2 Functions

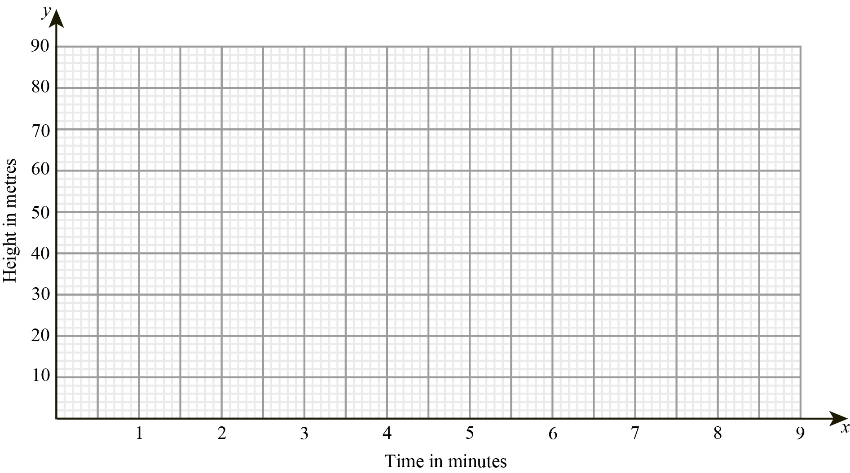
Activity: Big wheel  
(Student version)

A big wheel (like, for example, the Singapore Flyer) has a diameter of 40 metres and rotates around an axle that is 30 metres above the ground. It takes 3 minutes to complete one full rotation.

You decide to ride the big wheel and get into one of the cars when it is at its lowest point.

Questions

**1** Using the axes below, sketch a graph to show how your height varies over time.

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**2** Your motion can be modelled using the formula

*h* = *a* + *b* cos *ct*

where *h* is the height of the car in metres, *t* is the time that has elapsed in minutes and *a*, *b* and *c* are constants.

Find values for *a*, *b* and *c* that will effectively model your motion on the big wheel.

**3** Create a cosine function for a big wheel with any diameter, rotational speed and central axle height. Be sure to do the following:

* Fully **explain** your formula (describe what and why). This may require graphs, tables, etc.
* **Define** and describe all variables as needed.
* **Describe** the *realistic* scope and limitations of the variables (*h*, *t*) and parameters (*a*, *b*, *c*) – in other words, **describe** real-world limitations on your model variables and parameters and how these would affect your model – what would the real-life model look like?
* Be clear, concise and complete.

**4** **Optional** extension question

Huw is on the original big wheel from Question 1. He becomes scared and starts screaming when he is 50 metres or more above the ground.

**a** When will Huw first start screaming?

**b** How long will he scream for?