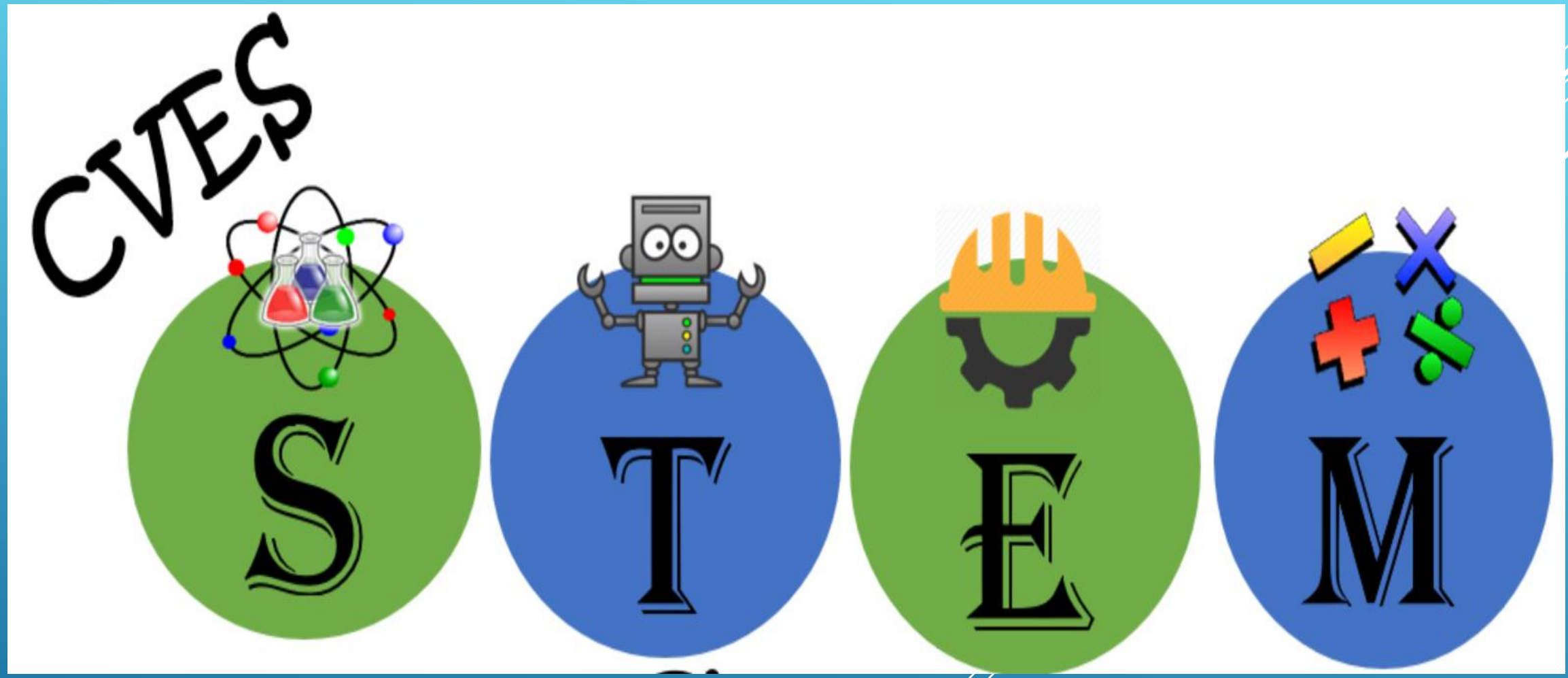
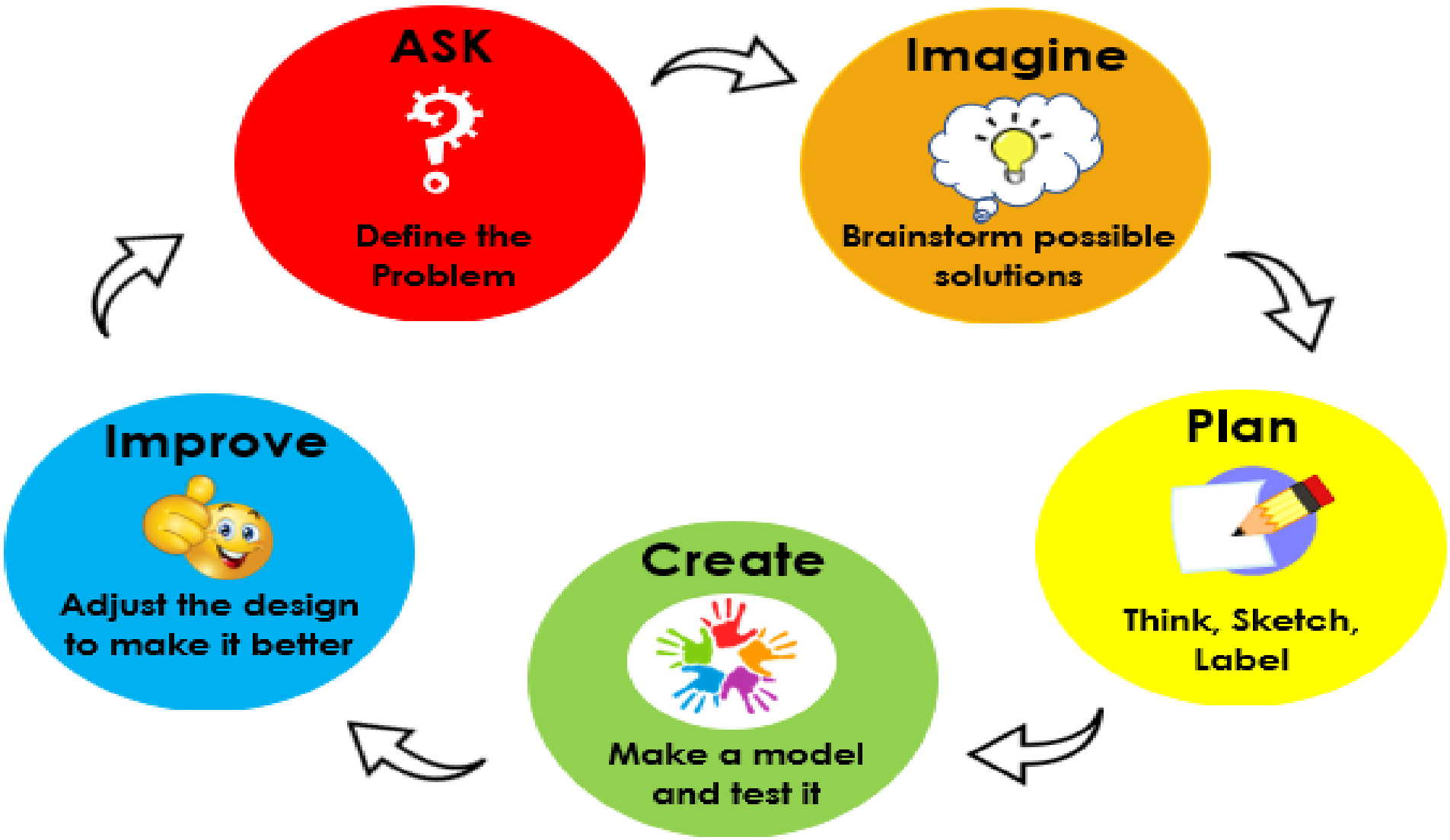


