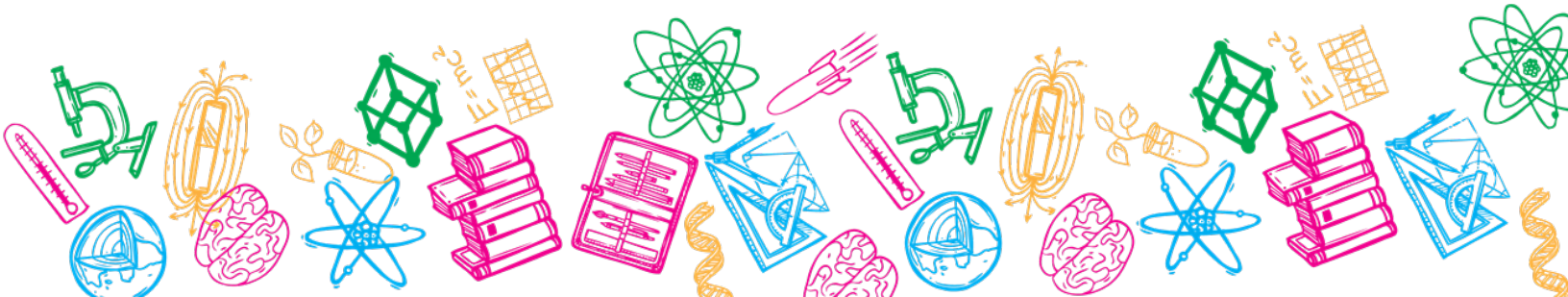
ABB Girls in STEM

Patch Program
Girl Scout Workbook

girl scouts
carolinas peaks
to piedmont



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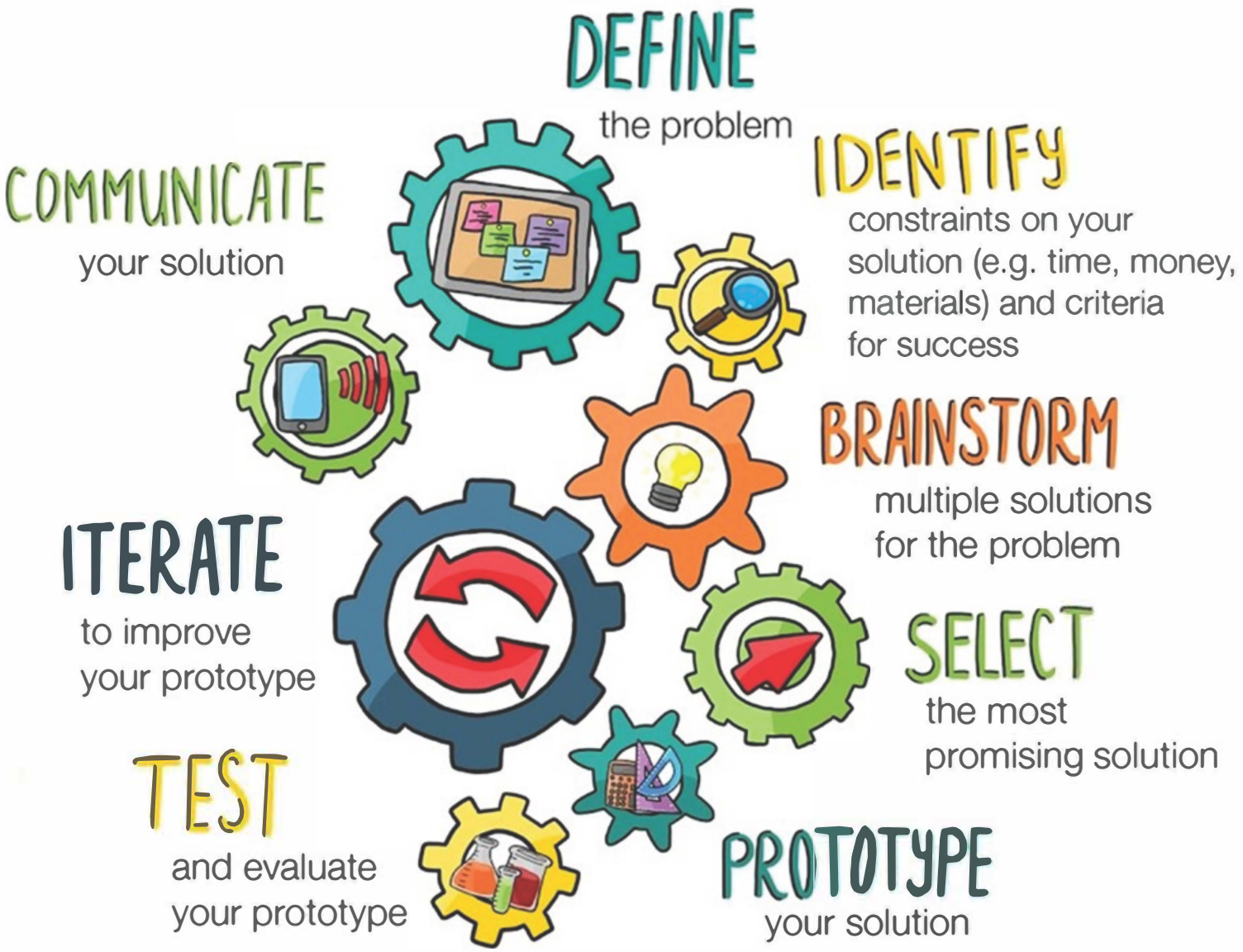
DESIGN THINKING PROCESS



