ORLANDO SCIENCE CENTER

Curtis Rising Star Science Challenge

Engineering Notebook
Level: Basic

This engineering journal belongs to:

Design a Scaffolding System

Goal: Design a scaffolding system.

Height: _____

My scaffolding system must be **stable**. This means it can balance without me touching it.

Imagine

Imagine at least two solutions to the problem.

Plan

Work with your group to come up with a plan.

Draw the plan for your design below.

Create

Here are the steps we followed to create our design:

First, my team:

Next, my team:

Last, my team:

Test 1

Check off the criteria your group met.

- ☐ Our design is tall enough.
  Our design **height** is: _____ .
- ☐ Our design is **stable**.

Improve

My team will **improve** our design by:

Test 2

Check off the criteria your group met for your improved design.

- ☐ Our improved design is tall enough.
  Our improved design height is: _____ .
- ☐ Our improved design is stable.

Reflect:

My design | did did not | improve. I know because:

If we had more time, my team would **improve** our design by:

Design a Roller Coaster

Goal: Design a roller coaster.

Length: My roller coaster must go from a chair to the floor.

My scaffolding system must be **safe**. This means the marble does not fall off the track.

Imagine

Imagine at least two solutions to the problem.

Plan

Work with your group to come up with a plan.

Draw the plan for your design below.

Create

Here are the steps we followed to create our design:

First, my team:

Next, my team:

Last, my team:

Test 1

Check off the criteria your group met.

- ☐ Our design is long enough to go from the chair to the floor.
- ☐ Our design is **safe**.

Improve

My team will **improve** our design by:

Test 2

Check off the criteria your group met.

- ☐ Our design is long enough to go from the chair to the floor.
- ☐ Our design is **safe**.

Reflect:

My design | did | did not | improve. I know because:

If we had more time, my team would **improve** our design by:

Design Play Dough

Goal: Design high quality play dough.

Play Dough Quality		
High Quality 3	Medium Quality 2	Low Quality 1

Imagine

What are the **properties** of our materials?

Water	Flour	Salt

Plan

Work with your group to come up with a plan.

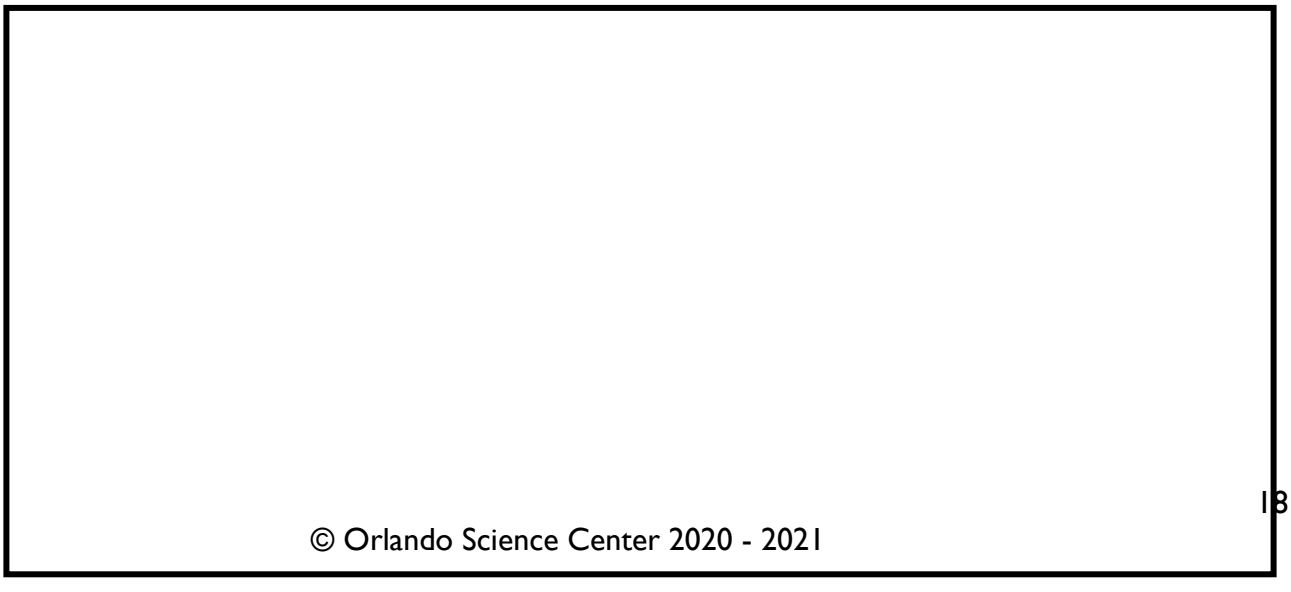
Glue your steps below. You do not need to fill in all steps.

