



# **Curtis Rising Star Science Challenge**

## **Engineering Journal**

This engineering journal belongs to:

Name: \_\_\_\_\_

# Design a Scaffolding System

**Goal: Design a scaffolding system.**

Height:

My scaffolding system must be at least \_\_\_\_\_ .

Strength:

My scaffolding system must support at least \_\_\_\_\_ for 30 seconds.

My scaffolding system must be **stable**. This means...

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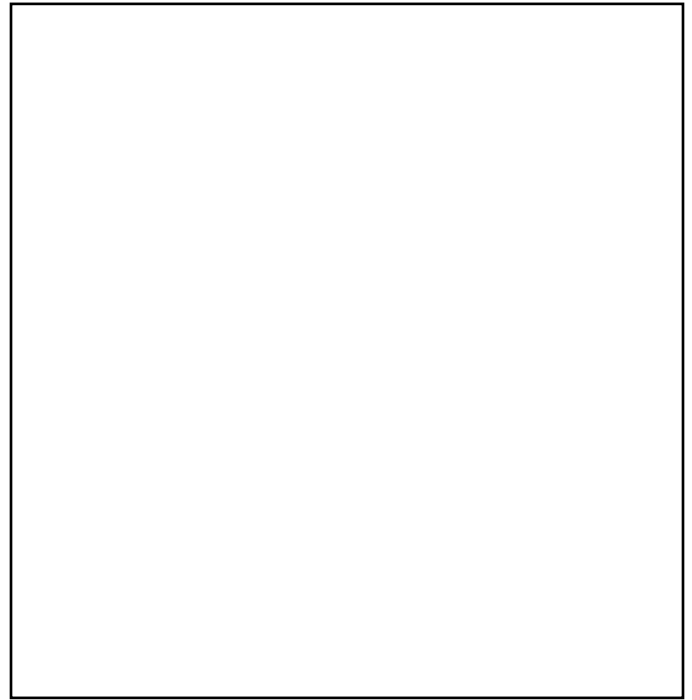
The measurement of the book my scaffolding system must support is:

Length: \_\_\_\_\_

Width: \_\_\_\_\_

# 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:

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_
3. \_\_\_\_\_  
\_\_\_\_\_
4. \_\_\_\_\_  
\_\_\_\_\_
5. \_\_\_\_\_  
\_\_\_\_\_

# Test I

The perimeter of the top of our design is: \_\_\_\_\_ .

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

- Our design is tall enough.  
Our design height is: \_\_\_\_\_ .
- Our design is stable.
- Our design can support the workers' mass for 30 seconds.

The total mass our design can support is: \_\_\_\_\_ .

## Improve

What will your team improve about your design? Why?

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## Test 2

The perimeter of the top of our improved design is: \_\_\_\_\_ .

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

- Our improved design is tall enough.  
Our improved design height is: \_\_\_\_\_ .
- Our improved design is stable.
- Our improved design can support the workers' mass for 30 seconds.

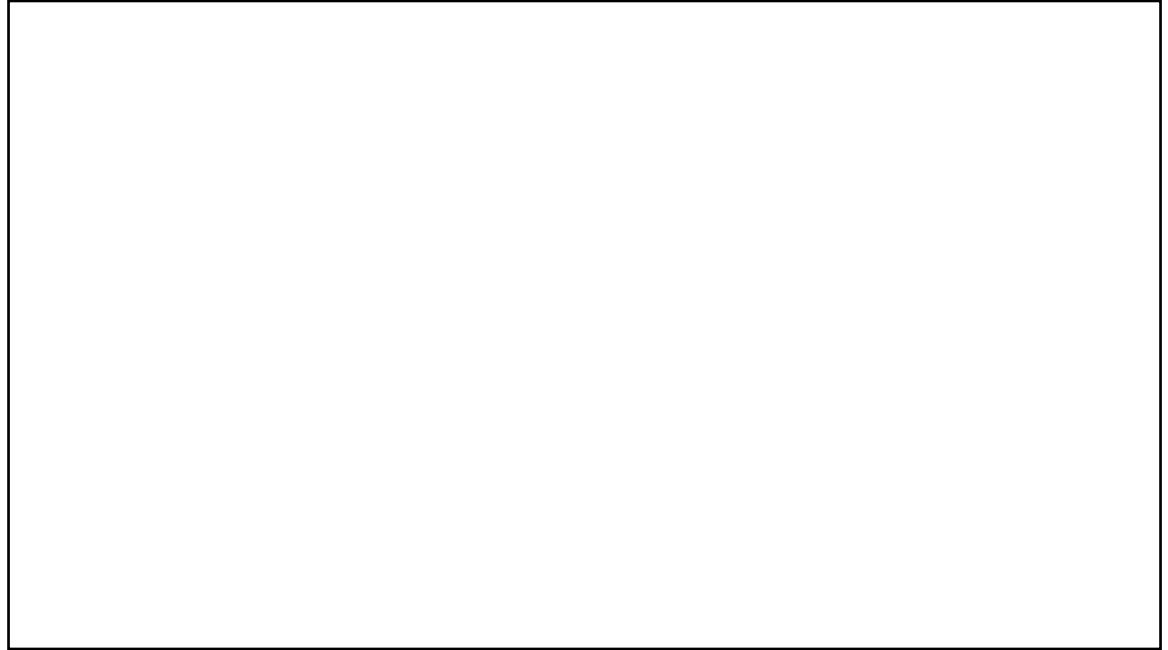
The total mass our improved design can support is: \_\_\_\_\_ .