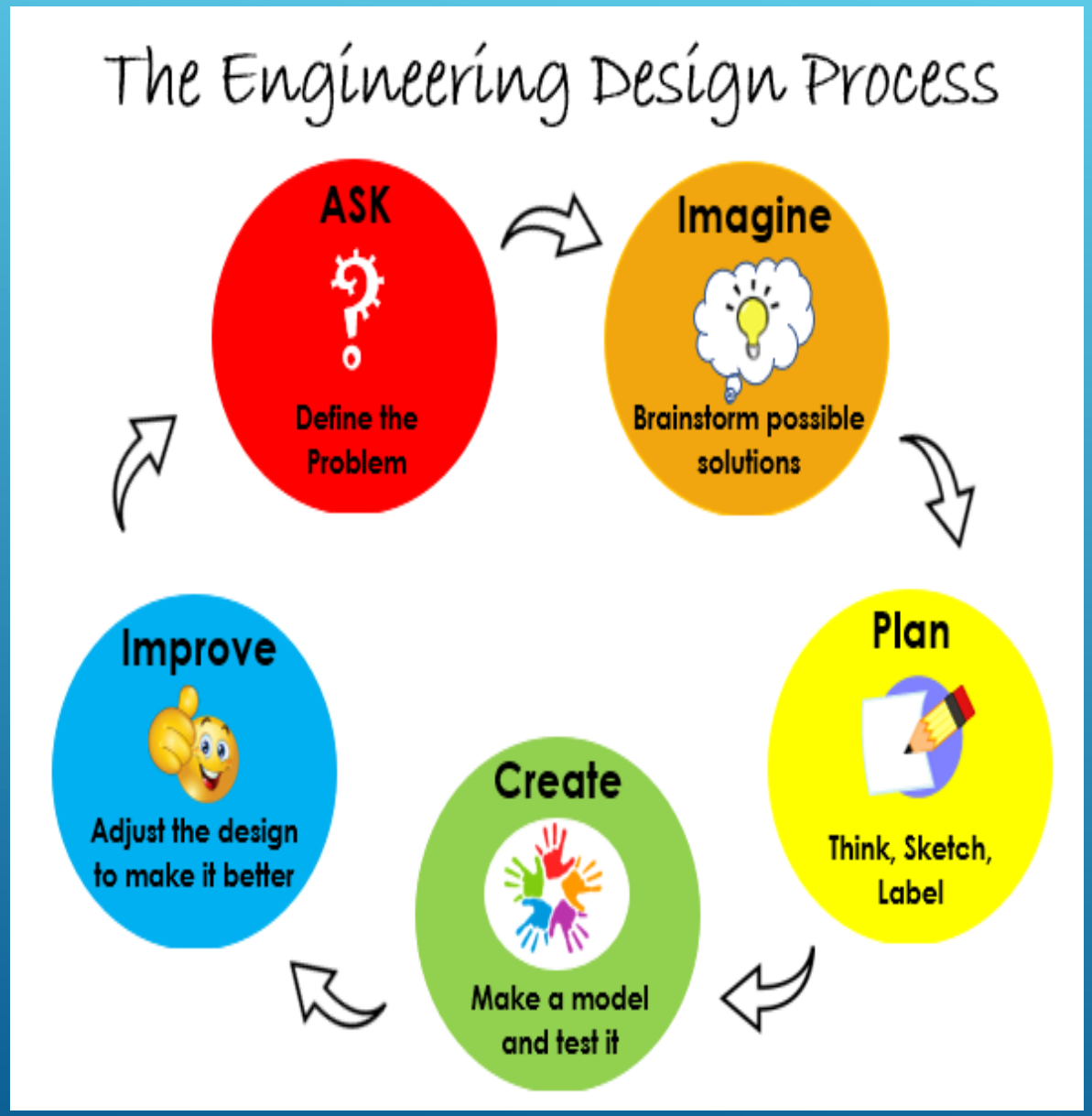
Stem Integration
K & 1st Grade

What is STEM?

