

Investigating



Communicating



Knowledge and understanding



An experimental investigation: How far can I travel in 10 seconds?

Learning outcomes in focus

Students should be able to:

NS3 design, plan and conduct investigations; explain how reliability, accuracy, precision, fairness, safety, ethics, and selection of suitable equipment have been considered.

NS4 produce and select data (qualitatively/quantitatively), critically analyse data to identify patterns and relationships, identify anomalous observations, **draw and justify conclusions.**

NS5 review and reflect on the skills and thinking used in carrying out investigations, and apply their learning and skills to solving problems in unfamiliar contexts.

NS7 organise and communicate their research **and investigative findings in a variety of ways fit for purpose and audience, using relevant** scientific terminology and **representations.**

PW1 select and use appropriate measuring instruments.

PW2 identify and measure/calculate length, mass, time, temperature, area, volume, density, speed, acceleration, force, potential difference, current, resistance, electrical power.

PW3 investigate patterns and relationships between physical observables.

Learning intentions

We are learning to:

- design, plan, conduct and report an investigation.
- plan a safe experiment to give accurate, reliable results by choosing suitable measuring equipment and controlling key variables.
- accurately measure physical quantities such as length and time.
- evaluate the reliability and quality of our data and, if appropriate, suggest improvements that could be made to our experimental design.

Teaching and learning context

First year students were asked the question, How far can you travel in 10 seconds? They were then asked to plan, conduct and record the method and results of their experiment to answer the question. One class was allocated for discussion and preparation, with an emphasis on measurement and error. Two classes were allocated for data collection. Homework was set and completed over two evenings, namely the production of graphs and a conclusion relating to the patterns in the data. Open access to necessary resources was provided and a written end product expected.

Task

Plan and conduct an experiment to answer the question “How far can I travel in 10 seconds?” Pay particular attention to accuracy. Record your method and results and present your graphs and conclusions.

Success Criteria

I can:

SC1: make a prediction based on the variables I am going to measure.

SC2: identify key variables

SC3: select appropriate equipment to accurately measure values for distance and time

SC4: record, organise and present the method and results of my experiment with appropriate units in a way that makes sense to others

SC5: draw and justify conclusions from my observations or graphs.

SC6: review my investigation design, referring to errors, extensions and/or improvements to promote accuracy and precision.

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Planning a Scientific Investigation

Name

How far can you go in 10 seconds?

What are you going to investigate?

We are investigating who far we can go in 10 sec WITH a stopwatch, different types of movement and lots of different variables

List the variables you think might affect how far you can go in 10 seconds.

Age, Movement, Shoe Type, Weather, Surface, Fitness, Speed, Stamina, Wind Direction, Time Limit

Decide which variables you are going to measure. Explain how these variables might affect how far you can go in 10 seconds.

Age - What age you will affect it.
Movement - Some movements are faster than each other.
Speed/Fitness - Speed would affect how fast everyone is some people won't be as fit as someone else which makes the fitter one go faster

Put your experimental design into action. Assemble the equipment as you see fit and collect your data. Think carefully about how you will analyse and present your data. You must write this experiment up using all of the following headings for each section:

- Experiment Title
- List of Apparatus
- Diagram of Experiment
- Method
- Results
- Analysis & Conclusion
- Sources of Error
- Suggested Improvements to Design
- Graphs

SC2:
Key variables identified

SC1:
Presents a simple prediction that a fitter person will go faster so linking speed to the measurement of distance and time.

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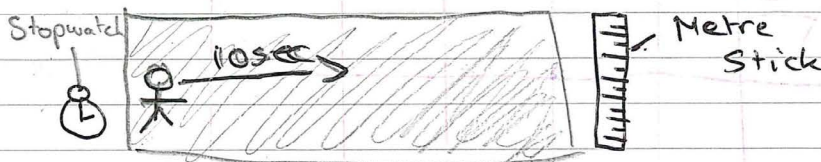
17-1-17
Title of Experiment - How far can I run/other movements in 10 seconds?

List of Apparatus = Stop watch
Person x2
Metre Stick
Place to run/other movements
Results.

