TEST CODE **02105032**

FORM TP 2015137

MAY/JUNE 2015

C A R I B B E A N   E X A M I N A T I O N S   C O U N C I L

CARIBBEAN ADVANCED PROFICIENCY EXAMINATION®

APPLIED MATHEMATICS

STATISTICAL ANALYSIS

UNIT 1 – Paper 032

1 hour 30 minutes

11 JUNE 2015 (p.m.)

This examination paper consists of THREE questions.
The maximum mark for each section is 20.
The maximum mark for this examination is 60.
This examination consists of 4 printed pages.

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. Answer ALL questions.

2. Unless otherwise stated in a question, all numerical answers MUST be given exactly OR correct to three significant figures as appropriate.

<u>Examination Materials</u>

Mathematical formulae and tables (Revised 2010)
Electronic calculator
Ruler and graph paper

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

5032

Answer ALL questions.

1. (a) Choose the word from the brackets that describes the data in EACH of the following cases:

(i) The types of tomatoes grown on a farm ***(qualitative, quantitative)*** **[1 mark]**

(ii) The volumes of refrigerators sold at an appliance store ***(qualitative, quantitative)*** **[1 mark]**

(iii) The number of athletes who ran a 5000 metre race ***(discrete, continuous)*** **[1 mark]**

(b) Choose the word from the bracket which identifies the method of sampling described in each of the following procedures:

(i) Divide the population into distinct groups or layers. Take a simple random sample from each group or layer proportionate to the size of the group or layer. ***(cluster, stratified)*** **[1 mark]**

(ii) Sample in such a way that every member of the population will have a chance of being in the sample. ***(random, non-random)*** **[1 mark]**

(c) Explain how the method of systematic random sampling can be used to take a sample of 30 students from 150 first-year students in a school. **[3 marks]**

(d) The times, in minutes (x), taken by 20 students to complete an experiment were recorded as

25	28	32	37	38	42	43	45	48	50
54	54	54	56	57	57	59	60	61	63

(i) Construct a stem and leaf diagram, to show this information, starting at 20, and using groups of 10. **[3 marks]**

(ii) Determine, from the data presented above, the

a) mode **[1 mark]**

b) median **[2 marks]**

c) inter-quartile range. **[2 marks]**

(iii) Given that $\Sigma x = 963$, calculate, to the NEAREST minute, the mean time taken to complete the experiment. **[2 marks]**

(iv) Describe the shape of the distribution. **[2 marks]**

Total 20 marks

2. (a) A game consists of throwing three rings onto a bottle from a given distance. The probability of getting a ring onto the bottle is 0.4.

Let X denote the number of rings that will get onto the bottle.

(i) Construct the probability distribution for X. **[4 marks]**

(ii) Calculate the probability that more than 2 rings will get onto the bottle. **[2 marks]**

(iii) Calculate the expected number of rings that will go onto the bottle. **[2 marks]**

(b) The marks awarded to a large number of candidates in a Science examination are normally distributed with mean 45 marks and standard deviation 20 marks.

The award of Grade A is for students who get more than 75 marks. Estimate the percentage of students who will be awarded a Grade A in the examination. **[6 marks]**

(c) It is known that 30% of the cars in a car park will be parked for at least 5 hours. A check at 10 o'clock revealed that there were 150 cars in the car park.

(i) Determine the number of cars that are expected to be parked for AT LEAST 5 hours. **[1 mark]**

(ii) Calculate the probability that MORE THAN 90 cars will remain in the car park for AT LEAST 5 hours. **[5 marks]**

Total 20 marks

3. (a) A large population is known to have a mean of 20 and a standard deviation of 13. A random sample of 45 observations is drawn from this population. State FULLY the approximate distribution of the sample mean, $\overline{X}$. **[3 marks]**

(b) A random sample of 60 observations from a normal population with mean μ gave the following results: $\Sigma x = 758$; $\Sigma x^2 = 19\ 528$.

Calculate, to TWO decimal places, unbiased estimates for

(i) the mean, μ **[1 mark]**

(ii) the variance, σ^2. **[3 marks]**

(c) The amount of coffee dispensed from a packaging machine follows a normal distribution with a mean mass of 55 grams and a standard deviation of 5.2 grams. A random sample of 81 packages taken from the machine gave a mean mass of 54.2 grams. Carry out a test at the 5% level of significance to determine whether or not the mean mass of the packages produced is 55 grams.

(i) State appropriate null and alternate hypotheses, using statistical symbols for carrying out this test. **[2 marks]**

(ii) Determine the critical region(s) of the test. **[3 marks]**

(iii) Calculate the value of the test statistic used to conduct the test. **[3 marks]**

(iv) State clearly the conclusion drawn from this test. **[2 marks]**

(d) The yield, y, in tonnes per acre, of a particular crop is thought to be dependent on the amount of rainfall, x, in centimetres, in the growing season. The least squares regression equation of y on x is $y = 5.42 + 1.15x$.

(i) Interpret the value 1.15 in the regression line. **[1 mark]**

(ii) Given that rainfall in a particular year was 14.0 cm, estimate the yield for that year. **[2 marks]**

Total 20 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.