1.

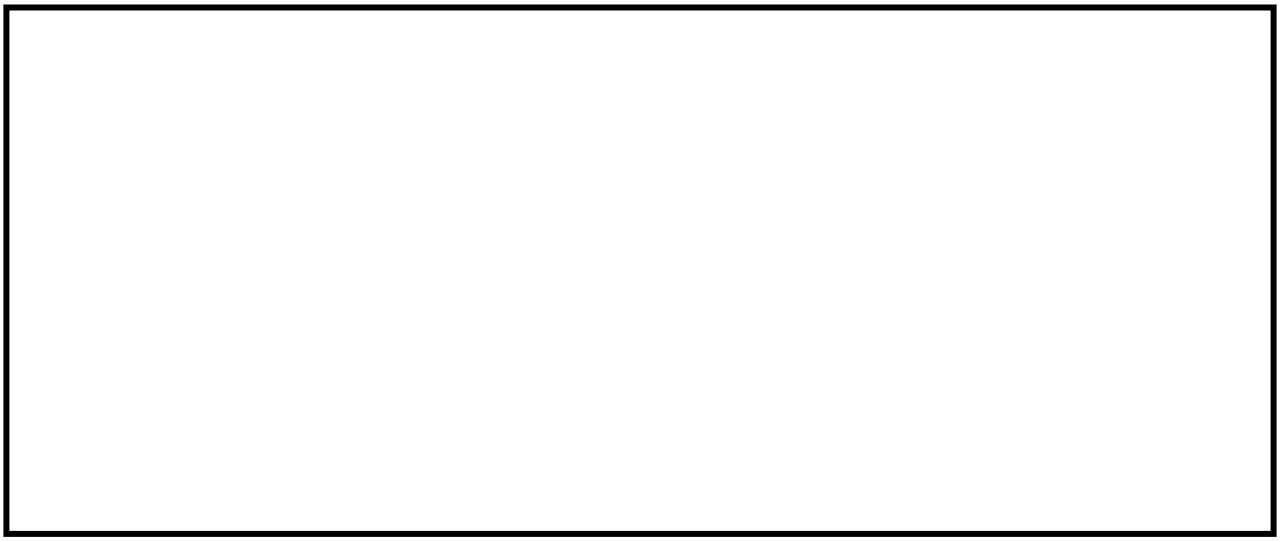
2.

3.

4.



5.



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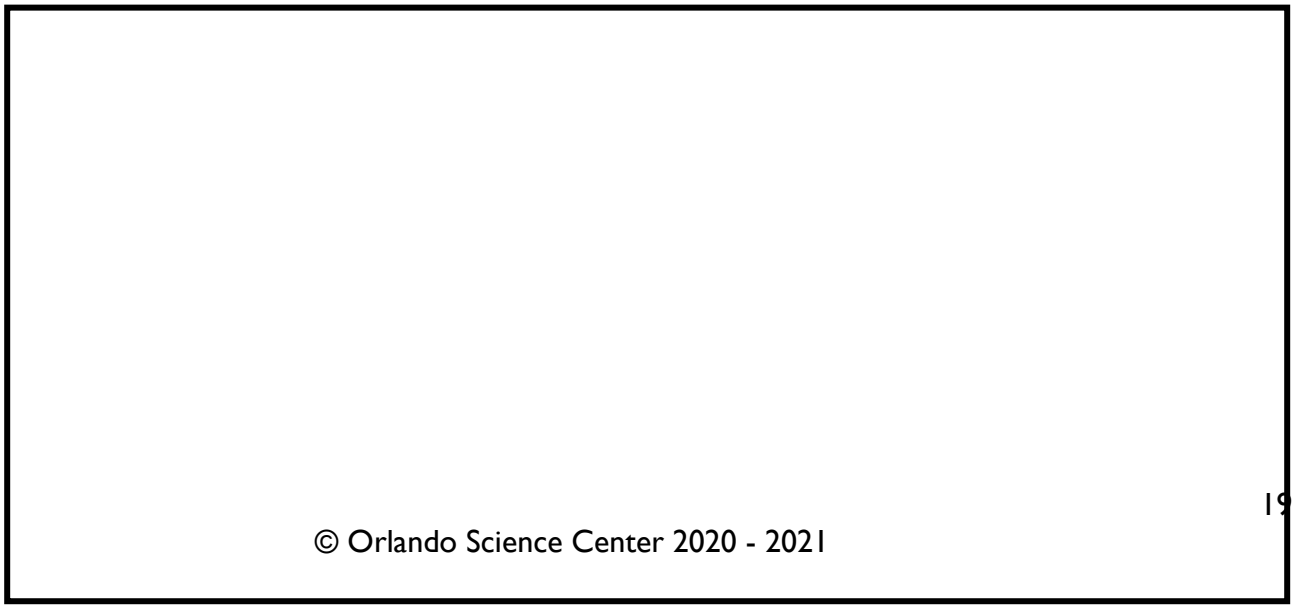

