

Paper Reference(s)

6684

Edexcel GCE

Statistics S2

(New Syllabus)

Advanced/Advanced Subsidiary

Wednesday 23 January 2002 – Afternoon

Time: 1 hour 30 minutes

Materials required for examination

Answer Book (AB16)
Graph Paper (ASG2)
Mathematical Formulae (Lilac)

Items included with question papers

Nil

Candidates may use any calculator EXCEPT those with the facility for symbolic algebra, differentiation and/or integration. Thus candidates may NOT use calculators such as the Texas Instruments TI 89, TI 92, Casio CFX 9970G, Hewlett Packard HP 48G.

Instructions to Candidates

In the boxes on the answer book, write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Statistics S2), the paper reference (6684), your surname, other name and signature.

Values from the statistical tables should be quoted in full. When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.

Full marks may be obtained for answers to ALL questions.

This paper has 7 questions.

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.

1. Explain what you understand by

(a) a population, (1)

(b) a statistic. (2)

A questionnaire concerning attitudes to classes in a college was completed by a random sample of 50 students. The students gave the college a mean approval rating of 75%.

(c) Identify the population and the statistic in this situation. (2)

(d) Explain what you understand by the sampling distribution of this statistic. (2)

2. The number of houses sold per week by a firm of estate agents follows a Poisson distribution with mean 2.5. The firm appoints a new salesman and wants to find out whether or not house sales increase as a result. After the appointment of the salesman, the number of house sales in a randomly chosen 4-week period is 14.

Stating your hypotheses clearly test, at the 5% level of significance, whether or not the new salesman has increased house sales. (7)

3. An airline knows that overall 3% of passengers do not turn up for flights. The airline decides to adopt a policy of selling more tickets than there are seats on a flight. For an aircraft with 196 seats, the airline sold 200 tickets for a particular flight.

(a) Write down a suitable model for the number of passengers who do not turn up for this flight after buying a ticket. (2)

By using a suitable approximation, find the probability that

(b) more than 196 passengers turn up for this flight, (3)

(c) there is at least one empty seat on this flight. (2)

4. Jean catches a bus to work every morning. According to the timetable the bus is due at 8 a.m., but Jean knows that the bus can arrive at a random time between five minutes early and 9 minutes late. The random variable X represents the time, in minutes, after 7.55 a.m. when the bus arrives.

(a) Suggest a suitable model for the distribution of X and specify it fully. (2)

(b) Calculate the mean time of arrival of the bus. (3)

(c) Find the cumulative distribution function of X . (4)

Jean will be late for work if the bus arrives after 8.05 a.m.

(d) Find the probability that Jean is late for work. (2)

5. An Internet service provider has a large number of users regularly connecting to its computers. On average only 3 users every hour fail to connect to the Internet at their first attempt.

(a) Give 2 reasons why a Poisson distribution might be a suitable model for the number of failed connections every hour. (2)

(b) Find the probability that in a randomly chosen hour

(i) all Internet users connect at their first attempt, (2)

(ii) more than 4 users fail to connect at their first attempt. (2)

(c) Write down the distribution of the number of users failing to connect at their first attempt in an 8-hour period. (1)

(d) Using a suitable approximation, find the probability that 12 or more users fail to connect at their first attempt in a randomly chosen 8-hour period. (6)

6. The owner of a small restaurant decides to change the menu. A trade magazine claims that 40% of all diners choose organic foods when eating away from home. On a randomly chosen day there are 20 diners eating in the restaurant.

(a) Assuming the claim made by the trade magazine to be correct, suggest a suitable model to describe the number of diners X who choose organic foods. (2)

(b) Find $P(5 < X < 15)$. (4)

(c) Find the mean and standard deviation of X . (3)

The owner decides to survey her customers before finalising the new menu. She surveys 10 randomly chosen diners and finds 8 who prefer eating organic foods.

(d) Test, at the 5% level of significance, whether or not there is reason to believe that the proportion of diners in her restaurant who prefer to eat organic foods is higher than the trade magazine's claim. State your hypotheses clearly. (5)

7. A continuous random variable X has cumulative distribution function $F(x)$ given by

$$F(x) = \begin{cases} 0, & x < 0, \\ kx^2 + 2kx, & 0 \leq x \leq 2, \\ 8k, & x > 2. \end{cases}$$

(a) Show that $k = \frac{1}{8}$. (1)

(b) Find the median of X . (3)

(c) Find the probability density function $f(x)$. (3)

(d) Sketch $f(x)$ for all values of x . (3)

(e) Write down the mode of X . (1)

(f) Find $E(X)$. (3)

(g) Comment on the skewness of this distribution. (2)

END