# Edexcel GCE
# Statistics S2
# Gold Level G1
# (Question Paper)

| **Materials required for examination papers** | **Items included with question** |
|---|---|
| Mathematical Formulae (Green) | Nil |

**Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulas stored in them.**

### Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Statistics S2), the paper reference (6684), your surname, initials and signature.

### Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
There are 7 questions in this question paper. The total mark for this paper is 75.

### Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner. Answers without working may gain no credit.

**Suggested grade boundaries for this paper:**

| A* | A | B | C | D | E |
|---|---|---|---|---|---|
| 66 | 56 | 45 | 35 | 27 | 19 |

**1.** (*a*) Explain what you understand by a census.

**(1)**

Each cooker produced at GT Engineering is stamped with a unique serial number. GT Engineering produces cookers in batches of 2000. Before selling them, they test a random sample of 5 to see what electric current overload they will take before breaking down.

(*b*) Give one reason, other than to save time and cost, why a sample is taken rather than a census.

**(1)**

(*c*) Suggest a suitable sampling frame from which to obtain this sample.

**(1)**

(*d*) Identify the sampling units.

**(1)**

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**2.** David claims that the weather forecasts produced by local radio are no better than those achieved by tossing a fair coin and predicting rain if a head is obtained or no rain if a tail is obtained. He records the weather for 30 randomly selected days. The local radio forecast is correct on 21 of these days.

Test David's claim at the 5% level of significance.

State your hypotheses clearly.

**(7)**

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**3.** (*a*) State two conditions under which a Poisson distribution is a suitable model to use in statistical work.

**(2)**

The number of cars passing an observation point in a 10 minute interval is modelled by a Poisson distribution with mean 1.

(*b*) Find the probability that in a randomly chosen 60 minute period there will be

(i)  exactly 4 cars passing the observation point,

(ii) at least 5 cars passing the observation point.

**(5)**

The number of other vehicles, other than cars, passing the observation point in a 60 minute interval is modelled by a Poisson distribution with mean 12.

(*c*) Find the probability that exactly 1 vehicle, of any type, passes the observation point in a 10 minute period.

**(4)**

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**4.** The continuous random variable $X$ is uniformly distributed over the interval $[-4, 6]$.

(*a*) Write down the mean of $X$.

**(1)**

(*b*) Find $P(X \le 2.4)$.

**(2)**

(*c*) Find $P(-3 < X - 5 < 3)$.

**(2)**

The continuous random variable $Y$ is uniformly distributed over the interval $[a, 4a]$.

(*d*) Use integration to show that $E(Y^2) = 7a^2$.

**(4)**

(*e*) Find $Var(Y)$.

**(2)**

(*f*) Given that $P(X < \frac{8}{3}) = P(Y < \frac{8}{3})$, find the value of $a$.

**(3)**

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**5.** A web server is visited on weekdays, at a rate of 7 visits per minute. In a random one minute on a Saturday the web server is visited 10 times.

(*a*) (i) Test, at the 10% level of significance, whether or not there is evidence that the rate of visits is greater on a Saturday than on weekdays. State your hypotheses clearly.

(ii) State the minimum number of visits required to obtain a significant result.

**(7)**

(*b*) State an assumption that has been made about the visits to the server.

**(1)**

In a random two minute period on a Saturday the web server is visited 20 times.

(*c*) Using a suitable approximation, test at the 10% level of significance, whether or not the rate of visits is greater on a Saturday.

**(6)**

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**6.** A bag contains a large number of coins. It contains only 1p and 2p coins in the ratio 1:3.

(*a*) Find the mean $\mu$ and the variance $\sigma^2$ of the values of this population of coins.

**(3)**

A random sample of size 3 is taken from the bag.

(*b*) List all the possible samples.

**(2)**

(*c*) Find the sampling distribution of the mean value of the samples.

**(6)**

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**7.** The continuous random variable $X$ has probability density function given by

$$f(x) = \begin{cases} \dfrac{1}{6}x & 0 < x \le 3 \\ 2 - \dfrac{1}{2}x & 3 < x < 4 \\ 0 & \text{otherwise} \end{cases}$$

(*a*) Sketch the probability density function of $X$.

**(3)**

(*b*) Find the mode of $X$.

**(1)**

(*c*) Specify fully the cumulative distribution function of $X$.

**(7)**

(*d*) Using your answer to part (*c*), find the median of $X$.

**(3)**

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**TOTAL FOR PAPER: 75 MARKS**

**END**