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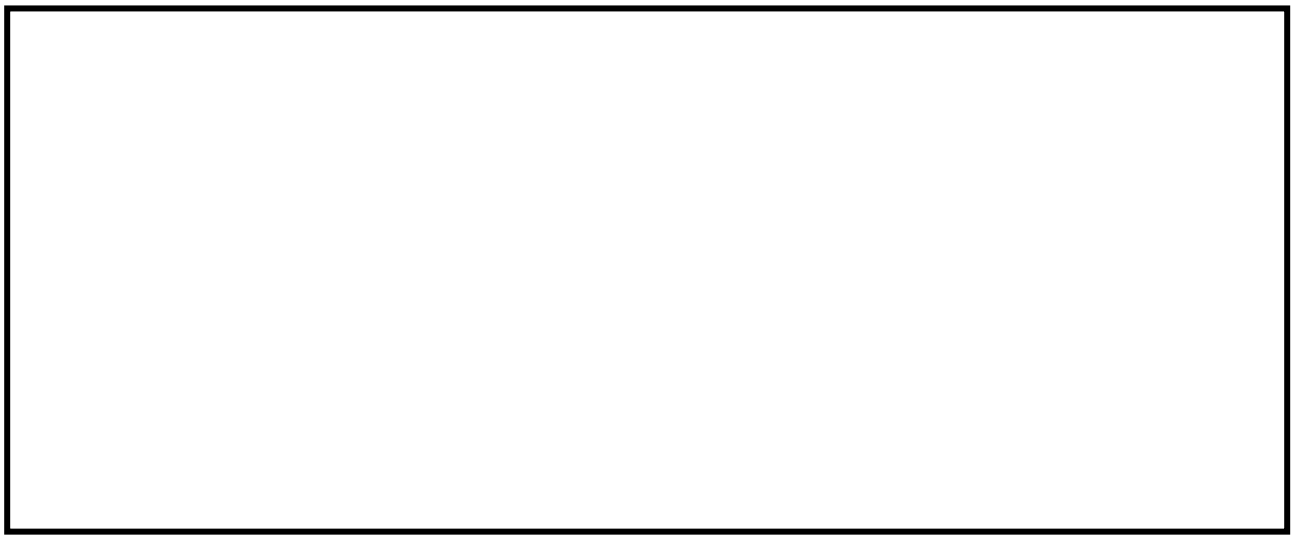


Test 1

Our play dough quality is (circle answer):

1 2 3

Improve

My team will **improve** our design by:

Test 2

Our play dough quality is (circle answer):

1 2 3

Reflect:

My design | did did not | improve. I know because:

If we had more time, my team would **improve** our design by:

Water Runoff Reduction System

Goal: Design a system which will reduce water runoff into a lake from a nearby city.

Original lake level:

_____

_____ Centimeters (cm)

Create a system which will reduce water runoff in an urban landscape to less than:

_____

_____ cm

Imagine

Imagine at least two solutions to the problem.

Plan

Work with your group to come up with a plan.

Draw the plan for your design below.

Create

Here are the steps we followed to create our design:

First, my team:

Next, my team:

Last, my team:

Test 1

Water level after rain:

_____ cm

Check off the criteria your group met.

☐ Our system reduced the water runoff.

Improve

My team will **improve** our design by:

Test 2

Water level after rain:

_____ cm

Check off the criteria your group met.

☐ Our system reduced the water runoff.