The Engineering Design Process



STEM and PBL Connection



6 CHARACTERISTICS OF EFFECTIVE STEM CLASSROOM DESIGN

- Flexible
- Mobile
- Integrated
- Organized
- Flipped
- Team Focused

- **Standards for Mathematical Practice**
- 1. Make sense of problems and preserver in solving them.
- 2. Reason abstractly and quantitatively.
- 3. Construct viable arguments and critique the reasoning of others.
- 4. Model with mathematics.
- 5. Use appropriate tools strategically.
- 6. Attend to precision.
- 7. Look for and make use of structure.
- 8. Look for and express regularity in repeated reasoning.

Science & Engineering Practices

1. Asking Questions and Defining Problems
2. Developing and Using Models
3. Planning and Carrying Out Investigations
4. Analyzing and Interpreting Data
5. Using Mathematics and Computational Thinking
6. Constructing Explanations and Designing Solutions
7. Engaging in Argument from Evidence
8. Obtain, Evaluate, and Communicate

KINDERGARTEN

Rock Sorting Machine

Can you design and build a rock sorting machine?

Can you explain how it works to sort rocks?

Science Standards:

SKE2. Obtain, evaluate, and communicate information to describe the physical attributes of earth materials (soil, rocks, water, and air).

a. Ask questions to identify and describe earth materials—soil, rocks, water, and air.

b. Construct an argument supported by evidence for how rocks can be grouped by physical attributes (size, weight, texture, color).

Math Standards:

MGSEK.MD.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference.

MGSEK.MD.3 Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.

Next Generation Engineering Standards:

K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

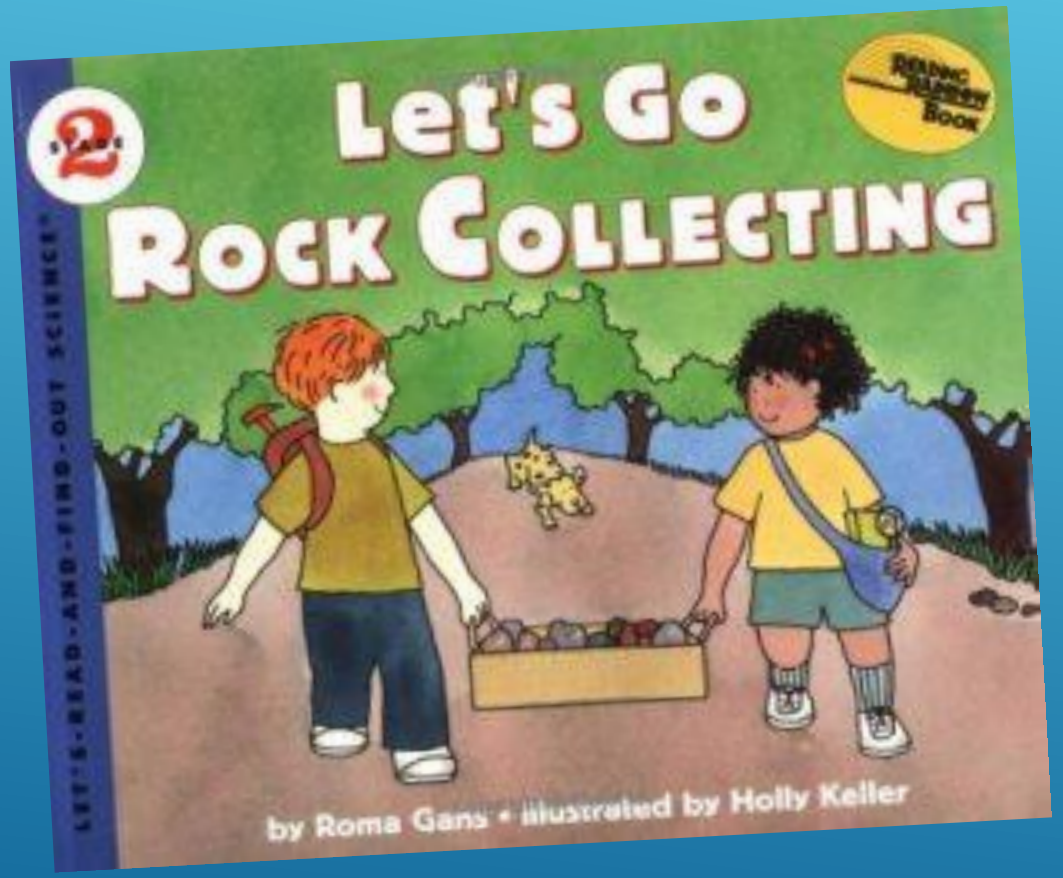
Computer Science Standards

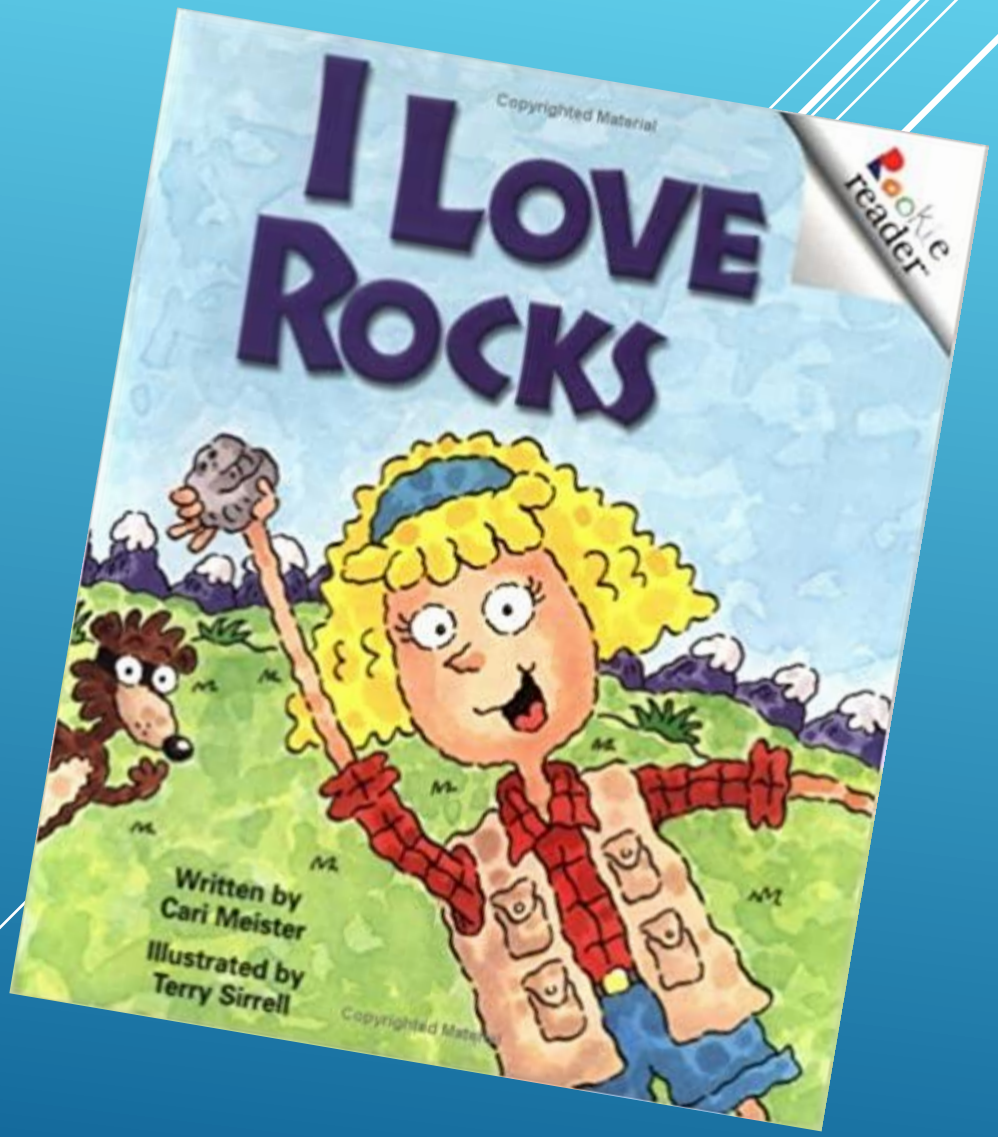
Innovative Designer and Creator

CSS.IDC.K-2.4 Use the Design Process (use, modify, create) with a variety of tools to identify and solve problems by creating new, modified, or imaginative solutions.

1. Understand that a model is used for developing and testing ideas for a diverse range of users.

ELA CONNECTION





STEM Career - Geologist

ROCKS INVESTIGATION

Geologist _____

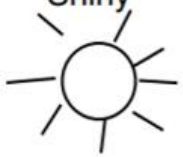
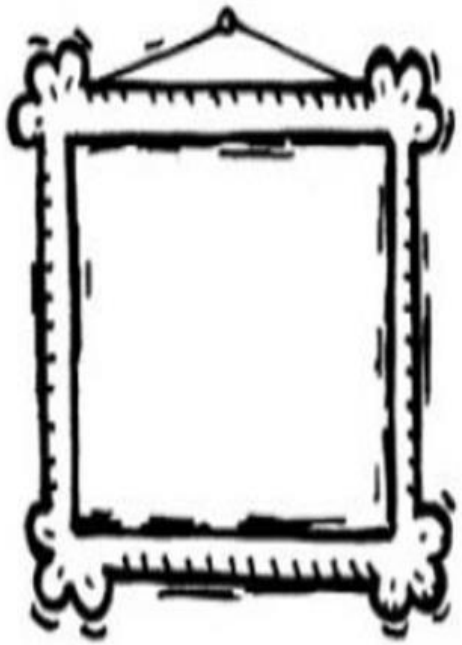
Color	Texture	Luster
Multicolor  One color 	Smooth  Rough 	Shiny  Dull 

Photo of my Rock



Sorting Objects

Number of Rocks

10		
9		
8		
7		
6		
5		
4		
3		
2		
1		

Rock Categories

Word Bank

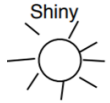
Multicolor

One color

Smooth

Rough

Shiny

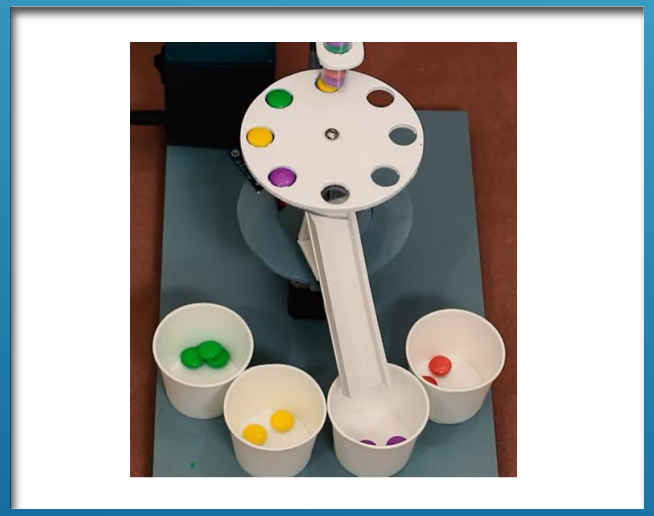


Dull

STEM Career – Mechanical Engineer

Would you like to know how machines work and figure out what makes them go?

Mechanical Engineers design and build machines!



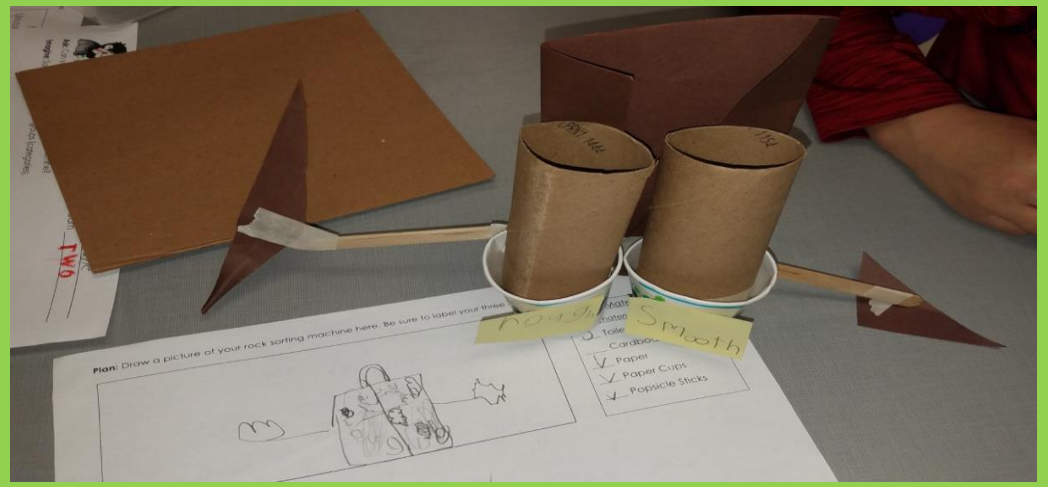
SORTING MACHINES

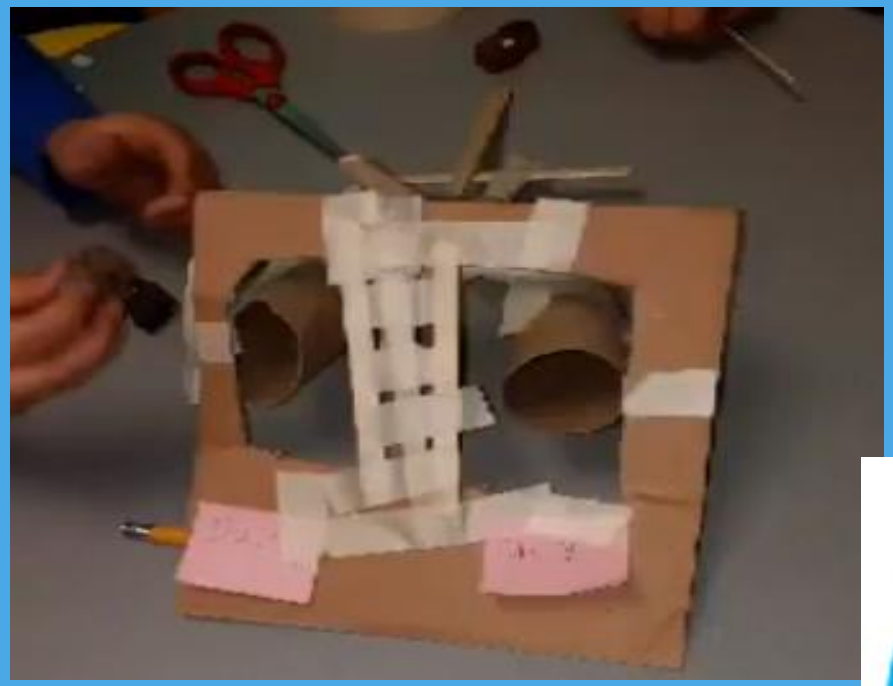
Plan

Think, Sketch, Label

Create

Make a model and test it





Improve

Adjust the design to make it better

FIRST GRADE

Can you build a shadow puppet theater, then use light to put on a show?

-Build a Shadow Puppet Theater, then use light to put on a show.
-Use materials provided
-Size – sheet of white copy paper or smaller
-must stand up on own

Science Standards

S1P1. Obtain, evaluate, and communicate information to investigate light and sound.
a. Use observations to construct an explanation of how light is required to make objects visible.

b. Ask questions to identify and compare sources of light.

c. Plan and carry out an investigation of shadows by placing objects at various points from a source of light.

