TAYLOR'S COLLEGE

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CAMBRIDGE A LEVEL PROGRAMME

SEMESTER ONE EXAMINATION JUNE 2012

(January 2012 Intake)

Tuesday **12 June 2012** **3.00 – 4.15 pm**

MATHEMATICS 9709/6

PAPER 6 Probability & Statistics 1 (S1) 1 hour 15 minutes

Additional materials: Answer Paper
Graph Paper
List of formulae (MF9)

READ THESE INSTRUCTIONS FIRST

Write your name and class on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

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.
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 marks for this paper is 50.
Questions carrying smaller numbers of marks are printed earlier in the paper, and questions carrying larger numbers of marks later in the paper.
The use of an electronic calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

This document consists of 3 printed pages.

[Turn over

1 The lengths of 50 ribbons, x mm, are summarized as follows.

$\sum(x-120)=-280$, standard deviation of $x=5.3$.

(i) Find the mean length. [2]
(ii) Find $\sum(x-120)^2$. [2]

2 (a) Find the number of ways that the word **GEOMETRY** can be arranged in a row if

(i) there is no restrictions, [1]
(ii) the two letters E are not together. [2]

(b) A concert pianist agrees to take part in a charity concert. She offers a choice of 10 works, of which 5 were composed by Chopin, 3 by Ann and 2 by Jane. Calculate the number of ways these 4 works can be selected if there must be at least one work by each composer. [3]

3 A health club lets members use, on each visit, its facilities for as long as they wish. The club's records suggest that the length of a visit can be modeled by a normal distribution with mean 90 minutes. Only 20% of members stay for more than 125 minutes.

(i) Find the standard deviation of the normal distribution. [3]
(ii) Find the probability that a visit lasts between 25 minutes and 50 minutes. [3]

4 The table below records the time taken for a group of 220 candidates to finish a task.

Time taken, t minutes	Number of candidates
$5 \le t < 10$	32
$10 \le t < 15$	56
$15 \le t < 20$	61
$20 \le t < 25$	42
$25 \le t < 30$	29

(i) Draw, on graph paper, a cumulative frequency curve to represent this information. [3]
(ii) From the curve, estimate the median and interquartile range. [3]
(iii) Estimate how long it took for the first 150 candidates to finish the task. [1]

5 On a long train journey a statistician is invited by a gambler to play a dice game. The game uses two ordinary dice which the statistician is to throw. If the total score is 12, the statistician is paid \$6 by the gambler. If the total score is 8, the statistician is paid \$3 by the gambler. However, if both or either dice show a 1, the statistician pays the gambler \$2. Let \$$X$ be the amount paid to the statistician by the gambler after the dice are thrown once.

(i) Write down the probability distribution of X. [3]
(ii) Find the expected gain would be if the statistician played the game 100 times. [3]
(iii) Find the amount, \$$a$, that the \$6 would have to be changed to in order to make the game fair. [2]

6 A company always sends letters by second class post unless they are marked first class. Over a long period of time it has been established that 20% of letters to be posted are marked first.
In a random selection of 10 letters to be posted, find the probability that the number marked fist class is

(i) fewer than 2, [2]
(ii) at least 3. [2]

One Monday morning there are only 12 first class stamps. Given that there are 70 letters to be posted that day,

(iii) use a suitable approximation to find the probability that there are enough first class stamps. [5]

7 In a school there are 148 students in Years 12 and 13 studying Science, Humanities or Arts subjects. Of these students, 89 wear glasses and the others do not. There are 30 Science students of whom 18 wear glasses. The corresponding figures for the Humanities students are 68 and 44 respectively. A student is chosen at random.
Find the probability that this student

(i) is studying Arts, [3]
(ii) does not wear glasses, given that the student is studying Arts. [2]

Amongst the Science students, 80% are right-handed. Corresponding percentages for Humanities and Arts students are 75% and 70% respectively.
A student is again chosen at random.

(iii) Find the probability that this student is right-handed. [3]
(iv) Given that this student is right-handed, find the probability that the student is studying Science. [2]