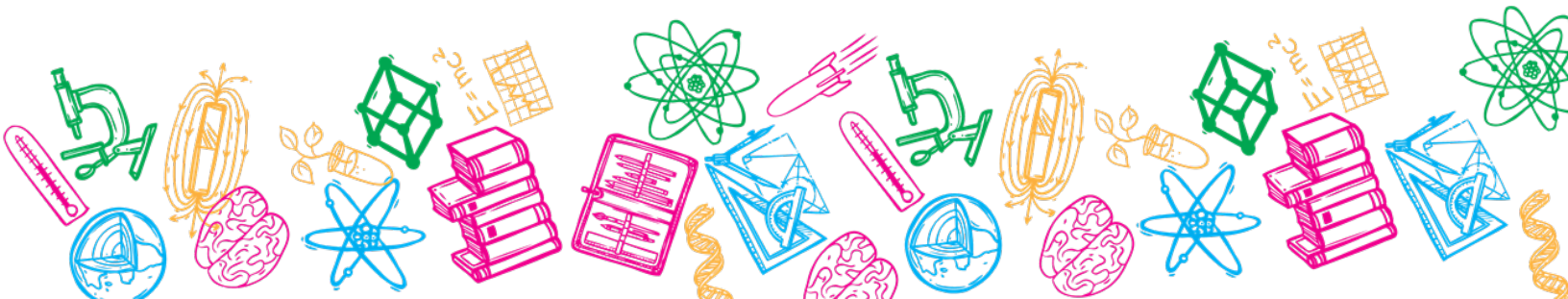
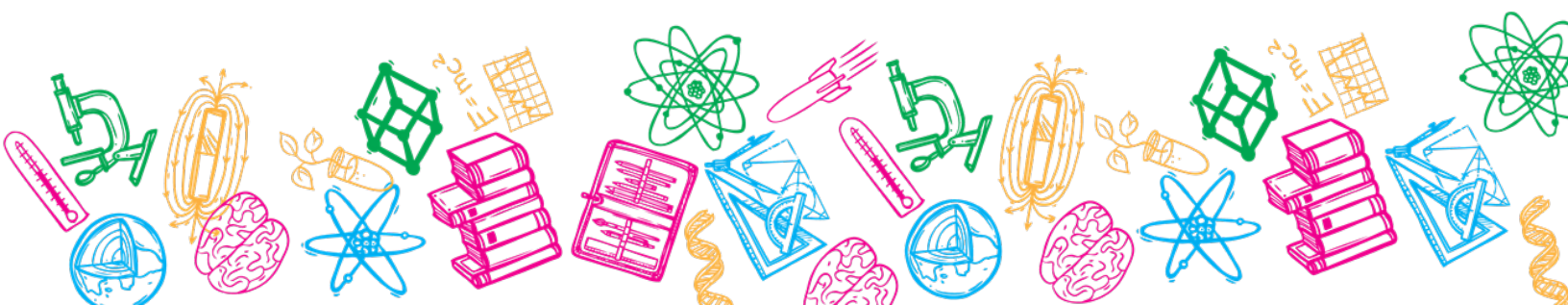
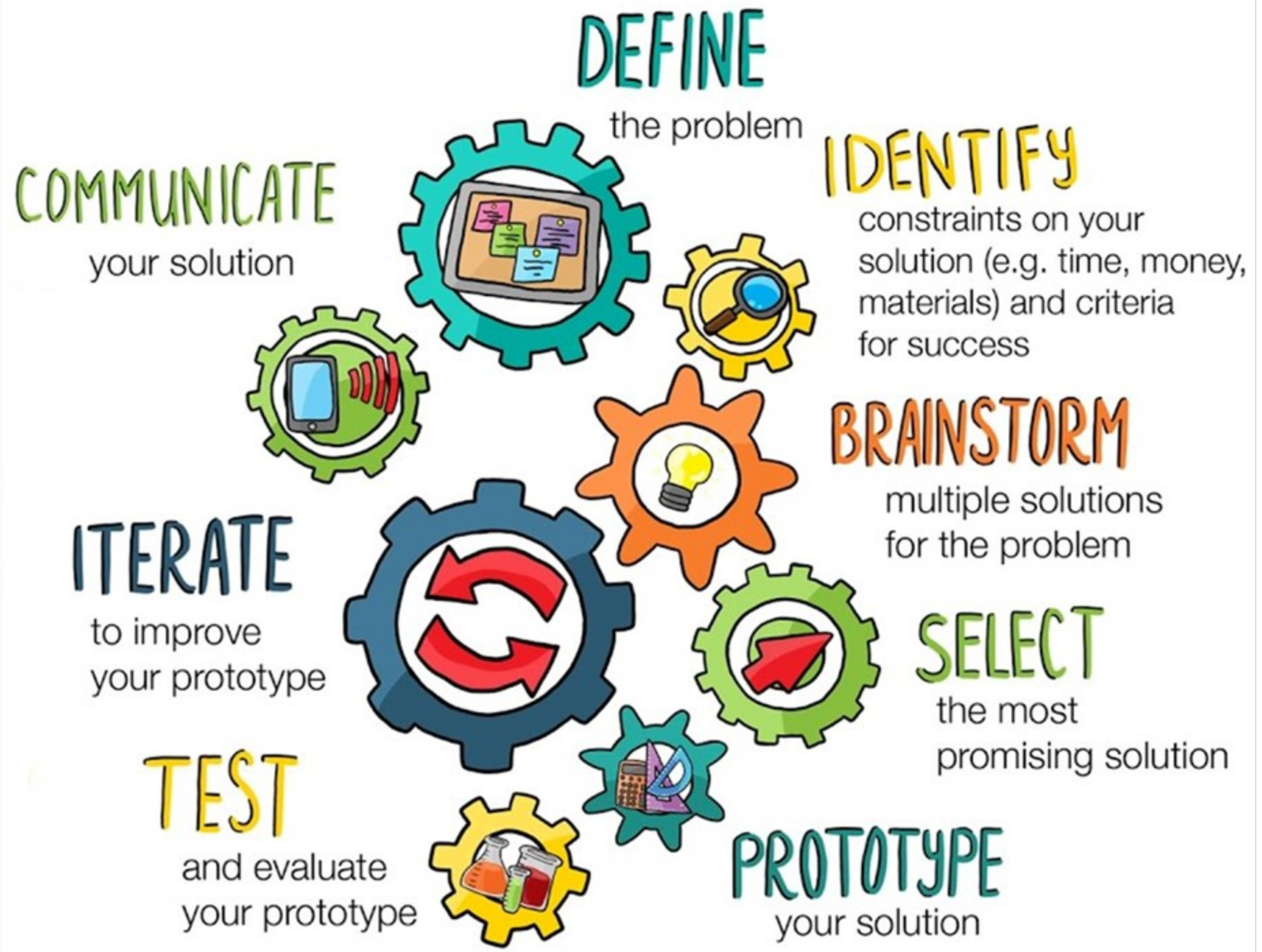