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CHALLENGE ONE—EMERGENCY LIGHT

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

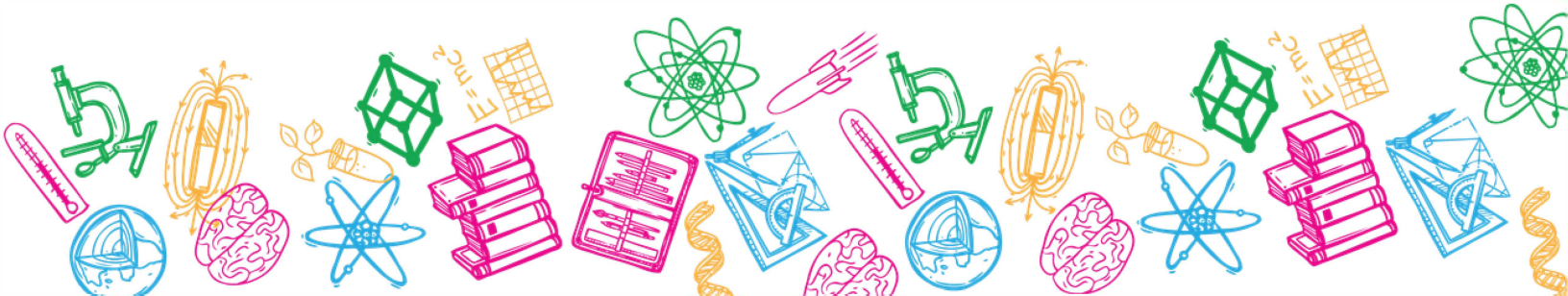
To complete this challenge you will learn how to make a circuit out of copper tape, and then build your own light prototype.

Activity	Materials
Warm Up	Girl Scout Workbook / Computer or Tablet Time: 15 minutes
Learn a Skill	Copper tape (two 10-inch lengths for each Girl Scout) Button battery (one or two for each girl) Diode light (one for each Girl Scout) Paper circuit template (one for each Girl Scout) Binder clips (one for each girl) Scotch tape Time: 15 minutes
Design a Solution	Notebook and pencil / scratch paper (computer is optional) 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/newspaper Scissors Craft sticks Markers/crayons/colored pencils Time: 45+ minutes

QUESTIONS TO THINK ABOUT:

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

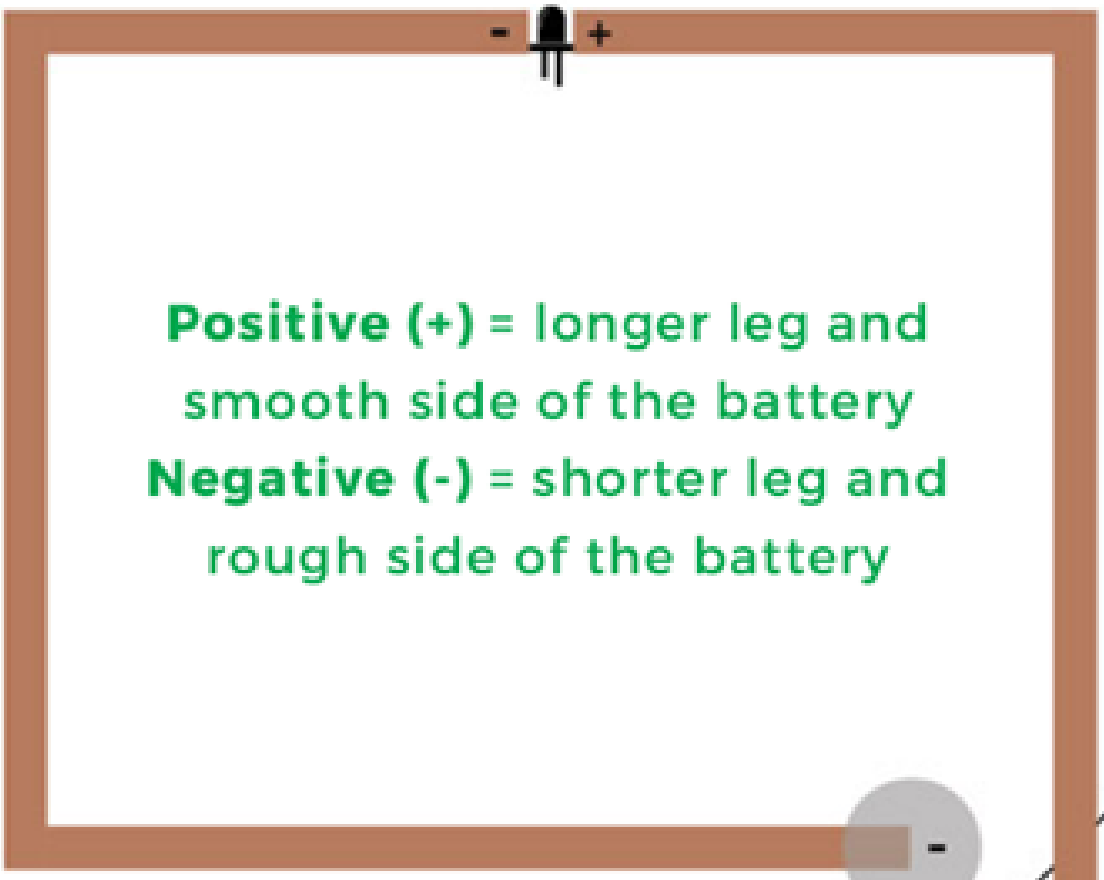
What kind of emergency lights did you have to use?



CHALLENGE ONE—EMERGENCY LIGHT

PAPER CIRCUIT

SIMPLE



Positive (+) = longer leg and smooth side of the battery

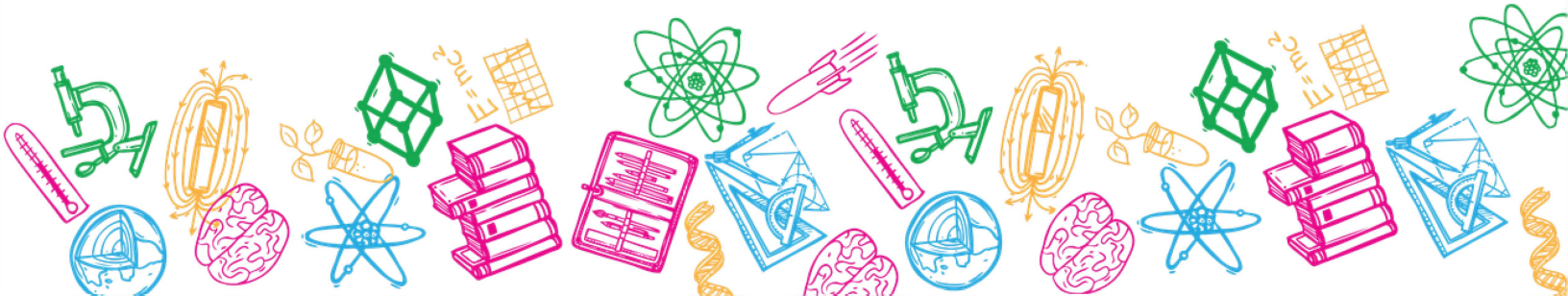
Negative (-) = shorter leg and rough side of the battery

Part 3: Design a Solution

Define the Problem: The power went out and we need an emergency light! How can we build one?

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

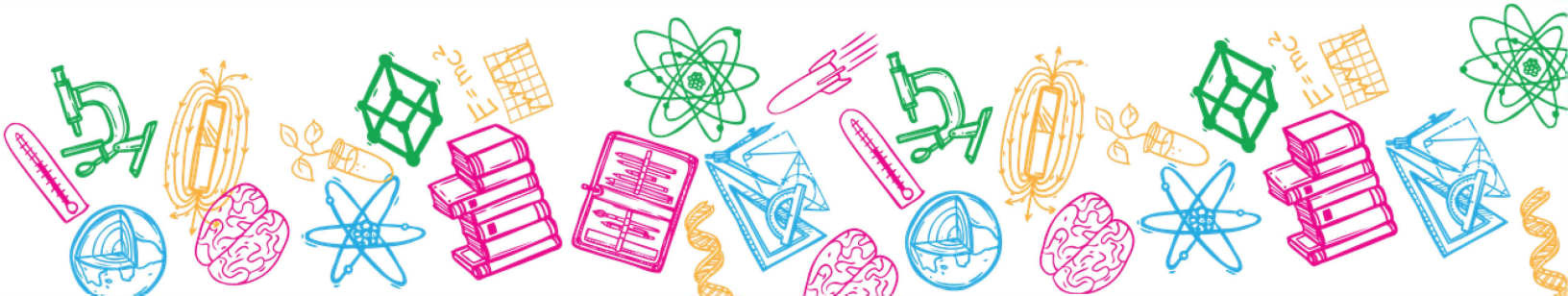
Identify Constraints: What can we not do as we build an emergency light? What do we not have?



Part 3: Design a Solution

Brainstorm Ideas:

Select the Best Idea: Use your criteria!

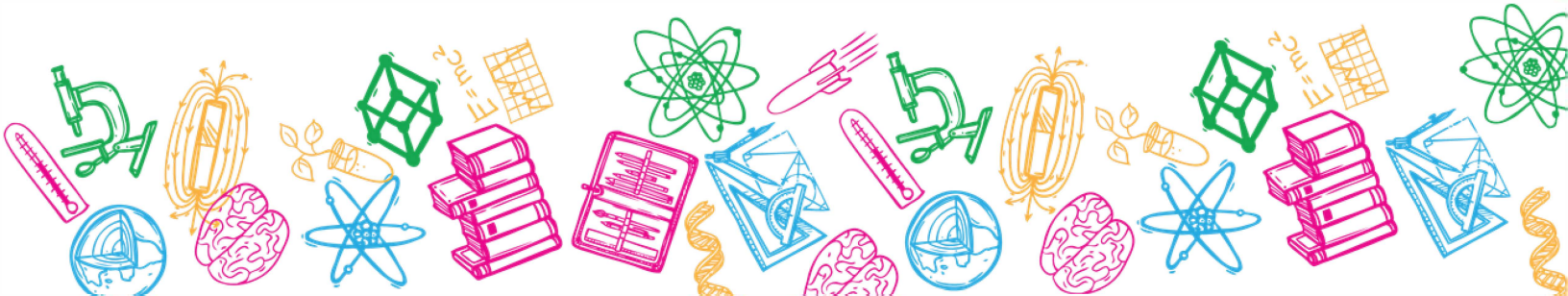


Part 3: Design a Solution

Sketch Your Prototype:

Things to Think About:

Where will your light go? Your battery? Can you draw the circuit between the two? How do real emergency lights work? Which ones are more effective and why? Why did the electricity go out?



Part 3: Design a solution.

Test 1 Improvements:

Test 2 Improvements:

Test 3 Improvements:

