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Cambridge International AS & A Level

**Cambridge International Examinations**
Cambridge International Advanced Subsidiary and Advanced Level

| CANDIDATE NAME | |
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| CENTRE NUMBER | | | | | | CANDIDATE NUMBER | | | | |
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**MATHEMATICS** **9709/61**

Paper 6 Probability & Statistics 1 **(S1)** **October/November 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 The discrete random variable $X$ has the following probability distribution.

| $x$ | 1 | 2 | 3 | 6 |
|---|---|---|---|---|
| $P(X = x)$ | 0.15 | $p$ | 0.4 | $q$ |

Given that $E(X) = 3.05$, find the values of $p$ and $q$. [4]

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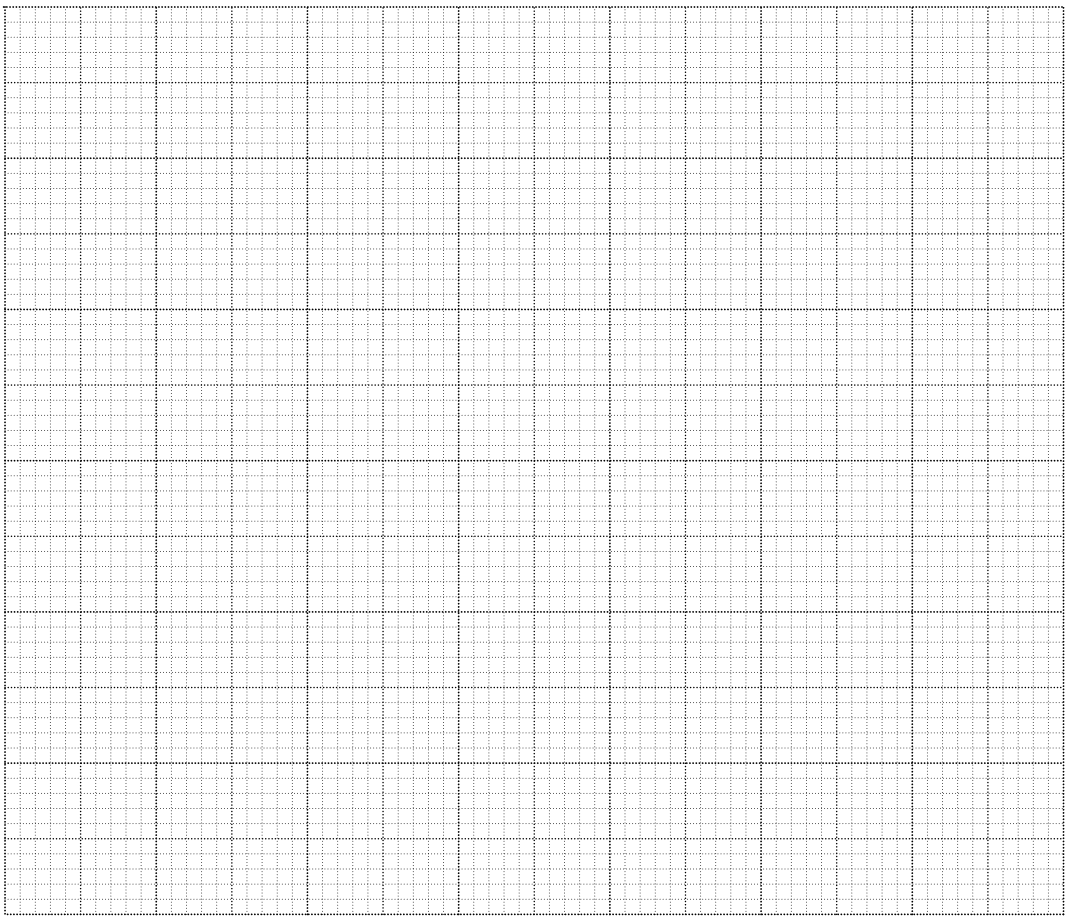
**2** The time taken by a car to accelerate from 0 to 30 metres per second was measured correct to the nearest second. The results from 48 cars are summarised in the following table.

| Time (seconds) | 3 – 5 | 6 – 8 | 9 – 11 | 12 – 16 | 17 – 25 |
|---|---|---|---|---|---|
| Frequency | 10 | 15 | 17 | 4 | 2 |

**(i)** On the grid, draw a cumulative frequency graph to represent this information. [3]



**(ii)** 35 of these cars accelerated from 0 to 30 metres per second in a time more than $t$ seconds. Estimate the value of $t$. [2]

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**3** An experiment consists of throwing a biased die 30 times and noting the number of 4s obtained. The experiment was repeated many times and the average number of 4s obtained in 30 throws was found to be 6.21.

**(i)** Estimate the probability of throwing a 4. [1]

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**(ii)** find the variance of the number of 4s obtained in 30 throws, [1]

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**(iii)** find the probability that in 15 throws the number of 4s obtained is 2 or more. [3]

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**4** The ages of a group of 12 people at an Art class have mean 48.7 years and standard deviation 7.65 years. The ages of a group of 7 people at another Art class have mean 38.1 years and standard deviation 4.2 years.

**(i)** Find the mean age of all 19 people. [2]

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**(ii)** The individual ages in years of people in the first Art class are denoted by $x$ and those in the second Art class by $y$. By first finding $\Sigma x^2$ and $\Sigma y^2$, find the standard deviation of the ages of all 19 people. [4]

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**5** Over a period of time Julian finds that on long-distance flights he flies economy class on 82% of flights. On the rest of the flights he flies first class. When he flies economy class, the probability that he gets a good night's sleep is $x$. When he flies first class, the probability that he gets a good night's sleep is 0.9.

**(i)** Draw a fully labelled tree diagram to illustrate this situation. [2]

The probability that Julian gets a good night's sleep on a randomly chosen flight is 0.285.

**(ii)** Find the value of $x$. [2]

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**(iii)** Given that on a particular flight Julian does not get a good night's sleep, find the probability that he is flying economy class. [3]

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**6** **(a)** A village hall has seats for 40 people, consisting of 8 rows with 5 seats in each row. Mary, Ahmad, Wayne, Elsie and John are the first to arrive in the village hall and no seats are taken before they arrive.

**(i)** How many possible arrangements are there of seating Mary, Ahmad, Wayne, Elsie and John assuming there are no restrictions? [2]

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**(ii)** How many possible arrangements are there of seating Mary, Ahmad, Wayne, Elsie and John if Mary and Ahmad sit together in the front row and the other three sit together in one of the other rows? [4]

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**(b)** In how many ways can a team of 4 people be chosen from 10 people if 2 of the people, Ross and Lionel, refuse to be in the team together? [4]

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**7** The weight, in grams, of pineapples is denoted by the random variable $X$ which has a normal distribution with mean 500 and standard deviation 91.5. Pineapples weighing over 570 grams are classified as 'large'. Those weighing under 390 grams are classified as 'small' and the rest are classified as 'medium'.

**(i)** Find the proportions of large, small and medium pineapples. [5]

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**(ii)** Find the weight exceeded by the heaviest 5% of pineapples. [3]

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**(iii)** Find the value of $k$ such that $P(k < X < 610) = 0.3$. [5]

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