ABB Girls in STEM

Fun Patch
Girl Scout Guide



DESIGN THINKING PROCESS



CHALLENGE ONE—EMERGENCY LIGHT

Oh no, the power has gone out! Can you design an emergency light?

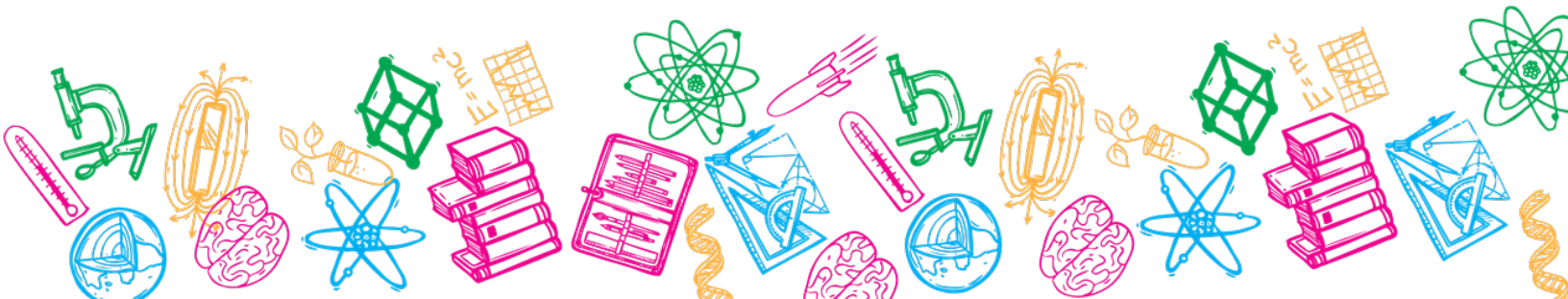
To complete this challenge you will learn how to make a circuit out of copper tape, and then build your own light prototype.

Activity	Materials
Warm Up	None
Learn a Skill	Copper tape (two 10-inch lengths for each girl) Button battery (one or two for each girl) Diode light (one for each girl) Paper circuit template (one for each girl) Binder clips (one for each girl) Scotch tape
Design a Solution	Notebook and pencil Copper tape Button battery Diode light Prototype-building materials (this is a sample list- feel free to customize based on what you have on hand) Recycled objects (boxes, egg cartons, paper towel rolls, etc.) Masking tape Construction paper Scissors Craft sticks Markers/crayons/colored pencils

QUESTIONS TO THINK ABOUT:

Can you remember a time when you lost power? What happened?