Math Standards

MGSE1.MD.2 Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps.

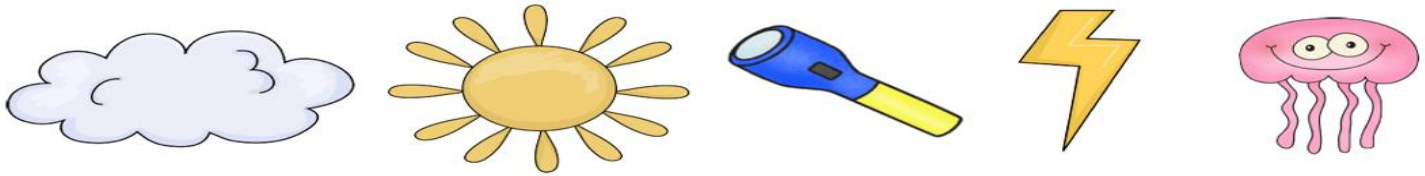
Next Generation Engineering Standards:

K-2-ETS1-1.	**Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.**
K-2-ETS1-2.	**Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.**

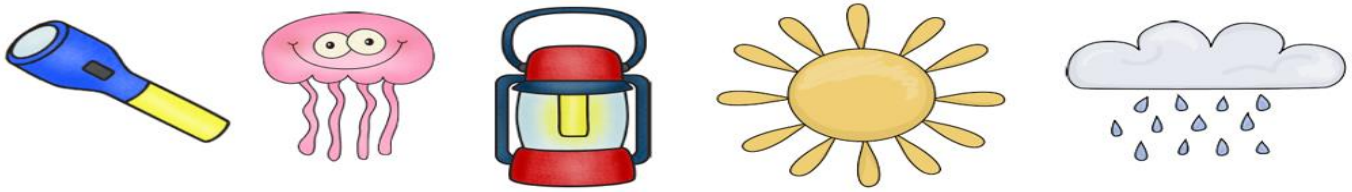
Shadow play, also known as **shadow puppetry**, is an ancient form of storytelling and entertainment which uses flat articulated cut-out figures (**shadow puppets**) which are held between a source of light and a translucent screen.

Imagine -

Circle examples of natural light:



Circle examples of artificial light:



When solid objects block light, it makes a _____.

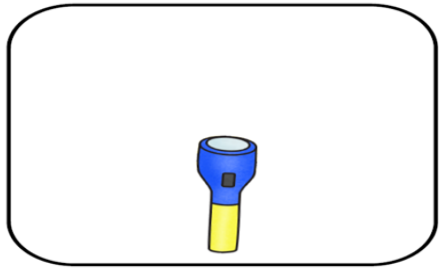
Draw how the shadow would look behind this object.

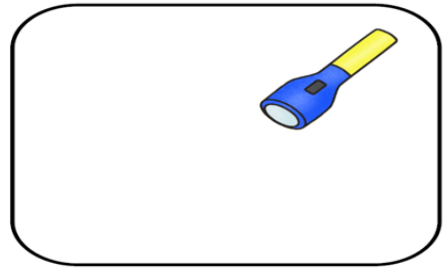
Draw how the shadow would look behind this object.

Draw a line to match.

1. Black Paper	A. Some light passes – Translucent
2. Clear Sheet	B. All light passes – Transparent
3. White Paper	C. Blocks light - Opaque

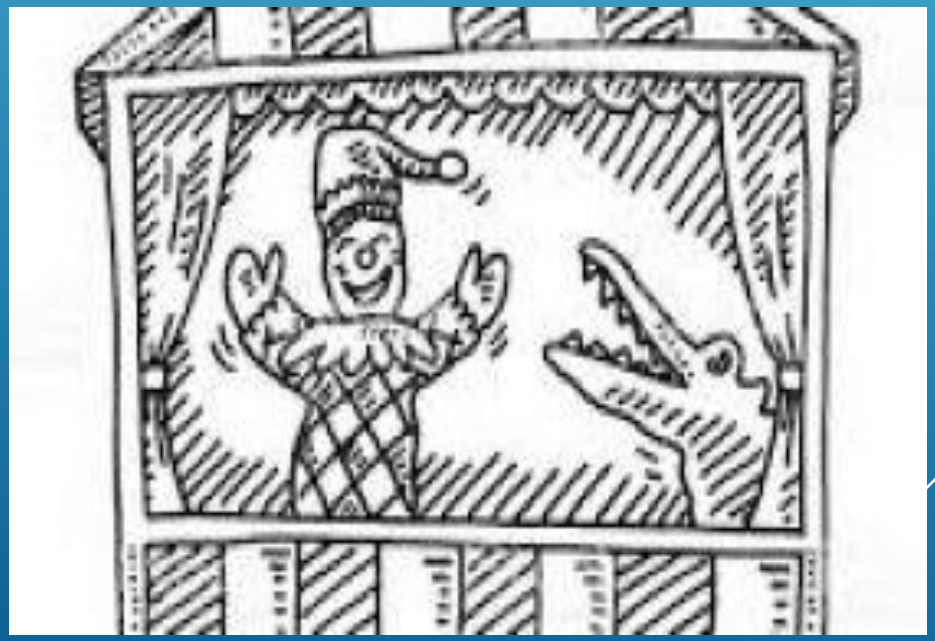
Draw how the light will move.

