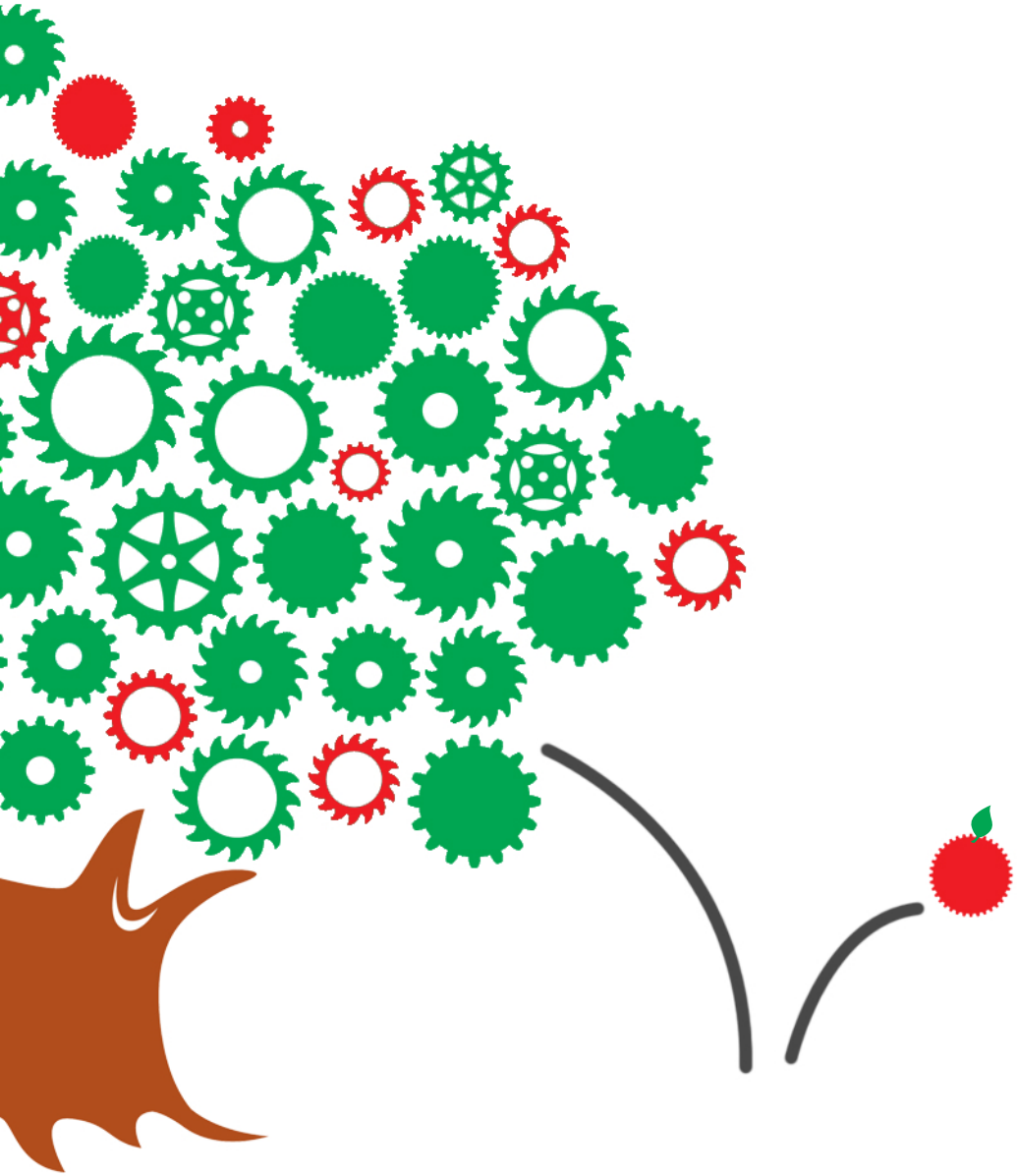

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ENGINEERING DESIGN

A SCIENCE @ HOME ACTIVITY

GRAVITY

OVERVIEW FOR PARENTS

The Engineering Design Process...

This lesson introduces the process which engineers use when creating, developing, improving, or implementing an idea. The goal is to help students understand this process when coming up with a solution to a problem. In this experiment:

- A problem has been presented with some questions to think about
- Some ideas have been presented in helping them come up with a solution
- Students should take notes as they work through the process
- Length of time for the project will be different for each individual

We would love to see their creativity so please tag us at James E. Richmond Science Center on Facebook and Twitter.

