Free-Standing Mathematics Qualification
Advanced Level
June 2010

Modelling with Calculus 6992/2PM

Unit 12

Preliminary Material

Data Sheet

To be opened and issued to candidates between Tuesday 11 May 2010 and Tuesday 18 May 2010

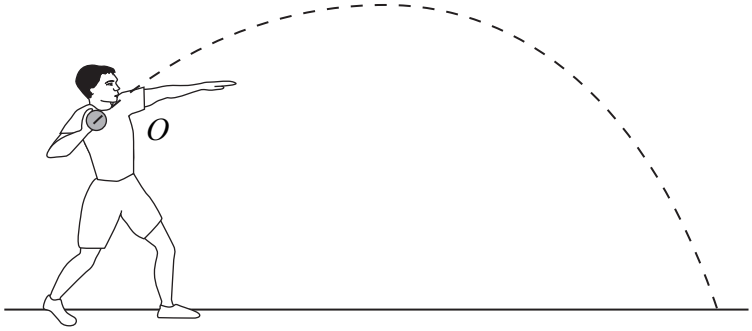
REMINDER TO CANDIDATES

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

Shot put

Felipe is taking part in the shot put competition.
Felipe throws the shot at a speed of $14\,\text{m}\,\text{s}^{-1}$.

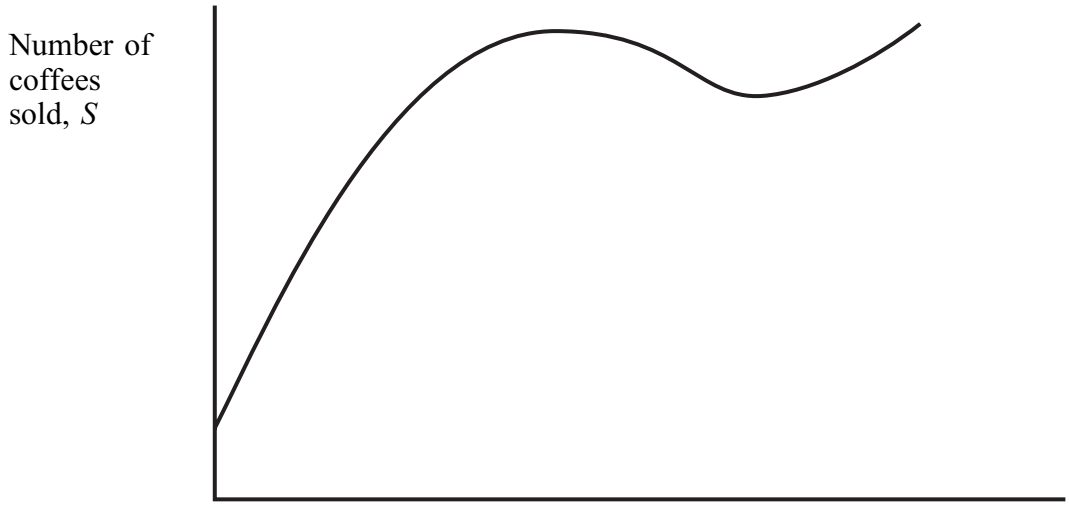
The shot is thrown from point O.



Coffee shop

Helen is the manageress of a coffee shop which has just opened.

Helen records the number of coffees, S, sold per day. The graph below shows the data recorded.



Height of a sunflower

The height of a sunflower is measured every day after it appears above the surface of the ground. When fully grown, the height of the sunflower will be 150 centimetres. The rate of increase of the height of the sunflower will depend upon the type of sunflower, the climate and other growing conditions.

Let h centimetres be the height of the sunflower t days after it appears above the surface of the ground. A biologist thinks that the rate of increase in height, $\frac{\mathrm{d}h}{\mathrm{d}t}$, is directly proportional to $150 - h$, ie $\frac{\mathrm{d}h}{\mathrm{d}t} \propto (150 - h)$.

Turn over

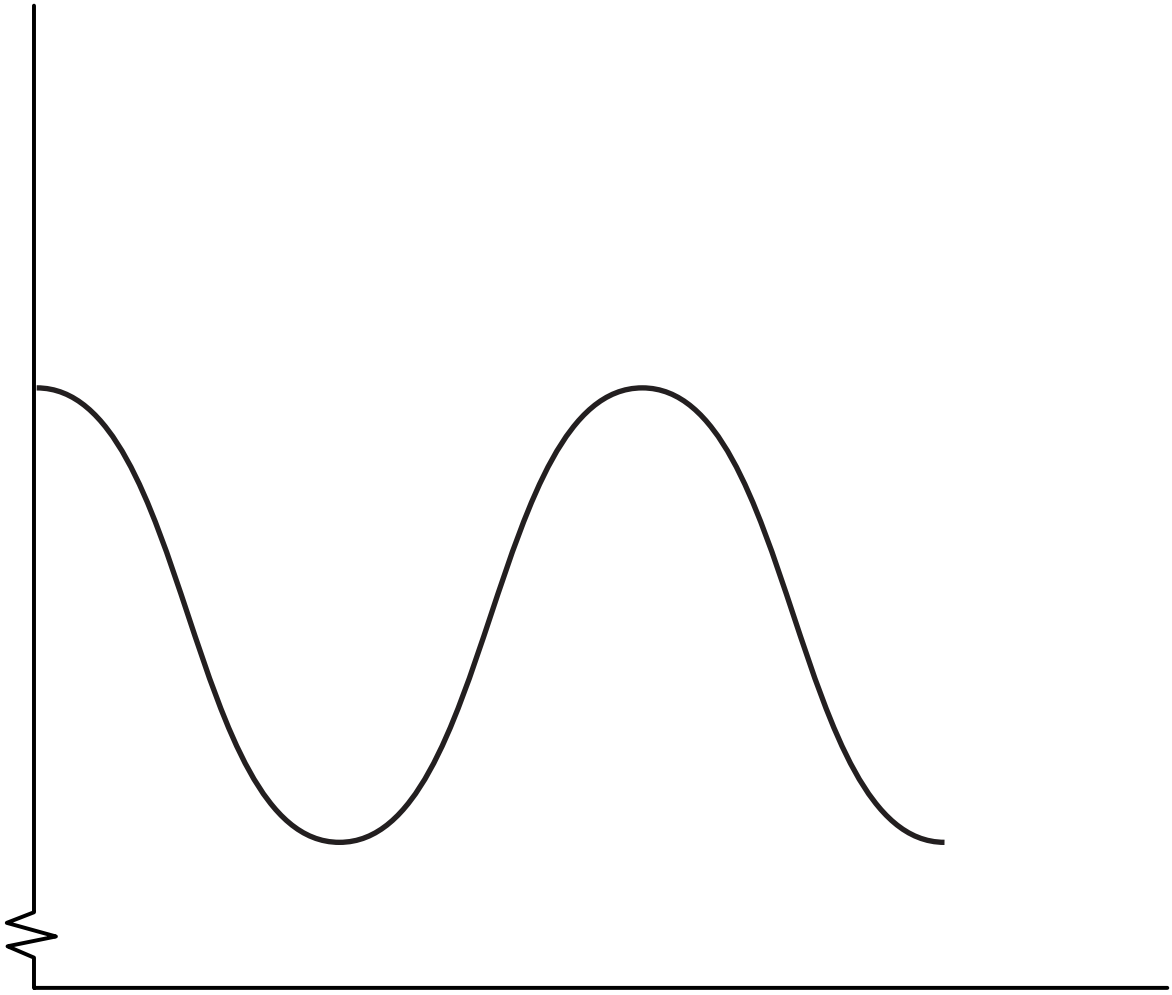
Experiment with an elastic string

Chris and Becky are carrying out an experiment to find the elasticity of an elastic string and to see how long the string remains in motion.

They fasten one end of the string to a fixed point, *O*, and fasten a small weight to the other end of the string.

They set the system into motion by pulling down the weight and releasing it. They plot a graph to show how the position of the weight varies with time.

The graph showing the data found is given below.



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