Diagram of experiment



Tarmac



Method

- Find a place to run
- Get equipment
- Start the stopwatch for 10sec and get someone to do different movements.
- Analyse how far they've gone.
- Record
- Try 2
- Then try on different surface

SC3:
Metre stick
inappropriate

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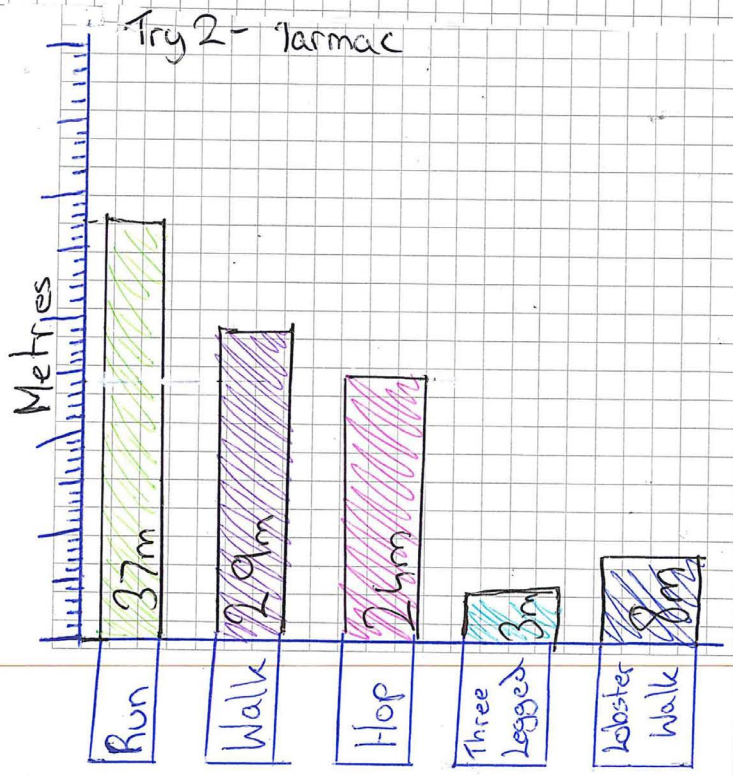
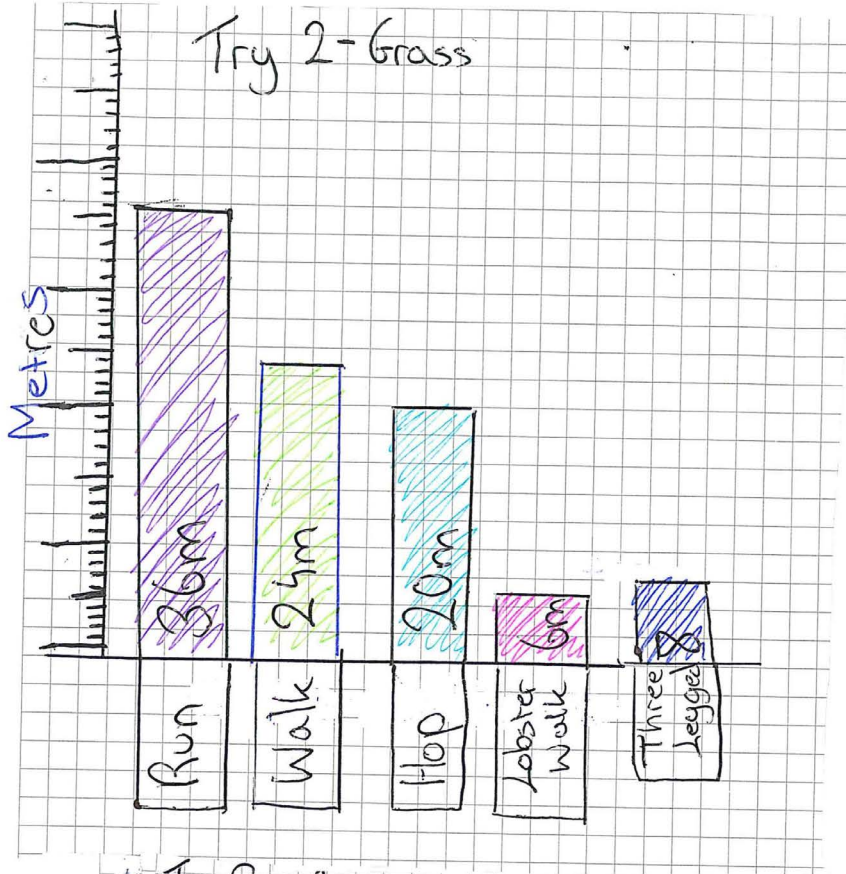
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Movement	Try 1	Try 2
Run	48m	37m
Walk	24m	28.50m
Hop	21m	24m
Lobster Walk	3m	3m
Three Legged	8m	8m

