

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.**

	Name: _____
--	-------------

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

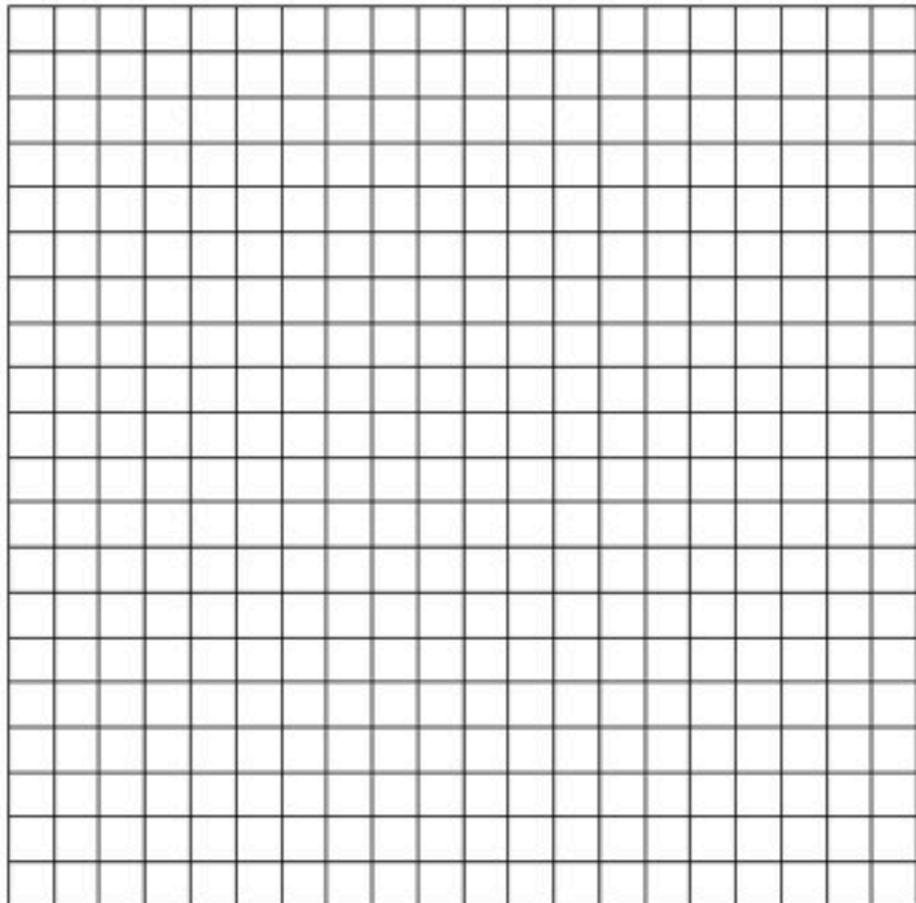
Graph: (A visual representation of our experimental data)

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): _____