Stats 2 Poisson Distribution Questions

1 A study undertaken by Goodhealth Hospital found that the number of patients each month, X, contracting a particular superbug can be modelled by a Poisson distribution with a mean of 1.5 .

(a) (i) Calculate $P(X = 2)$. *(2 marks)*

(ii) Hence determine the probability that exactly 2 patients will contract this superbug in each of three consecutive months. *(2 marks)*

(b) (i) Write down the distribution of Y, the number of patients contracting this superbug in a given 6-month period. *(1 mark)*

(ii) Find the probability that at least 12 patients will contract this superbug during a given 6-month period. *(2 marks)*

(c) State **two** assumptions implied by the use of a Poisson model for the number of patients contracting this superbug. *(2 marks)*

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1 The number of A-grades, X, achieved in total by students at Lowkey School in their Mathematics examinations each year can be modelled by a Poisson distribution with a mean of 3.

(a) Determine the probability that, during a 5-year period, students at Lowkey School achieve a total of more than 18 A-grades in their Mathematics examinations. *(3 marks)*

(b) The number of A-grades, Y, achieved in total by students at Lowkey School in their English examinations each year can be modelled by a Poisson distribution with a mean of 7.

(i) Determine the probability that, during a year, students at Lowkey School achieve a total of fewer than 15 A-grades in their Mathematics and English examinations. *(3 marks)*

(ii) What assumption did you make in answering part (b)(i)? *(1 mark)*

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2 The number of computers, A, bought during one day from the Amplebuy computer store can be modelled by a Poisson distribution with a mean of 3.5.

The number of computers, B, bought during one day from the Bestbuy computer store can be modelled by a Poisson distribution with a mean of 5.0.

(a) (i) Calculate $\mathrm{P}(A = 4)$. *(2 marks)*

(ii) Determine $\mathrm{P}(B \leqslant 6)$. *(1 mark)*

(iii) Find the probability that a total of fewer than 10 computers is bought from these two stores on one particular day. *(3 marks)*

(b) Calculate the probability that a total of fewer than 10 computers is bought from these two stores on at least 4 out of 5 consecutive days. *(3 marks)*

(c) The numbers of computers bought from the Choicebuy computer store over a 10-day period are recorded as

8 12 6 6 9 15 10 8 6 12

(i) Calculate the mean and variance of these data. *(2 marks)*

(ii) State, giving a reason based on your results in part (c)(i), whether or not a Poisson distribution provides a suitable model for these data. *(2 marks)*

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2 The number of telephone calls per day, X, received by Candice may be modelled by a Poisson distribution with mean 3.5.

The number of e-mails per day, Y, received by Candice may be modelled by a Poisson distribution with mean 6.0.

(a) For any particular day, find:

(i) $\mathrm{P}(X = 3)$; *(2 marks)*

(ii) $\mathrm{P}(Y \geqslant 5)$. *(2 marks)*

(b) (i) Write down the distribution of T, the total number of telephone calls and e-mails per day received by Candice. *(1 mark)*

(ii) Determine $\mathrm{P}(7 \leqslant T \leqslant 10)$. *(3 marks)*

(iii) Hence calculate the probability that, on each of three consecutive days, Candice will receive a total of at least 7 but at most 10 telephone calls and e-mails. *(2 marks)*
