



Free-Standing Mathematics Qualification  
Advanced Level  
June 2014

# Working with Algebraic and Graphical Techniques

**6991/2PM**

Unit 11

## Preliminary Material

## Data Sheet

To be opened and issued to candidates between  
Monday 5 May 2014 and Monday 12 May 2014

### REMINDER TO CANDIDATES

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

**Bungee jumping**

In bungee jumping, a person attached to an elastic rope jumps from a high point.

The rope is slack until the person has fallen  $L$  metres, where  $L$  is the unstretched length of the rope.

Then, as the rope becomes more stretched, it exerts an increasing upward force on the person. The person falls to the lowest point and is then pulled upwards. After that, the rope may become slack again for a while as the person moves upwards and then starts falling again.

This sequence repeats itself until eventually the rope no longer becomes slack as the person bounces up and down. The oscillations then slow down until the person is almost stationary.



**Electric car**

The graph shows performance data for the Warp 9 electric car motor.

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It shows how the number of revolutions per minute (RPM) of the electric car engine is related to the torque of the engine in foot pounds.

*Torque* is a measure of the turning effect of a force.

**Turn over ►**

**Pendulum**

A *simple pendulum* is a weight, called a bob, on the end of a light string. Nearly all the weight of the system is concentrated in the bob. This makes it unlike many pendulums in clocks, where the weight is distributed more evenly along the pendulum.



The period,  $T$ , of the pendulum is the time it takes to swing from one extreme position to the other and back again.

$T$  can be modelled as being proportional to the square root of the length,  $l$ , of the pendulum. According to this model

$$T = kl^{\frac{1}{2}} \quad \text{where } k \text{ is a constant.}$$

**END OF DATA SHEET**

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Pendulum: © Getty Images

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