

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

A-level MATHEMATICS

Unit Statistics 2B

Tuesday 19 June 2018

Afternoon

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- the blue AQA booklet of formulae and statistical tables.

You may use a graphics calculator.

Instructions

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Write the question part reference (eg (a), (b)(i) etc) in the left-hand margin.
- You must answer each question in the space provided for that question. If you require extra space, use an AQA supplementary answer book; do **not** use the space provided for a different question.
- Do not write outside the box around each page.
- Show all necessary working; otherwise marks for method may be lost.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- The **final** answer to questions requiring the use of tables or calculators should normally be given to three significant figures.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 75.

Advice

- Unless stated otherwise, you may quote formulae, without proof, from the booklet.
- You do not necessarily need to use all the space provided.

| For Examiner's Use | |
|---------------------|------|
| Examiner's Initials | |
| Question | Mark |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| TOTAL | |



Answer **all** questions.

Answer each question in the space provided for that question.

- 1** The continuous random variable X has the probability density function defined by

$$f(x) = \begin{cases} \frac{1}{160}x & 8 \leq x \leq 16 \\ \frac{1}{10} & 16 \leq x \leq c \\ 0 & \text{otherwise} \end{cases}$$

where c is a constant.

- (a) (i)** Find the value of c .

[3 marks]

- (ii)** Hence find the 90th percentile of X .

[1 mark]

- (b)** Find the median value of X .

[3 marks]

QUESTION
PART
REFERENCE

Answer space for question 1



2 Rodney runs a game at a school fundraising event. In the game, 10 unbiased coins are tossed and the number of heads obtained, X , is counted.

The table below shows part of the probability distribution for X , giving values correct to three decimal places.

(a) Show that $P(X = 10) = 0.001$, correct to three decimal places, and complete the table.

[2 marks]

(b) Rodney charges people 10p to play the game. He pays an £8 prize if 10 heads are obtained, a £2 prize if 9 heads are obtained, a 50p prize if 8 heads are obtained and no prize if 7 heads or fewer are obtained.

(i) Calculate the mean value of the prize paid per game, and show that the standard deviation of the prize lies between 33p and 34p.

[5 marks]

(ii) Someone complains that the three prizes are too small and suggests that Rodney should double the size of each prize. Make **two** comments on this suggestion.

[2 marks]

QUESTION
PART
REFERENCE

Answer space for question 2

(a)

| | | | | |
|------------|------------|-------|---|----|
| x | 7 or fewer | 8 | 9 | 10 |
| $P(X = x)$ | 0.945 | 0.044 | | |



3 Nigella owns a restaurant where a free dessert is offered with each main course. She wants to know whether there is any association between the main course eaten by the diners and the dessert that they choose.

Table 1 shows the data Nigella obtained when she observed a sample of 250 diners who accepted the offer of a free dessert.

Table 1

| | Main course | | | | Total |
|-------------|-------------|------|---------|------------|-------|
| | Beef | Lamb | Chicken | Vegetarian | |
| Fruit salad | 36 | 16 | 16 | 12 | 80 |
| Ice cream | 33 | 24 | 28 | 20 | 105 |
| Gâteau | 16 | 10 | 16 | 23 | 65 |
| Total | 85 | 50 | 60 | 55 | 250 |

Nigella plans to use a χ^2 -test, using the 5% significance level, to investigate whether these data indicate any such association.

- (a) State, in context, the null hypothesis that Nigella should use. [1 mark]
- (b) Complete Table 2 opposite to show the expected frequencies that must be used in the test. [2 marks]
- (c) Carry out the χ^2 -test. [6 marks]
- (d) Make **one** comment about a significant difference between the observed values and the expected values. [1 mark]

QUESTION
PART
REFERENCE

Answer space for question 3



QUESTION
PART
REFERENCE

Answer space for question 3

Table 2

| | Beef | Lamb | Chicken | Vegetarian |
|--------------------|-------------|-------------|----------------|-------------------|
| Fruit salad | 27.2 | 16.0 | 19.2 | 17.6 |
| Ice cream | 35.7 | 21.0 | | |
| Gâteau | 22.1 | 13.0 | | |

Turn over ►



5 The continuous random variable X has a rectangular distribution on the interval $[a, b]$.

The continuous random variable Y is related to X by the equation

$$Y = 2X - 5$$

(a) Given that $E(Y) = 11$ and $\text{Var}(Y) = 3$, find values for $E(X)$ and $\text{Var}(X)$. **[2 marks]**

(b) Hence find values for:

(i) a and b ; **[4 marks]**

(ii) $P(5 < X < 9)$. **[2 marks]**

QUESTION
PART
REFERENCE

Answer space for question 5



There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED**

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