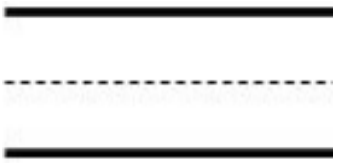
Reflect:

My design | did | did not | improve. I know because:

If we had more time, my team would **improve** our design by:

Design a Zip Line

Goal: Design a container which can transport a company's products using a zip line to a town on the other side of a protected forest.

Distance: 

The container must deliver the payload into the destination without dropping in on the ground.

Imagine

Imagine at least two solutions to the problem.

Plan

Work with your group to come up with a plan.

Draw the plan for your design below.

Check off the 5 materials your group will use. You may select an item multiple times.

☐ Small paper cup	☐ Plastic cup
☐ Large paper cup	☐ Paper
☐ Index card	☐ Yarn, 12 in.
☐ Wax paper, 12 in. x 12 in.	☐ Aluminum foil 12 in. x 12 in.
☐ Paper clip	☐ Masking tape, 12 in.

Create

Here are the steps we followed to create our design:

First, my team:

Next, my team:

Last, my team:

Test 1

Check off the criteria your group met. Record test data on your graph.

☐ Our design is stable. The payload did not drop onto the ground.

☐ Our design traveled far enough.

The distance our container traveled is: _____

☐ Our design delivered the payload successfully to the destination.

Improve

My team will **improve** our design by:

Test 2

Check off the criteria your group met. Record test data on your graph.

☐ Our design is stable. The payload did not drop onto the ground.

☐ Our design traveled far enough.

The distance our container traveled is: _____

☐ Our design delivered the payload successfully to the destination.

Reflect:

My design | did | did not | improve. I know because:

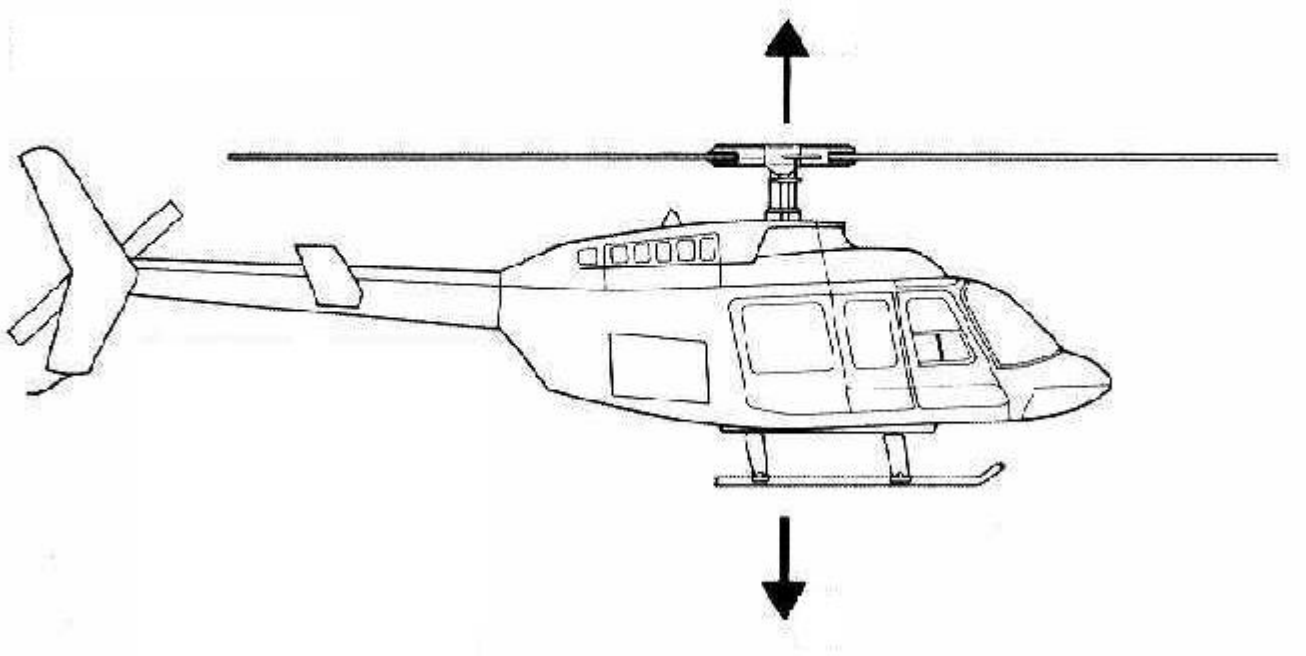
If we had more time, my team would **improve** our design by:

Design a Paper-copter

Goal: Design a paper-copter which can drop <u>slowly</u>.

