

# IYGB GCE

## Mathematics FS1

### Advanced Level

#### Practice Paper M

Difficulty Rating: 3.6600/1.5385

**Time: 1 hour 30 minutes**

**Candidates may use any calculator allowed by the regulations of this examination.**

#### Information for Candidates

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This practice paper follows closely the Pearson Edexcel Syllabus, suitable for first assessment Summer 2018.

The standard booklet “Mathematical Formulae and Statistical Tables” may be used.

Full marks may be obtained for answers to ALL questions.

The marks for the parts of questions are shown in round brackets, e.g. (2).

There are 7 questions in this question paper.

The total mark for this paper is 75.

#### Advice to Candidates

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You must ensure that your answers to parts of questions are clearly labelled.

You must show sufficient working to make your methods clear to the Examiner.

Answers without working may not gain full credit.

Non exact answers should be given to an appropriate degree of accuracy.

The examiner may refuse to mark any parts of questions if deemed not to be legible.

**Question 1**

Nine gymnasts performed in a gymnastics competition.

Their names were Arnold (A), Brian (B), Christian (C), Damon (D), Eli (E), Fabian (F), Gordon (G), Harry (H) and Ian (I).

<b>Rank</b>	1	2	3	4	5	6	7	8	9
<b>Judge 1</b>	D	C	E	B	F	A	I	H	G
<b>Judge 2</b>	D	E	F	C	I	B	A	G	H

- a) Calculate Spearman's rank correlation coefficient for this data. (4)
- b) Test whether or not the judges are generally in agreement, at the 1% level of significance, stating your hypotheses clearly. (3)
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**Question 2**

The Dean of a faculty at a London University believes that the gender is independent of the class of the degree achieved.

A random sample of 240 male students and 80 female students were examined and the **percentages for each gender** are summarized in the table below.

	<b>First Class</b>	<b>Second Upper</b>	<b>Second Lower or less</b>
<b>Male</b>	22.5%	35%	42.5%
<b>Female</b>	20%	42.5%	37.5%

Use a  $\chi^2$  test, at the 10% level of significance, to investigate whether there is evidence to support the Dean's claim. (11)

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**Question 3**

Two standard fair cubical dice, numbered 1 to 6 are such rolled and the random variable  $X$  represents the sum of the scores of the two dice.

Determine the value of  $\text{Var}(X)$ . (7)

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**Question 4**

A website receives visitors at the constant rate of 1.2 per minute.

Using a distributional approximation, find the probability that during a randomly selected hour the website will receive more than 65 but less than 75 visitors. (7)

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**Question 5**

Since his retirement, Fred goes fishing Monday to Friday, for 3 hours on each of these 5 days. The number of fish he catches every hour follows a Poisson distribution with mean 2.5 .

- a) Find the probability that Fred catches more than 9 fish on exactly 2 of the days, in a given 5 day fishing week. (6)

Fred buys a new type of bait and decides to test whether there is any difference to the rate at which he catches fish. He tries his new bait by going fishing on a Sunday and ends up catching 14 fish in 4 hours.

- b) Carry out a significance test, at the 5% level, stating your hypotheses clearly. (7)
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**Question 6**

A piece of string of length  $a$ , where  $a$  is a positive constant, is cut into 2 pieces at a random point. The continuous random variable  $X$  represents the length of the longer piece of the string.

- a) Assuming that  $X$  is uniformly distributed show by integration that

$$\text{Var}(X) = \frac{a^2}{48}. \quad (6)$$

- b) Find the probability that the length of the longer piece is more than 4 times the length of the shorter piece. (4)
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**Question 7**

The continuous random variable  $X$  has probability density function  $f(x)$ , given by:

$$f(x) = \begin{cases} \frac{1}{10}x & 0 \leq x < 4 \\ 2 - \frac{2}{5}x & 4 \leq x \leq 5 \\ 0 & \text{otherwise} \end{cases}$$

- a) Sketch the graph of  $f(x)$  for all  $x$ . (3)
- b) State the mode of  $X$ . (1)
- c) Show clearly that  $E(X) = 3$ . (4)
- d) Calculate the value of  $\text{Var}(X)$ . (6)
- e) Find and specify fully the cumulative distribution function of  $X$ ,  $F(x)$ . (6)
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