Write your name here

Surname	Other names

Pearson Edexcel GCE

Centre Number	Candidate Number

A level Mathematics

Practice Paper
Statistics – Hypothesis testing

You must have:
Mathematical Formulae and Statistical Tables (Pink)

Total Marks

Instructions

- Use black ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- Fill in the boxes at the top of this page with your name, centre number and candidate number.
- Answer all the questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided – there may be more space than you need.
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Inexact answers should be given to three significant figures unless otherwise stated.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 6 questions in this question paper. The total mark for this paper is 62.
- The marks for each question are shown in brackets – use this as a guide as to how much time to spend on each question.
- Calculators must not be used for questions marked with a * sign.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

1. A shopkeeper knows, from past records, that 15% of customers buy an item from the display next to the till. After a refurbishment of the shop, he takes a random sample of 30 customers and finds that only 1 customer has bought an item from the display next to the till.

(*a*) Stating your hypotheses clearly, and using a 5% level of significance, test whether or not there has been a change in the proportion of customers buying an item from the display next to the till.

(6)

During the refurbishment a new sandwich display was installed. Before the refurbishment 20% of customers bought sandwiches. The shopkeeper claims that the proportion of customers buying sandwiches has now increased. He selects a random sample of 120 customers and finds that 31 of them have bought sandwiches.

(*b*) Using a suitable approximation and stating your hypotheses clearly, test the shopkeeper's claim. Use a 10% level of significance.

(8)

(Total 14 marks)

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2. (*a*) Explain what you understand by a hypothesis.

(1)

(*b*) Explain what you understand by a critical region.

(2)

Mrs George claims that 45% of voters would vote for her.

In an opinion poll of 20 randomly selected voters it was found that 5 would vote for her.

(*c*) Test at the 5% level of significance whether or not the opinion poll provides evidence to support Mrs George's claim.

(4)

In a second opinion poll of n randomly selected people it was found that no one would vote for Mrs George.

(*d*) Using a 1% level of significance, find the smallest value of n for which the hypothesis $H_0 : p = 0.45$ will be rejected in favour of $H_1 : p < 0.45$.

(3)

(Total 10 marks)

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3. (*a*) State the conditions under which the normal distribution may be used as an approximation to the binomial distribution.

(2)

A company sells seeds and claims that 55% of its pea seeds germinate.

(*b*) Write down a reason why the company should not justify their claim by testing all the pea seeds they produce.

(1)

To test the company's claim, a random sample of 220 pea seeds was planted.

(*c*) State the hypotheses for a two-tailed test of the company's claim.

(1)

Given that 135 of the 220 pea seeds germinated,

(*d*) use a normal approximation to test, at the 5% level of significance, whether or not the company's claim is justified.

(7)

(Total 11 marks)

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4. A random sample of size n is to be taken from a population that is normally distributed with mean 40 and standard deviation 3. Find the minimum sample size such that the probability of the sample mean being greater than 42 is less than 5%.

(Total 5 marks)

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5. A machine fills packets with X grams of powder where X is normally distributed with mean μ. Each packet is supposed to contain 1 kg of powder.

To comply with regulations, the weight of powder in a randomly selected packet should be such that $P(X < \mu - 30) = 0.0005$.

(a) Show that this requires the standard deviation to be 9.117 g to 3 decimal places.

(3)

A random sample of 10 packets is selected from the machine. The weight, in grams, of powder in each packet is as follows:

999.8 991.6 1000.3 1006.1 1008.2 997.0 993.2 1000.0 997.1 1002.1

(b) Assuming that the standard deviation of the population is 9.117 g, test, at the 1% significance level, whether or not the machine is delivering packets with mean weight of less than 1 kg. State your hypotheses clearly.

(7)

(Total 10 marks)

TOTAL FOR PAPER: 50 MARKS