

ENGINEERING DESIGN

A
SCIENCE @ HOME
ACTIVITY

DESIGN A PENDULUM

CHARLES COUNTY PUBLIC SCHOOLS
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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

COMMUNICATE
your solution

ITERATE
to improve
your prototype

TEST
and evaluate
your prototype

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



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PROBLEM:



QUESTIONS

What is a pendulum?

Why would I want to make one?

How do I make it?

What materials could I use?

What resources can I use to help me?



AREA TO WRITE RESEARCH & IDEAS

THE FOUCAULT PENDULUM

A French physicist with the last name of Foucault (pronounced like Foo-koh) assembled a **pendulum** in 1851. This pendulum had a 62 pound iron ball suspended from a dome in the Panthéon by 220 feet of steel wire. The rotation of the swing was the first laboratory demonstration of the Earth spinning on its axis. (Encyclopaedia Britannica)



*What is a pendulum?
A pendulum is a weight hung from a
fixed point so that it can swing
freely backward and forward.*

How are pendulums used today?

- To tell time—Clocks
- To keep rhythm—Metronome
- To protect from earthquakes—buildings use friction pendulums to allow structures to sway

<https://sciencing.com/uses-pendulums-8541430.html>

HOW DOES FOUCAULT SHOW ROTATION?

Newton's Laws of Motion show if you set the pendulum in motion it will swing back and forth passing directly through the point where the chain is attached. Because Earth is rotating, and the room in which the pendulum is located *is also rotating*, the mass of the ball appears to follow a curved path over time.



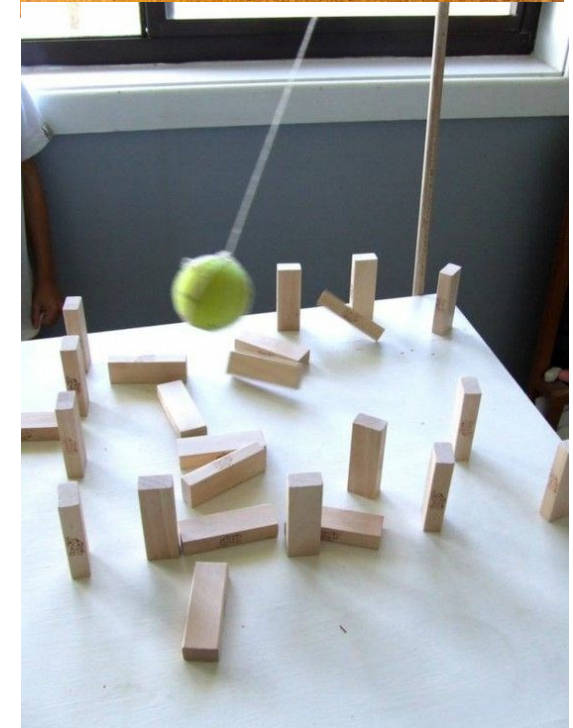
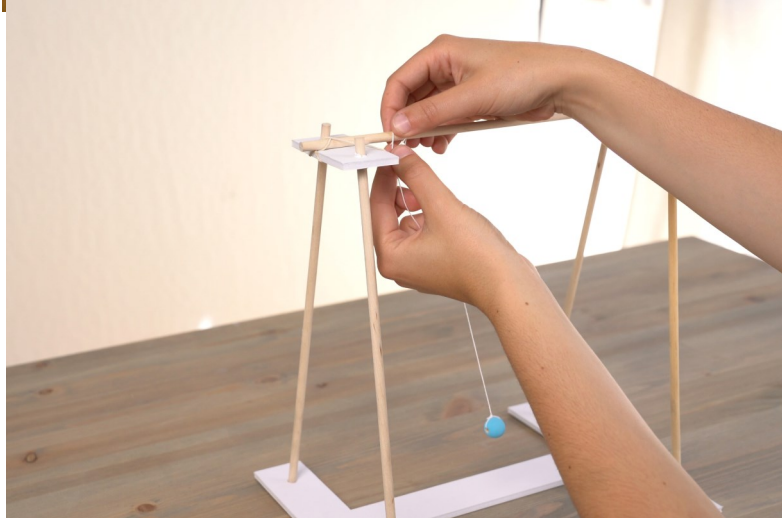
The following video link shows a Foucault Pendulum at the Chicago Museum of Science & Industry. The video is about 6 minutes so be patient if you want to see how it works.



https://youtu.be/iqpV1236_Q0

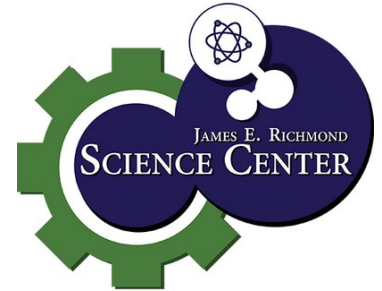
The mass* of the ball causes the pendulum to move back and forth over the same spot. The base is fixed in place and has stakes sticking up. As the Earth rotates, the fixed base also rotates, and over time the ball strikes each stake. Over a 24 hour period the ball would knock down each and every stake, therefore showing the rotation of the Earth every 24 hours.

*mass: a measure of how much matter is in an object



Videos to Help With Your Design
<https://youtu.be/Wvqt8Q3OT9I>
<https://youtu.be/67ObDqgkTSo>

Engineering Notebook



Design: _____

Materials Needed: _____

How To Construct: _____

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



Build Your Prototype (*prototype is another word for model*)

HOW?

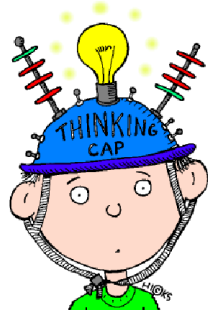
Use materials around the house to layout a model
or draw a picture



Now that you have your prototype it is time to test your final result—TIME TO BUILD!

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

- Are there better materials I could use?
- What happens if I hang the object of mass on a longer suspension?
- Would using an object of heavier mass change anything?
- Is there something I can add to knock down and really see the rotation of Earth?



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