IYGB GCE

Mathematics FS1

Advanced Level

Practice Paper R

Difficulty Rating: 2.6867/1.2072

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

$$\mathrm{P}(X = x) = \begin{cases} kx(5-x) & x = 1,2,3,4 \\ 0 & \text{otherwise} \end{cases}$$

a) Determine the value of the constant k. **(2)**

b) State the value of $\mathrm{E}(X)$. **(2)**

c) Calculate $\mathrm{Var}(X)$. **(4)**

d) Determine the value of $\mathrm{E}(4X-5)$. **(2)**

Question 2

At a certain safari park, it is known that 42% of the cars come from London.

a) Show that in a random sample of 37 cars, the probability that more than 22 cars came from London is approximately 1%. **(2)**

At the same safari park, it is known that 0.5% of the cars come from France.

b) Use a suitable approximation, to determine the probability that in a random sample of 80 cars, exactly 2 came from France. **(4)**

Question 3

A company advertises for a summer job every year.

It has been established over a long period of years that the number of applicants per year follows a Poisson distribution with mean 12.

This year there were 19 applicants for this summer job.

Test, at the 1% level of significance, whether there is evidence of an increase of the mean number of the applicants for the job.

State your hypotheses clearly. **(7)**

Question 4

An airport manager believes the number of suitcases checked in by passengers follows a binomial distribution with $p = 0.4$.

He records the number of suitcases checked in by a group of 50 passengers, and his results are summarized in the table below.

Number of Suitcases	Frequency
0	4
1	20
2	15
3	10
4	1

Use a χ^2 test, at 5% level of significance, to investigate the validity of the airport manager's claim. **(10)**

Question 5

The discrete random variable X has probability generating function

$$G_X(t) = k(1+t)^7,$$

where k is a positive constant.

a) State, with justification, the least and greatest value that X can take. **(2)**

b) State the name of the distribution, fully specifying any parameters. **(2)**

c) Determine the value of $P(X = 5)$. **(2)**

d) Use $G_X(t)$ to calculate the mean and variance of X.

No credit will be given if the mean and variance of X are obtained by alternative methods. **(6)**

Question 6

A shop sells a particular make of smart phone. It is assumed that the daily sales of this type of phone is a Poisson variable with mean 3.

a) Find the probability, giving the answers in terms of e, that on a particular day the shop sells …

i. … exactly 3 smart phones. **(2)**

ii. … at least 4 smart phones. **(4)**

It is further given that in a particular day at least 4 smart phones were sold.

b) Show that the probability that exactly 7 smart phones were actually sold that day is given by

$$\frac{243}{k\left(e^3-13\right)},$$

where k is an integer to be found. **(7)**

Question 7

A bag contains a large number of coins, of which some are pound coins and some are two pound coins. A coin is selected at random from the bag with replacement, **until a two pound coin** is selected.

It is given that the probability it will take …

… exactly 2 attempts until a two pound coin is selected is $\frac{3}{16}$.

… more than 3 attempts until a two pound coin is selected is $\frac{27}{64}$.

Determine the probability that a two pound coin will be selected for the first time on the fifth attempt. **(10)**

Question 8

A standard fair dice with faces numbered $1, 2, 3, 4, 5, 6$ is rolled 80 times.

Determine the approximate probability that the mean score of the 80 scores obtained will exceed 3.8.

(7)