



What type of footwear is best used in a race?

The investigation

A group of learners in Year 10 investigated the force developed between different shoes worn by athletes and the ground.



What they did

They decided to drag different types of shoes, e.g. trainer, studs, blades, plimsolls and a hiking boot, across a wooden surface and recorded the force needed to get the shoe to move.

They recorded their results in a table.

Type of shoe	Force to move shoe (N)						
	1 st attempt	2 nd attempt	3 rd attempt	4 th attempt	5 th attempt	Most likely value	Mean value
Shoe type A	11	12	13	11	11	11	
Shoe type B	12	10	10	12	10	11	
Shoe type C	8	7	9	7	6	7	
Shoe type D	10	14	17	13	12	13	
Shoe type E	7	6	4	6	5	6	

What is the data telling us and how can we arrive at some conclusions?

Explore and evaluate the data that has been collected

- Discuss in your groups the reasons why you think there are differences between each of the readings taken for each shoe.
- If you had only taken one reading for each shoe, which shoe would you say had the best grip? Explain your answer.
- If you had taken two readings for each shoe, would your answer have been any different? Explain your answer.
- Based on this data, would your opinion of the shoe with the best grip have changed after the third, fourth and fifth readings?

Process the data

- Calculate the mean values.

Asking questions about the data that will help you come to a conclusion

- How do you think the group arrived at their 'most likely value'?
- Why and how would you use the 'most likely value' **and** the 'mean value' when processing your results?
- Rank the shoes in order of grip from most to least.
- Are there any results for any shoe that don't fit in with the overall pattern? If so, which ones and why?
- Should you still include this result in your mean value and in your final conclusion? What do we call results that don't fit the pattern?
- Are you more confident that your final result is correct after taking five readings instead of just one? Explain your answer.

Things to think about

- Why is a table useful when setting out the data collected?
- Why do scientists always repeat their readings when they are carrying out experiments?
- Does it matter how many times you repeat your results (e.g. 3, 4, 5 or more)?
- Consider whether displaying the results in the form of a graph would help you to find out more information from the data than if it was in a table. If so, how and why?

Arriving at a conclusion to the investigation

- After considering **all the evidence** that you have collected, try to arrive at some final conclusions to this investigation. Remember to state how and why you came to these conclusions. Also point out the evidence you used to arrive at your conclusions. These could come from your general knowledge of science.