

Name: _____

WHIRLYBIRDS

Group Members: _____

Modelling quadratic equations--finding the maximum and optimising performance.

A whirlybird is a flying machine that is constructed from paper. In this investigation you will determine a model for how the length of wing of a whirlybird affects the flight time.

You are provided with four whirlybirds with different wing lengths.

GROUP WORK - Data Collection

- i) Form groups, with 3 or 4 students in each group. Construct your whirly birds.
- ii) Allocate tasks to group members. You will need a Timekeeper, Dropper and Recorder. If you have a fourth person, they should also be a Recorder to verify data collection.
- iii) For each whirlybird, measure the length of the wings AND time it takes for the whirly bird to fall a certain distance. **IMPORTANT:** one data point will not be reliable, so repeat each drop with each whirlybird at least three times and calculate the average of three drops. **ENSURE ALL WHIRLYBIRDS ARE FALLING THE SAME DISTANCE EACH TIME.**
- iv) You can trim the length of the wings on the longer whirlybirds to discover if the ideal whirlybird (i.e, the one that has the longest flight time) has wings with a different length than the ones provided--again, measure the wing length and record times for three flights.

INDIVIDUAL WORK--Data Analysis

- v) On the back of this sheet, for each whirlybird, plot the length of the wings on the x-axis, and the average time taken for the three falls on the y-axis.
- vi) Draw a smooth curve to join the points.
- vii) Note the region where the maximum y-values of the curve appear. If you were to build a better whirlybird (i.e. longer flight time), what is the range of the wing lengths you might further investigate? **MARK THIS REGION ON THE GRAPH AND MAKE A NOTE ABOUT OPTIMUM WING LENGTHS ON THE GRAPH.**

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Part 1: Table

Wing Length	Flight Time (seconds)			Average Flight Time $t_{avg} = \frac{t_1 + t_2 + t_3}{3}$
	Trial			
	1	2	3	

Part 2: Graph

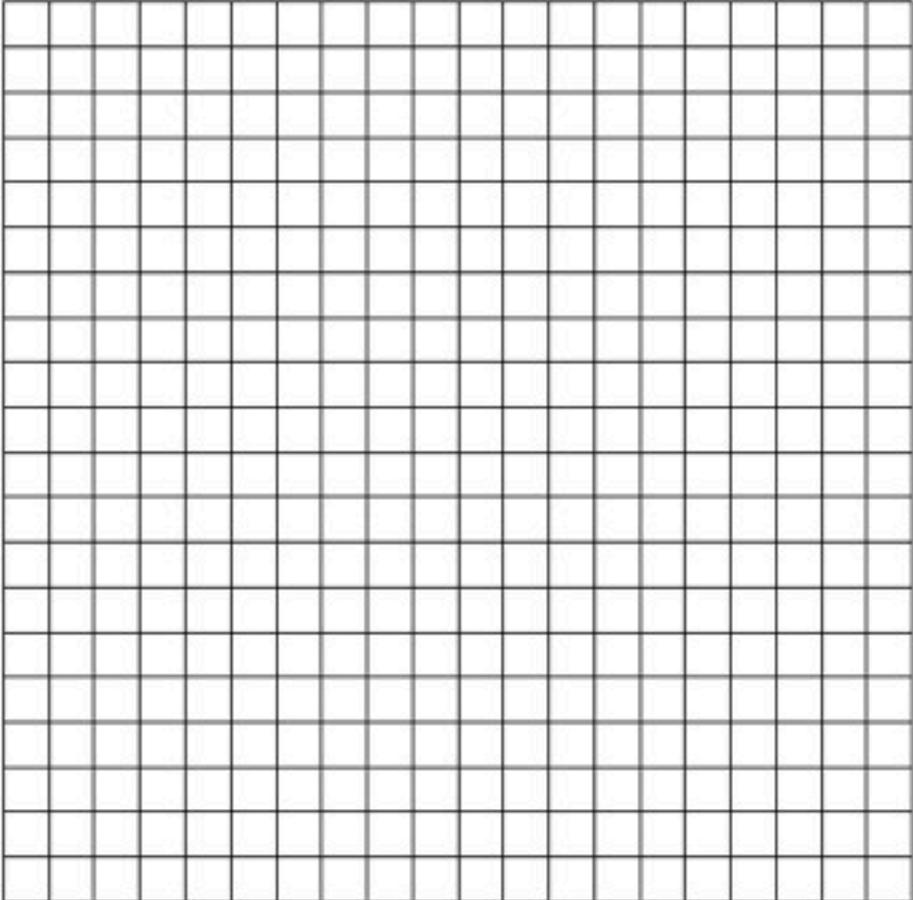
Graph: (A visual representation of our experimental data)

When graphing experimental data, we put the *independent data* on the horizontal axis, and the *dependent data* on the vertical axis.

Graphs should always include a title, and each of the axes should be labelled with a description and the units (if it has units).

Title: _____

Label Vertical Axis
(units in brackets):



Label Horizontal Axis (units in brackets): _____