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Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

2565197600

MATHEMATICS **9709/61**

Paper 6 Probability & Statistics 1 **(S1)** **May/June 2018**

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 in the space provided. If additional space is required, you should use the lined page at the end of this booklet. The question number(s) must be clearly shown.
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 **13** printed pages and **3** blank pages.

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1 In a statistics lesson 12 people were asked to think of a number, x, between 1 and 20 inclusive. From the results Tom found that $\Sigma x = 186$ and that the standard deviation of x is 4.5. Assuming that Tom's calculations are correct, find the values of $\Sigma(x - 10)$ and $\Sigma(x - 10)^2$. [3]

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2 In a survey 55 students were asked to record, to the nearest kilometre, the total number of kilometres they travelled to school in a particular week. The results are shown below.

5	5	9	10	13	13	13	15	15	15	15
16	18	18	18	19	19	20	20	20	20	21
21	21	21	23	25	25	27	27	29	30	33
35	38	39	40	42	45	48	50	50	51	51
52	55	57	57	60	61	64	65	66	69	70

(i) On the grid, draw a box-and-whisker plot to illustrate the data. [5]

An 'outlier' is defined as any data value which is more than 1.5 times the interquartile range above the upper quartile, or more than 1.5 times the interquartile range below the lower quartile.

(ii) Show that there are no outliers. [2]

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3 Andy has 4 red socks and 8 black socks in his drawer. He takes 2 socks at random from his drawer.

(i) Find the probability that the socks taken are of different colours. [2]

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The random variable X is the number of red socks taken.

(ii) Draw up the probability distribution table for X. [3]

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(iii) Find $\mathrm{E}(X)$. [1]

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4 **(a)** The distance that car tyres of a certain make can travel before they need to be replaced has a normal distribution. A survey of a large number of these tyres found that the probability of this distance being more than 36 800 km is 0.0082 and the probability of this distance being more than 31 000 km is 0.6915. Find the mean and standard deviation of the distribution. [5]

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(b) The random variable X has the distribution $N(\mu, \sigma^2)$, where $3\sigma = 4\mu$ and $\mu \neq 0$. Find $P(X < 3\mu)$. [3]

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5 In Pelmerdon 22% of families own a dishwasher.

(i) Find the probability that, of 15 families chosen at random from Pelmerdon, between 4 and 6 inclusive own a dishwasher. [3]

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(ii) A random sample of 145 families from Pelmerdon is chosen. Use a suitable approximation to find the probability that more than 26 families own a dishwasher. [5]

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6 Vehicles approaching a certain road junction from town A can either turn left, turn right or go straight on. Over time it has been noted that of the vehicles approaching this particular junction from town A, 55% turn left, 15% turn right and 30% go straight on. The direction a vehicle takes at the junction is independent of the direction any other vehicle takes at the junction.

(i) Find the probability that, of the next three vehicles approaching the junction from town A, one goes straight on and the other two either both turn left or both turn right. [4]

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(ii) Three vehicles approach the junction from town A. Given that all three drivers choose the same direction at the junction, find the probability that they all go straight on. [4]

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7 Find the number of different ways in which all 9 letters of the word MINCEMEAT can be arranged in each of the following cases.

(i) There are no restrictions. [1]

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(ii) No vowel (A, E, I are vowels) is next to another vowel. [4]

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5 of the 9 letters of the word MINCEMEAT are selected.

(iii) Find the number of possible selections which contain exactly 1 M and exactly 1 E. [2]

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(iv) Find the number of possible selections which contain at least 1 M and at least 1 E. [3]

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Additional Page

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