Engineering a Marble Run!

This activity helps fulfill the following badge requirements:

- **Daisies: Mechanical Engineering – Step 2**
- **Brownies: Inventor: Step 1**

Materials

- Activity One
  - Cardboard
  - Cardboard tubes
  - Tape (safe for walls if you have it)
  - Scissors
  - Marbles, cars, anything that rolls
  - Boxes

Introduction

Engineers think up creative, useful solutions and work with other people to invent, design and build things that help us every day. We are surrounded by items that have been designed by engineers. The table you sit at, the phone you use, even the toys you play with have all been designed by engineers.

Engineers use the engineering design process to work together to dream up and create new ideas.

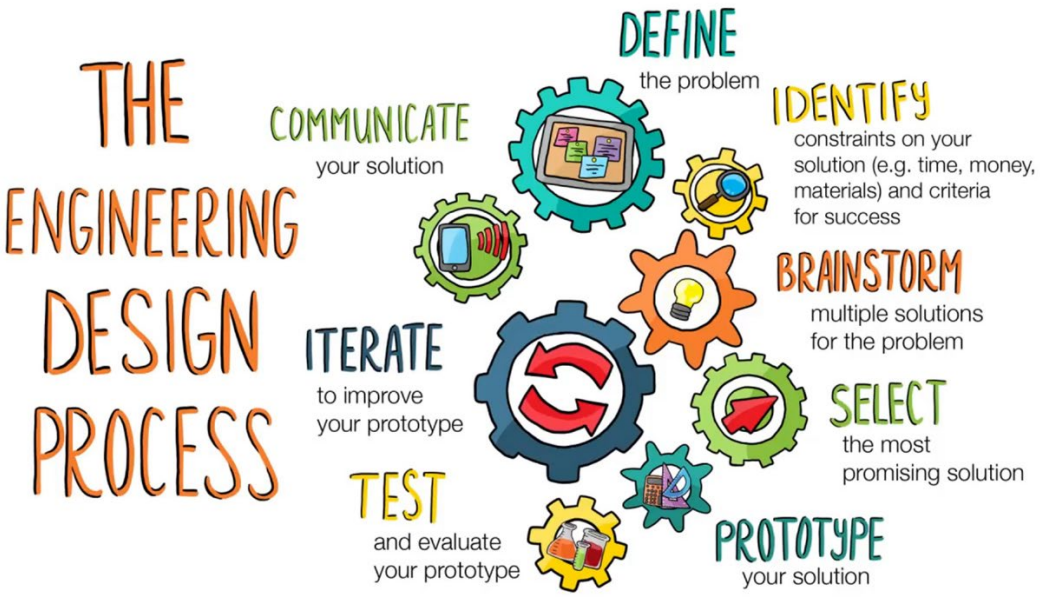
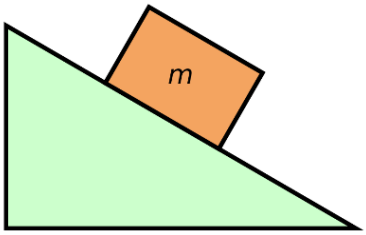


Photo credit: nationalgeographic.org

Activity One: Marble Run



Step 1: Define the problem - Your challenge is to make a course for marbles to follow using things found around you home.
To race marbles you will need some kind of slide or run, like a water slide. It uses gravity while keeping friction to a minimum.
Friction is the force between two surfaces that causes a moving object to slow down. Think about the breaks on a bike.

Step 2: Brainstorm and design – Take a moment before you start to build to make a plan, think about where you are going to be building this run. Are you going to use a box, tape things to the wall (with an adult's permission), how many turns is it going to have? It is good to have more than one idea, get creative!

Step 3: Select and Build your prototype – Pick a design to start building, try and make the run as close to your drawing as possible.

Cardboard is a really good material for prototypes, it is easy to find, can be cut into lots of shapes and sizes, you can bend it, and can be changed quickly.

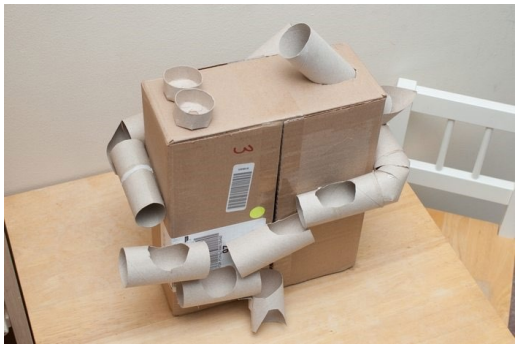
Making a cardboard strut
Cut a strip of cardboard the length of the section of run you need. Fold it in half hotdog ways so it looks like a really long "V". Now you can tape this to the wall or box.

Step 4: Test your Model – This can be done as you are building the prototype, test a section see if it is working the way you want. If not, go to step 5.

Step 5: Iterate (which means Evaluate and Redesign) – Think about what isn't working the best, how can it be improved, try a new way, test it and repeat.

Examples of Runs:

Wall Run – the wall run uses cardboard tubes and struts attached to the wall with tape approved of by an adult.



Box Run – This design uses a cardboard box as the base for the run you can have the run travel around the box.

Additional Challenges:

- Have your marble take 30 seconds from start to finish, no more no less.
- Have the marble travel uphill for part of the run.
- Design a creative end to the run

Wrap up

Testing and redesigning is a processes, engineers are constantly looking at their designs and trying to make them easier to use, more effective, or more fun.

Once you have finished your runs take a photo or short video and share it with us.