4.5 Homework

A-level Applied Mathematics

Statistics : Hypothesis Testing : Year 1

Question 1

Find the critical regions for the test statistic x given that $X \sim B(20, 0.40)$ with null hypothesis $H_0 : p = 0.40$, and alternative hypothesis $H_1 : p \neq 0.40$ using a 5 % level of significance.

The probability of rejecting either tail should be ***as close as possible*** to 2.5 %.

Question 2

Explain what is meant by;

(i) A hypothesis test

(ii) A critical value

(iii) An acceptance region

Question 3

A pharmaceutical company claims that 85 % of pigs suffering from a chronic rash recover when treated with a new skin cream, ***Oinkment***™

A random sample of 20 pigs with this rash is extracted from veterinary records.

(i) Write down a suitable distribution to model the number of patients in this sample who recover when treated with ***Oinkment***™

[2 marks]

(ii) Given that the claim is correct, find the probability that ***Oinkment***™ will be successful for exactly 16 pigs

[2 marks]

An Animal Hospital believes that the claim is incorrect and the percentage who will recover is lower. From the records an administrator took a random sample of 30 pigs who had been prescribed ***Oinkment***™.

She found that 20 had recovered.

(iii) Stating you hypothesis clearly, test, at the 5 % level of significance, the Animal Hospital's belief.

[6 marks]

Question 4

Ewan believes the probability is 0.2 of him being late to his statistics lesson. To test this he counts the number of times he is late in a random sample of 20 such lessons.

(i) Find the critical regions for a two-tailed test, at the 10 % level of significance, of whether the probability he is late for a statistics lesson differs from 0.2. The probability of rejecting either tail should be ***as close as possible*** to 5 %.

(ii) State the actual significance level of the test

Ewan discovers he is late for 7 out of the 20 statistics lessons.

(iii) Comment on whether Ewan should accept or reject his belief that the probability he is late for a statistics lesson is 0.2