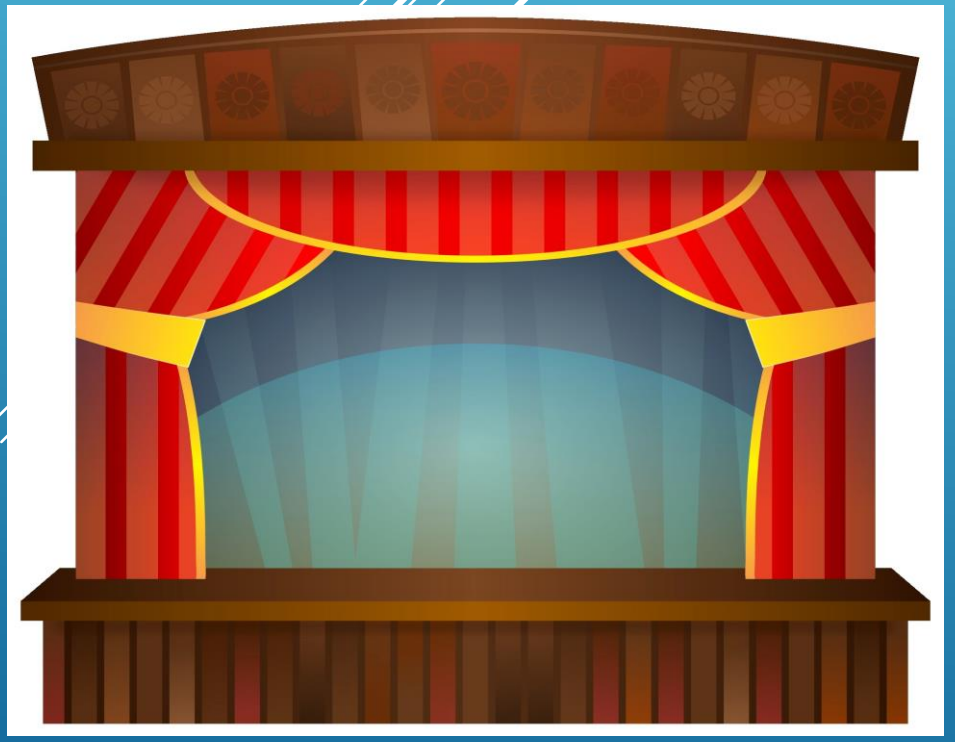




Did you block the light?		
Wood Block	YES	NO
Clear Bag	YES	NO
Puppet	YES	NO
Scissors	YES	NO


Imagine
Brainstorm possible solutions





Plan

Sketch,
abel

Plan

Blueprint of Shadow Puppet Theater…

Materials…

____ Black paper

____ Clear Sheet

_____White Paper

_____ Wax Paper

_____ Color Paper

_____ Craft Sticks

_____ Straws

_____ Glue

_____ Tape

MEASUREMENT

MGSE1.MD.2 Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps.

Create

Make a model and test it

Create/Improve – Work with your team to build the theatre.

____ I can see the shadow puppets with a light on

____ Theater is the size of a sheet of paper or smaller

____ I have a sign or curtains

Improve

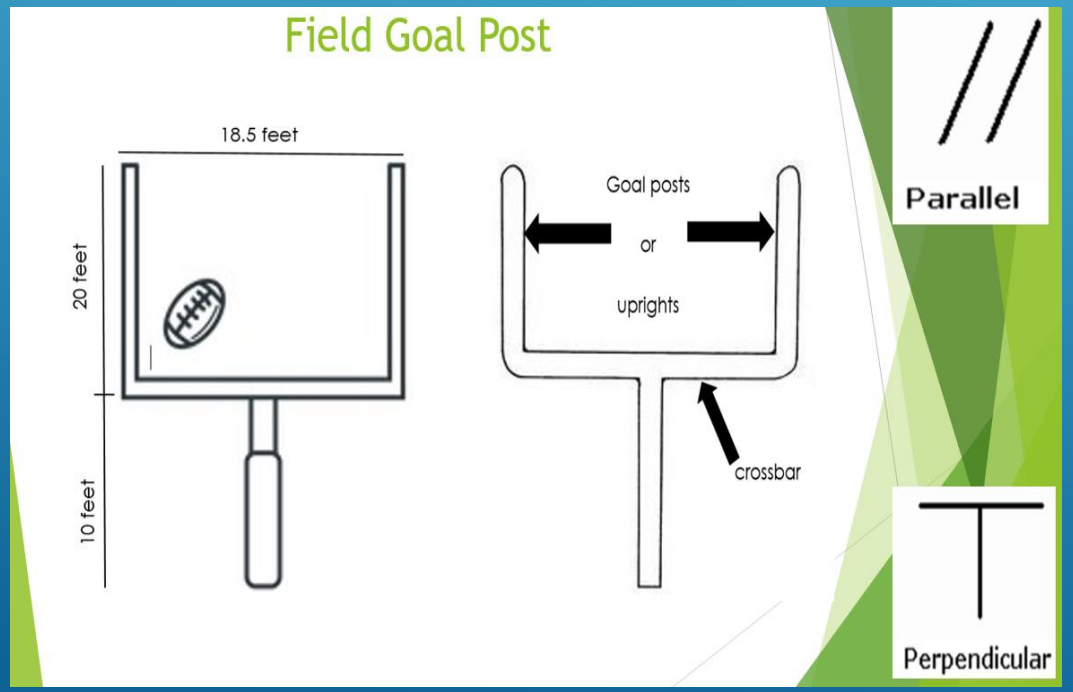
Adjust the design to make it better

ELA CONNECTION

LET'S BUILD…

The Super Bowl is the last game of the season. The NFL has asked for all of the field goal post in each stadium to be replaced next season. Sportsfield Specialties needs help in order to create enough goal posts for every team by next season.

