



Free-Standing Mathematics Qualification
Advanced Level
June 2011

Modelling with Calculus 6992/2PM

Unit 12

Preliminary Material

Data Sheet

**To be opened and issued to candidates between
Wednesday 4 May 2011 and Wednesday 11 May 2011**

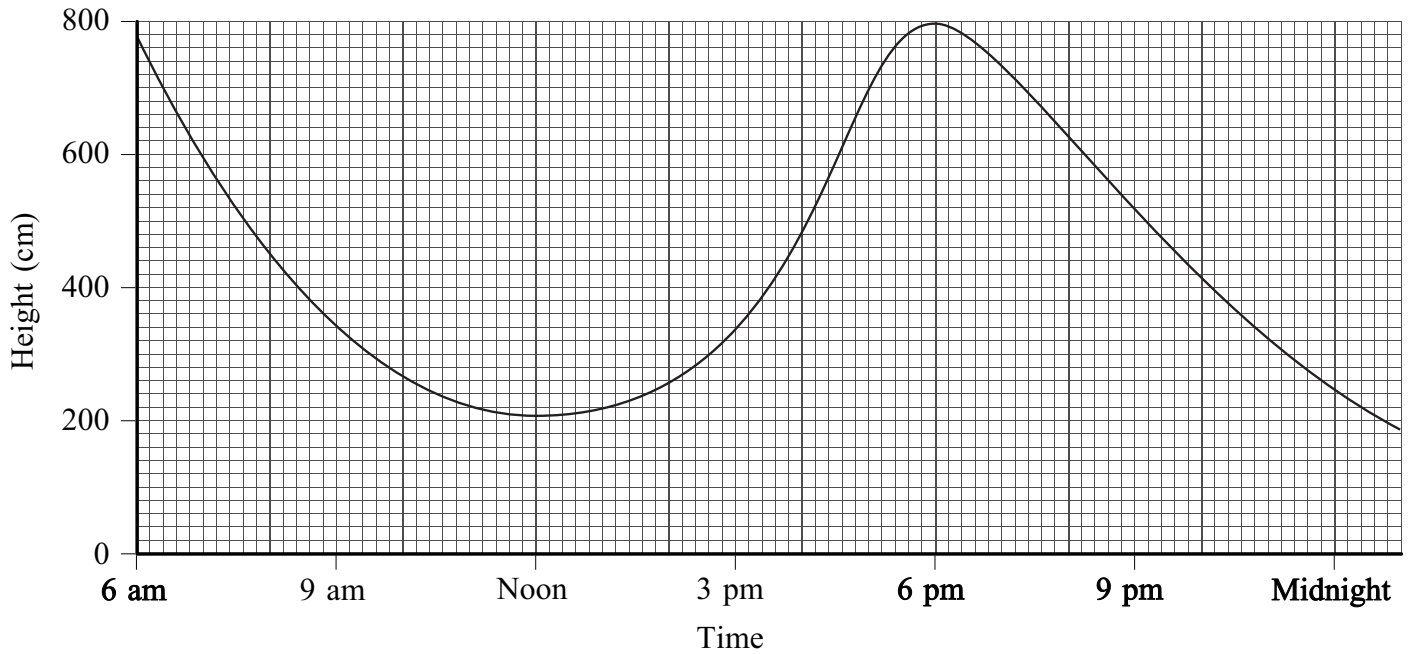
REMINDER TO CANDIDATES

**YOU MUST NOT BRING THIS DATA SHEET
WITH YOU WHEN YOU SIT THE EXAMINATION.
A CLEAN COPY WILL BE MADE AVAILABLE.**

Tides at Ilfracombe

The height of the sea water at Ilfracombe was recorded on 4 August 2009.

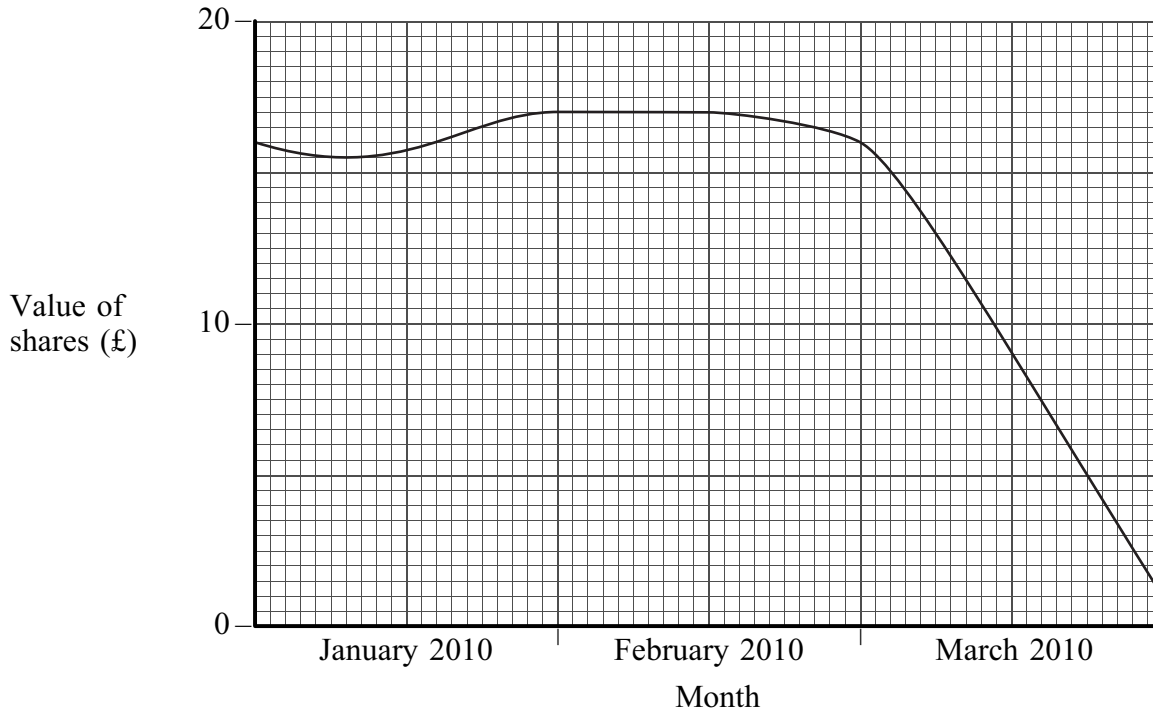
The height, h centimetres, above chart datum, is shown by the graph below.



Shares

During the first few months of 2010, the value of shares in a company was recorded on each day that the stock market was open.

The graph below shows the value, £ v , of the shares t months after the start of the year.



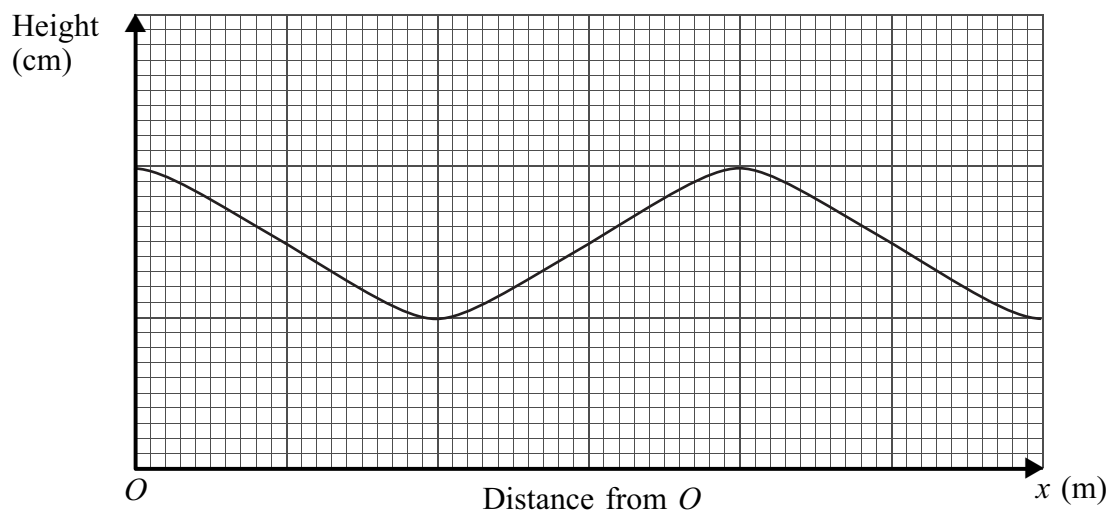
Turn over

Turn over ►

Rollercoaster

Daniel is riding on a small rollercoaster.

The graph below shows the height, h centimetres, of the rollercoaster above the ground when Daniel is a distance of x metres, horizontally, from the starting point O .



Radioactive decay

Lauren is carrying out an experiment on a radioactive substance.

When $t = 0$, the mass of her radioactive substance is 40 grams.

The rate of change of the mass of the radioactive substance is directly proportional to the mass at that time.

This can be expressed by the differential equation

$$\frac{dm}{dt} = -km$$

where k is a positive constant.

The half-life of a radioactive substance is the time taken for the mass of the radioactive substance to halve.

END OF DATA SHEET