Thanks for visiting! See you soon!

THE ENGINEERING DESIGN PROCESS

DEFINE
the problem

IDENTIFY
constraints on your solution (e.g. time, money, materials) and criteria for success

BRAINSTORM
multiple solutions for the problem

SELECT
the most promising solution

PROTOTYPE
your solution

TEST
and evaluate your prototype

ITERATE
to improve your prototype

COMMUNICATE
your solution

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PROBLEM:

I want to test gravity.

<u>QUESTIONS</u>

What is gravity?

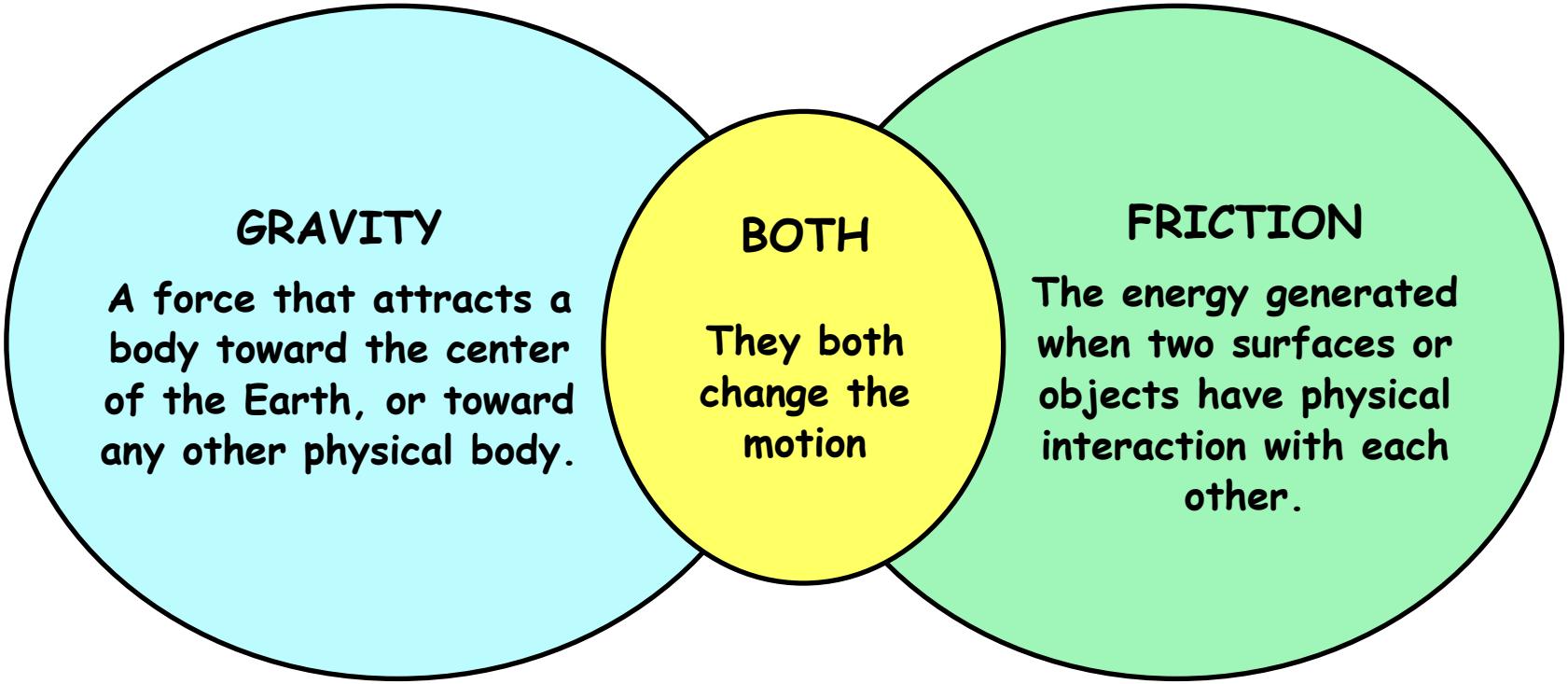
Who discovered gravity?

How could I test it?

What materials could I use?

Are there other effects that counteract (work against) gravity?

AREA TO WRITE RESEARCH & IDEAS



In last week's lab we discussed friction, *a force that acts in the opposite direction of the original force produced.* This is why some items are harder to move than others and why our hands get warm when we rub them together.

