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4. In a peat bog, Common Spotted-orchids occur at a mean rate of 4.5 per m^2

(a) Give an assumption, not already stated, that is required for the number of Common Spotted-orchids per m^2 of the peat bog to follow a Poisson distribution.

(1)

Given that the number of Common Spotted-orchids in 1 m^2 of the peat bog can be modelled by a Poisson distribution,

(b) find the probability that in a randomly selected 1 m^2 of the peat bog

(i) there are exactly 6 Common Spotted-orchids,

(ii) there are fewer than 10 but more than 4 Common Spotted-orchids.

(4)

Juan believes that by introducing a new management scheme the number of Common Spotted-orchids in the peat bog will increase. After three years under the new management scheme, a randomly selected 2 m^2 of the peat bog contains 11 Common Spotted-orchids.

(c) Using a 5% significance level assess Juan's belief. State your hypotheses clearly.

(5)

Assuming that in the peat bog, Common Spotted-orchids still occur at a mean rate of 4.5 per m^2

(d) use a normal approximation to find the probability that in a randomly selected 20 m^2 of the peat bog there are fewer than 70 Common Spotted-orchids.

(3)

Following a period of dry weather, the probability that there are fewer than 70 Common Spotted-orchids in a randomly selected 20 m^2 of the peat bog is 0.012

A random sample of 200 non-overlapping 20 m^2 areas of the peat bog is taken.

(e) Using a suitable approximation, calculate the probability that at most 1 of these areas contains fewer than 70 Common Spotted-orchids.

(3)

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Question 4 continued

(Total 16 marks)

Q4