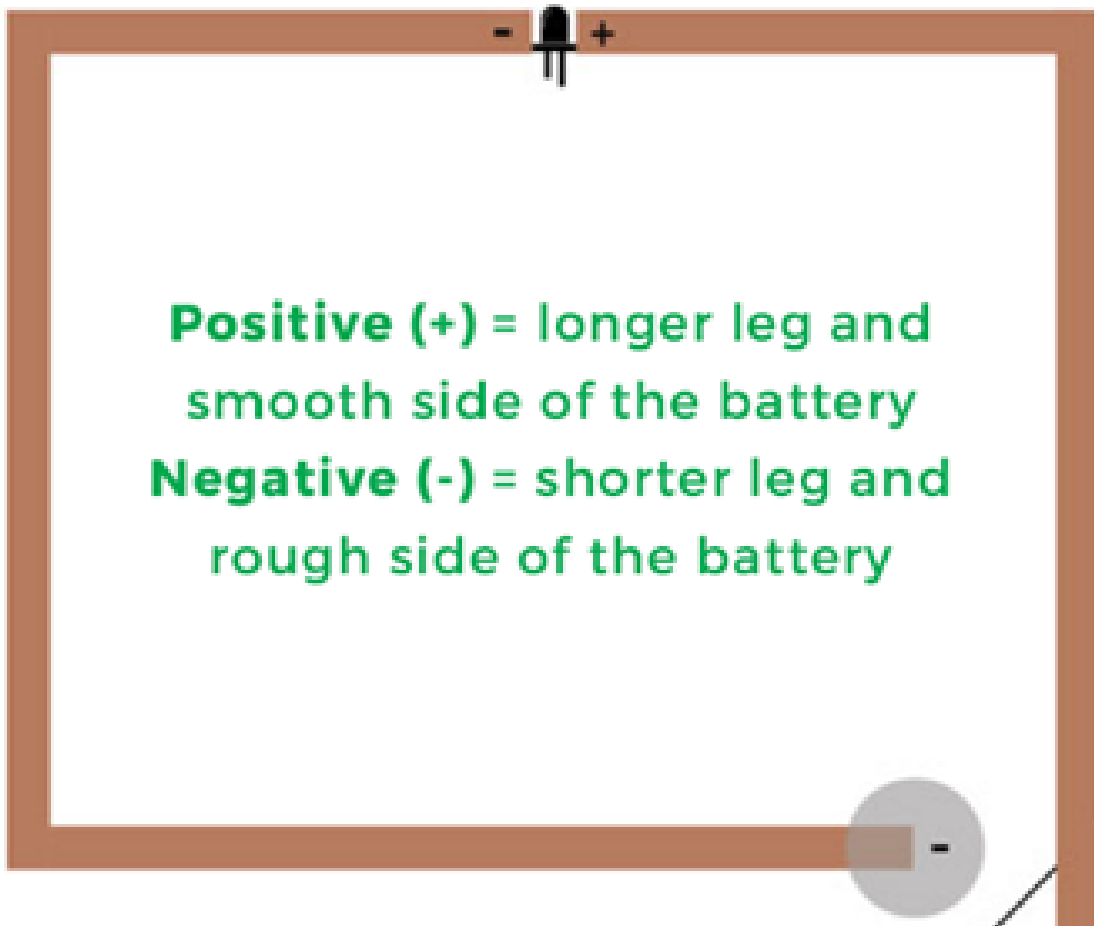
What kind of emergency lights did you have to use?



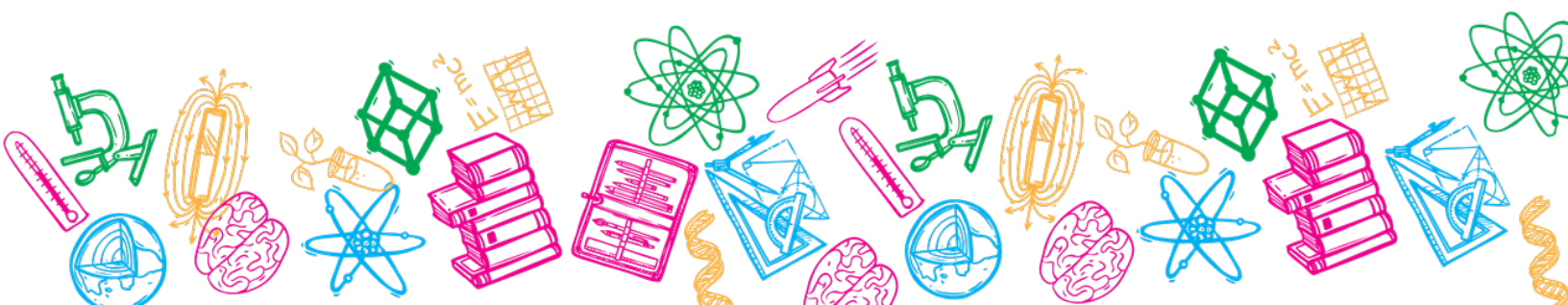
CHALLENGE ONE—EMERGENCY LIGHT

PAPER CIRCUIT

SIMPLE



Positive (+) = longer leg and smooth side of the battery
Negative (-) = shorter leg and rough side of the battery

