

IYGB GCE

Mathematics FS1

Advanced Level

Practice Paper N

Difficulty Rating: 3.2800/1.3235

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 8 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

The probability distribution of a discrete random variable X is given by

x	0	1	2	3	4
$P(X = x)$	$\frac{3}{8}$	$\frac{1}{3}$	$\frac{1}{4}$	a	$\frac{1}{24}$

where a is a positive constant.

- a) Explain why $a = 0$. (1)
- b) Find the value of $E(X)$. (2)
- c) Calculate $\text{Var}(X)$. (3)
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Question 2

The discrete variable X is thought to have distribution $B(5, 0.2)$.

Some actual observations of X are summarized in the table below.

X	Frequency
0	15
1	36
2	17
3	10
4	1
5	1

Use a χ^2 test, at 5% level of significance, to investigate whether the above data can be modelled by $B(5, 0.2)$. (10)

Question 3

Olson has a rope which is 180 cm long. The tip of one of the two ends of the rope is dyed red. Olson cuts his rope at a random point so he now has two pieces.

The random variable X represents the length, in cm, of the piece of the rope whose tip is dyed red.

a) Determine the value of ...

i. ... $P(X < 70)$. (1)

ii. ... $E(X)$. (1)

iii. ... the standard deviation of X . (3)

b) Calculate the probability that the length of the **shorter** piece of the rope is less than 70 cm. (2)

Question 4

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

$$f(x) \equiv \begin{cases} mx & 0 \leq x \leq 4 \\ k & 4 \leq x \leq 9 \\ 0 & \text{otherwise} \end{cases}$$

where m and k are positive constants.

Given that the graph of $f(x)$ consists of two straight lines meeting at $x = 4$, find as an exact simplified fraction the value of $E(X)$. (10)

Question 5

The table below shows the marks obtained by a group of students, in two separate tests.

Student	A	B	C	D	E	F	G	H
Test 1	27	38	17	29	41	42	32	9
Test 2	13	24	17	17	29	19	25	8

The first test is out of 50 marks while the second test is out of 30 marks.

Let x and y represent the marks obtained in Test 1 and Test 2, respectively.

The following summary statistics are given.

$$\sum x = 235, \quad \sum x^2 = 7853, \quad \sum y = 152, \quad \sum y^2 = 3214, \quad \sum xy = 4904.$$

- a) Find, showing full workings, the value of the product moment correlation coefficient between x and y . (4)
- b) Explain how the value of the product moment correlation coefficient between x and y will be affected if the individual test marks were converted into percentage marks. (1)
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Question 6

A continuous random variable X has the following cumulative distribution function $F(x)$, defined by

$$F(x) = \begin{cases} 0 & x < 0 \\ \frac{1}{5}x^2(6-x^2) & 0 \leq x \leq 1 \\ 1 & x > 1 \end{cases}$$

a) Find $P(X > 0.5)$. (2)

b) Define $f(x)$, the probability density function of X , for all values of x . (3)

A skewness coefficient can be calculated by the formula

$$\frac{\text{mean} - \text{mode}}{\text{standard deviation}}.$$

c) Given that $E(X) = \frac{16}{25}$ and $E(X^2) = \frac{7}{15}$, evaluate the skewness coefficient for this distribution. (7)

Question 7

The table below shows the marks obtained by a group of students, in two separate tests.

Student	A	B	C	D	E	F	G	H
Test 1	35	42	21	55	33	29	39	40
Test 2	30	28	21	38	35	27	30	k

Use linear regression for the test marks of the students A – G, to estimate the value of k , for student H.

Detailed workings are expected. (7)

Question 8

In a survey, along a certain coastline, plastic objects were found at a constant average rate of 250 per km.

- a) Determine the probability that a 10 m length of this coastline will contain more than 4 plastic objects. (3)

A similar survey, along the same coastline, drinks cans were found at a constant average rate of 160 per km.

- b) Calculate the probability that a 30 m length of this coastline will contain exactly 5 drinks cans (2)

The local authority believes that in this coastline the average rate of drinks cans is higher than 160 per km.

- c) Test, at the 1% level of significance, the local authority's belief. (6)

Let T represent the total number of plastic objects and drinks cans per 100 m of the above mentioned coastline.

- d) Use a distributional approximation to find the approximate value of $P(T > 50)$. (7)
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