

Free-Standing Mathematics Qualification  
June 2008  
Advanced Level



**MODELLING WITH CALCULUS**  
**Unit 12**

**6992/2PM**

**PRELIMINARY MATERIAL**

**DATA SHEET**

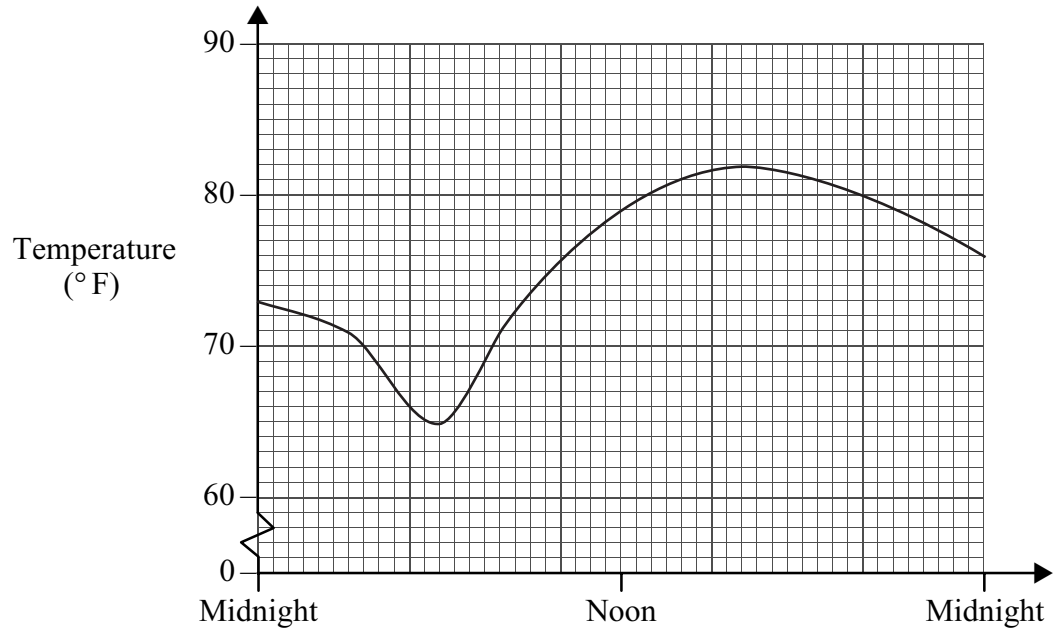
**To be issued to candidates between Wednesday 30 April 2008  
and Wednesday 7 May 2008**

**REMINDER TO CANDIDATES**

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

**Temperatures**

The temperature, in °Fahrenheit, in Southampton was recorded on one day in July and is shown on the graph below.



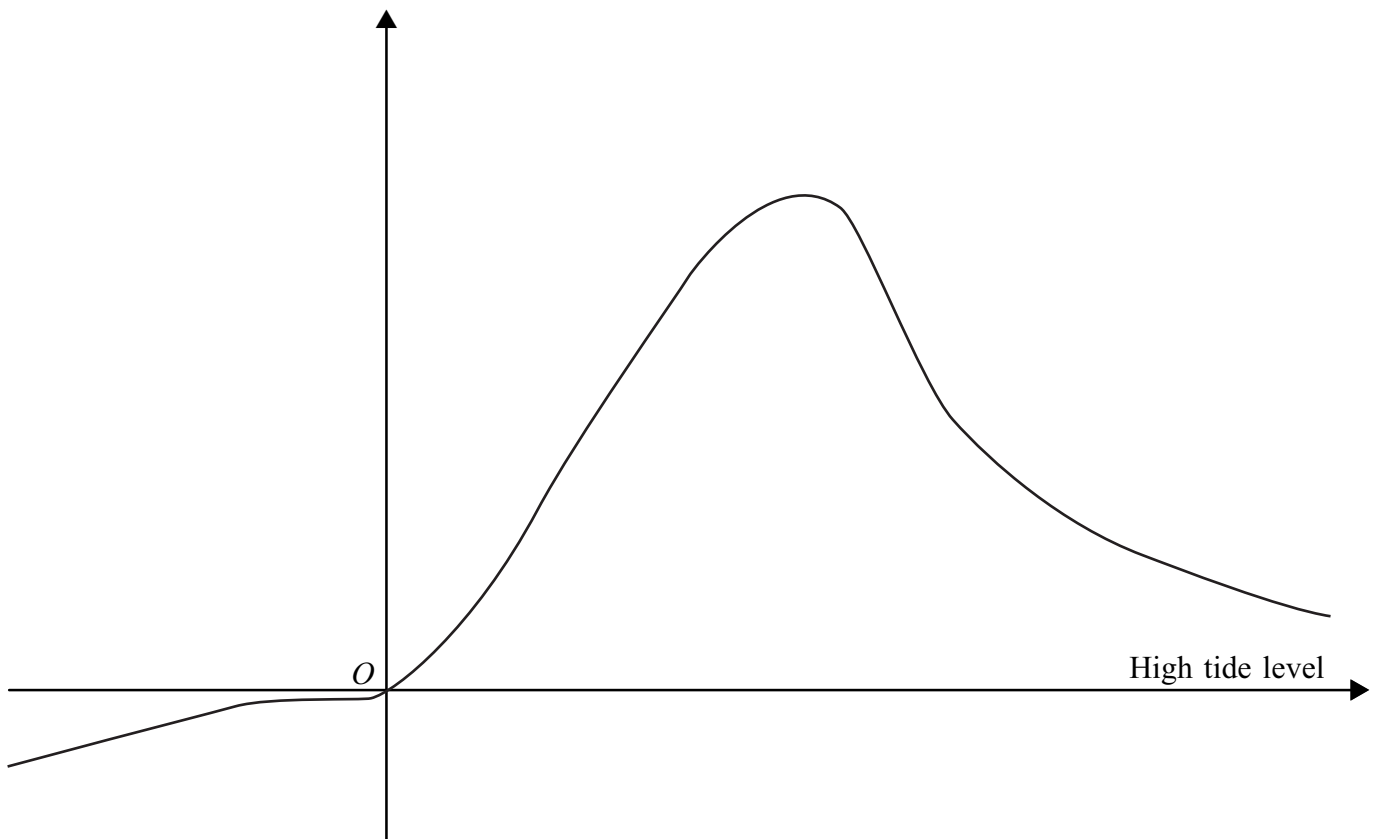
**Sand dunes**

Aquitaine is a flat pine-covered region in the South West of France, bordering the Atlantic Ocean.

The land is protected from the sea by sand dunes. The highest sand dune in mainland Europe is Dune du Pyla which has a height of 105 metres. It is 2700 metres long and 500 metres wide.

The cross section of a typical sand dune on this coast is shown below.

The origin  $O$  is taken on the high tide mark.



**Turn over**

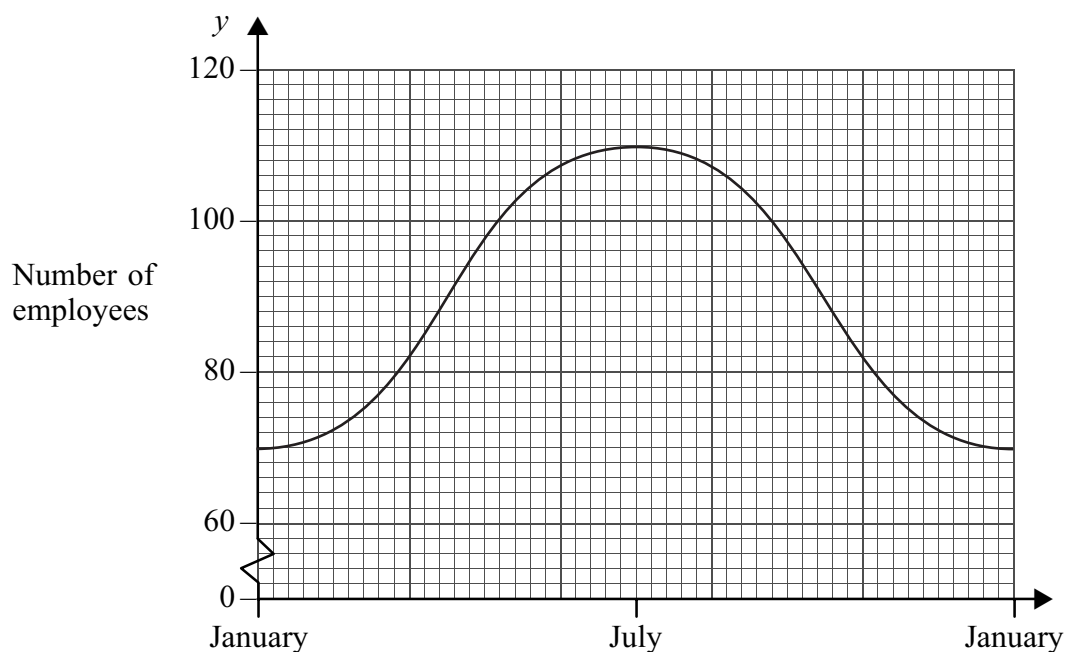
**Turn over ►**

### Ice cream manufacturer

Janet and Paul manage a company making ice cream products.

The number of employees,  $y$ , changes during the year to reflect demand for their products and is a maximum during the summer.

This is shown in the graph below.



### Balloon

A large balloon, which is in the shape of a sphere, has been blown up so that it has a radius of 4 m.

There is a small hole in the balloon and, as air escapes from the balloon, its radius starts to decrease.

After  $t$  minutes, the radius of the balloon,  $r$  m, satisfies the differential equation

$$\frac{dr}{dt} = -0.2r .$$

**END OF DATA SHEET**