Science in your pocket

Introduction

Have you ever thought about what *else* your phone can do? Sure it makes calls, takes photos, accesses endless information on the internet, tells you where you are, plays games, helps you get fit...This is still your phone remember.

There is more to it too. It also does science! Your phone is a sophisticated measurement device, and this investigation will concentrate on just on the of the many complicated measurements your phone can do.

1a. Questions and predicts - Guided

Aim

To investigate the relationship in intensity of light measurements over distance using a smartphone.

Write a hypothesis to achieve this aim. In a science experiment, we change one variable (the independent variable) and measure another (the dependent variable) and see what the effect of the change is.

Hypothesis

Write a hypothesis to achieve this aim.
Use words like *If, this, then,*

2a. Learns and plans - Guided

Equipment you'll need
Apart from a phone, what equipment will you need?

Investigate some apps on your phone, make a choice about which one you'll use and justify your choice. How many apps should you test?

I chose the app _____ because:

What are the safety concerns with this investigation? List three risks and corresponding consequences and precautions

Risk	Consequence	Precaution

Method
Make a list of steps for this experiment. You'll need to make sure the steps could be followed by someone else wanting to replicate your investigation. Include a diagram. Be sure to control for variables. Make sure you list variables and how you have considered them.

Use words like *Control Variable*, *Independent variable*, *Dependant variable*

How many times should you run the experiment? What units will you be measuring?

3a. Conducts - Guided

Results
Complete the results table below.

How many times did you record the data? _____

Light intensity, phone (lux)	Distance, r (m)	$1/r^2$
	.10	

Why have we got the column $1/r^2$?

4a. Processes and analyses - Guided

How would you best present this data to a scientific audience? You'll need to place your results in the graph that show the results from the experiment.

When plotting graphs, there is a handy mnemonic to use in order to make sure your graph is *CUTLASS*.
C - Crosses. Use crosses instead of dots, dots can be seen as marks)
U - Units. Use appropriate units, like lux and meters
T - Title, the graph needs a title
L - Line of best fit. If you can, make a line of best fit. In this case we will. The line of best fit will give us a chance to make prediction. Line of best fit is not a join the dots
A - Axes. Use the correct axes. The independent variable (what you change) in the x-axis and the dependant variable (what you measure) on the y-axis
S - Scale. Your axes need to have appropriate scales and they need to be spaced incrementally
S - Size. Use the space provided, We want your graph to be as big as it can be. This is for as much clarity as we can manage

5a. Problem Solving - Guided

Discussion
What is the relationship between Intensity and distance, r? Can you find a mathematical expression for the relationship? Does your conclusion match your hypothesis?

Try and complete a risk assessment for an industry or career application that deals with light intensity.

Further investigation
How would you make the investigation better? What else could you measure with a phone? What else to phones measure and why?

If you were to extend your investigation, what would your next hypothesis be? Try to use your results from this investigation to help you guide your next investigation

Hypothesis

6a. Communicates - Guided

Conclusion
Answer the question that we asked in the Aim. Use words like relationship, aim, results, hypothesis

The relationship is: The implications are:

Advancing Science & Engineering through Laboratory Learning

Science in your pocket - part b

Introduction

In the previous part of this investigation we have used a smartphone to measure the relationship between light intensity and distance. We can now do the same investigation with a light meter in order to make a comparison between the smart phone and a lab-based measurement device

1b. Questions and predicts - Guided

Aim

To investigate the relationship in intensity of light measurements over distance using a light meter.

Write a hypothesis to achieve this aim. In a science experiment, we change one variable (the independent variable) and measure another (the dependent variable) and see what the effect of the change is.

Use words like *If, this, then,*

Hypothesis

Write a hypothesis to achieve this aim.
Use words like *If, this, then,*

2b. Learns and plans - Guided

Equipment you'll need
Apart from a light meter, what equipment will you need?

What are the safety concerns with this investigation? List three risks and corresponding consequences and precautions

Risk	Consequence	Precaution

Method
Make a list of steps for this experiment. You'll need to make sure the steps could be followed by someone else wanting to replicate your investigation. Include a diagram. Be sure to control for variables. Make sure you list variables and how you have considered them.

Use words like *Control Variable*, *Independent variable*, *Dependant variable*

How many times should you run the experiment? What units will you be measuring?

3b. Conducts - Guided

Results

Results
Complete the results table below.

How many times did you record the data? _____

Light intensity, light meter (lux)	Distance, r (m)	$1/r^2$
	0.10	

Why have we got the column $1/r^2$?

4b. Processes and analyses - Guided

How would you best present this data to a scientific audience? You'll need to place your results in the graph that show the results from the experiment.

When plotting graphs, there is a handy mnemonic to use in order to make sure your graph is *CUTLASS*.
C - Crosses. Use crosses instead of dots, dots can be seen as marks)
U - Units. Use appropriate units, like lux and meters
T - Title, the graph needs a title
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S - Scale. Your axes need to have appropriate scales and they need to be spaced incrementally
S - Size. Use the space provided, We want your graph to be as big as it can be. This is for as much clarity as we can manage

5b. Problem Solving - Guided

Discussion

Now that you have done this investigation with a phone and a light meter, you can make a comparison between the two.

List similarities and differences between a light meter and a Phone	
Similarities • • •	**Differences** • • •

What is the relationship between Intensity and distance, r? Can you find a mathematical expression for the relationship? Does your conclusion match your hypothesis?

Try and complete a risk assessment for an industry or career application that deals with light intensity.

Further investigation
How would you make the investigation better? What else could you measure with a light meter?

If you were to extend your investigation, what would your next hypothesis be? Try to use your results from this investigation to help you guide your next investigation

Hypothesis

6b. Communicates - Guided

Conclusion
Answer the question that we asked in the Aim. Use words like relationship, aim, results, hypothesis

The relationship is: The implications are: