AQA – Poisson distribution – AS Further Mathematics Statistics

1. June/2020/Paper_2/No.8

There are two hospitals in a city.

Over a period of time, the first hospital recorded an average of 20 births a day.

Over the same period of time, the second hospital recorded an average of 5 births a day.

Stuart claims that birth rates in the hospitals have changed over time.

On a randomly chosen day, he records a total of 16 births from the two hospitals.

(a) Investigate Stuart's claim, using a suitable test at the 5% level of significance.

[6 marks]

(b) For a test of the type carried out in part **(a)**, find the probability of making a Type I error, giving your answer to two significant figures.

[3 marks]

2. June/2019/Paper_2/No.6

A company owns two machines, *A* and *B*, which make toys. Both machines run continuously and independently.

Machine *A* makes an average of 2 errors per hour.

(a) Using a Poisson model, find the probability that the machine makes exactly 5 errors in 4 hours, giving your answer to three significant figures.

[2 marks

(b) Machine *B* makes an average of 5 errors per hour. Both machines are switched on and run for 1 hour.

The company finds the probability that the total number of errors made by machines *A* and *B* in 1 hour is greater than 8.

If the probability is greater than 0.4, a new machine will be purchased.

Using a Poisson model, determine whether or not the toy company will purchase a new machine.

[3 marks

(c) After investigation, the standard deviation of errors made by machine *A* is found to be 0.5 errors per hour and the standard deviation of errors made by machine *B* is also found to be 0.5 errors per hour.

Explain whether or not the use of Poisson models in parts **(a)** and **(b)** is appropriate.

[2 marks]