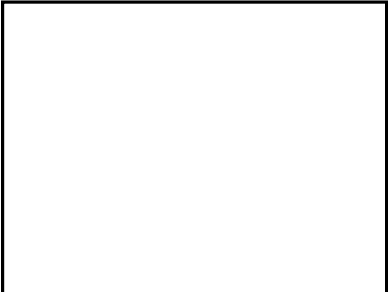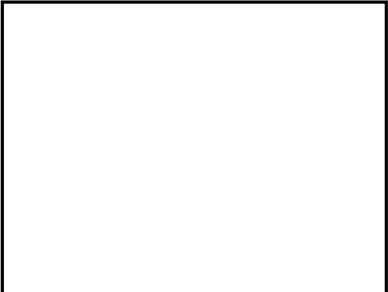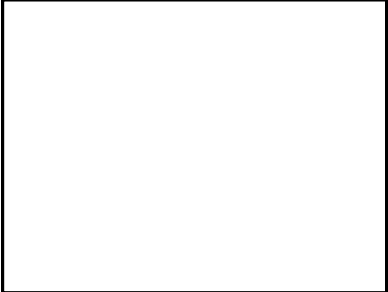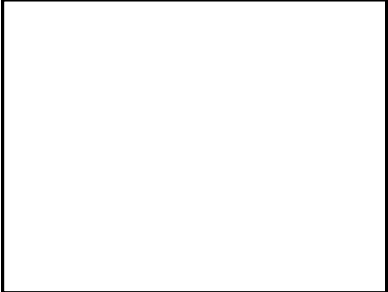# Engineering Investigation Planning Form

Investigators: _____

Planning Step #1: Brainstorming
Place Post It Notes in the squares below. Only one idea on each note.

Potential solutions, improvements, problems to be solved:

Engineering Goal: _____

(choose one of the ideas from above)

Transfer the Post It Note to this box.

Things the investigator could change or vary to evaluate the prototype:

Things the investigator could measure or observe (different from above):
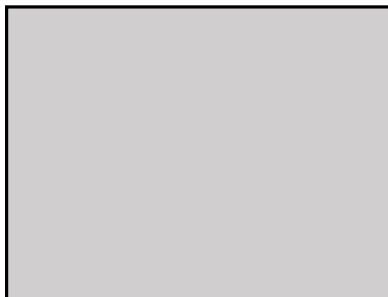
Planning Step #2: Choosing Variables
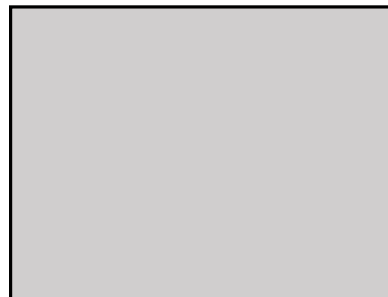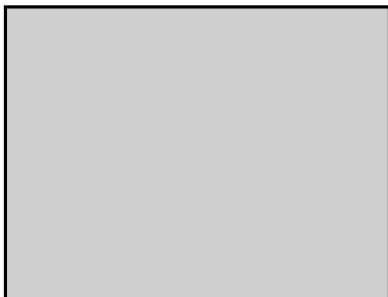
Place Post It Notes in the squares below.
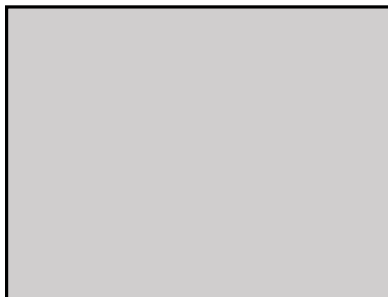
Part to change (independent variable):

Part to measure (dependent variable).

Part or parts to keep the same where possible (controlled variables or constants):

Step 1: Problem/Question/Engineering Goal

What is the question this experiment will try to answer? Include the independent and dependent variables in the question. For Example: *Will designing a car with a dimpled surface improve the aerodynamic efficiency compared to a smooth surface car?*

Independent Variable   Dependent Variable

Write your question here:

Step 2: Information (Background Research)

What background information would be helpful to know?

Step 2: Prototype Schematic

Step 3: Hypothesis or Engineering Goal

Independent Variable

*If the **independent variable** changes…*

Dependent Variable

*…then this is what will happen to the **dependent variable**.*

Write your hypothesis below, using the boxes above as a guide.

If the _____ is _____,
　　　　　　Independent Variable　　　　　　　　　　　　　describe how you will change it

then the _____ will _____,
　　　　　　Dependent Variable　　　　　　　　　　　　　describe the effect of the change

because _____,

as measured by (with) _____.
　　　　　　　　　　　　　　　instrument, tool, probe, etc.

Step 4: Experiment
Write out your experimental plan.

<u>Materials List:</u>   <u>Safety Precautions:</u>   <u>Preparation:</u>

<u>Step-by-step instructions (like a recipe):</u>

_____

_____

_____

_____

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_____

## Step 5: Results – Data Table

Place Post It Notes in the squares below.

Set up a sample data table like the one below specific to your variables and number of trials.

When the independent variable changed:	This was the result (dependent variable)
Independent Variable	Dependent Variable

Step 5: Results – Graph

Title: The effect of _____ on _____.

<div align="center">(Independent Variable)   (Dependent variable)</div>

Y Axis: Dependent Variable

X Axis: Independent Variable
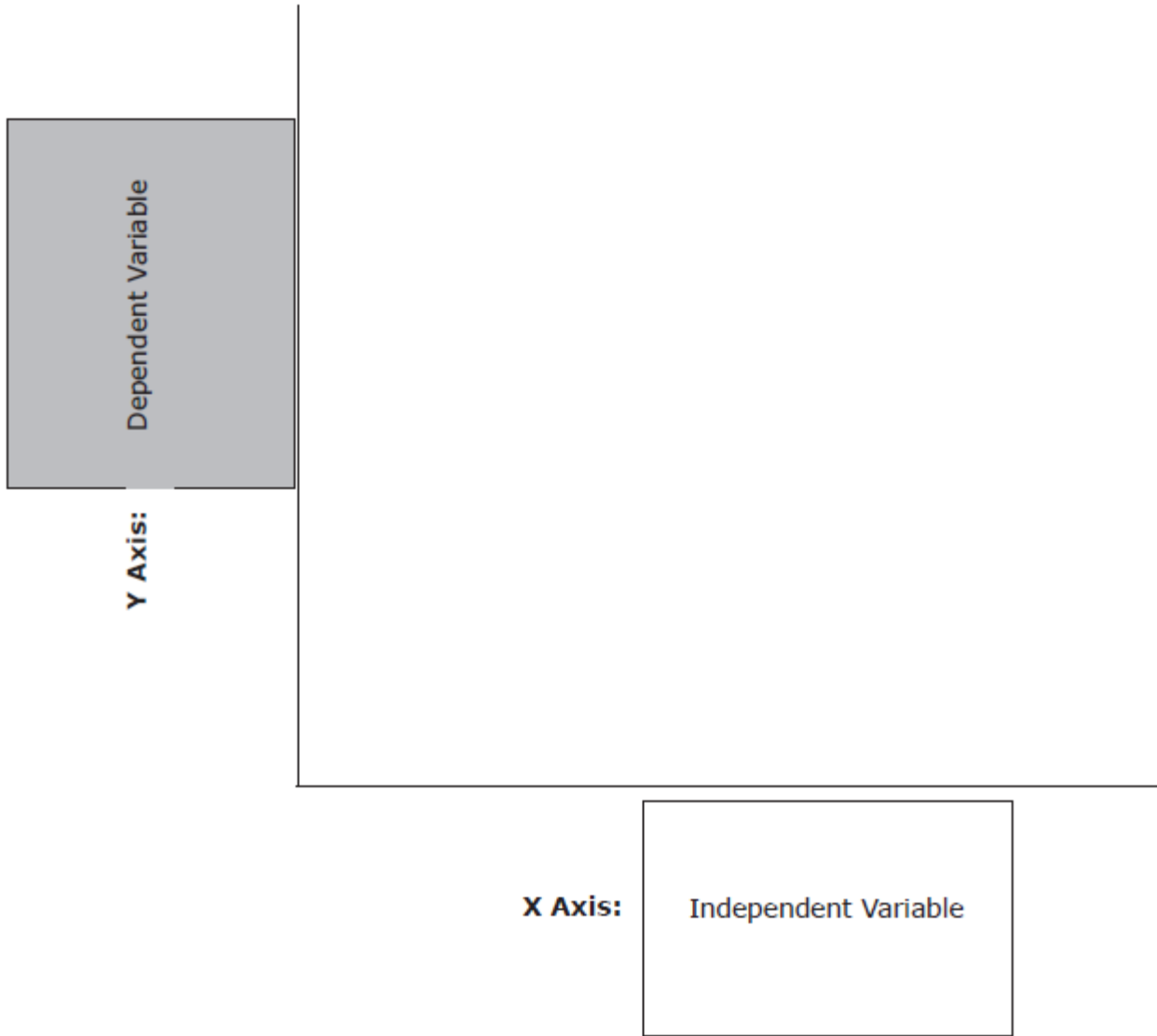
Create a graph like this in your logbook or on a separate sheet of paper, as appropriate.

Step 5: Results – Statistics

Statistical tests will be discussed and modeled in class.

Step 6: Discussion

1. Explanation of findings in paragraph form. MUST include numerical data to back up your claims.

2. Summarize trends observed in the data.

3. Discuss the statistical tests that were conducted, why you used the test you did and which comparisons did or did not show statistically significant findings.

4. How did your findings compare with your predictions, other research, other scientific facts you know, or other experimentation?

5. Discuss problems and/or possible sources of error that might have occurred.

6. How could the experiment be improved, or changed for further study? (See "New Design" below)

7. *New Design: The next thing the investigator might want to know is:*

<table>
<tr><td>The next variable to change…</td><td>The next variable to measure…</td></tr>
</table>

Step 7: Conclusion – Finding Patterns

Write out your conclusion, answering these questions. Do not introduce any NEW information in your conclusion.

1. What was the purpose of the experiment?

2. What were the major findings: Include data (numbers) examples.

3. Was the hypothesis <u>supported</u> by the data? (Do not use "proved".)

4. What are the practical applications of your experiment?