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7. A drugs company claims that 75% of patients suffering from depression recover when treated with a new drug.

A random sample of 10 patients with depression is taken from a doctor's records.

(a) Write down a suitable distribution to model the number of patients in this sample who recover when treated with the new drug. (2)

Given that the claim is correct,

(b) find the probability that the treatment will be successful for exactly 6 patients. (2)

The doctor believes that the claim is incorrect and the percentage who will recover is lower. From her records she took a random sample of 20 patients who had been treated with the new drug. She found that 13 had recovered.

(c) Stating your hypotheses clearly, test, at the 5% level of significance, the doctor's belief. (6)

(d) From a sample of size 20, find the greatest number of patients who need to recover for the test in part (c) to be significant at the 1% level. (4)

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7. It is known from past records that 1 in 5 bowls produced in a pottery have minor defects. To monitor production a random sample of 25 bowls was taken and the number of such bowls with defects was recorded.

(a) Using a 5% level of significance, find critical regions for a two-tailed test of the hypothesis that 1 in 5 bowls have defects. The probability of rejecting, in either tail, should be as close to 2.5% as possible.

(6)

(b) State the actual significance level of the above test.

(1)

At a later date, a random sample of 20 bowls was taken and 2 of them were found to have defects.

(c) Test, at the 10% level of significance, whether or not there is evidence that the proportion of bowls with defects has decreased. State your hypotheses clearly.

(7)



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Question 7 continued

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5. Sue throws a fair coin 15 times and records the number of times it shows a head.

(a) State the distribution to model the number of times the coin shows a head.

(2)

Find the probability that Sue records

(b) exactly 8 heads,

(2)

(c) at least 4 heads.

(2)

Sue has a different coin which she believes is biased in favour of heads. She throws the coin 15 times and obtains 13 heads.

(d) Test Sue's belief at the 1% level of significance. State your hypotheses clearly.

(6)



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4. Past records suggest that 30% of customers who buy baked beans from a large supermarket buy them in single tins. A new manager questions whether or not there has been a change in the proportion of customers who buy baked beans in single tins. A random sample of 20 customers who had bought baked beans was taken.
- (a) Using a 10% level of significance, find the critical region for a two-tailed test to answer the manager’s question. You should state the probability of rejection in each tail which should be less than 0.05. **(5)**
- (b) Write down the actual significance level of a test based on your critical region from part (a). **(1)**

The manager found that 11 customers from the sample of 20 had bought baked beans in single tins.

- (c) Comment on this finding in the light of your critical region found in part (a). **(2)**



