 Riding a scooter down a small slope

Resources required

* Grid paper for graphing
* A risk assessment
* A small decline or ramp
* A bike/scooter and a helmet
* Minimum 15 cones or as many cones as you want
* Stop watches
* Access to a Laptop and Geogebra software

Activity

During this activity students will experience rates of change including velocity and acceleration and how this is demonstrated on a displacement/time graph. The video clip below demonstrates the activity. John Thompson who features in the clip has kindly given permission for his image to be included in this video.



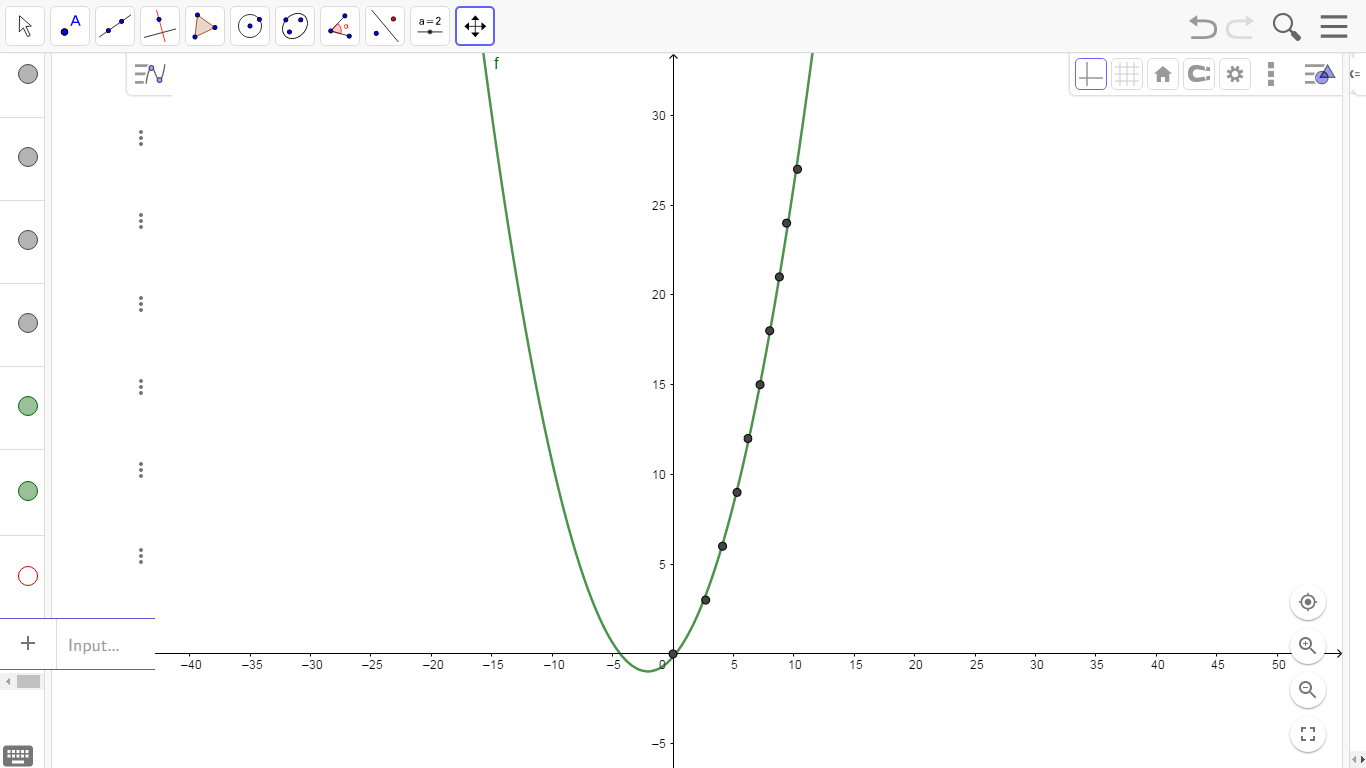
1. Place the cones a set distance apart (for example: 3 metres apart) down the slope
2. Have a student stationed at each cone with a stop watch
3. Have a student ride a bike or scooter down the slope and ask them to consider their feelings during various stages of the ride.
4. Students start their stop watch on go and then stop their watch when the rider goes past them
5. Record the results (times) in order
6. Repeat the process several times with a different student riding each time

| Cone number | Total  distance  (metres) | Run 1  (seconds) | Run 2  (seconds) | Run 3  (seconds) | Average  time  (seconds) |
| --- | --- | --- | --- | --- | --- |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 3 | 2.9 | 2.95 | 2.29 | 2.7 |
| 2 | 6 | 4.07 | 4.49 | 3.74 | 4.1 |
| 3 | 9 | 5.07 | 5.75 | 4.94 | 5.3 |
| 4 | 12 | 6.08 | 6.63 | 6 | 6.2 |
| 5 | 15 | 6.20 | 7.70 | 7.64 | 7.2 |
| 6 | 18 | 6.89 | 8.61 | 8.37 | 8.0 |
| 7 | 21 | 7.82 | 9.40 | 9.11 | 8.8 |
| 8 | 24 | 8.48 | 10.08 | 9.72 | 9.4 |
| 9 | 27 | 9.76 | 10.75 | 10.32 | 10.3 |