Your job is to work as a team to design a goal post for the company to present to the NFL.



Construct a Field Goal Post

- Crossbar and uprights must be perpendicular
- Uprights must be parallel
- Field goal post must be free-standing
- Must be10 inches tall and 8 inches wide
- Use only materials provided

Kick (flip) field goals

- Kick (flip) from data chart distances
- Paper football must touch the table or floor before flipping
- Paper football must be between the uprights and above the crossbar to score

Super Bowl STEM – Field Goal
4th Grade

Name_____
Team _____

ASK: How can I design and create a free-standing field goal post? How can I use force to kick (flip) the football to make a field goal?

Imagine: Explore "Football Basics" to learn about the sport and field goal posts.

Plan: Make a sketch and label your goal post.

Materials

___ craft sticks ___ straws

____ paper ____ tape

___ pipe cleaners

Create: Construct your goal post.

Draw your final creation.

Test/Improve:
Does your field goal post stand on its own?
_____

Are the uprights parallel? _____

Are the uprights and crossbar perpendicular? _____

Is the post at least 10 inches tall? _____

Is the post 8 inches wide? _____

Reflect
How did you improve your design?
What changes did you make?

_____

_____

What was the most difficult part of the challenge?

_____

_____

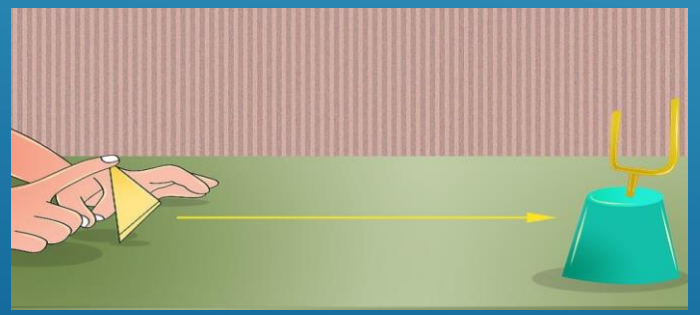
Super Bowl STEM **Name** _____

Field Goal SCORECARD

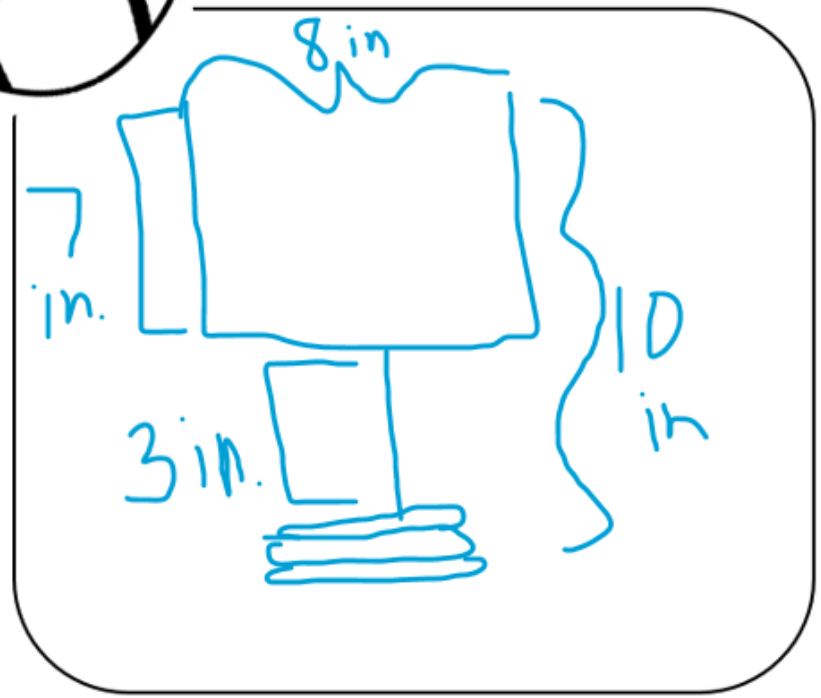
You are a field goal kicker. You are going to kick (flip) the football from different locations on the field. Kick (flip) the paper football 10 times from each location and collect your data. Remember, a field goal is worth 3 points.

	Distance from goal post	Tally Marks of field goals	Fraction of field goals missed	Percentage of field goals missed	Fraction of field goals made	Percentage of field goals made	Total Points made (3 points each)
EXAMPLE	5 inches	Missed		Decimal		Decimal	
		Made		Percentage		Percentage	
	10 inches	Missed		Decimal		Decimal	
		Made		Percentage		Percentage	
	15 inches	Missed		Decimal		Decimal	
		Made		Percentage		Percentage	
	20 inches	Missed		Decimal		Decimal	
		Made		Percentage		Percentage	

What variables (gravity, balanced, unbalanced forces) contributed to your data results?



Plan: Make a sketch and label your goal post.



Materials

- ✓ craft sticks
- ✓ straws
- ✓ paper
- ✓ tape
- ___ pipe cleaners

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