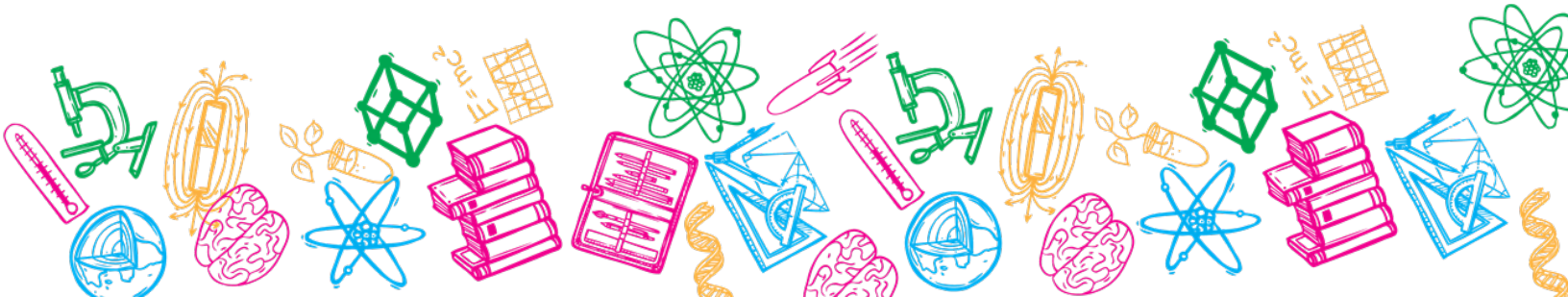


CHALLENGE ONE—EMERGENCY LIGHT

Define the Problem: The power went out and we need an emergency light!

Identify Criteria: What does a good emergency light need to have?

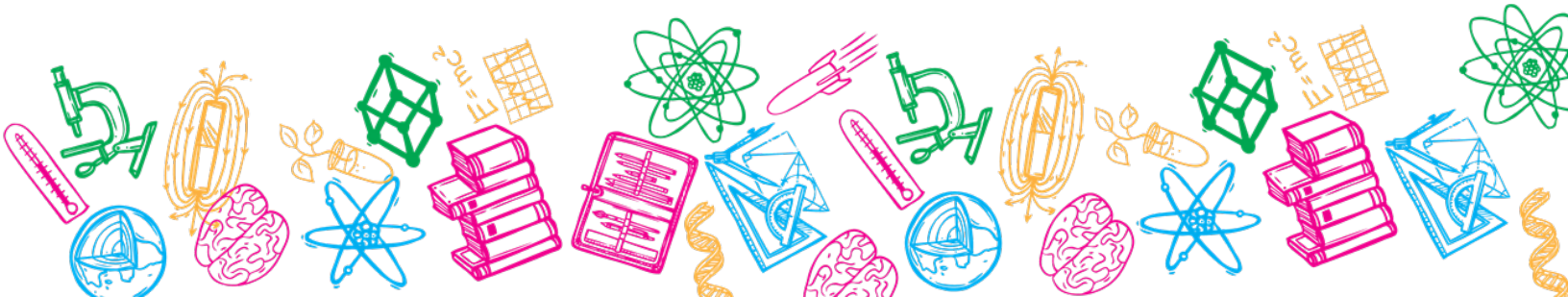
Identify Constraints: What can we not do as we build an emergency light?



CHALLENGE ONE—EMERGENCY LIGHT

Brainstorm Ideas:

Select the Best Idea: Use your criteria!



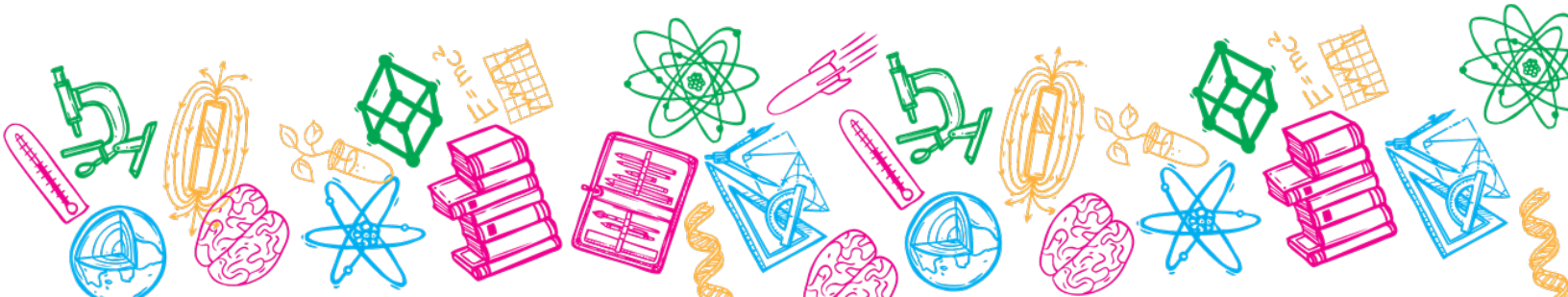
CHALLENGE ONE—EMERGENCY LIGHT

Sketch Your Prototype:

Things to Think About:

Where will your light go? Your battery?