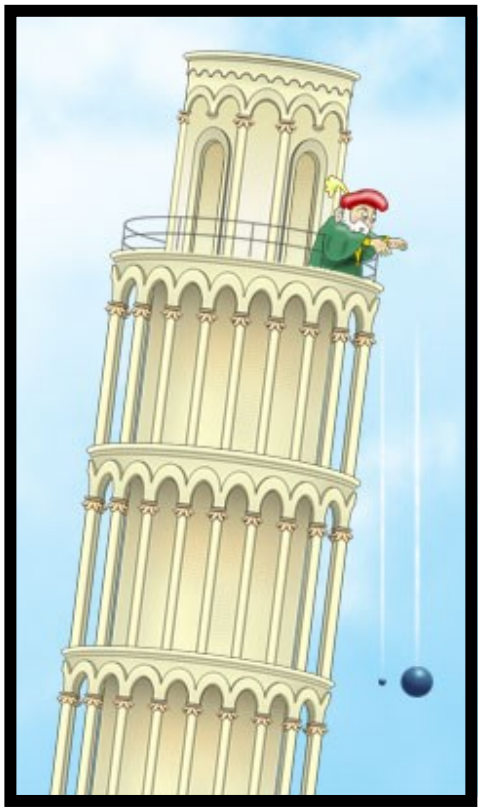
This week we are discussing gravity. Gravity on Earth gives weight to physical objects. Gravitational pull on the Moon is responsible for ocean tides. Gravity from the Sun keeps the planets in orbit.

Since both are forces *(strength or energy as an attribute of physical action or movement)* both change motion. Follow along next week as we start studying Newton's Laws of Motion.

ARISTOTLE

2 Famous Scientists with different theories

GALILEO



Aristotle believed that two objects dropped at the same time would hit the ground at a different time based on the weight of the object. Speed of the Object $\propto$ Weight of the Object (Means proportional to)	Galileo believed that two objects of the same size, but different weights, dropped at the same time from the same height would hit the ground at the same time. Speed of the Object $\not\propto$ Weight of the Object (Means not proportional to)

How Can I Test the Effects of Gravity?

Websites to Help With Ideas

https://www.brighthubeducation.com/science-fair-projects/96195-gravity-science-projects/ (provides ideas for primary & middle grades)

https://thatafterschoollife.com/gravity_challenge.html (good outline for adults to help run experiment and keep mess under control) 😜

Try and balance a pencil on your fingertip. Gravity wants to pull each side down but if you are able to find the ***center of gravity*** you will be able to balance it.

Drop the same item with a different weight from the same height (from a deck, a ladder, a chair, etc.)

Punch a hole the size of your index finger in the bottom of a cup. Cover the hole and fill with water. When you uncover the water pours through to the ground due to gravity. Now cover the hole, fill with water, and try to uncover the hole while dropping the cup at the same time. Most of the water should stay in due to the speed of the drop being the same and gravity having the same effect on both. (Hint-you may want to do this outside to keep Mom happy.) 😜

Engineering Notebook

Design/Plan:_____

_____

_____

Materials Needed: _____

_____

_____

_____

How To Run Test: _____

_____

_____

_____

_____

_____

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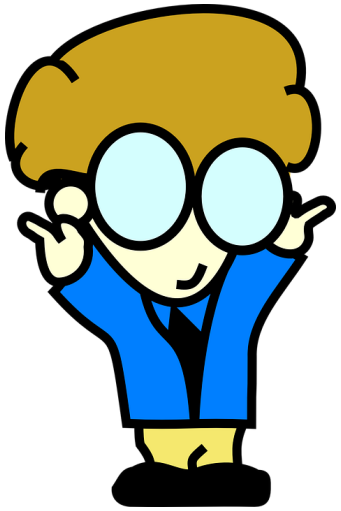
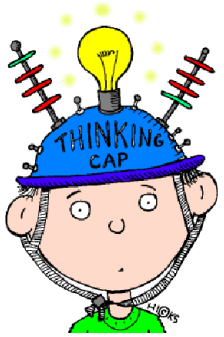
It is important to note the engineering process is a *cycle* and can be started *anywhere* in the process/cycle.



Engineers are always thinking and taking notes so let's put on our thinking cap:



- What changes if I add an incline (slope/ramp)?
- Is the impact the two objects make the same?
- What if I test with more objects and/or people? What variables might change the outcome?
- How do different types of friction (ex. air resistance, water resistance) affect gravity?

NOTES SECTION

We at the Science Center would love to see your finished project, notes you have taken in your engineering notebook, and/or get general feedback.

Tag us on Twitter or Facebook at James E. Richmond Science Center