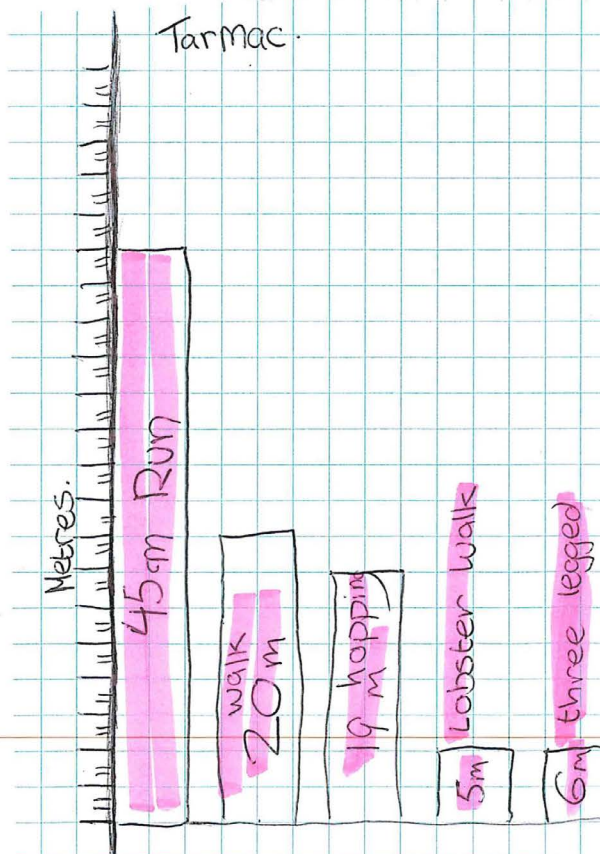
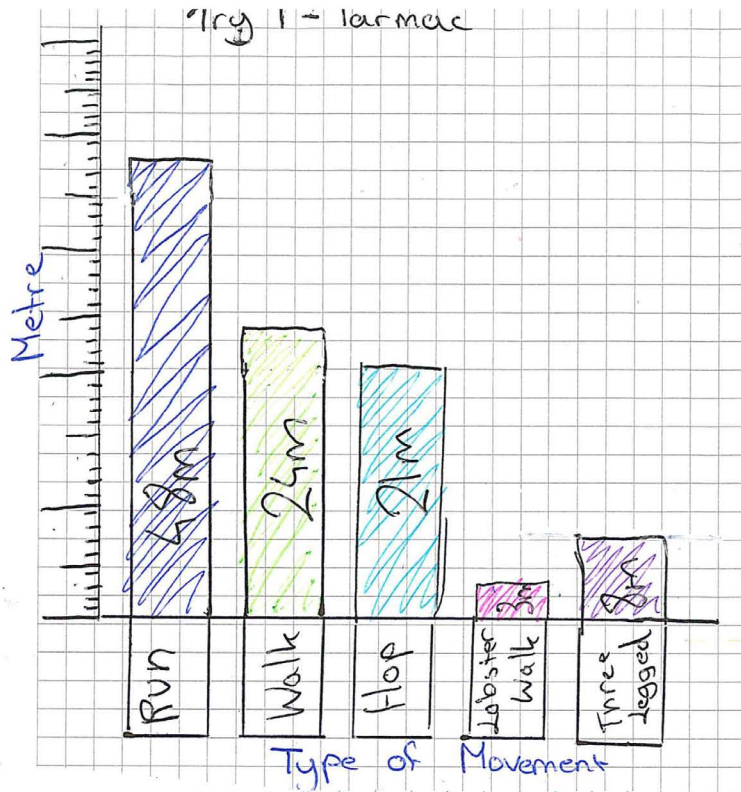
Movement	Try 1	Try 2
Run	45m	36m
Walk	20m	24m
Hop	19m	20m
Lobster Walk	5m	6m
Three Legged	6m	75 = 60cm

SC4:
 Results are clearly recorded organised and presented in tables with appropriate units, however there are some inaccuracies in the graphs

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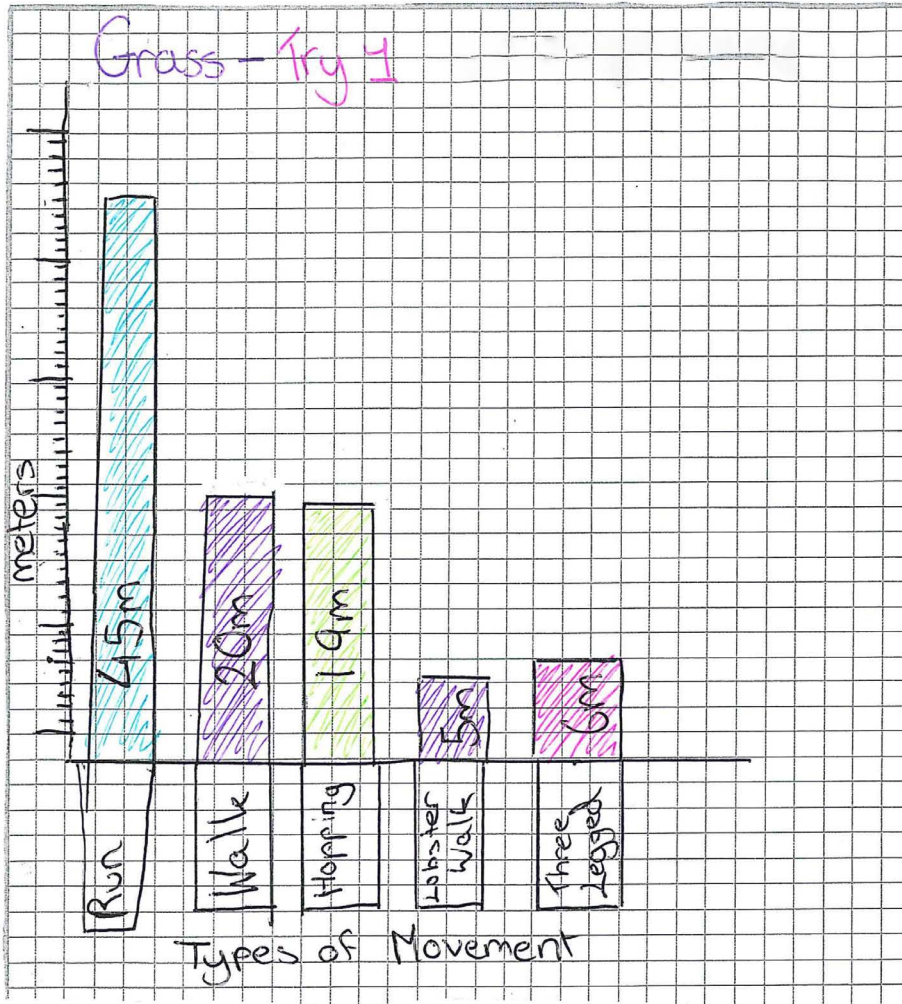


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Analysis and Conclusion

On the Tarmac you'd have more grip for most of the movements. The Tarmac has more grip than the grass because the grass was slippery but for the Lobster Walk the Tarmac was uncomfortable to put your hands on the ground because of the gravel. On the grass it's more comfortable because it's softer.

When we were doing ours ~~we~~ there was a bit of wind that was on the first tries but then the next day we did it for Try 2's as you can see in our results it got higher in some of them. So the wind has an affect on it of pushing you further. Different types of footwear would depend how far you go aswell. Say if you were wearing 10 inch heels or like runners what would you think get you ~~to~~ further. Of course the runners because the heels are well to uncomfortable to walk in let alone run.

SC5:

Conclusions drawn that tarmac gives more grip than slippery grass for most movements but affected negatively impacted on the lobster walk. The effect of wind is also considered

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Sources of error

- Measurement could have been wrong.
- We'd be tired maybe after a while.
- The ~~stopwatch~~ stopwatch could've been faulty.

Suggested Improvements to design

- A better system of measurement eg. trundle wheel, long tape measure.
- Have breaks
- Get a very good stopwatch or keep a better eye on it.

SC6:
Faults are identified and suggestions for improvement made

Overall judgement:  In Line With Expectations