Can you draw the circuit between the two?

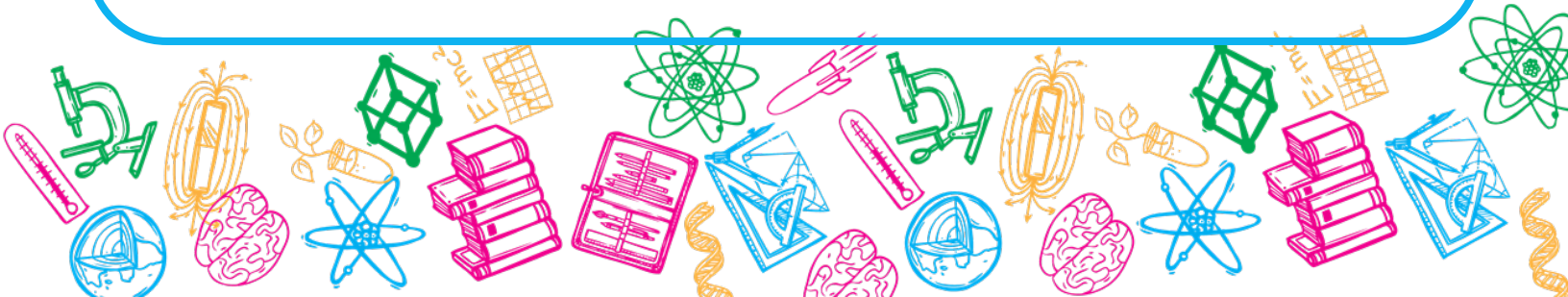


CHALLENGE ONE—EMERGENCY LIGHT

Test 1 Improvements:

Test 2 Improvements:

Test 3 Improvements:



CHALLENGE TWO—FACTORY ROBOT

The local factory needs a new robot! Design a robot that can lift or push.

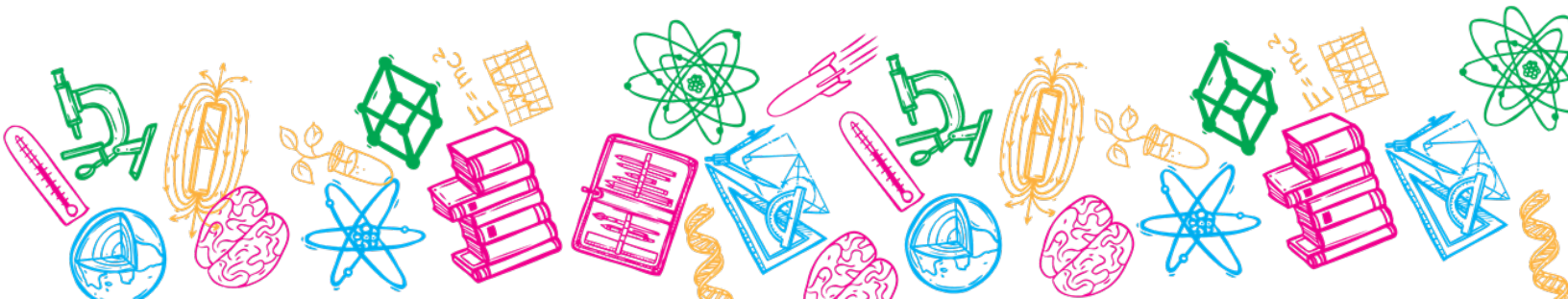
To complete this challenge you will learn how to make a hydraulic piston system, then build your own prototype of a robot that pushes or lifts!!



Activity	Materials
Warm Up	None
Learn a Skill	Oral syringes (2 per girl) Plastic tubing (8-inch length per girl) Cup of water
Design a Solution	Notebook and pencil Zip ties Cardboard Scissors Masking tape Construction paper Markers/crayons/colored pencils Craft sticks Recycled objects (boxes, egg cartons, paper towel rolls, etc.)

QUESTIONS TO THINK ABOUT:

Have you ever seen a robot in real life? What did it do?