The copter must drop _____ feet.

The blades cause drag.



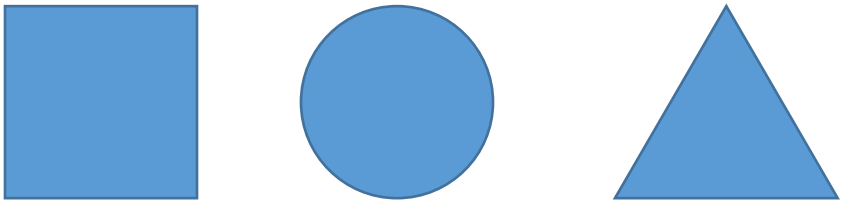
Gravity pulls down.

Imagine

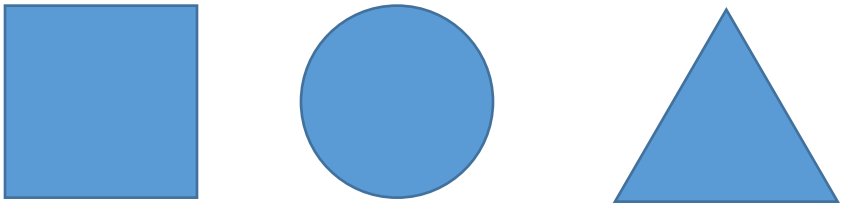
Blade Shape	Circle	Square	Triangle
Drop Time			

Draw the shapes in order from slowest to fastest.

Circle the shape which was most successful:

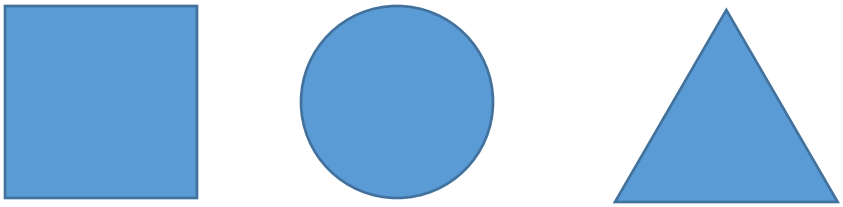


Circle the shape which was least successful:



Plan

Circle which shape you will use for your blades?



Which size will you use for your blades? 1 2 3 4 5

Draw your paper-copter:

Create

Here are the steps we followed to create our design:

First, my team:

Next, my team:

Last, my team:

Test 1

How long did your paper-copter take to drop?

_____

_____ seconds

Improve

My team will **improve** our design by:

_____

_____

_____

Test 2

How long did your paper-copter take to drop?

_____

_____ seconds

Compare your designs.
Create a bar graph.

Seconds

Test 1 Test 2

Reflect:

My design | did did not | improve. I know because:

If we had more time, my team would **improve** our design by:

Design a Telephone

Goal: Design a telephone which transfer sound <u>clearly</u>.

The sound must travel _____ feet.

_____ words must be heard clearly.

Imagine

Draw at least two ideas.

Plan

Circle which size and material you will use for your cup to speak in:

Small	Plastic
Medium	Paper
Large	Styrofoam

Circle which size and material you will use for your cup to speak in:

Small	Plastic
Medium	Paper
Large	Styrofoam

Which material will you use to connect the cups?

String Yarn Rubber band

Draw your plan for your telephone:

Create

Here are the steps we followed to create our design:

First, my team:

Next, my team:

Last, my team:

Test 1

Write down the words you heard:

What is your score out of 5 words?

_____ words

Improve

My team will **improve** our design by:

Test 2

Write down the words you heard:

What is your score out of 5 words?

_____ words

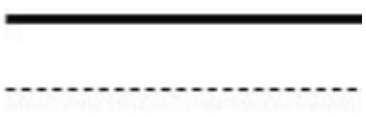
Reflect:

My design | did | did not | improve. I know because:

If we had more time, my team would **improve** our design by:

Plant Hydrating System

Goal: Design a filter which will deliver the amount of water a plant needs in one day.