# Data Graph

Record the data from the first and second test below.

Height

Height

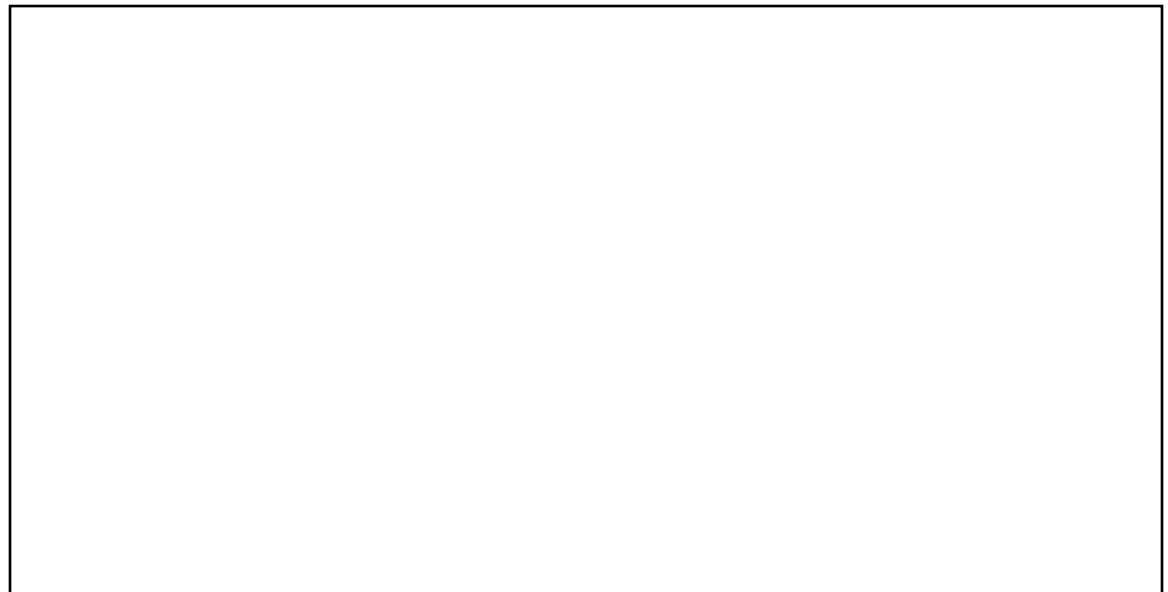


Test I

Test I

Mass supported

Strength



Test I

Test I

**Reflect:** Was your improved design more successful than your first design? How do you know?

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How would you improve your design if there were time? Why?

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# Design a Roller Coaster

**Goal: Design a roller coaster.**

My scaffolding system must be **safe**. This means...

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My roller coaster must be **fun**. This means...

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## Imagine

Imagine at least two solutions to the problem.

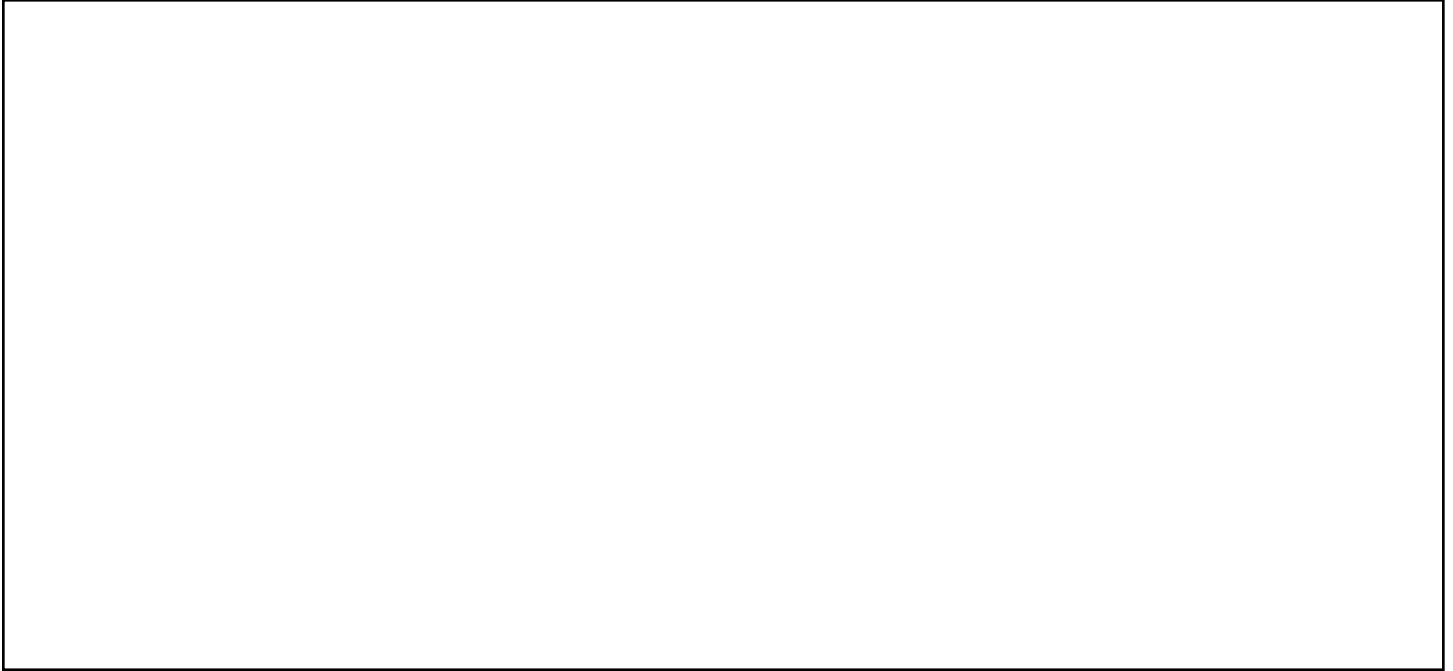




# Plan

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:

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_
3. \_\_\_\_\_  
\_\_\_\_\_
4. \_\_\_\_\_  
\_\_\_\_\_
5. \_\_\_\_\_  
\_\_\_\_\_

# Test I

The length of our roller coaster track is: \_\_\_\_\_ .

The length of time the car was on the track is \_\_\_\_\_ .

$$\frac{\text{Speed}}{\text{Distance}} = \frac{\text{Distance}}{\text{Time}}$$

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

- Our design is safe.
- Our roller coaster is the fastest design.

## Improve

What will your team improve about your design? Why?

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# Test 2

The length of our roller coaster track is: \_\_\_\_\_ .

The length of time the car was on the track is \_\_\_\_\_ .

$$\frac{\text{Speed}}{\text{Speed}} = \frac{\text{Distance}}{\text{Distance}} \div \frac{\text{Time}}{\text{Time}}$$

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

- Our design is safe.
- Our roller coaster is the fastest design.

## Data Graph

Record the data from the first and second test below.

Speed



Test 1

Test 1

**Reflect:** Was your improved design more successful than your first design? How do you know?

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How would you improve your design if there were time? Why?

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# Design Play Dough

**Goal: Design a recipe which will produce high-quality play dough.**

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

## Imagine

List the properties of each material:

- Flour: \_\_\_\_\_
- Salt: \_\_\_\_\_
- Water: \_\_\_\_\_
- Cream of Tartar: \_\_\_\_\_
- Oil: \_\_\_\_\_

What do you think went wrong with the low-quality play dough? Why?

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# Plan

Work with your group to come up with a plan.

Write the steps of your recipe.

- When adding materials, record how many full or  $\frac{1}{2}$  tablespoons you will add.
- When stirring or kneading, record how many seconds you will do so for.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_

# Test I

Properties of our play dough:

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Play dough rating: \_\_\_\_\_

# Improve

What will your team improve about your design? Why?

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# Test 2

Properties of our play dough:

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Play dough rating: \_\_\_\_\_

What fraction of your play dough was made up of each material?

- Flour: \_\_\_\_\_
- Salt: \_\_\_\_\_
- Water: \_\_\_\_\_
- Cream of Tartar: \_\_\_\_\_
- Oil: \_\_\_\_\_

**Reflect:** Was your improved design more successful than your first design? How do you know?

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How would you improve your design if there were time? Why?

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# Water Runoff Reduction System

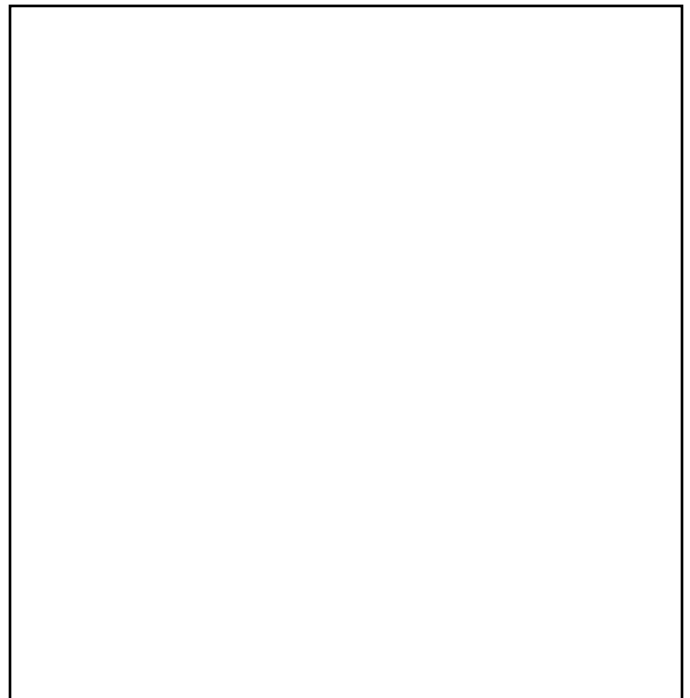
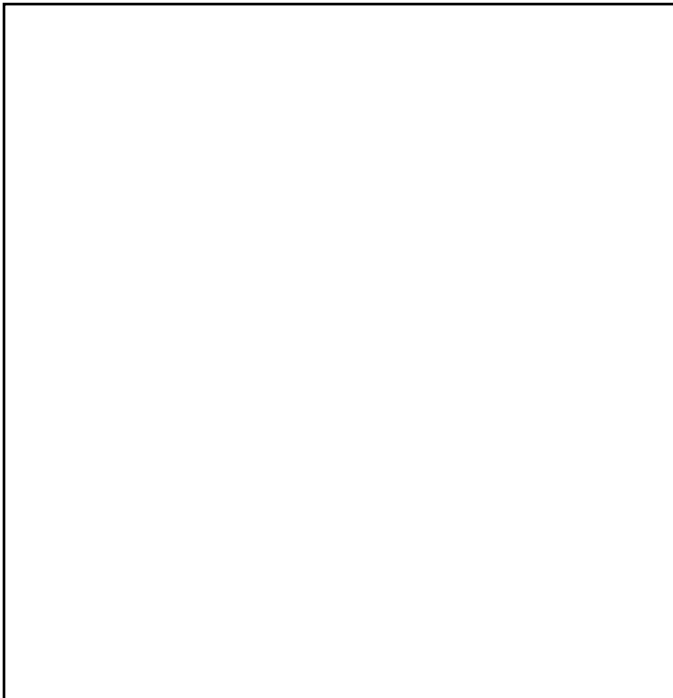
**Goal: Design a system which will reduce water runoff from an urban landscape into a nearby lake.**