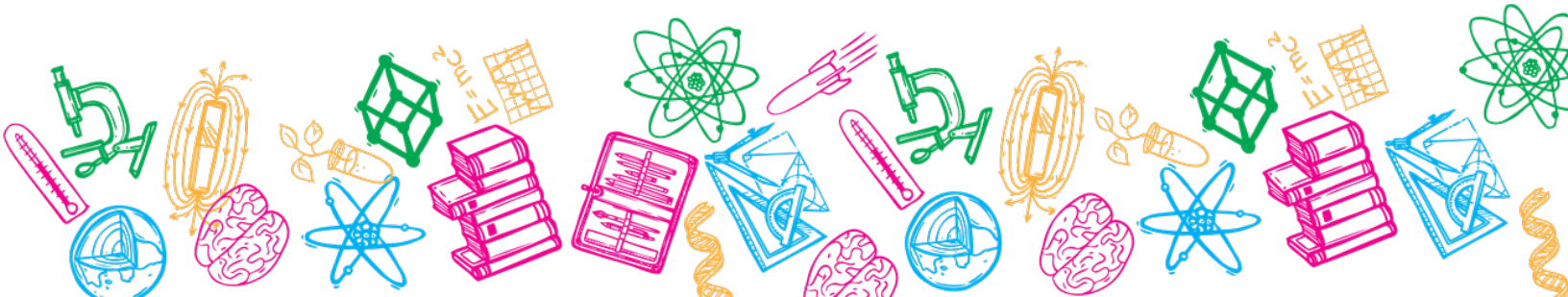


CHALLENGE TWO—FACTORY ROBOT

Define the Problem: The local factory needs a new robot that pushes or lifts!

Identify Criteria: What does a good factory robot need to have?

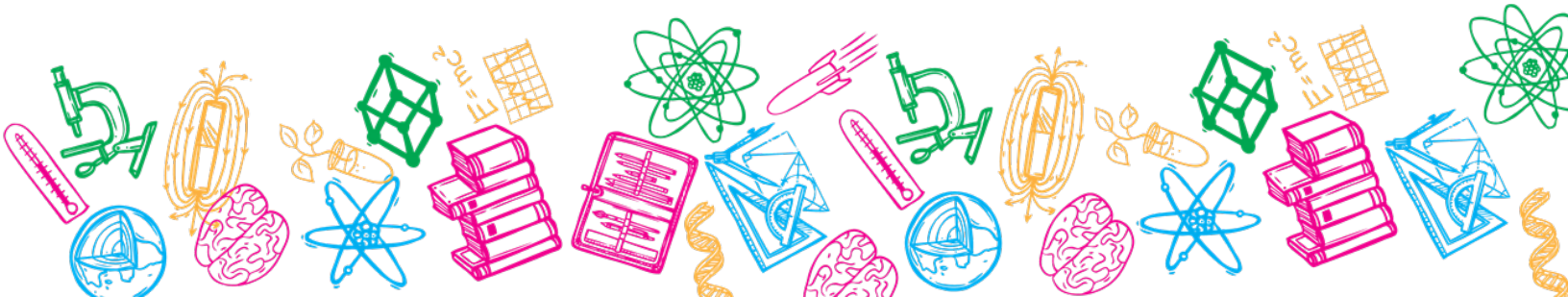
Identify Constraints: What can we not do as we build a factory robot?



CHALLENGE TWO—FACTORY ROBOT

Brainstorm Ideas:

Select the Best Idea: Use your criteria!



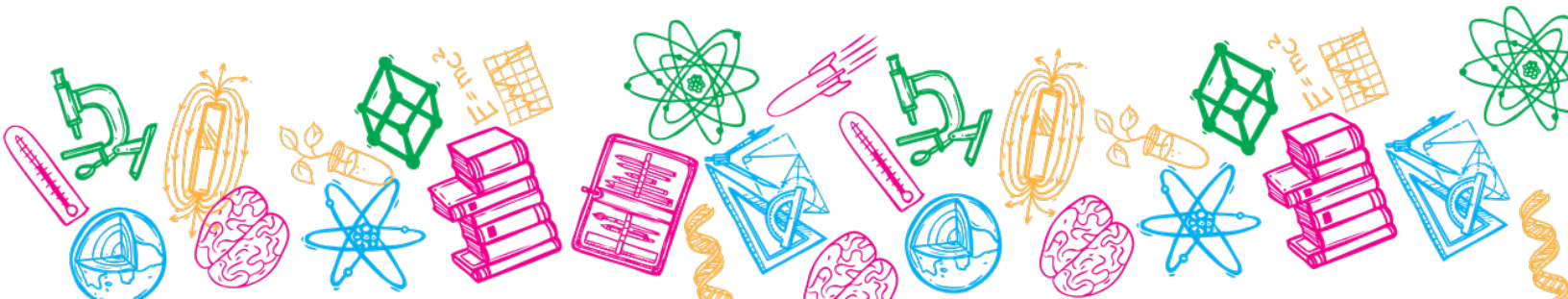
CHALLENGE TWO—FACTORY ROBOT

Sketch Your Prototype:

Things to Think About: Think about how your robot will move. Up and down or back and forth?

What will hold or push the object the robot is moving? Do you need a platform, a bucket, or a narrow poker?

What will anchor the stationary part of the robot?

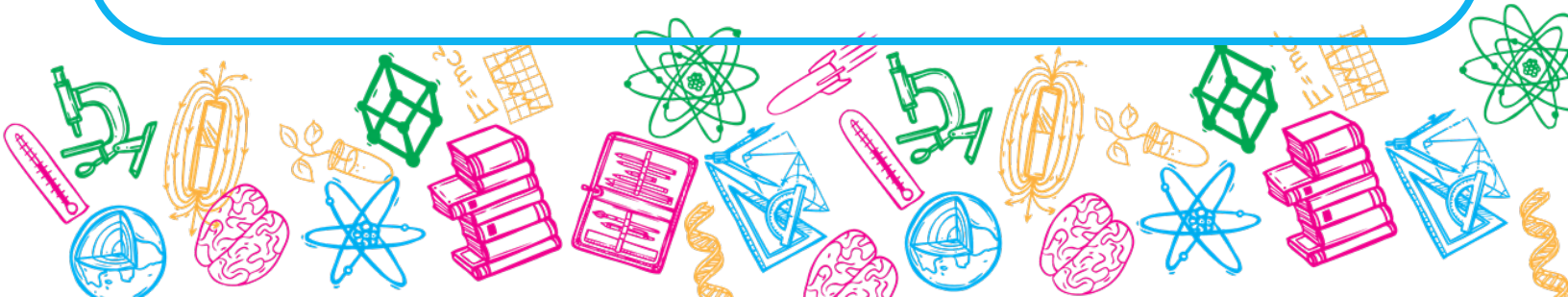


CHALLENGE TWO—FACTORY ROBOT

Test 1 Improvements:

Test 2 Improvements:

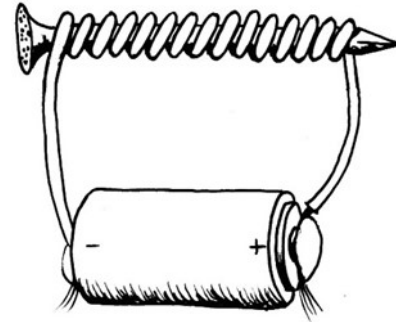
Test 3 Improvements:



CHALLENGE THREE—ELECTROMAGNETS

The recycling centers needs help sorting the recycling!
How can they pull out the magnetic material to recycle it appropriately?

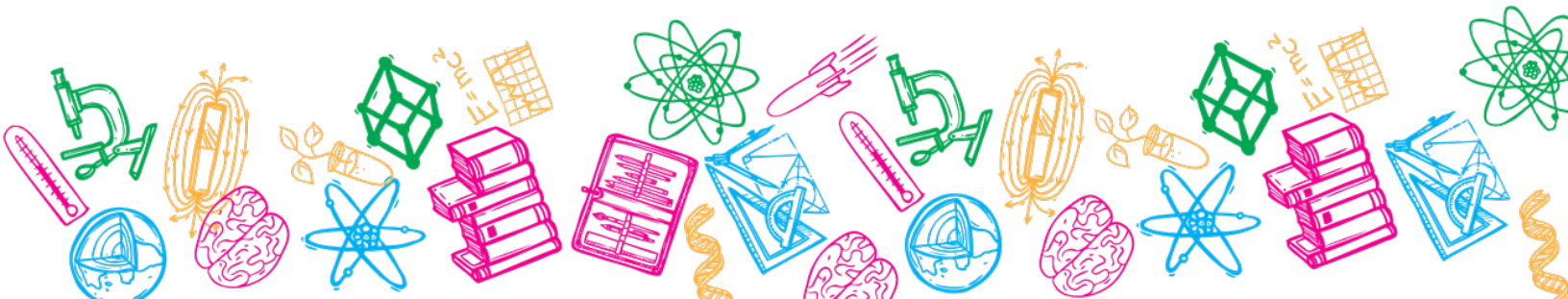
To complete this challenge you will learn how to make an electromagnet and build your own magnetic sorting machine.



Activity	Materials
Warm Up	None
Learn a Skill	Kitchen magnet Assorted magnetic and non-magnetic materials. Iron nail Magnet wire (1 coil per girl) Sandpaper Battery Scotch tape
Design a Solution	Notebook and pencil Electromagnet Assorted recyclable materials (metal and plastic) Recycled materials for machine creation (this is a sample list- feel free to customize based on what you have on hand) Recycled objects (boxes, egg cartons, paper towel rolls, etc.) Masking tape Construction paper Scissors Craft sticks Markers/crayons/colored pencils

QUESTIONS TO THINK ABOUT:

Does your family recycle at home? Why is it a good thing to recycle?

