

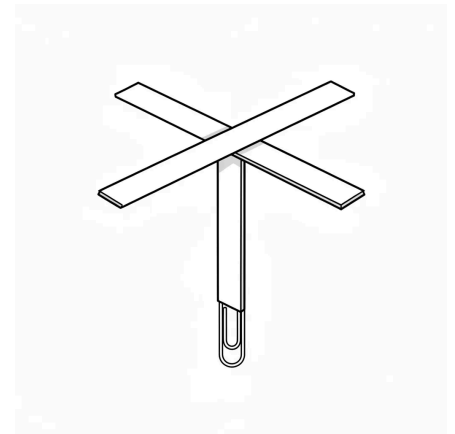
Identifying Variables & Planning a Fair Test: Paper Helicopters

Name _____

Date _____

Introduction: The Paper Helicopter

When you drop a paper helicopter, gravity pulls it down while air resistance pushes up against the wings, causing it to spin and slow its fall. To understand how different designs affect flight, scientists must identify variables and plan a fair test. A **fair test** is an experiment where only one variable is changed at a time, while all other conditions are kept the same.



Part 1: Identifying Variables

Scenario A: Maya's Wing Length Experiment (Fictional Practice Example)

(Fictional Practice Example) Maya wants to find out if changing the wing length of a paper helicopter affects how long it stays in the air. She makes three paper helicopters with wing lengths of 4 cm, 6 cm, and 8 cm. She drops each helicopter from a height of 2.0 meters and uses a stopwatch to measure the time it takes to hit the ground. She uses the same type of paper and the same size paperclip for all three helicopters.

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1. What is the independent variable in Maya's experiment?

- ☐ A The height from which the helicopter is dropped (2.0 meters)
- ☐ B The wing length of the paper helicopter (4 cm, 6 cm, 8 cm)
- ☐ C The time it takes for the helicopter to hit the ground
- ☐ D The type of paper used to make the helicopter

2. What is the dependent variable in Maya's experiment?

- ☐ A The wing length of the paper helicopter
- ☐ B The size of the paperclip used
- ☐ C The flight time (time to hit the ground)
- ☐ D The height of the drop

3. Identify two variables that Maya controlled (kept the same) in her experiment to ensure it was a fair test. (2 pts)

Part 2: Interpreting Experimental Data

Scenario B: Leo's Weight Experiment (Fictional Practice Example)

(Fictional Practice Example) Leo is testing how the number of paperclips attached to the bottom of a paper helicopter affects its flight time. To ensure a fair test, he uses identical helicopter designs, the same paperclip type and release method, and conducts his trials in the same indoor location. He drops each helicopter three times from a height of 2.5 meters and records the flight times in the table below.

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Leo's Flight Time Data (Fictional Practice Example)

Number of Paperclips	Trial 1 (s)	Trial 2 (s)	Trial 3 (s)	Average Flight Time (s)
1 paperclip	2.4	2.5	2.3	2.4
2 paperclips	1.8	1.9	1.7	1.8
3 paperclips	1.2	1.3	1.1	1.2

4. Based on Leo's data, describe the relationship between the number of paperclips and the average flight time. (2 pts)

5. Why did Leo drop each helicopter three times and calculate an average instead of dropping it only once? (2 pts)

6. In Leo's experiment, what was the independent variable and what was the dependent variable? (2 pts)

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Part 3: Design Your Own Fair Test

Scenario C: Paper Type Investigation (Fictional Practice Example)

(Fictional Practice Example) Now it's your turn to plan an experiment. You want to investigate how the **type of paper** (e.g., printer paper, construction paper, tissue paper) affects the flight time of a paper helicopter. Note: No practical flight test is required for this planning task. If your teacher chooses to conduct a physical test, always use a safe, reachable drop height while standing on the floor—never stand on chairs or desks.

7. Write a hypothesis for this experiment. (Use the 'If... then...' format). (2 pts)

8. Describe the step-by-step procedure you would follow to conduct this experiment. Explain how you will measure the dependent variable. (4 pts)

9. Identify three variables you must control (keep the same) in this experiment to ensure a fair test. (3 pts)