Original lake level: \_\_\_\_\_ 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 and calculate your budget.

**Budget:** \$ \_\_\_\_\_

<b>Material</b>	<b>Unit cost</b>	<b>Quantity</b>	<b>Extended Cost</b>
Aluminum foil (per sq. in.)	\$		\$
Felt (per sq. in.)	\$		\$
Rock	\$		\$
Duct tape (per in.)	\$		\$
Sponge	\$		\$
Craft stick	\$		\$
Sand (per tbsp.)	\$		\$
<b>Total Cost:</b>			<b>\$</b>

# Create

Here are the steps we followed to create our design:

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_
3. \_\_\_\_\_  
\_\_\_\_\_
4. \_\_\_\_\_  
\_\_\_\_\_
5. \_\_\_\_\_  
\_\_\_\_\_

# Test I

Water level after rain: \_\_\_\_\_ cm

Did you meet the criteria? Why or why not?

\_\_\_\_\_

# Improve

What will your team improve about your design? Why?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Test 2

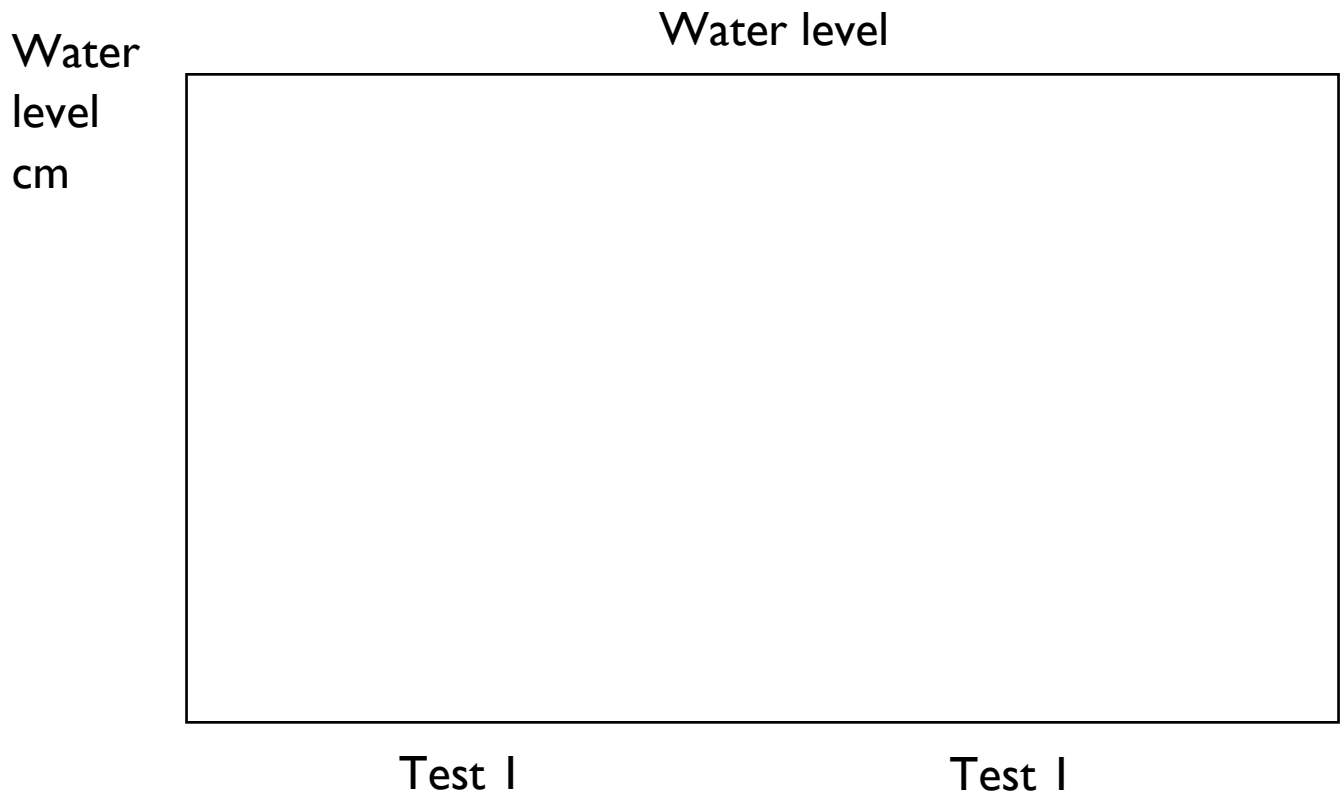
Water level after rain: \_\_\_\_\_ cm

Did you meet the criteria? Why or why not?

