AQA

Modelling with Calculus 6992/2PM

Unit 12

Preliminary Material

Data Sheet

**To be opened and issued to candidates between
Wednesday 2 May 2012 and Wednesday 9 May 2012**

REMINDER TO CANDIDATES

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

6992/2PM

Mall shoppers

A large shopping mall records the number of people who entered the mall on one Saturday.

The graph below shows the number of people, p, in thousands per hour, who entered the mall t hours after the mall opened at 9 am.
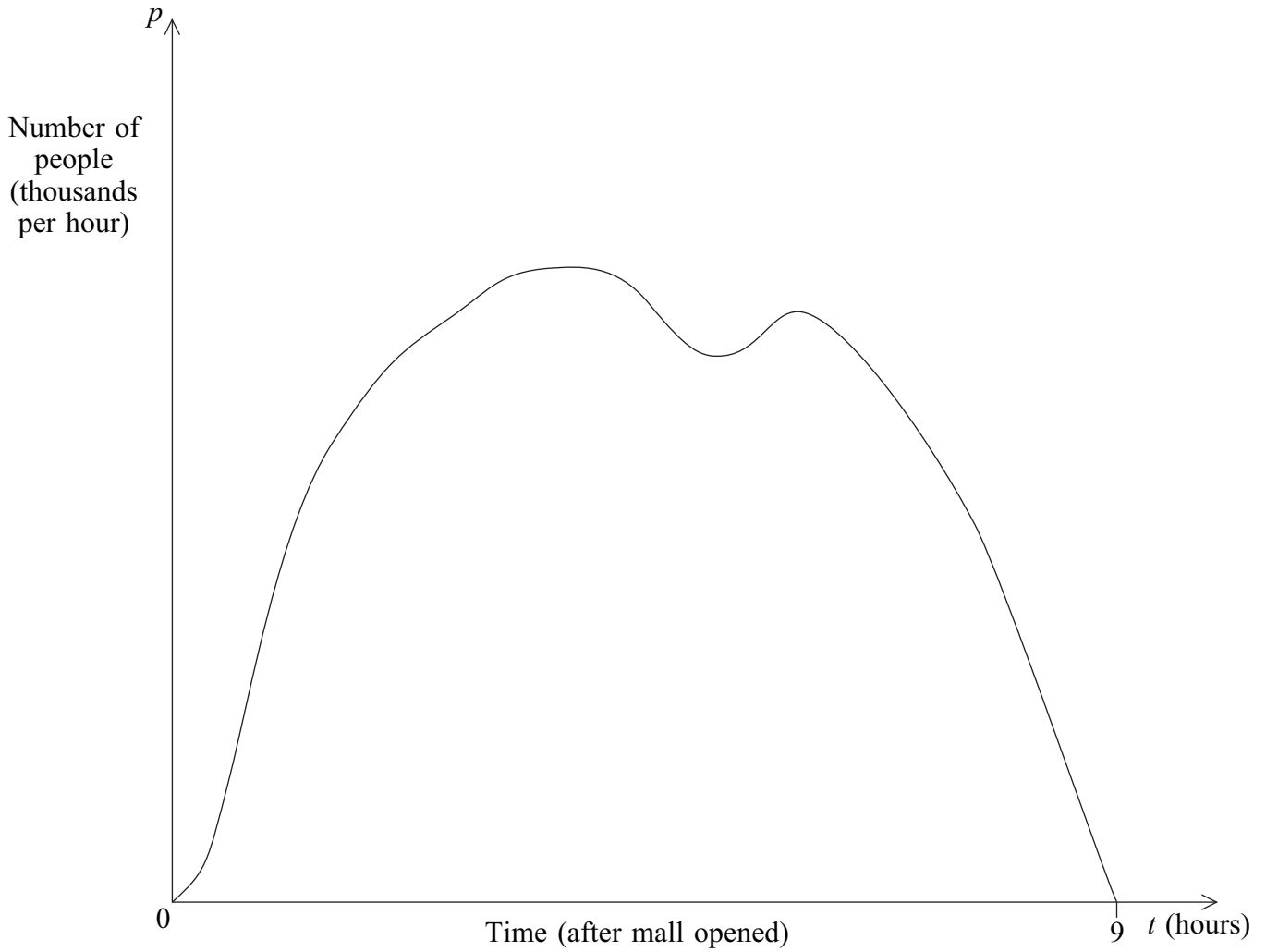
Length of retirement

The Office for National Statistics reported on the life expectancy of people in the UK when they reach the state pension age. The report, in February 2009, gave the life expectancy, by sex, for people who reach this age. The data shown in the graph below refer to people who reach this age during the years 1981–2009. At the beginning of this period, the state pension age was sixty-five for men and sixty for women.