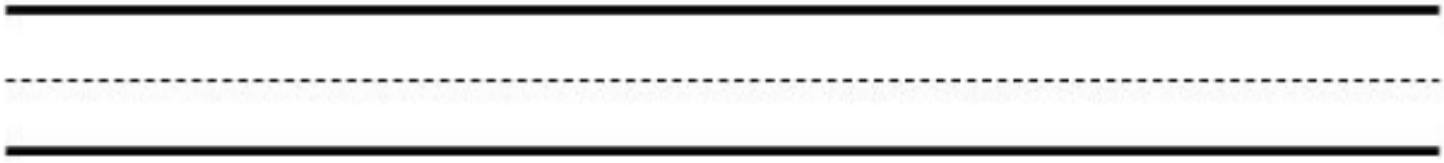
The plant needs _____ water each day.

Imagine

How much water did each material absorb?

Sponge	Paper Towel	Diaper
- _____	- _____	- _____

Order the materials from least to most absorbent:



Plan

Work with your group to come up with a plan.

Draw the plan for your design below.

Create

Here are the steps we followed to create our design:

First, my team:

Next, my team:

Last, my team:

Test 1

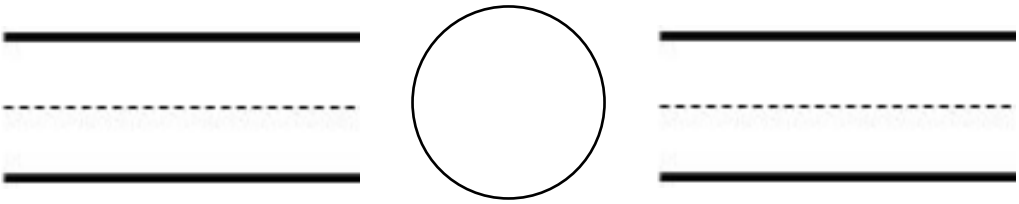
Check off the criteria your group met.

Did the design overflow? ☐ Yes ☐ No

Did any water pass through the filter? ☐ Yes ☐ No

Volume of water that passed through the filter: _____

Is the volume of water passed through greater than, equal to, or less than the optimal volume?



Improve

My team will **improve** our design by:

_____

_____

_____

Test 1

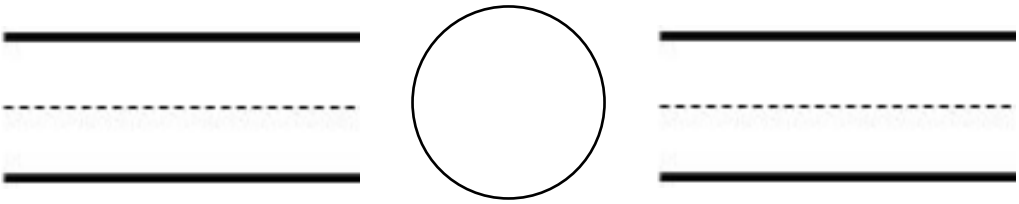
Check off the criteria your group met.

Did the design overflow? ☐ Yes ☐ No

Did any water pass through the filter? ☐ Yes ☐ No

Volume of water that passed through the filter: _____

Is the volume of water passed through greater than, equal to, or less than the optimal volume?



Reflect:

My design | did | did not | improve. I know because:

_____

_____

_____

If we had more time, my team would **improve** our

Board Game Challenge

Goal: Design a board game that is both fun and engaging. To be fun, the game board needs to have 30 spaces measured in inches and allow for four players to participate. To be engaging, players must use simple addition to move throughout the board.

Imagine:

Draw the game board you would design yourself:

Here are some math equations I would include:

Plan:

Work with your group to come up with a design.

Draw your group's game board design here.

Here are some math equations we will include:

Create

Here are the steps we followed to create our design:

First, my team:

Next, my team:

Last, my team:

Test 1

Check off the criteria your group met based on the feedback from the other group.

Does the game board have 30 spaces or more? ☐ Yes ☐ No

Can four players participate? ☐ Yes ☐ No

Write down three addition equations included in the game below:

Improve:

My team will **improve** our design by:

Test 2

Check off the criteria your group met based on the feedback from the other group.

Does the game board have 30 spaces or more? ☐ Yes ☐ No

Can four players participate? ☐ Yes ☐ No

Write down three addition equations included in the game below:

Reflect:

My design | did did not | improve. I know because:

If we had more time, my team would **improve** our