Statistical Hypothesis Testing – 2021/20 GCE AS Statistics Mathematics A

1. Oct/2021/Paper_H230/01/No.12

The variable X has the distribution $B(50, \frac{1}{6})$. The probabilities $P(X = r)$ for $r = 0$ to 50 are given by the terms of the expansion of $(a + b)^n$ for specific values of a, b and n.

(a) State the values of a, b and n. [1]

A student has an ordinary 6-sided dice. They suspect that it is biased so that it shows a 2 on fewer throws than it would if it were fair. In order to test the suspicion the dice is thrown 50 times and the number of 2s is noted. The student then carries out a hypothesis test at the 5% significance level.

(b) Write down suitable hypotheses for the test. [2]

(c) Determine the rejection region for the test, showing the values of any relevant probabilities. [4]

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2. Oct/2020/Paper_H230/01/No.10

Some packets of a certain kind of biscuit contain a free gift. The manufacturer claims that the proportion of packets containing a free gift is 1 in 4. Marisa suspects that this claim is not true, and that the true proportion is less than 1 in 4. She chooses 20 packets at random and finds that exactly 1 contains the free gift.

(a) Use a binomial model to test the manufacturer's claim, at the 2.5% significance level. **[7]**

The packets are packed in boxes, with each box containing 40 packets. Marisa chooses three boxes at random and finds that one box contains 19 packets with the free gift and the other two boxes contain no packets with the free gift.

(b) Give a reason why this suggests that the binomial model used in part **(a)** may not be appropriate. **[1]**

3. June/2019/Paper_H230/01/No.11

It is known that, under the standard treatment for a certain disease, 9.7% of patients with the disease experience side effects within one year.

In a trial of a new treatment, a random sample of 450 patients with this disease was selected and the number X who experienced side effects within one year was noted.

(a) State one assumption needed in order to use a binomial model for X. [1]

It was found that 51 of the 450 patients experienced side effects within one year.

(b) Test, at the 10% significance level, whether the proportion of patients experiencing side effects within one year is greater under the new treatment than under the standard treatment. [7]