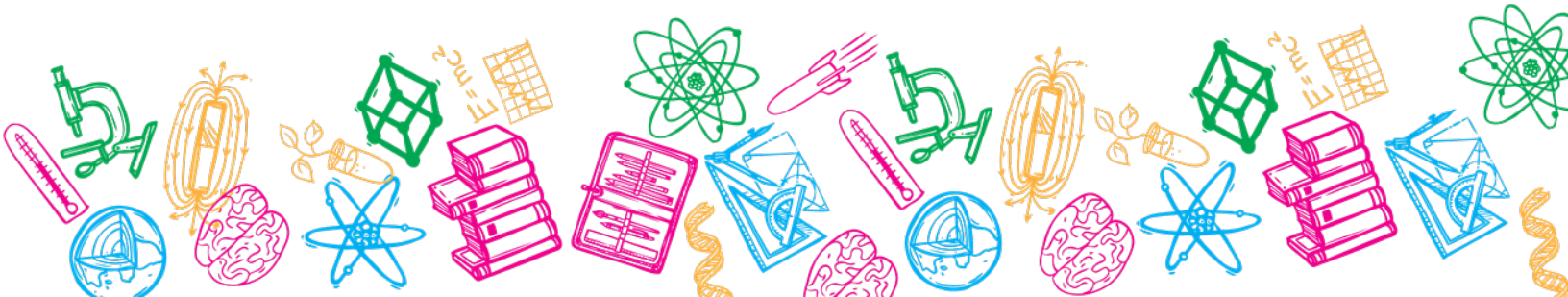


CHALLENGE THREE—ELECTROMAGNETS

Define the Problem: The recycling center needs help sorting the recycling!

Identify Criteria: What does a good recycling-sorting machine need to have?

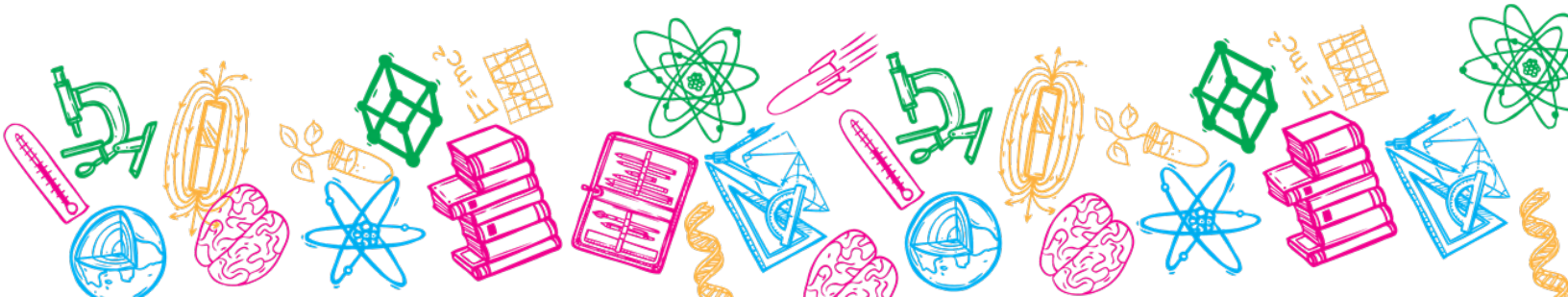
Identify Constraints: What can we not do as we build a recycling-sorting machine?



CHALLENGE THREE—ELECTROMAGNETS

Brainstorm Ideas:

Select the Best Idea: Use your criteria!



CHALLENGE THREE—ELECTROMAGNETS

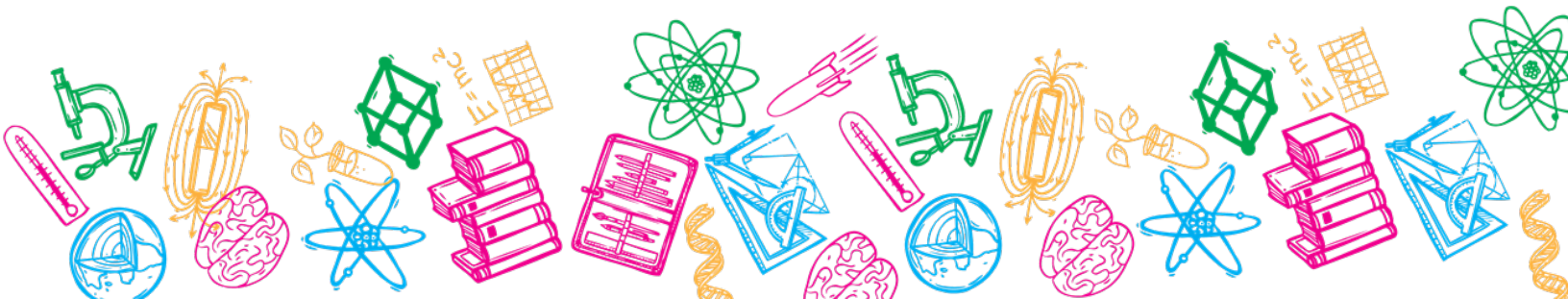
Sketch Your Prototype:

Things to Think About: Maybe use a shoebox as an “empty factory.”

What will hold the electromagnet?

How will the electromagnet interact with the recycling? Will the magnet move, or will the recycled objects? How?

Where will the materials end up when they have been sorted?



CHALLENGE THREE—ELECTROMAGNETS

Test 1 Improvements:

Test 2 Improvements:

Test 3 Improvements:

