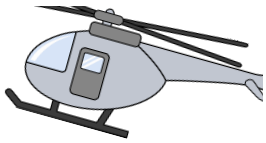
Falling Rotocopters



The experiment that we are going to do today simulates helicopter flight. Helicopter manufacturers are always trying to improve the design of helicopters to ensure that if, unfortunately, something should happen and a helicopter is going to crash, survival of the occupants could be made more likely. One way to do this is to increase the amount of time the helicopter remains in the air so it will crash slower and with less force. How do you make helicopters stay in the air longer as they fall? We are going to make rotocopters out of paper to simulate helicopters. You need to think of one variable that may effect the "air-time" of the rotocopter.

- Make sure you make one control copter and at least three different treatment copters. *Example: After conducting research you decide that longer wings will make the rotocopter fall slower. Plan and conduct an experiment with rotocopters that have wings of different lengths. Remember: Do not change anything except the wing length in each design. All other factors must remain constant.*

- Observe/record the time it takes for each rotocopter to fall to the ground from a fixed distance.

- Calculate the speed of each trial

- You must run at least 5 trials for each copter.

- Complete the attached lab as you work.

- Use the attached paper as your "control" rotoocopter design.

- Create a presentation poster to display your findings. You must include all elements of your lab:
    - Problem
    - Hypothesis
    - Procedure
    - Data table
    - Graph
    - Analysis/Conclusions
    - Attach your rotocopter designs
    - Include a labeled blueprint diagram of your best performing prototype.

Name _____ Date ____/____/____

Falling Rotocopter Lab

A **problem** is a question you have about an **observation** you've made. Write the problem below:

_____

_____

_____

A **hypothesis** is a response to the problem that is based on what you know or observations you've made in the past. A hypothesis has two parts. The first part is the answer to the question posed in the problem. The second part of a hypothesis is a **rationale**. A rationale is a description of the knowledge you had or previous observations you've made that led you to form your hypothesis.

Write your hypothesis:

If_____,then _____

_____

because: _____

_____

We need to consider **variables** at this point. A variable is something that changes during the experiment.

An **independent variable** is the variable you have control over or that you base your data collection around. Let's say that you want to observe the effects of caffeine on heart rate. The independent variable in this case is the amount of caffeine given to the test subjects. You control that amount.

What is the independent variable? _____

A **dependent variable** is the variable that you measure during the experiment. This variable depends on the conditions set by the independent variable.

What is the dependent variable?_____

A **procedure** is a description of the actions you will take to collect data to test your hypothesis. A good procedure is clearly written and descriptive so that other people can follow it without your help. You should always conduct multiple **trials** when you perform your experiment. Note the number of trials you will perform in your procedure. You should always note which equipment you used but do not have to describe how to use standard tools in a normal way!

You should always try to design a **control** into your procedure. A control is the experiment done without changing an independent variable. A control allows you to compare your results with what would have happened normally.

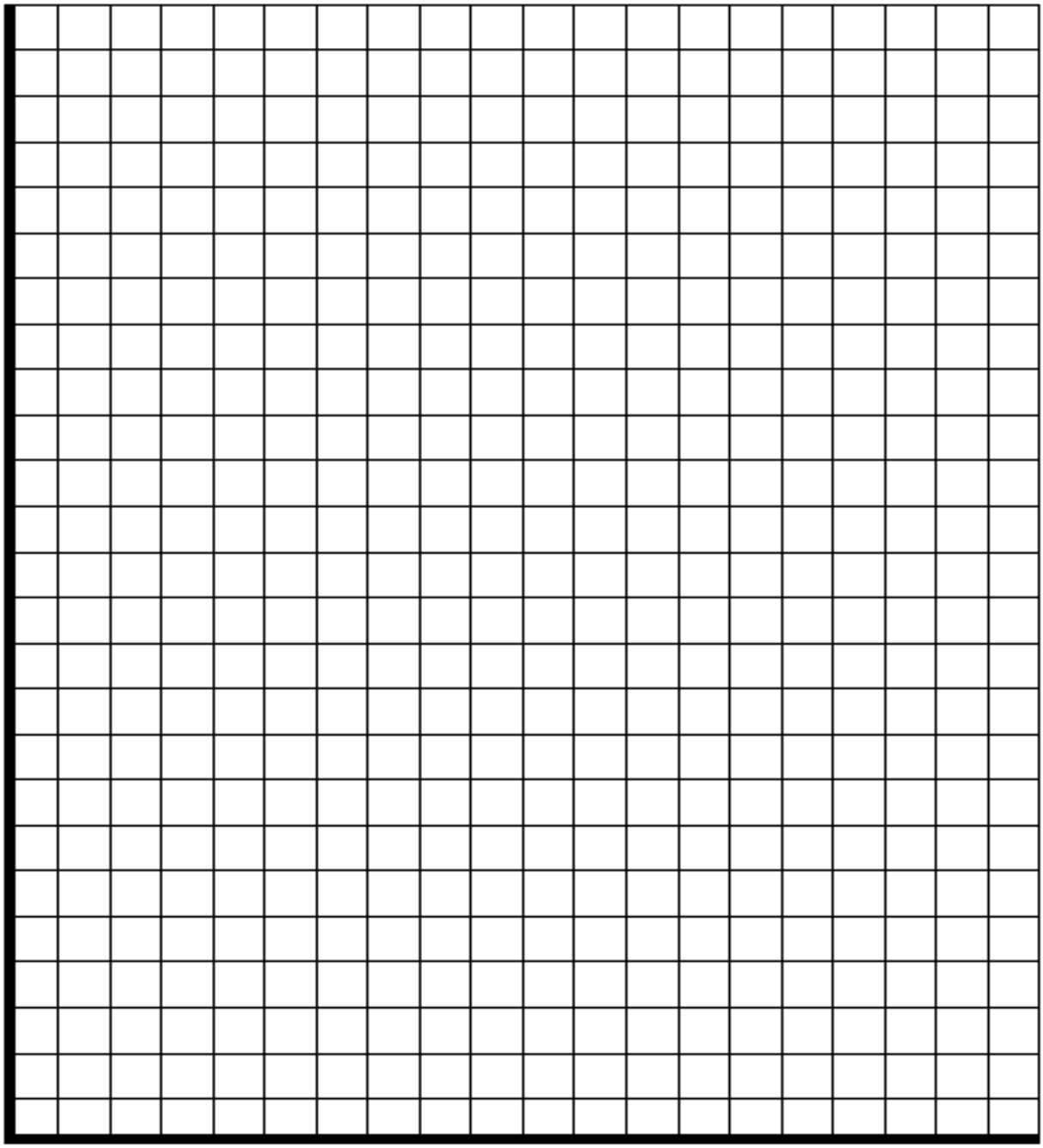
Write your procedure (it should include multiple trials and it should be easy for someone to follow):

Make a list materials needed to carry out your procedure:

Data is the results of your experiment. You should always record independent variables with the corresponding dependent variables using the correct units. Describe each design in the table.

Experiment Group	**Average Speed (cm/sec) (speed = distance/time)**					
	Trial 1	**Trial 2**	**Trial 3**	**Trial 4**	**Trial 5**	**Average**
Control						
Design 1:						
Design 2:						
Design 3:						

Graph your data. The independent variable is always expressed on the x axis and the dependent variable is expressed on the y axis. Don't forget to label your graph and include a title.



An **analysis** is a written description of what you did, what you thought might happen, and what actually happened. You may wish to discuss the effects of the environment on you experiment and what experimental errors may have occurred.

Write a brief description of your experiment:

Describe your results:

Why do you think that you got these results?

A **conclusion** is an answer to the question posed in the problem based on the data you obtained during your experiment. You should note whether your hypothesis was **nullified** or **validated**. A nullified hypothesis is a hypothesis that was proved to be incorrect by the data.

Based on your data, what is the answer to the question posed in the problem?

Was your hypothesis nullified or validated by your data?

What specific data supports your conclusion?

Put it all together to write your conclusion.