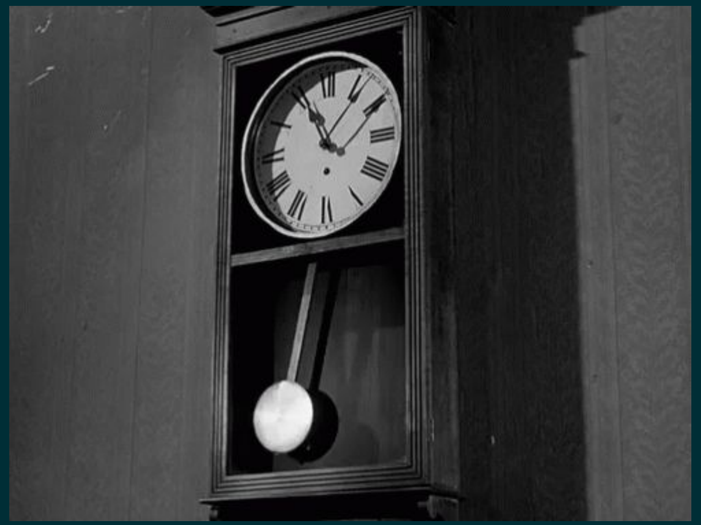
- *It might seem weird that all objects accelerate at the same rate of 9.8 m/s^2. Wouldn't you expect a heavier object to fall faster?*
- *However, all objects have a property called inertia, which is a resistance to acceleration. Objects with more mass have more inertia.*

Let’s Think:

Have you ever been on a swing?
How does it work?

Pendulum

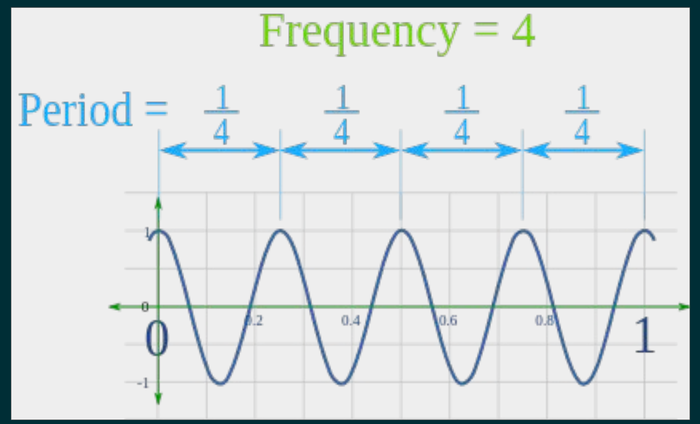
- *Any **weight** that is hung from a **fixed area,** that is allowed to **freely move** and **oscillate** (swing back and forth).*
- *Can you think of any **examples** of a pendulum that you may have seen before?*



Period/Frequency

- *An object that oscillates has two very important features.*
- *Period (T) is the time, in seconds, that it takes for the object to go through one full cycle and return to the same position.*
- *Frequency (f) is the number of full cycles completed per second, measured in Hertz (Hz).*

$$T = \frac{1}{f} \qquad f = \frac{1}{T}$$



Questions?

Materials

- *String*
- *Tape*
- *2-3 different weights/small objects (e.g. a key and a ball)*
- *Ruler/measuring tape*
- *Stopwatch/timer*

Procedure

1. *Take a short length of string and tie one end of it to your object.*
2. *Tape the other end of the string to a surface (like a table) so that the string hangs down. Use as much tape as is needed to fully support the weight.*
3. *Get your stopwatch ready. Gently pull the string to one side, and then release it, starting your stopwatch at the same time as you release.*
4. *Pause the timer and catch the string when it returns to its original position* ***for the third time****. Divide the time by three and write it down. What you have written down is the period.*

Procedure

1. *Take a longer length of string and tie one end of it to your object.*
2. *Tape the other end of the string to a surface (like a table) so that the string hangs down. Use as much tape as is needed to fully support the weight.*
3. *Get your stopwatch ready. Gently pull the string to one side, and then release it, starting your stopwatch at the same time as you release.*
4. *Pause the timer and catch the string when it returns to its original position, and write down the time.*
5. *Pause the timer and catch the string when it returns to its original position* ***for the third time****. Divide the time by three and write it down.*

Procedure

1. *Use string with a similar length, but tie it to a different object. Consider whether this is a heavier or lighter object than the first one.*
2. *Tape the other end of the string to a surface (like a table) so that the string hangs down. Use as much tape as is needed to fully support the weight.*
3. *Get your stopwatch ready. Gently pull the string to one side, and then release it, starting your stopwatch at the same time as you release.*
4. *Pause the timer and catch the string when it returns to its original position, and write down the time.*
5. *Pause the timer and catch the string when it returns to its original position* ***for the third time****. Divide the time by three and write it down.*

What do you see?

What was different each time?

Reflection Questions

1. *Why do you think we let the string oscillate 3 times?*

2. *What do you think is the reason why when we put more weight on the pendulum, the time didn't change?*

3. *What might be some real-world applications of pendulums?*

See you all next week!

Visit our website, **futureforyoungscientists.org**.

If you have any photos from this week, please share these with us by email (futureforyoungscientists@gmail.com) or Facebook, as we would like to be able to share everyone's experience.