

# Using Data Loggers

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## Introduction

The aim of this workshop is to demonstrate and practice the use of data loggers while carrying out mandatory experiments from the preliminary and HSC syllabus. Four experiments have been chosen to familiarize you with different probes. It is envisaged that you could then use these skills in other experiments as well. The data logger being used is the Data Harvest Easy Sensed Advanced.

## Experiment 1

### Syllabus Reference 9.2.2

- plan, choose equipment or resources for, and perform a first hand investigation to model the effect of friction and heat on a range of materials, including metals and ceramics

### Resources

Data logger with temperature probe.

Orbital sander

Samples of materials:

Metal ceramic plate

Fibreglass sheet

Plastic

Glass

### Method

1. Use an orbital sander to provide the friction. Turn on the sander and push it against the metal surface for a specified time.
2. Hold the temperature probe onto the surface that has just been sanded for a specified time.
3. Repeat steps 1 and 2 for each different material.

### Data logger settings.

1. Turn the data logger on by pressing the *Enter* button and make sure the LCD screen says *Easylog enter to begin*.
2. Plug the data logger into the computer. From this moment all control of the logger is made using the computer, do not press any of the buttons on the logger.
3. Plug the temperature probe into the number one port.
4. Start the Sensing Science program.
5. Click on the *Graph* button. The computer automatically determines which probe is attached and the axes of the graph will already show degrees celcius. The table of results can be viewed simultaneously with the graph by clicking and dragging out the far left of the screen.
6. Press start just before you touch the probe onto the surface, as this will measure the ambient temperature.
7. To improve the scale of the graph you click on the *Display* button on the bottom right of the screen. Choose *Sensor axis limits* from the pop up menu and change it to the desired settings.

### Extras

You may wish to reduce the number of readings in the table and this can be done using the *selection wizard*. Click on the *Tools* button the choose *Selection Wizard* from the pop up menu. From here you can choose to use every second or third reading. Make your choice then go the *Display* button and choose *Use Selection* from the pop up menu. You can copy and paste the table and the graph into spreadsheets or word processing documents.

## Experiment 2

### Syllabus reference 8.4.4

- perform first hand investigations to gather and data and analyse the change in momentum during collisions

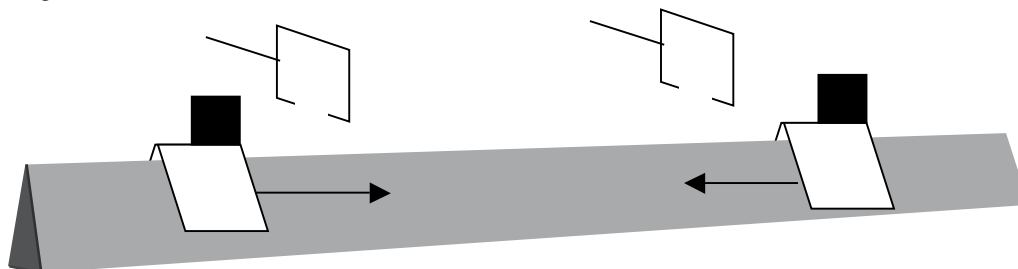
### Resources

Data logger with light gates

Linear air track

Two gliders

Cardboard flags



### Method

1. Push both gliders simultaneously.
2. (the logger will calculate their speed as they pass through the light gates in one direction then after the collision as they head back their speeds are calculated again.)
3. Use the values from the data logger to calculate momentum before and after the collision.

### Data Logger set-up

1. Turn the data logger on by pressing the enter button and make sure the LCD screen says Easylog enter to begin.
2. Plug the data logger into the computer. From this moment all control of the logger is made using the computer, do not press any of the buttons on the logger.
3. Plug the light gates into the number 5 and 6 digital ports.
4. Start the Sensing Science program.
5. Click on the *Timing* button. The computer automatically determines which probe is attached.
6. You need to press the New button in the top left hand corner next to the red arrow. This sends you through a series of screens that allow you to set up what you want to measure.
7. Screen 1- choose *Velocity*  
*Next.*
8. Screen 2- choose *Velocity at A or B*  
input the length of the card that will pass through the light gates  
*Next.*
9. Screen 3- choose *Repeated events*  
*Table*  
*Finish.*

### Interpreting results

For each collision you will have four data values. Two from gate A and two from gate B. The first of A and B is before the collision and the second of A and B for after the collision.

Care must be taken to prevent the gliders from bouncing off the end of the track and returning back through the light gates again.

Since the program has already calculated the speed it is simple to calculate momentum before and after the collision.

All other types of collisions can also be investigated using a similar procedure.

## Experiment 3

### Syllabus reference 8.2.3

- plan, choose equipment or resources for and perform a first-hand investigation and gather information to model the inverse square law for light intensity and distance from the source

### Resources

Data logger  
Light intensity probe  
Torch  
Metre rule

### Method

1. Shine the torch at the light intensity probe of the data logger.
2. Take readings of light intensity at increasing distances from the probe.

### Data Logger set-up

This experiment will use the data logger remotely

1. Turn the data logger on by pressing the *Enter* button and make sure the LCD screen says *Easylog enter to begin*.
2. Use the arrow button, below the *Enter* button, to scroll through the various modes until you reach *Snapshot*.
3. Plug the light intensity probe into the number 1 port.
4. When you are ready to begin recording press *Enter*. Each time you press *Enter* it records the light intensity.
5. When you finish press *stop*.
6. Use the arrow to scroll back to *Easylog enter to begin*.
7. Plug the data logger into the computer.
8. Open the Sensing Science program and choose *Graph*.
9. Click on the Collect Remote button in the bottom right corner.
10. A screen comes up with all the remote data that has been saved on the data logger. Choose the one that you want and then click *Retrieve*.
11. The graph of the information comes up immediately.
12. To change the scale click *Display* then *Auto scale*.
13. To change the X-axis click *Display* then *Display Wizard* then in the X- axis choose *Reading number*.

## Experiment 4

### Acceleration due to gravity

#### Syllabus reference

##### 9.2.1

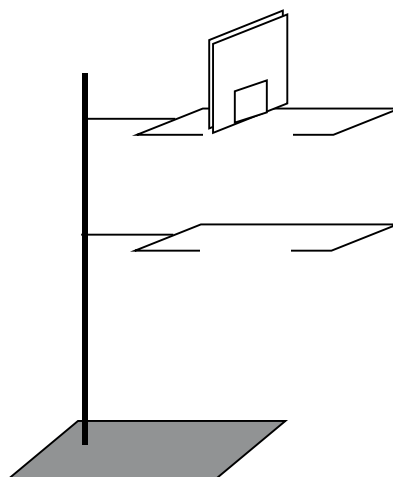
perform an investigation and gather information to determine a value for the acceleration due to gravity using pendulum computer assisted and /or other strategies to explain possible sources of variations from the value  $9.8 \text{ ms}^{-2}$

#### Resources

Data logger  
Light gates  
Floppy disk

#### Method

1. Set up the equipment as shown in the diagram.



2. Set up the data logger for measuring acceleration.

3. Start the data logger,

4. Release the disk so that it falls through the two gates. (The closer the gates are together the less likely that the disk will turn on an odd angle and affect your results.)

#### Data Logger set-up

1. Turn the data logger on by pressing the enter button and make sure the LCD screen says *Easylog enter to begin*.

2. Plug the data logger into the computer. From this moment all control of the logger is made using the computer, do not press any of the buttons on the logger.

3. Plug the light gates into the number 5 and 6 digital ports.

4. Start the Sensing Science program.

5. Click on the *Timing* button. The computer automatically determines which probe is attached.

6. You need to press the *New* button in the top left hand corner next to the red arrow. This sends you through a series of screens that allow you to set up what you want to measure.

7. Screen 1- choose *Acceleration*  
*Next.*

8. Screen 2- chooses *Acceleration from A to B*  
input the length of the card that will pass through the light gates  
*Next.*

9. Screen 3- choose *Repeated events*  
*Table*  
*Finish.*

10. Carry out the experiment as many times as you like. The table shows the acceleration.

11. To show the average value, highlight all the values then go to the *Analyse* menu at the top of the screen and select *Average*. The average is written at the bottom left of the screen.