Currently, a person's life expectancy is increasing. Thus life expectancy on reaching the state pension age initially shows an increase. However, as the age at which people reach the state pension age is changed, life expectancy after reaching the state pension age will reduce. The data reflect the pension age increases which had been announced by February 2009.

The graph below shows the life expectancy, L years, for a person reaching the state pension age on 1 January of each year.

LIFE EXPECTANCY AND HEALTHY AGEING
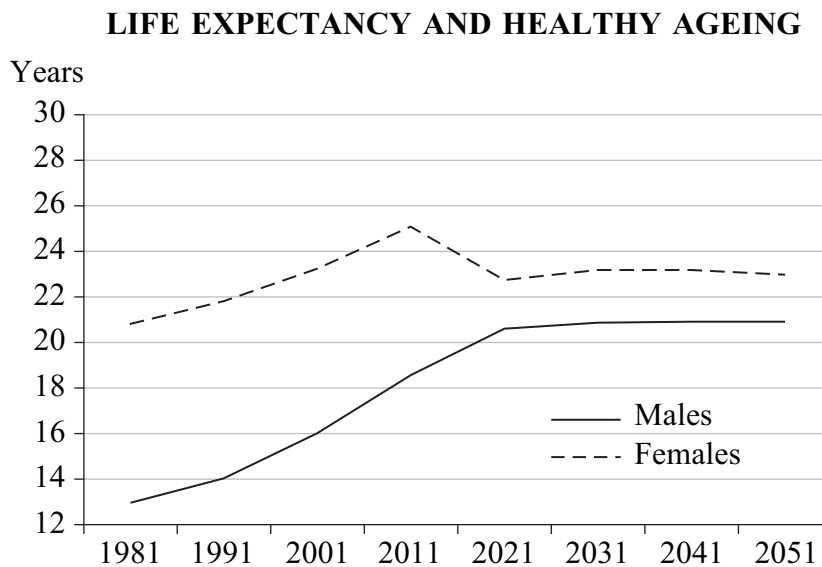
Projected principal period life expectancy at state pension age: by sex, 1981 to 2051

Turn over

Investment

Ruth is calculating the potential value of her investment. Ruth has invested £v in a bond which she expects to increase in value by a constant percentage each year.

The rate of increase in the value of the investment is directly proportional to the value of the investment at the start of that year.
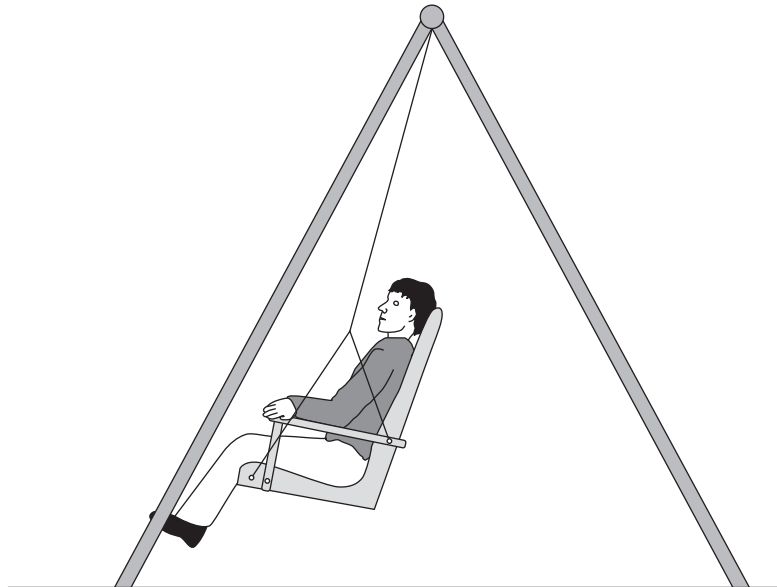
This can be expressed by the differential equation

$$\frac{dv}{dt} = \lambda v$$

where λ is a positive constant.

Swing

Tim is sitting on a garden swing which is swinging.

END OF DATA SHEET