IYGB GCE

Mathematics FS2

Advanced Level

Practice Paper R

Difficulty Rating: 3.3333/1.5000

Time: 1 hour 30 minutes

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

Information for Candidates

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

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

A geologist is investigating the mean number of fossils found in standard size rock samples collected from a certain area.

His data is summarized in the table below.

Number of Fossils	0	1	2	3	4	5	6	7
Number of Rocks	11	45	56	66	47	23	9	1

Find a 95% confidence interval for the mean number of fossils per rock, based on the samples collected from that area. **(7)**

Question 2

The table below shows a set of bivariate data involving two variables t and v.

t	151	154	157	163	169
v	8800	7800	7400	6500	3100

a) Use the coding equations

$$x = \frac{t-157}{3} \quad \text{and} \quad y = \frac{v}{100}$$

to find the value of S_{xx}, S_{yy} and S_{xy}. **(5)**

b) Show that the product moment correlation coefficient between x and y is approximately -0.958. **(2)**

c) State with justification the value of the product moment correlation coefficient between t and v. **(1)**

d) Determine the equation of the regression line between t and v, giving the answer in the form

$$v = A + Bt,$$

where A and B are constants. **(4)**

Detailed workings are expected in this question.

Question 3

The random variables S and T are Normally distributed, such that

$$S \sim \mathrm{N}\left(24, 3^2\right) \quad \text{and} \quad T \sim \mathrm{N}\left(30, 4^2\right),$$

where k is a positive constant.

Determine $\mathrm{P}(3S > 2T)$. **(8)**

Question 4

A new track surface is developed which is claimed to decrease the times of 100 m sprinters, compared with the old track surfaces currently used. To investigate this claim, the performances of 9 randomly chosen sprinters are measured on both surfaces. The results are summarised below.

Sprinter	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
Time on Old Surface (sec)	10.7	11.2	11.5	10.9	11.8	12.0	10.6	13.1	12.1
Time on New Surface (sec)	10.8	11.0	11.4	11.1	11.4	11.6	10.7	12.5	12.5

Test, at the 2.5% level of significance, the claim about the new track surface. **(11)**

Question 5

The continuous random variable X is uniformly distributed in the interval $[a,b]$, where a and b are constants.

The 45^{th} and 90^{th} percentiles are 51 and 78, respectively.

a) Determine the probability density function of X. **(7)**

The sum, denoted by S, of 100 random observations of X is obtained.

b) Calculate $\mathrm{P}(S > 5750)$. **(6)**

Question 6

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

$$f(x)=\begin{cases}\dfrac{2+x}{k} & 2\le x\le 5\\ 0 & \text{otherwise}\end{cases}$$

a) Show clearly that $k=\frac{33}{2}$. **(3)**

b) Find the value of $\mathrm{E}(X)$. **(3)**

c) Show that $\mathrm{Var}(X)=0.731$, correct to three decimal places. **(5)**

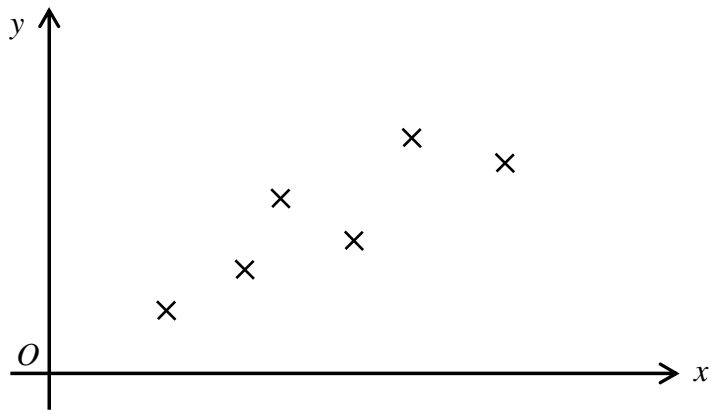
The cumulative distribution function of X, is denoted by $F(x)$.

d) Find and specify fully $F(x)$. **(4)**

e) Determine the median of X. **(3)**

Question 7

Six ordered pairs (x, y), of bivariate data, are shown in the following set of axes.



Determine the Spearman's rank correlation coefficient for this data. **(6)**