

FORM TP 2016140



TEST CODE 02105032

MAY/JUNE 2016

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN ADVANCED PROFICIENCY EXAMINATION®

APPLIED MATHEMATICS

STATISTICAL ANALYSIS

UNIT 1 – Paper 032

*1 hour 30 minutes*

**READ THE FOLLOWING INSTRUCTIONS CAREFULLY.**

1. This paper consists of THREE sections. Answer ALL questions from the THREE sections.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. Unless otherwise stated in the question, all numerical answers MUST be given exactly OR to three significant figures as appropriate.
5. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
6. **If you use the extra page(s) you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

**Examination Materials:**

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

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

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“\*”Barcode Area”\*

Sequential Bar Code

**Answer ALL questions.**

1. (a) State which of the following cases will constitute a sample and which will constitute a population:

(i) The 40 buses owned by “I’ll take you there tours”

.....  
[1 mark]

(ii) 40 of the persons who attended the health seminar last week

.....  
[1 mark]

(b) The manufacturer of certain line of beauty product wants to investigate the age of persons who use the product. To obtain this information, a random sample of the persons who use the product will be required.

(i) For EACH of the following sampling methods, state ONE reason why the method may be unsatisfactory.

a) Visit various beauty shops on Saturday morning and interview a selection of persons who buy the product.

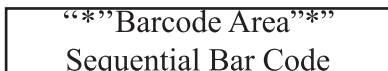
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[1 mark]

b) Post a questionnaire on the manufacturer’s Facebook page and ask page fans or followers to respond.

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[1 mark]

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(ii) The manufacturer sets up a sampling booth at an exhibition. As persons visit the booth, their names and other related information are taken. For EACH of the following activity, describe the sampling method that is used.

a) At the end of the exhibition, all the names are put into a box, and then a random sample of 50 names is taken from the box.

.....

.....

[1 mark]

b) Every fifth name is taken from the list of names collected over the three days of the exhibition.

.....

[1 mark]

(c) Of the 150 students in the third year group at a school, 60 are boys. Stratified random sampling was used to select a sample of 15 students from the group. How many boys will be in the sample?

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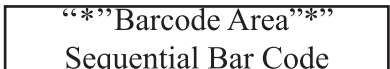
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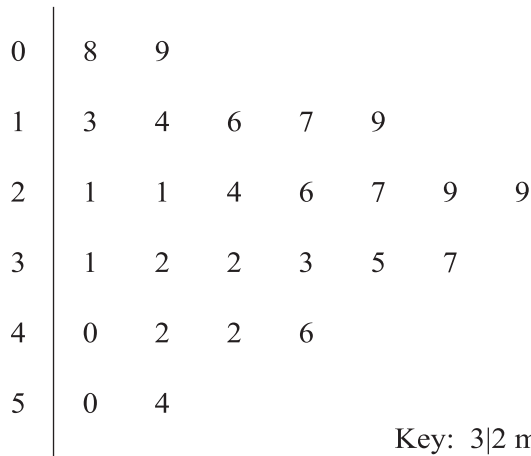


- (d) What is the advantage of preparing a stem-and-leaf diagram rather than grouping a data set using a frequency distribution?

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[1 mark]

- (e) The following stem and leaf diagram shows the number of minutes that patients waited at a medical centre for treatment.



Key: 3|2 means 32 minutes

- (i) Relative to the diagram, what does 4|6 mean?

.....

[1 mark]

- (ii) How many patients were in the sample?

.....

[1 mark]

- (iii) How many patients waited more than 35 minutes?

.....

[1 mark]

- (iv) Determine the range of the time that patients waited for treatment.

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[3 marks]

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- (v) Determine the median waiting time for the sample.

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[2 marks]

- (vi) Calculate the interquartile range for the data.

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[3 marks]

**Total 20 marks**

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2. (a) A bag contains three red markers, three blue markers and four black markers, all identical except for colour. A marker is taken from the bag, its colour noted and the marker returned to the bag. This is done three times. Calculate the probability that

(i) all three markers are red

.....  
.....

[2 marks]

(ii) two of the markers are black.

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[4 marks]

(b) The time that a customer takes to complete a transaction in the business line at the bank follows a normal distribution with a mean of 5.4 minutes and a standard deviation of 1.7 minutes.

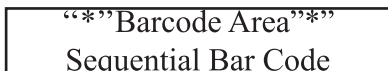
(i) What is the probability that a customer selected at random will spend more than 8 minutes to complete a transaction?

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[4 marks]

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- (ii) Below how many minutes will 80% of the customers spend in completing a transaction?

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**[4 marks]**

- (c) Market research has shown that in a certain district only 55% of the households have internet access.

- (i) In a random sample of 10 households, what is the probability that exactly 6 households have internet access?

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**[4 marks]**

- (ii) In a random sample of 80 households, how many will be expected to have internet access?

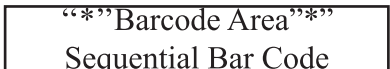
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**[2 marks]**

**Total 20 marks**

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3. (a) A random sample of 49 items with a sample mean of 13 was taken from a normal distribution with mean  $\mu$  and standard deviation of 4. Calculate a 96% confidence interval for  $\mu$ .

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[3 marks]

- (b) The relationship between the stem density (the number of stems per square metre),  $x$ , and the width of stems,  $y$  centimetres, was obtained from a sample of 10 plants. The results were as follows:

$x$	4	5	6	9	14	15	15	19	21	22
$y$	0.75	1.20	0.55	0.60	0.65	0.55	0	0.35	0.45	0.40

Summary:  $\sum x = 130$ ;  $\sum y = 5.5$ ;  $\sum xy = 59.95$ ;  $\sum x^2 = 2\ 090$ ;  $\sum y^2 = 3.875$

- (i) Determine the estimated regression line in the form  $y = a + bx$  for this data.

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[5 marks]

- (ii) Use your regression line to estimate the width of the stem when the stem density is 8.

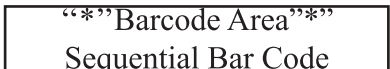
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[2 marks]

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- (iii) The correlation coefficient for this data is  $-0.63$ . Interpret this value as it relates to the data.

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.....

[2 marks]

- (c) Persons who visited the restroom of a certain fast-food outlet were asked to state their opinion of the quality of the restroom facilities. The following table shows the responses from a sample of 100 persons.

		Gender of Respondents		Totals
		Male	Female	
Quality of Facilities	Above average	8	7	15
	Average	26	24	50
	Below average	7	28	35
	<b>Totals</b>	<b>41</b>	<b>59</b>	<b>100</b>

A  $\chi^2$  test is carried out to determine whether there is an association between the gender of persons and their opinion.

- (i) State appropriate null and alternate hypotheses.

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[2 marks]

- (ii) Determine the critical region of the test at the 5% level of significance.

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[2 marks]

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(iii) What is the expected value corresponding to the value “24” (row 2, column 2)?

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[2 marks]

(iv) The calculated test value is  $\chi^2 = 9.825$ .

a) Will you accept or reject your null hypothesis?

.....  
.....

[1 mark]

b) Interpret your decision.

.....  
.....

[1 mark]

**Total 20 marks**

**END OF TEST**

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

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