



QUESTION WORKBOOK

Hypothesis testing with the binomial

Statistics · Year 12–13

7 questions · 29 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

A1 Define the null hypothesis, the alternative hypothesis and the significance level of a hypothesis test. [3]

A2 A die is suspected of being biased towards sixes. It is rolled 30 times. Write down suitable hypotheses in terms of p , and state the distribution of the number of sixes X under H_0 . [3]

SECTION B · Standard

B1 A spinner is claimed to land on red with probability 0.3. In 25 independent spins it lands on red 12 times. Test, at the 5% significance level, whether the spinner favours red more often than claimed. State your hypotheses clearly. [5]

- B2** Under H_0 , $X \sim B(20, 0.4)$, and the alternative hypothesis is H_1 : $p > 0.4$. Find the critical region for a test at the 5% significance level, and state the actual significance level of the test. [4]

- B3** For a test of H_0 : $p = 0.4$ against H_1 : $p > 0.4$ based on $X \sim B(20, 0.4)$, the critical region is $X \geq 13$. State the conclusion when a value of 12 is observed, and explain why this conclusion is not the same as proving that $p = 0.4$. [3]

SECTION C · Stretch

- C1** A researcher believes the proportion p of a population holding a certain view differs from 0.25. A random sample of 30 people is taken and X , the number holding the view, is recorded. Find the critical region for a two-tailed test of H_0 : $p = 0.25$ at the 5% significance level, and find the actual significance level of the test. [6]

- C2** A machine is claimed to produce faulty items with probability 0.3. An engineer believes the proportion has fallen. A random sample of 30 items is inspected. Find the critical region for a test of $H_0: p = 0.3$ against $H_1: p < 0.3$ at the 1% significance level, and write down the probability of a Type I error for this test. [5]