# Lesson 1: Engineering is Everywhere

***Student Worksheet – Civil Engineering***

What is civil engineering?

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Research and describe one structure that you think was created by a civil engineer?

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Civil engineering is the foundation of society. Explain how civil engineers helped build the first villages, towns and cities.

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Find a famous civil engineer. What have they designed?

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What would you design if you were a civil engineer?

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# Lesson 1: Engineering Is Everywhere

***Student Worksheet – Chemical Engineering***

What is chemical engineering?

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Research and describe something that you think was designed by a chemical engineer?

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Chemical engineers help develop new ways of distributing medicine. Find a pharmaceutical company that hires chemical engineers and describe what they produce.

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_____

Find a famous chemical engineer. What have they designed?

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What would you design if you were a chemical engineer?

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# Lesson 1: Engineering Is Everywhere

***Student Worksheet – Electrical Engineering***

What is electrical engineering?

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Research and describe one device that you think was created by an electrical engineer?

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Electrical engineers were extremely important in the development of the first computer. Can you explain what part of the computer electrical engineers might have helped design?

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Find a famous electrical engineering. What have they designed?

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What would you design if you were an electrical engineer?

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# Lesson 1: Engineering Is Everywhere

***Student Worksheet – Mechanical Engineering***

What is mechanical engineering?

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Research and describe one object that you think was created by a mechanical engineer?

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Mechanical engineering is very old. Can you find any examples of ancient mechanical engineering designs?

_____

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Find a famous mechanical engineer. What have they designed?

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What would you design if you were a mechanical engineer?

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# Lesson 2: Engineering Design Process

***Student Worksheet – Revising an Existing Design***

What device is your team going to improve? _____

What is the main purpose of the device?

_____

_____

_____

_____

Why does the device need to be improved?

_____

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_____

Are there any cost or material constraints that should be considered when improving this device?

_____

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Brainstorm: write your ideas and make sketches of possible ways to improve the device?

What is the best possible improvement that can be made to this device and why?

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Describe how you would sell your new and improved product to the public?

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# Lesson 4: Tool Shop Safety

***Student Quiz***

Why is it important to wear safety goggles when working with power tools?

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_____

Why should you clamp the PVC before cutting or drilling?

_____

_____

What could happen if too many people are crowded around a table?

_____

_____

Name two important rules to follow when using a soldering iron?

_____

_____

Circle the correct answer to the following:

Is it ok to wear sandals in the tool shop? Yes No

Should long hair be up or down in the tool shop? Up Down

# Lesson 6: Hydrostatics

***Student Worksheet***

## Pre-Lesson Questions


**1. Give three examples of objects that float.**

_____

_____

**2. What actually makes an object float?**

_____

_____

_____

**3. Why do people's ears hurt when they swim near the bottom of a pool?**

_____

_____

_____

## Post-Lesson Questions

**1. What are two examples of a compressible fluid?**

_____

_____

**2. What are two examples of an incompressible fluid?**

_____

_____

**3. What fluids interact with your underwater robot?**

_____

_____

_____

# Lesson 7: Fluid Dynamics, Thrust

*Student Worksheet*

## Pre-Activity Questions

**Answer the following questions before beginning the activity.**

**1. What parts of the airplane produce thrust?**

_____

_____

_____

**2. How can you increase the airplanes thrust?**

_____

_____

_____

**3. Why is it important that the airplane hangs level on the line?**

_____

_____

_____

**4. How will the plane behave differently if the wire is higher on the starting side then the ending side?**

_____

_____

_____

## Data Collection- Thrust Test

### Instructions:

- Place your airplane at the on end of the wire.
- Find the minimum number of winds required to make the airplane move.
- Start by winding the plane a certain number of times. Launch the plane and record the number of winds and the distance the plane traveled in the table.
- Try adjusting the winds to find the minimum winds required to make the airplane move. Record each trial in the data table.
- Now determine the number of winds required to reach the end of the wire. Record all trials in the data table.

| Number of Winds | Distance Traveled (inches) |
|---|---|
| | |
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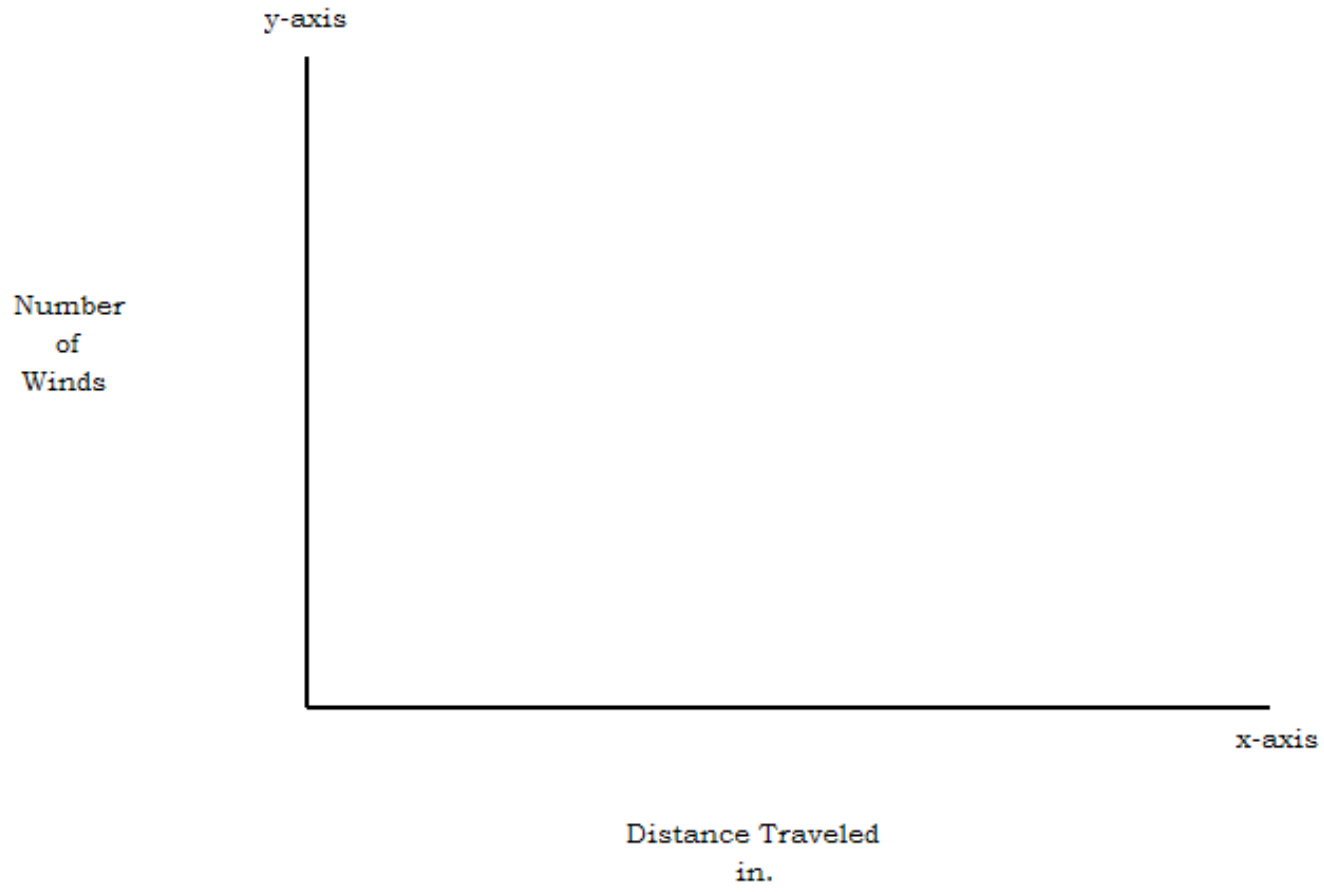
## Questions

How many winds did it take to reach the end of the wire? _____

What is the minimum number of winds required to move the airplane? _____

## Data Analysis Instructions

- Your goal is to graph the results of your test and determine if any trends appear.
- Based on your results determine an appropriate scale for the x axis and y axis.
  - For example: number of winds could go in increments of 5 (5, 10, 15…) and the distance traveled could go in increments of 2 in. (2 in, 4 in, 6 in)
  - Plot your data from the thrust test on the graph.



# Lesson 8: Fluid Dynamics, Drag

***Student Worksheet***

## Pre-Lesson Questions

**Answer the following questions to prepare for your introduction to drag.**

**1. Why do we need to worry about drag when we already have tried to improve thrust?**

_____

_____

_____

**2. Why are race cars more curved looking than buses?**

_____

_____

_____

**3. Why do you think it's hard to walk against a strong wind?**

_____

_____

_____

## Activity # 1 Hypothesis

**What do you think will happen to the speed of the propeller when it is placed in water?**

_____

_____

_____

## Post - Activity # 1 Questions

**Did the propeller act differently in the air verses in the water?**

_____

_____

_____

**How do you think the propeller would behave if it was dipped in a tub of molasses?**

_____

_____

_____

## Activity # 2 – Hypothesis

**What type of shape do you think will minimize the drag the best?**

_____

_____

_____

## Post - Activity # 2 – Questions

**In the table draw or write the shape being tested and record the time it takes to reach the ground.**

| | |
|---|---|
| 1. | 2. |
| Time: | Time: |
| 3. | 4. |
| Time: | Time: |

| | |
|---|---|
| 5. | 6. |
| Time: | Time: |

**Which shape had the shortest time? Which shape had the longest time?**

_____

_____

_____

**Was your prediction correct? If not why do you think you were incorrect?**

_____

_____

_____