# STEM Program

# Pendulums

## Astrophysics and Gravity Waves

Measuring gravity with a pendulum - In this activity you will find out what a pendulum is and find out how they work, then you will use one to calculate the gravitational potential and kinetic energy. This can help you to accurately measure the strength of the gravity no matter what location you're in!

This activity was inspired by our friends from the Australian National University Young Stars program, who gave us permission to reproduce it. Thanks Manik and team!

## Suited to Section

Joey Scouts | Cub Scouts | Scouts | Venturer Scouts | Rover Scouts

## Challenge Area


## Key SPICES Growth


## Likely Scout Method Elements

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## Plan

Materials needed:
1. A piece of string
2. Some Blu-Tack
3. 6 2x4 Lego bricks
4. A straight table edge
5. A way to record the time accurately (e.g., a stopwatch or phone)
6. Your thinking cap!

## Do

How to set up your pendulum experiment:
1. Tie your Lego bricks to your string, making sure that they're very secure
2. Find a solid table edge
3. Attach your string to the table using your Blu-Tack
4. Make sure that your pendulum doesn't hit anything when it swings
5. Measure the length of your string (It doesn't matter how long or short your string is)

The experiment:
1. Hold the end of the string at an angle (Again it doesn't matter what angle!)
2. Let go and time how long it takes to make 10 full swings (Forwards and backwards is one)
3. Use the formula of to calculate the gravity (l = length)(Period = swing forwards and back)
4. Repeat this with different lengths of string or angles

Keys and formula:
T = Time
G = Gravity
L = Length

Divide by ten to get times 1 swing

| Time (T) of swings | |
|---|---|
| Measure T taken for 10 swings | Measure T taken for 1 swing |
| | |
| | |

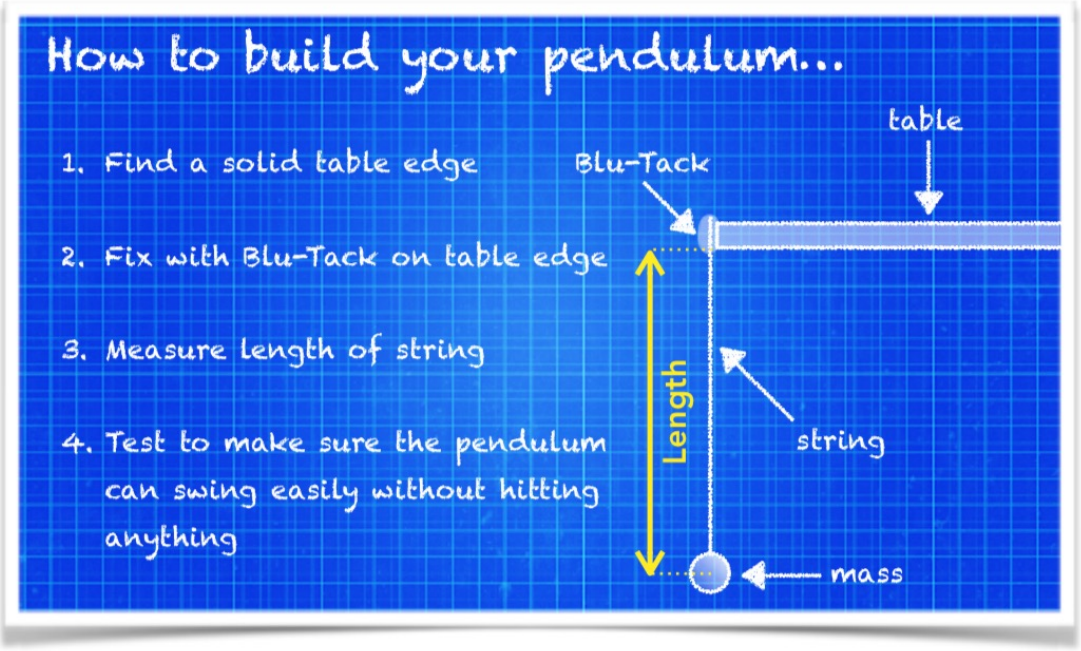
Formula:
$G = (4\pi^2 xL) / T^2$
$= (4\pi^2 x$ ____$) /$ ____$^2$
(use an advanced calculator for ease)

## Review

When you hold the pendulum at a big height, its potential energy is at its greatest, then as you drop the pendulum, the potential energy decreases and the mechanical energy is increased. In this the potential energy is unable to restore without physically making it not hit the same spot each time!

As a result of the formula, your calculations should be 9.8, although due to variable inconsistencies, any result from 9 to 10 is perfectly acceptable.

The shorter the length of the string, the more accurate you have to be with your measurements



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## Want To Learn More?

- Gravity Experiments for Kids - Galileo and Isaac Newton: https://bit.ly/GravityExperiments4Kids
- Teaching Engineering - Swinging Pendulum: https://bit.ly/SwingingPendulum
- Pendulum Experiment: https://explorable.com/pendulum-experiment

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## SciScouts Physics of Waves

The SciScouts Physics of Waves is a National Science Week project, undertaken in collaboration with Fizzics Education. These instructions were prepared by Scouts for Scouts. This National Science Week project is supported by the Australian Government.

Scouting has always been strong on STEM skills. Maths to calculate catering quantities and navigate, the science of water purification, the physics of abseiling, and the engineering of pioneering structures – they all have their place. In the current program for our youth members, STEM and Innovation forms one of six Special Interest Areas that enable Scouts to set goals and pursue their own ideas.