Poisson Distribution

1 A secretary is typing a document. The number of typing mistakes the secretary makes per page can be modelled by a Poisson distribution with mean 2. Find the probability that

Jan 05

(i) in a document consisting of one page, the secretary makes more than 3 mistakes, [2]

(ii) in a document consisting of two pages, the secretary makes a total of fewer than 6 mistakes. [2]

1 The number of currants in a randomly chosen fruit scone can be modelled by a Poisson distribution with mean $4\frac{2}{3}$.

Jan 04

(i) Calculate the probability that, in one randomly chosen fruit scone, there are exactly 3 currants. [2]

(ii) Use Poisson tables to find the probability that, in 3 randomly chosen fruit scones, there is a total of no more than 11 currants. [2]

6 The number of misprints in a randomly chosen page of the Barchester *Gazette* is denoted by the random variable M. The mean value of M is 2.

Jan 03

(i) State two conditions needed in order to model M by a Poisson distribution. [2]

(ii) Find the probability that, in five randomly chosen pages of the *Gazette*, in the edition of 31 January 2003, there will be a total of more than 12 misprints. [3]

(iii) Find the smallest number of complete pages such that the probability that they contain a total of more than 12 misprints is greater than 0.7. You should show the values of any relevant probabilities obtained from tables. [4]

4 Calls received by a car rescue service occur independently and at a constant average rate of 3 per minute.

June 03

(i) Find the probability that, in a randomly chosen period of 4 minutes, the number of calls received by the service is exactly 14. [3]

(ii) Find the longest period of time, in seconds to the nearest 0.1 s, for which the probability that no calls are received by the service is greater than 0.2. [4]

8 In a survey of supermarket queues, it is observed that customers arrive at the checkouts independently of one another. The average rate at which customers arrive at the checkouts between 11 a.m. and 3 p.m. is taken to be a constant 3 per minute.

Jan 02

(i) Find the probability that exactly ten customers arrive at the checkouts between 1.00 p.m. and 1.05 p.m. [3]

For the period between 11 a.m. and 3 p.m.,

(ii) use tables to estimate, correct to 2 significant figures, the longest time for which the probability that fewer than 2 customers arrive at the checkouts is greater than 0.06, [3]

(iii) by calculation find the range of values of t for which the probability that no customers arrive in a period of t seconds is greater than 0.000 01. [5]