Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

0111323182

MATHEMATICS **9709/61**

Paper 6 Probability & Statistics 1 **(S1)** **May/June 2017**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: List of Formulae (MF9)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions.
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
The use of an electronic calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 50.

This document consists of **11** printed pages and **1** blank page.

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1 Kadijat noted the weights, x grams, of 30 chocolate buns. Her results are summarised by

$$\Sigma(x - k) = 315, \qquad \Sigma(x - k)^2 = 4022,$$

where k is a constant. The mean weight of the buns is 50.5 grams.

(i) Find the value of k. [2]

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(ii) Find the standard deviation of x. [2]

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2 Ashfaq throws two fair dice and notes the numbers obtained. R is the event 'The product of the two numbers is 12'. T is the event 'One of the numbers is odd and one of the numbers is even'. By finding appropriate probabilities, determine whether events R and T are independent. [5]

3 Redbury United soccer team play a match every week. Each match can be won, drawn or lost. At the beginning of the soccer season the probability that Redbury United win their first match is $\frac{3}{5}$, with equal probabilities of losing or drawing. If they win the first match, the probability that they win the second match is $\frac{7}{10}$ and the probability that they lose the second match is $\frac{1}{10}$. If they draw the first match they are equally likely to win, draw or lose the second match. If they lose the first match, the probability that they win the second match is $\frac{3}{10}$ and the probability that they draw the second match is $\frac{1}{20}$.

(i) Draw a fully labelled tree diagram to represent the first two matches played by Redbury United in the soccer season. [2]

(ii) Given that Redbury United win the second match, find the probability that they lose the first match. [4]

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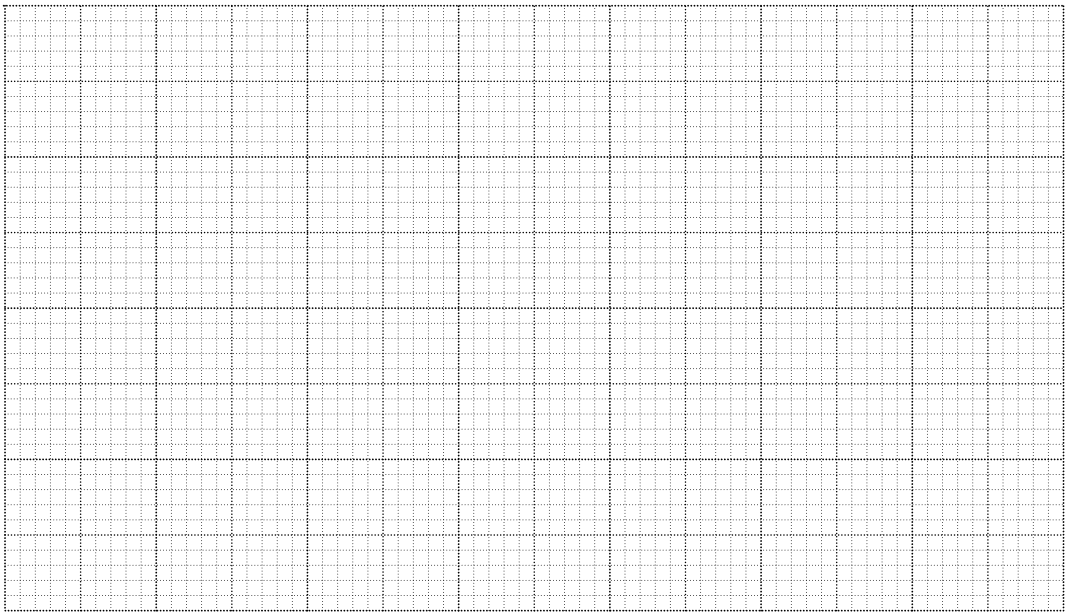
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4 The times taken, t seconds, by 1140 people to solve a puzzle are summarised in the table.

Time (t seconds)	$0 \leqslant t < 20$	$20 \leqslant t < 40$	$40 \leqslant t < 60$	$60 \leqslant t < 100$	$100 \leqslant t < 140$
Number of people	320	280	220	220	100

(i) On the grid, draw a histogram to illustrate this information. [4]



(ii) Calculate an estimate of the mean of t. [2]

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5 Eggs are sold in boxes of 20. Cracked eggs occur independently and the mean number of cracked eggs in a box is 1.4.

(i) Calculate the probability that a randomly chosen box contains exactly 2 cracked eggs. [3]

(ii) Calculate the probability that a randomly chosen box contains at least 1 cracked egg. [2]

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(iii) A shop sells n of these boxes of eggs. Find the smallest value of n such that the probability of there being at least 1 cracked egg in each box sold is less than 0.01. [2]

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6 **(a)** The random variable X has a normal distribution with mean μ and standard deviation σ. You are given that $\sigma = 0.25\mu$ and $P(X < 6.8) = 0.75$.

(i) Find the value of μ. [4]

(ii) Find $P(X < 4.7)$. [3]

(b) The lengths of metal rods have a normal distribution with mean 16 cm and standard deviation 0.2 cm. Rods which are shorter than 15.75 cm or longer than 16.25 cm are not usable. Find the expected number of usable rods in a batch of 1000 rods. [4]

7 **(a)** Eight children of different ages stand in a random order in a line. Find the number of different ways this can be done if none of the three youngest children stand next to each other. [3]

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(b) David chooses 5 chocolates from 6 different dark chocolates, 4 different white chocolates and 1 milk chocolate. He must choose at least one of each type. Find the number of different selections he can make. [4]

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(c) A password for Chelsea's computer consists of 4 characters in a particular order. The characters are chosen from the following.

- The 26 capital letters A to Z
- The 9 digits 1 to 9
- The 5 symbols # ~ * ? !

The password must include at least one capital letter, at least one digit and at least one symbol. No character can be repeated. Find the number of different passwords that Chelsea can make.

[4]

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