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## Data Graph

Record the data from the first and second test below.



**Reflect:** Was your improved design more successful than your first design? How do you know?

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How would you improve your design if there were time? Why?

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# Create a Zip Line

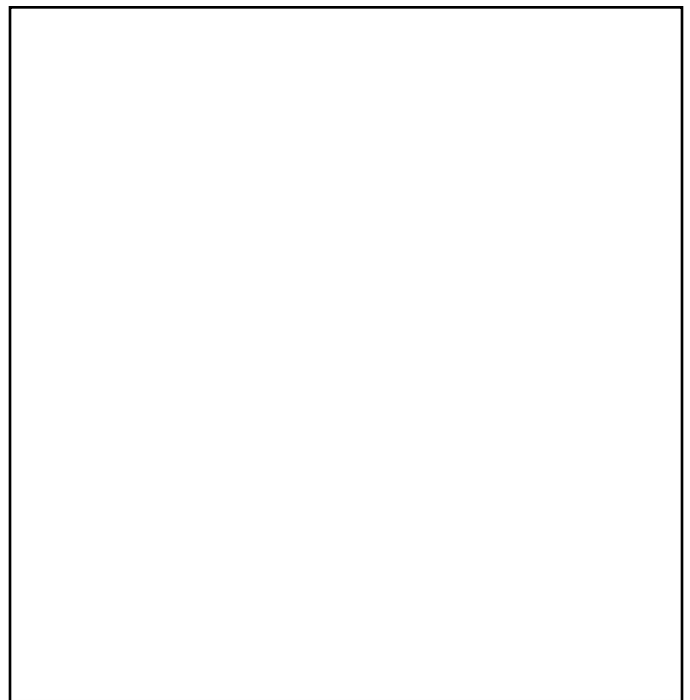
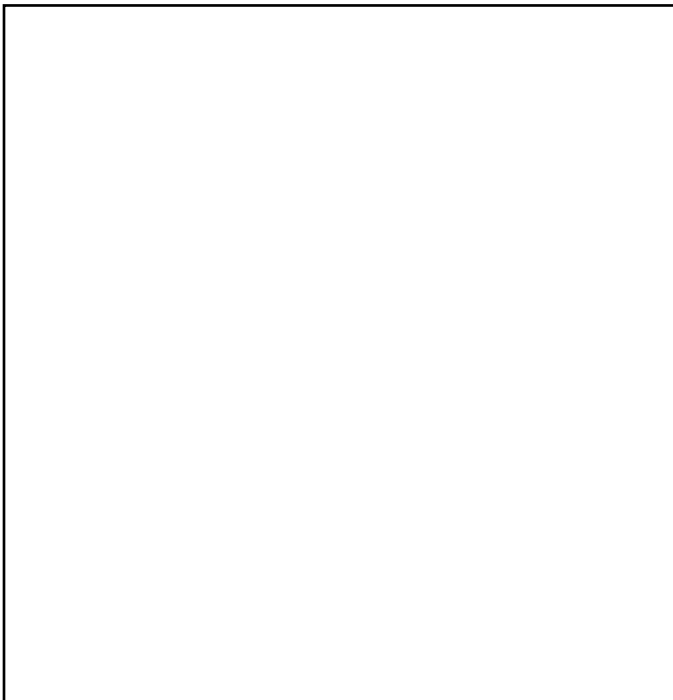
**Goal: Design a container which can transport a company's products using a zip line to a town on the other side of a protected forest.**

Distance: \_\_\_\_\_

The container must deliver the payload into the destination without dropping 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 and calculate your budget.

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

<input type="checkbox"/> Small paper cup	<input type="checkbox"/> Plastic cup
<input type="checkbox"/> Large paper cup	<input type="checkbox"/> Paper
<input type="checkbox"/> Index card	<input type="checkbox"/> Yarn, 12 in.
<input type="checkbox"/> Wax paper, 12 in. x 12 in.	<input type="checkbox"/> Aluminum foil 12 in. x 12 in.
<input type="checkbox"/> Paper clip	<input type="checkbox"/> Masking tape, 12 in.

# Create

Here are the steps we followed to create our design:

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_
3. \_\_\_\_\_  
\_\_\_\_\_
4. \_\_\_\_\_  
\_\_\_\_\_
5. \_\_\_\_\_  
\_\_\_\_\_

# Test I

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.

The total payloads our design can transport is: \_\_\_\_\_ .



# Improve

What will your team improve about your design? Why?

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## 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.

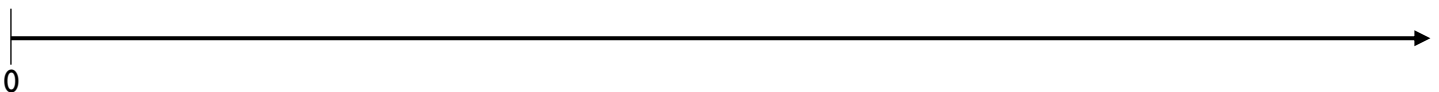
The distance our container traveled is: \_\_\_\_\_ .

- Our design delivered the payload successfully to the destination.

The total payloads our design can transport is: \_\_\_\_\_ .

## Distance Number Line

Create a number line below which shows the distance your design traveled in each test.



**Reflect:** Was your improved design more successful than your first design? How do you know?

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How would you improve your design if there were time? Why?

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# Design a Paper-Copter

**Goal: Design a paper-copter which will drop slowly to the ground.**

Drop Height:

The paper-copter will be dropped from a height of \_\_\_\_\_.

Mass:

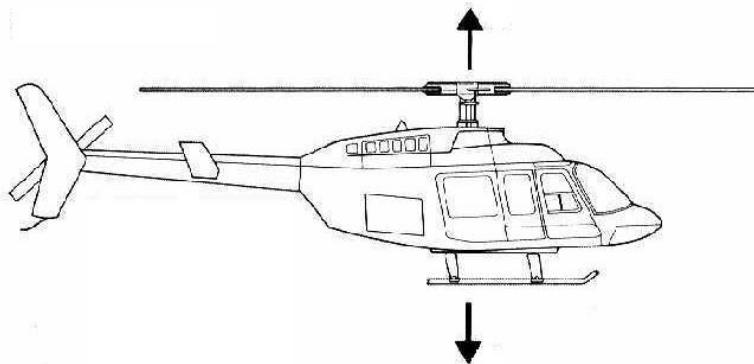
My paper-copter will carry a load of 5 grams.

My paper-copter blades will create **drag**. This means...

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# Imagine

Blade Size Test:

Size	Small Perimeter: Area:	Large Perimeter: Area:
Seconds to Fall		

Which size blade was more successful? Why?

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Mass Test:

Additional Mass	0 grams	3 grams
Seconds to Fall		

Which mass was more successful? Why?

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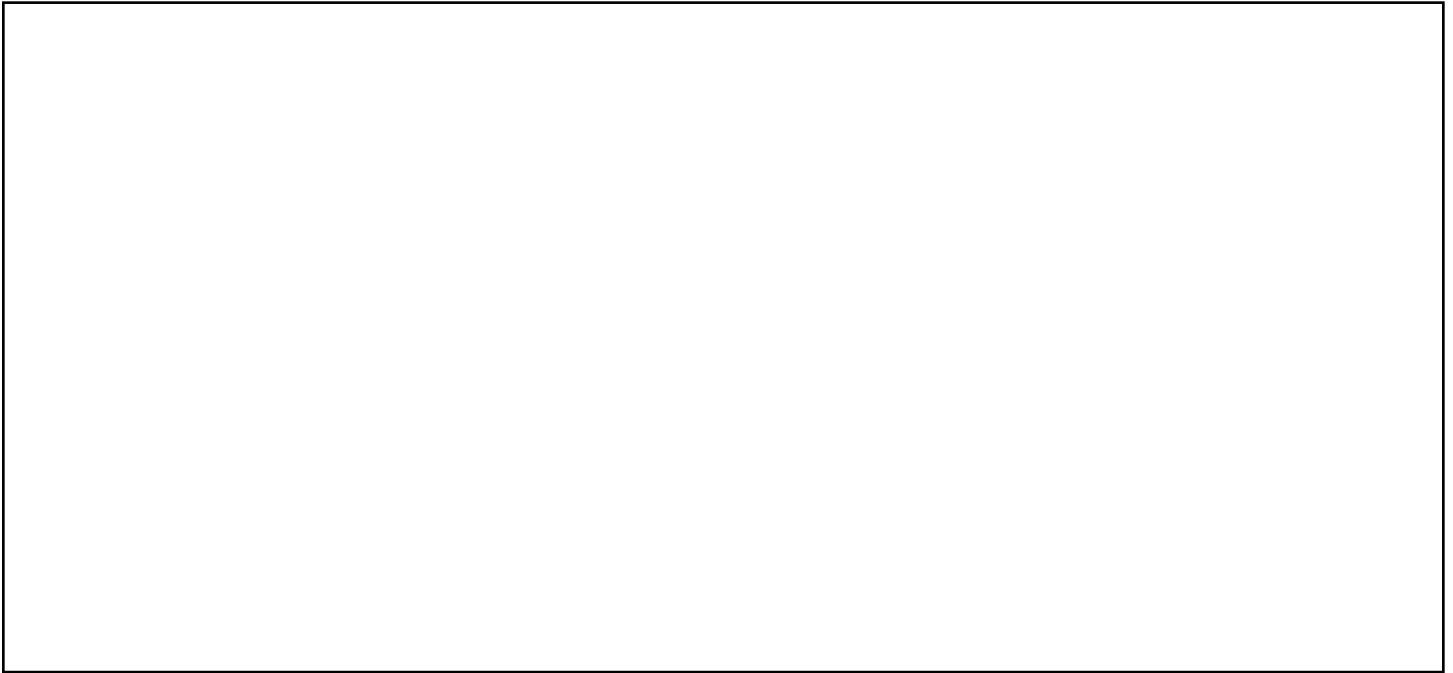
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# Plan

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:

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_
3. \_\_\_\_\_  
\_\_\_\_\_
4. \_\_\_\_\_  
\_\_\_\_\_

5. \_\_\_\_\_  
\_\_\_\_\_

## Test 1

Blade perimeter: \_\_\_\_\_

Blade area: \_\_\_\_\_

How long did your first design take to fall? \_\_\_\_\_ seconds

## Improve

What will your team improve about your design? Why?

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## Test 2

Blade perimeter: \_\_\_\_\_

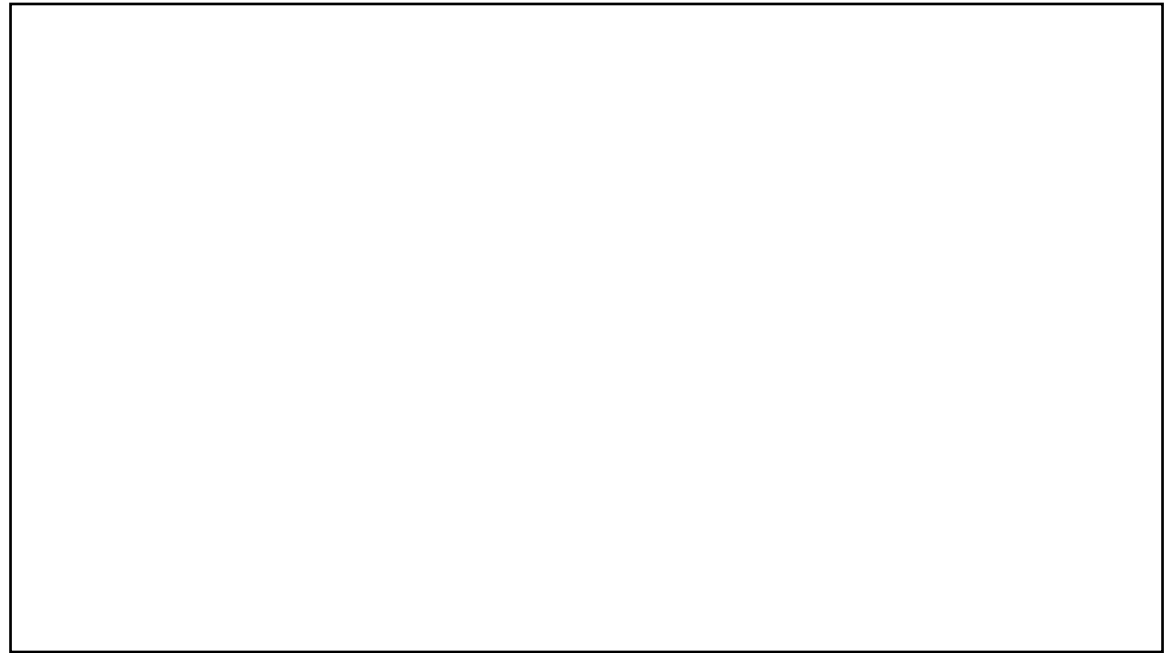
Blade area: \_\_\_\_\_

How long did your improved design take to fall? \_\_\_\_\_ seconds

# Data Graph

Record the data from the first and second test below.

Seconds



Test 1

Test 2

**Reflect:** Was your improved design more successful than your first design? How do you know?

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How would you improve your design if there were time? Why?

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# Design a Telephone

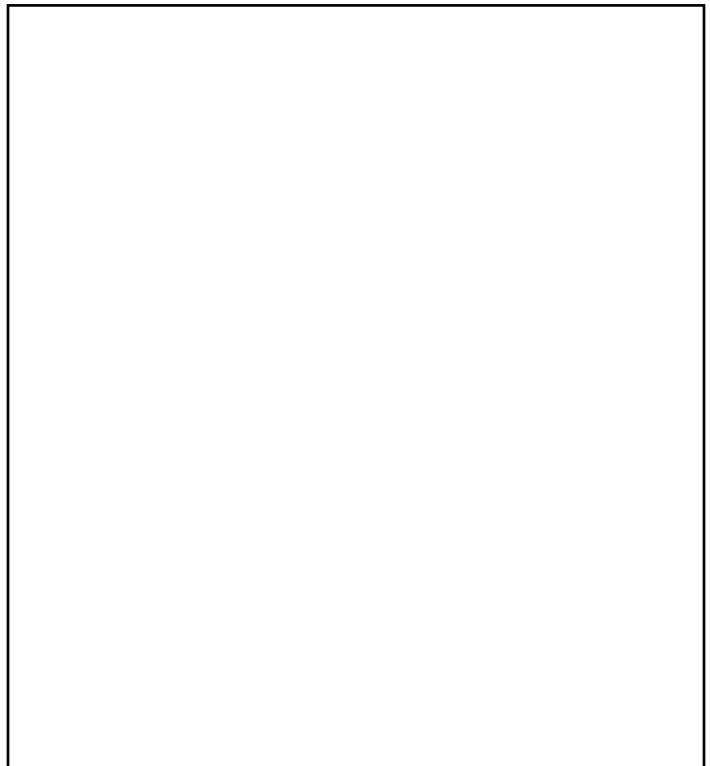
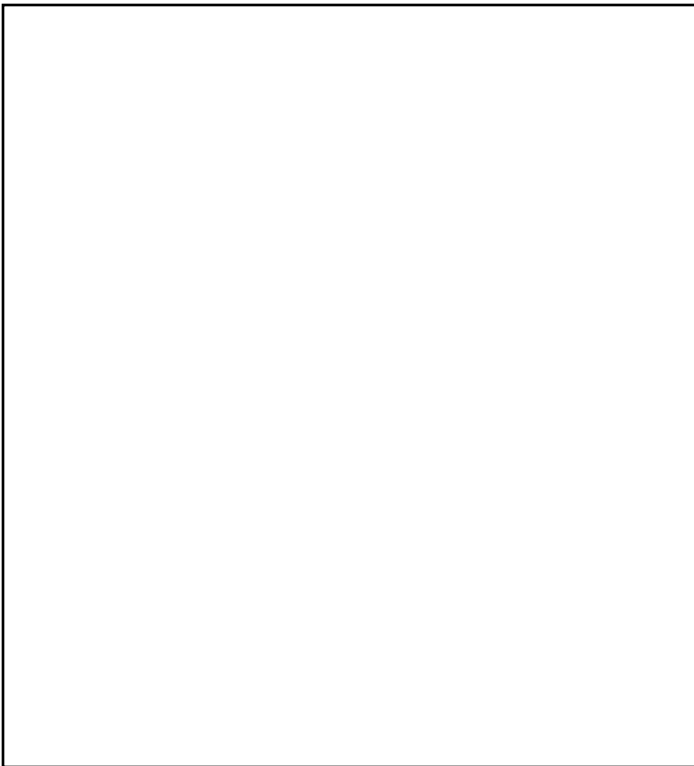
**Goal: Design a telephone which will transfer sound clearly.**

The sound must transfer \_\_\_\_\_ ft.

The telephone must transfer \_\_\_\_\_ words.

## Imagine

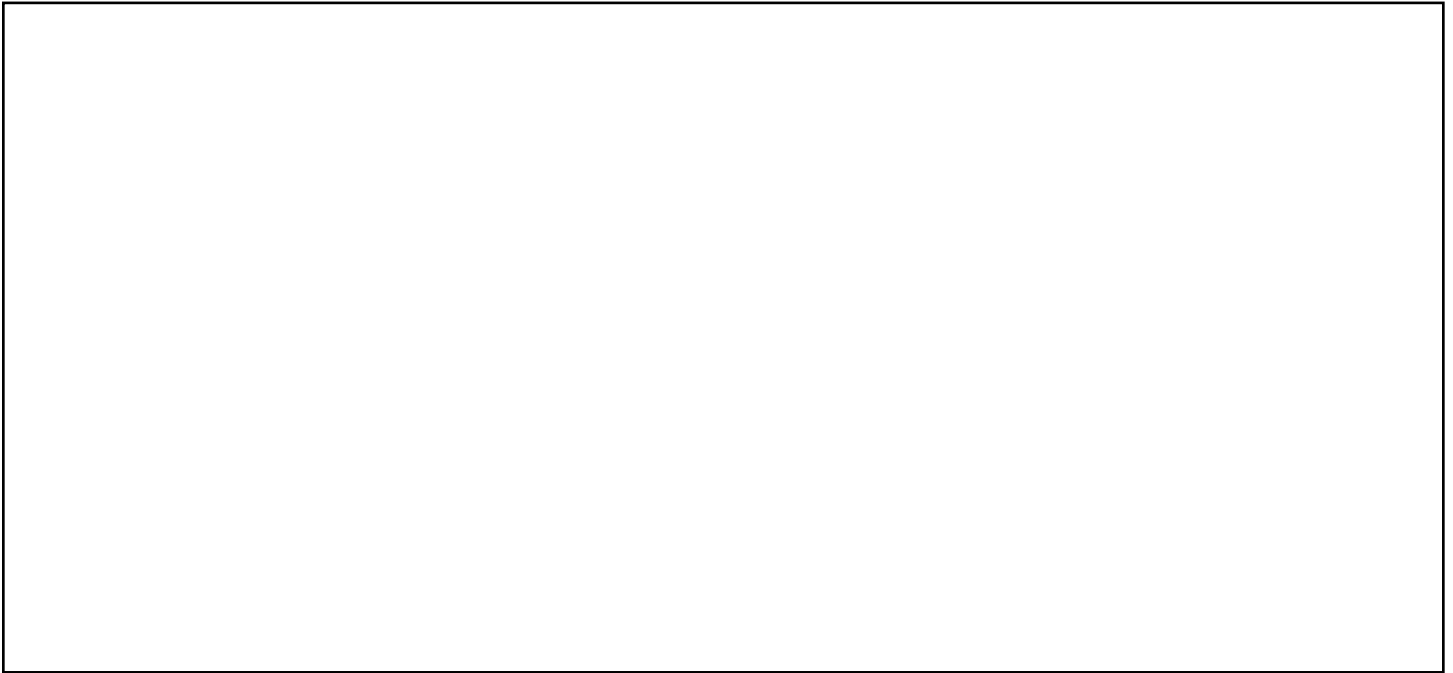
Draw two ideas below.



# 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:

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_
3. \_\_\_\_\_  
\_\_\_\_\_
4. \_\_\_\_\_  
\_\_\_\_\_
5. \_\_\_\_\_  
\_\_\_\_\_

## Test 1

Words heard clearly: \_\_\_\_\_

Scored: \_\_\_ out of 10 words = \_\_\_\_\_%

## Improve

What will your team improve about your design? Why?

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## Test 2

Words heard clearly: \_\_\_\_\_

Scored: \_\_\_ out of 10 words = \_\_\_\_\_%

**Reflect:** Was your improved design more successful than your first design? How do you know?

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How would you improve your design if there were time? Why?

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