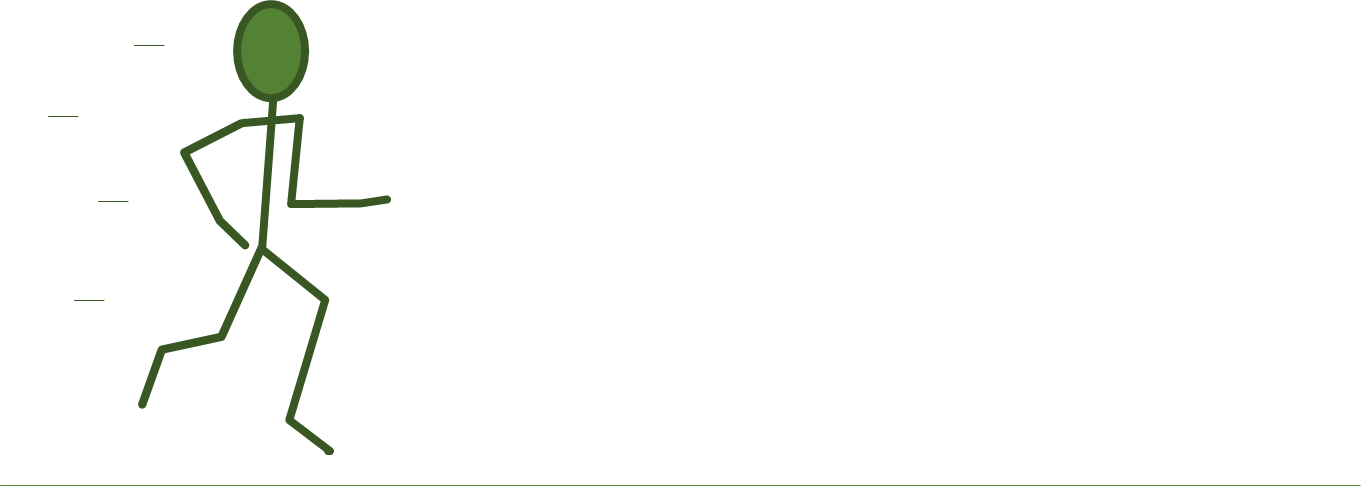
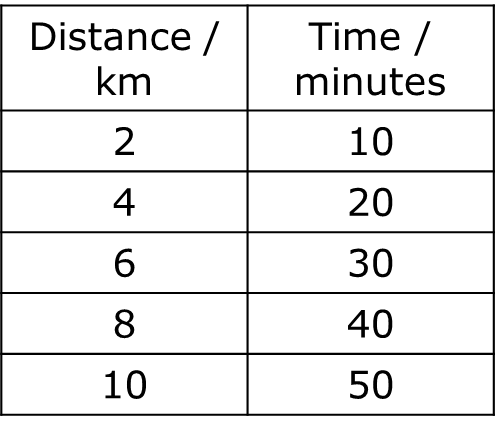
**Plot the line**

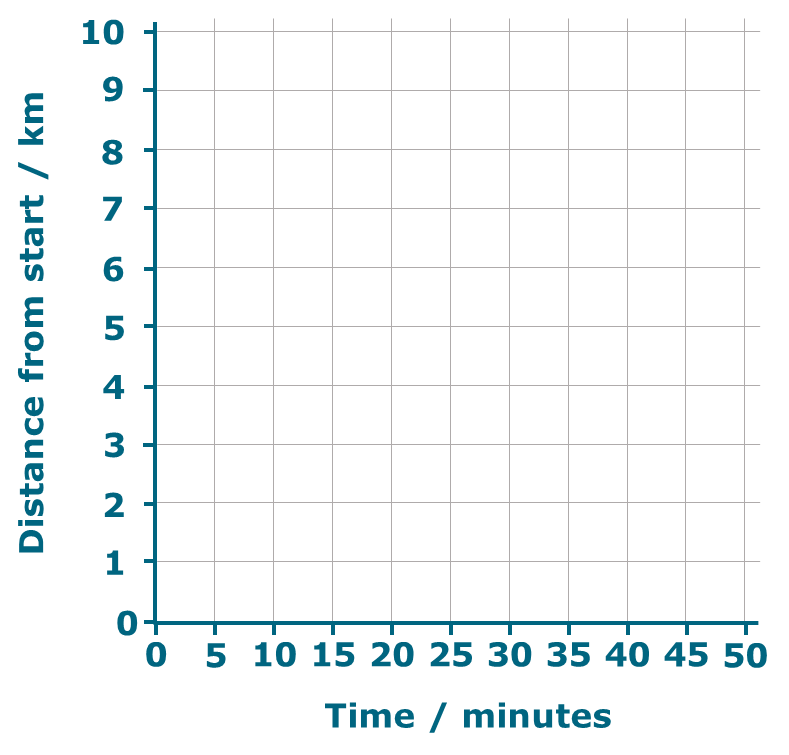
Aaron likes running long distances.

He runs steadily for 10 km.

**To do**

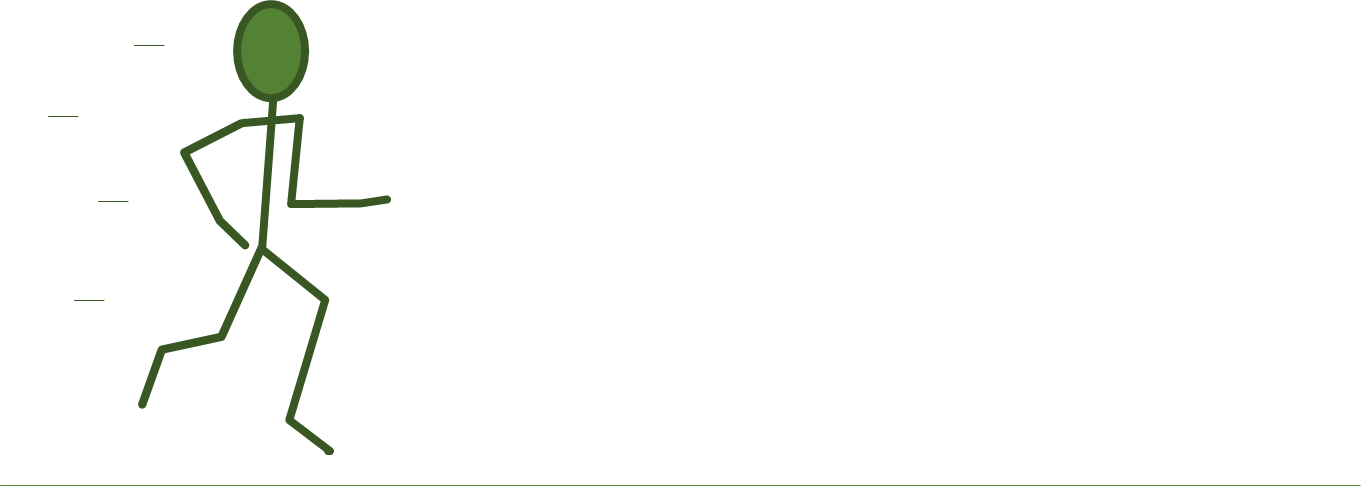
a. Plot a graph to show the distance Aaron ran.

Use your graph to find out how far he ran in 35 minutes.



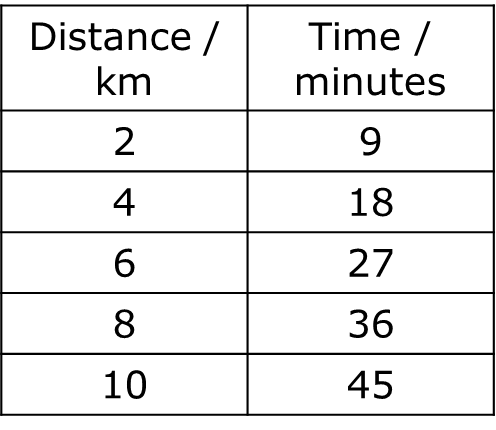
**Plot the line**

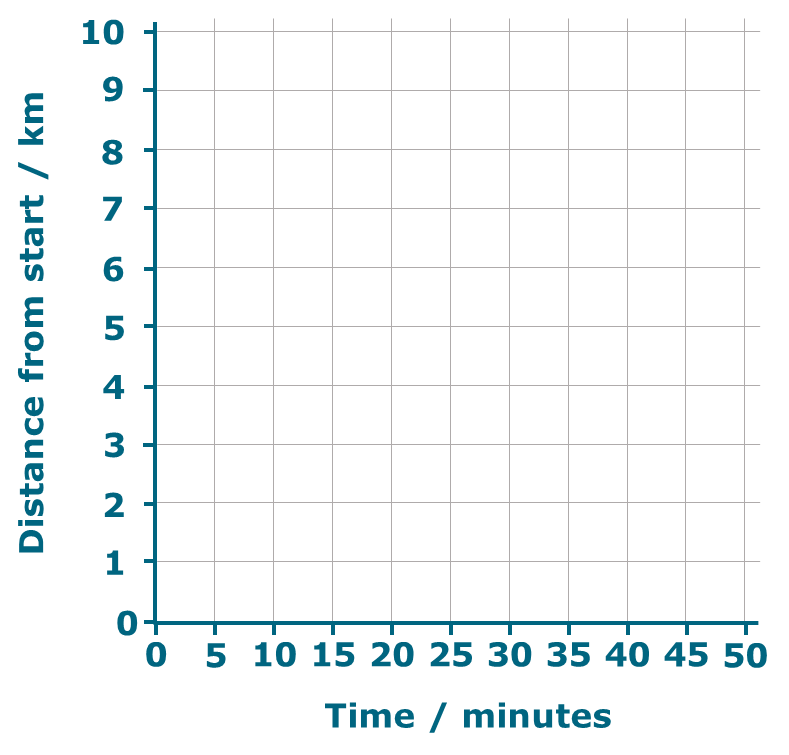
Aaron likes running long distances.

He runs steadily for 10 km.

**To do**

b. Plot a graph to show the distance Aaron ran.

Use your graph to find out how far he ran in 30 minutes.



*Physics > Big idea PFM: Forces and motion > Topic PFM2: Moving by force > Key concept PFM2.2: Motion graphs*

|  |
| --- |
| **Response activity** |
| **Plot the line** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Information about the motion of an object can be summarised on a distance-time graph: the plot shows the object’s distance from the start at a given time and the slope (gradient) at that point shows its speed. |
| Observable learning outcome: | Read values of distance or time off the axes of a distance-time graph for a plotted point |
| Activity type: | Application and practice |
| Key words: | Distance, time, graph |

This activity can help develop students’ understanding by addressing the sticking-points revealed by the following diagnostic question:

* Diagnostic question: Off the line

|  |  |
| --- | --- |
| **P** | **PRIOR UNDERSTANDING**  This activity explores ideas that are usually taught at age 5-11, to aid transition from earlier stages of learning. |

**What does the research say?**

Often text books (and teachers) put great attention on the procedures for plotting graphs and calculating gradients, rather than developing understanding of relationships that a graph shows(Stump, 1999). It can be more constructive to concentrate on the latter, which involves teaching:

* understanding of how to read information directly from a graph, interpreting each axis individually
* how to describe simple relationships between the axes such as those represented by straight lines
* how to interpret a graph, linking what it represents to a real situation (Friel, Curcio and Bright, 2001; Lingefjard and Farahani, 2018)

This activity gives students practice in plotting graphs in order to develop and consolidate understanding of how to read information directly from a graph.

**Ways to use this activity**

This activity gives students the opportunity to practise applying their understanding and to clarify their thinking through discussion. To support this, students should plot graphs individually and then answer the question in pairs or small groups.

Plots on graph *a* are all on the major grid lines, whereas those on graph *b* are not.

The focus of this activity is on plotting points and reading values from a graph, in order to better interpret the information represented in a graph. For this reason scales have been provided.

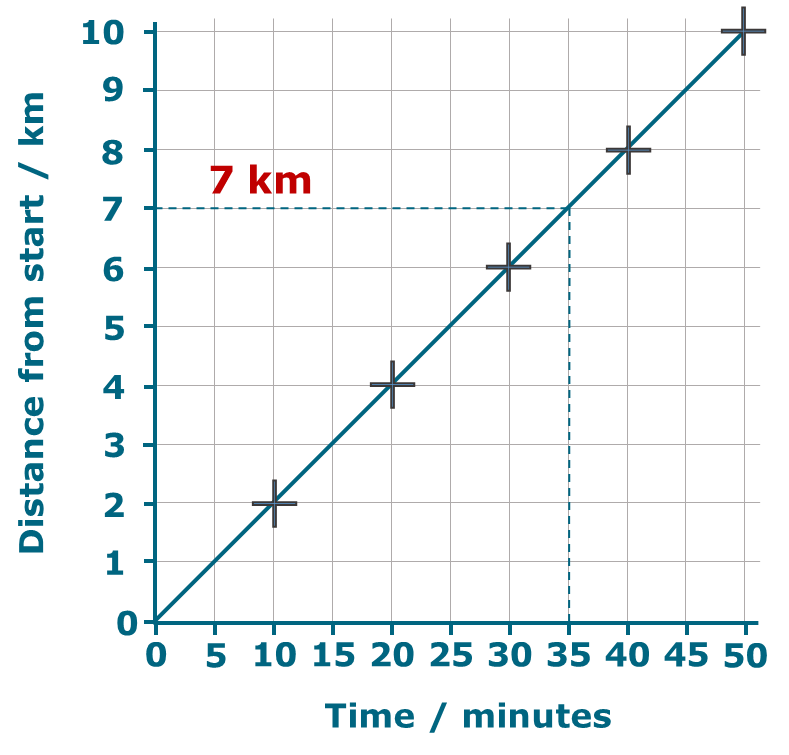
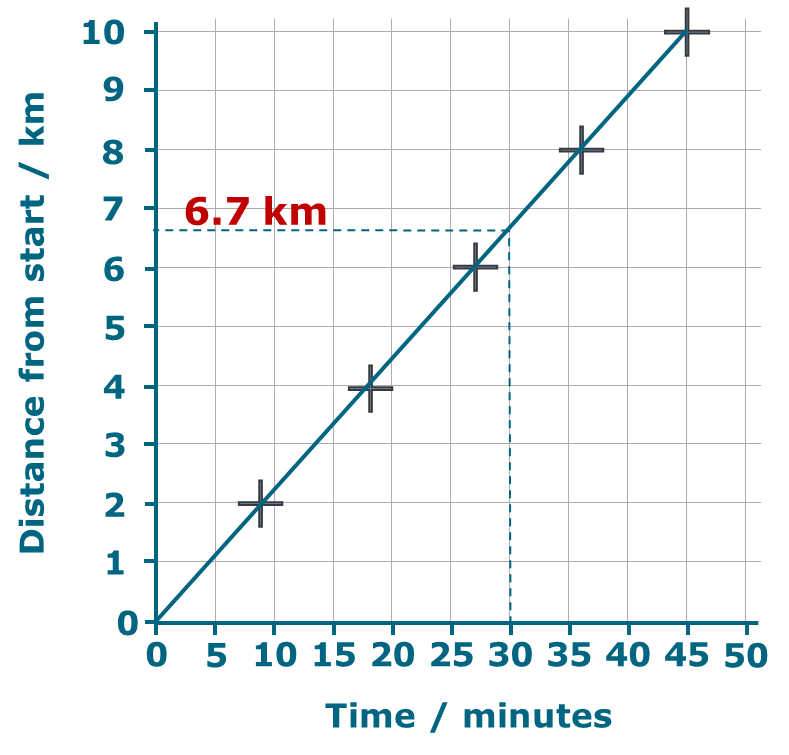
Observing students as they work often highlights any difficulties they might have. These can often be overcome, through a whole class clarification or redirection part way through the activity.

*Differentiation*

Sets of data can be adjusted to suit the mathematical skills of students. Some students may be able to select appropriate scales and confidently plot graphs without support.

If some students are working with a teaching assistant, then a list of graph plotting criteria for the TA could help to make this activity more purposeful.

**Expected answers**

a. b.

**Acknowledgments**

Developed by Peter Fairhurst (UYSEG).

Images: Peter Fairhurst (UYSEG).

**References**

Friel, S. N., Curcio, F. R. and Bright, G. W. (2001). Making Sense of Graphs: Critical Factors Influencing Comprehension and Instructional Implications. *Journal for Research in Mathematics Education,* 32(2)**,** 124-158.

Lingefjard, T. and Farahani, D. (2018). The Elusive Slope. *International Journal of Science and Mathematics Education,* 16**,** 1187-1206.

Stump, S. (1999). Secondary Mathematics Teachers' Knowledge of Slope. *Mathematics Education Research Journal,* 11(2)**,** 124-144.