1. Use Geogebra, or a similar application, to create a scatterplot of distance travelled against time for the data recorded. (The data may be entered into the spreadsheet view of Geogebra, before creating a list of points by selecting the data, right-clicking and selecting Create List of Points)
2. Discuss the results. How does the graph relate to how the rider felt at each stage? When was the rider going fastest and how does this appear of the graph?
3. Discuss how using the change in distance and change in time from the results will give you the average velocity but not the instantaneous velocity
4. Introduce the concept of the gradient as a rate of change between the two variable, in this case distance and time leading to velocity.
5. In Geogebra, enter into the input box to generate an equation and a graph for Velocity against Time.
6. And In enter into the input box to generate an equation and a graph for Acceleration against Time.

Distance-time graph

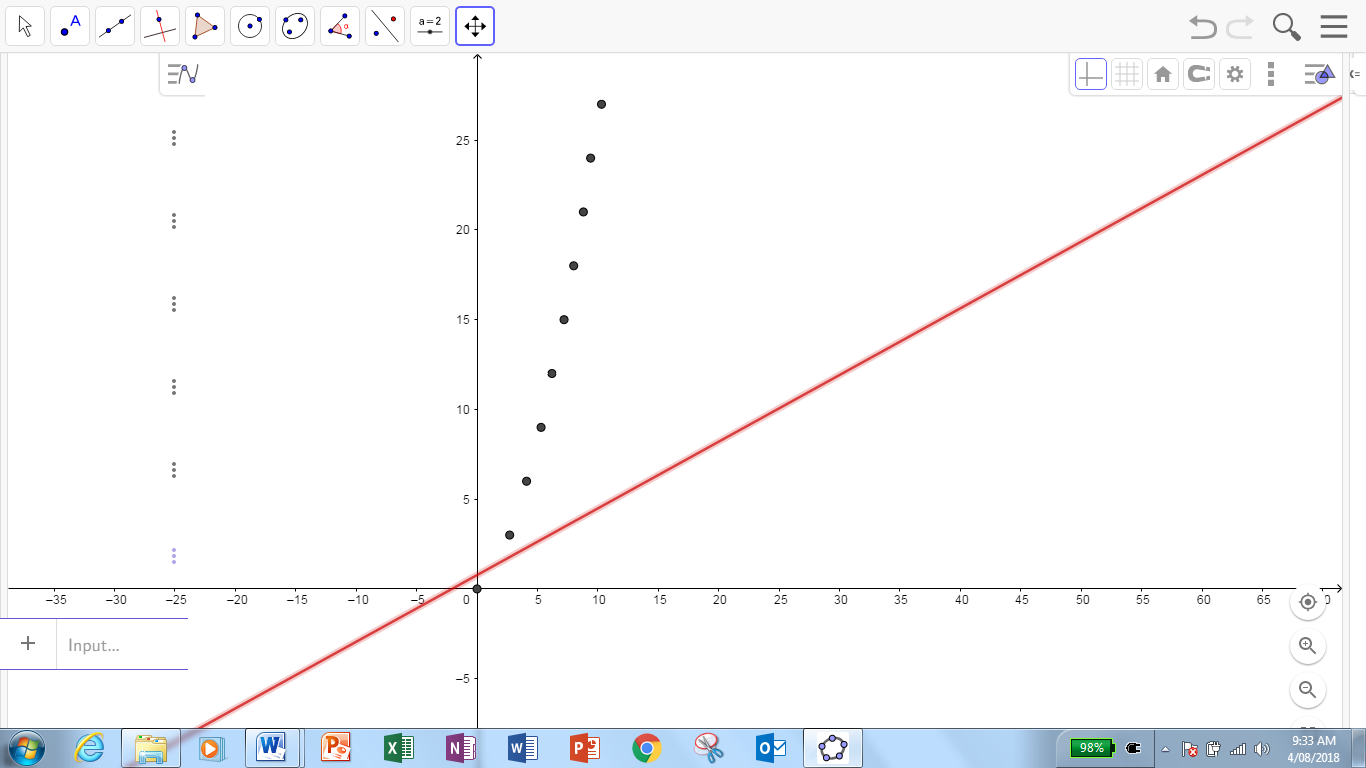
Use the fitpoly option in Geogebra



Use appropriate language to describe rates of change, for example ‘at rest’, ‘initially’, ‘change of direction’ and ‘increasing at an increasing rate’

Speed-time graph

Use the option in Geogebra



Acceleration-time graph

Use the option in Geogebra