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CHALLENGE TWO—FACTORY ROBOT

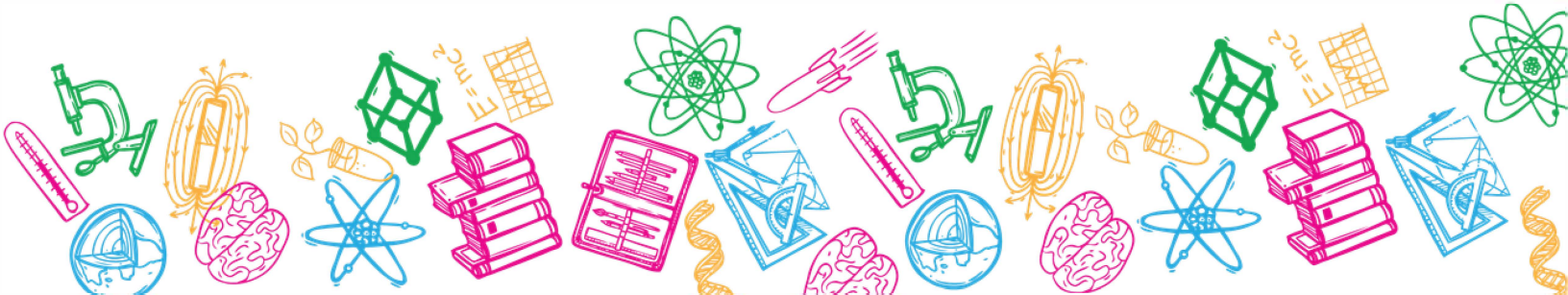
The local factory needs a new robot! Design a robot that can lift or push.

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?

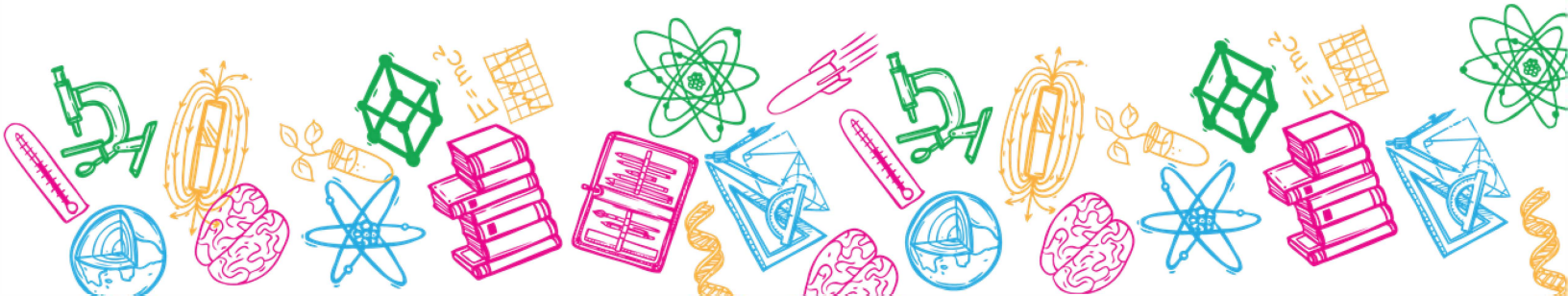


CHALLENGE TWO—FACTORY ROBOT

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?

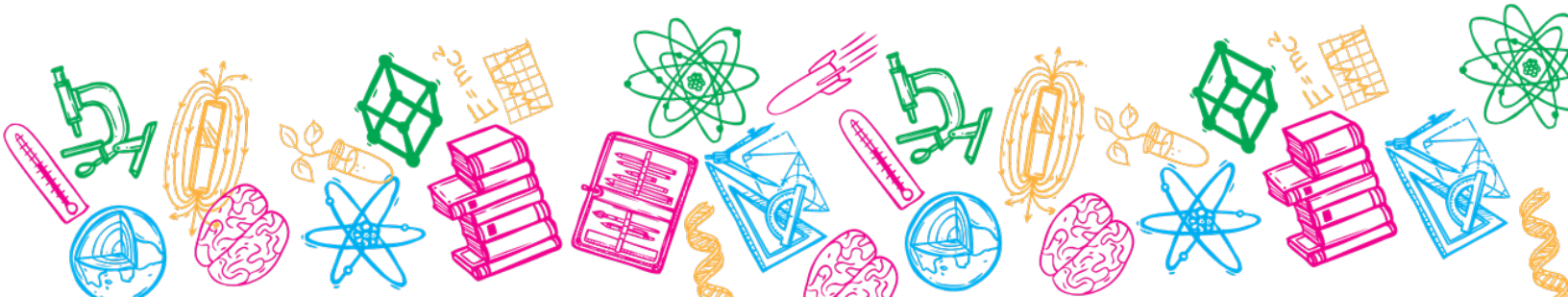
Identify Constraints: What can we not do as we build a factory robot?



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: