



CARIBBEAN EXAMINATIONS COUNCIL
CARIBBEAN ADVANCED PROFICIENCY EXAMINATION®

APPLIED MATHEMATICS

STATISTICAL ANALYSIS

UNIT 1 – Paper 032

1 hour 30 minutes

12 JUNE 2014 (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. DO NOT open this examination paper until instructed to do so.
2. Answer ALL questions.
3. Unless otherwise stated in the question, all numerical answers MUST be given exactly OR to three significant figures as appropriate.

Examination Materials:

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

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Answer ALL questions.

1. (a) Distinguish between
- (i) A population and a sample **[2 marks]**
 - (ii) A census and a sample survey **[2 marks]**
 - (iii) A parameter and a statistic **[2 marks]**
 - (iv) A random and a non-random sample **[2 marks]**

- (b) The 75 students in the science division of a college may register for two or three subjects being offered in the division. There are 50 students in the mathematics class, 35 students in the chemistry class, 18 students in the physics class, 40 students in the biology class and 32 students in the environmental science class.

A sample of 20 students is to be selected to attend a Science fair.

- (i) State a reason why stratified random sampling will NOT be appropriate to select this sample. **[1 mark]**
 - (ii) Explain clearly how to obtain a simple random sample of 20 students from the 75 students using random numbers. **[3 marks]**
- (c) The following frequency distribution gives the number of car accidents on a certain stretch of road that was reported to a police station over a given period of time.

Number of Car Accidents Reported	0	1	2	3	4	5	6
Number of Days	10	35	20	12	10	8	5

- (i) Over how many days was this data collected? **[1 mark]**
- (ii) What was the total number of car accidents reported for the period? **[2 marks]**
- (iii) Calculate the mean number of car accidents reported. **[2 marks]**
- (iv) Determine the median number of car accidents reported. **[2 marks]**

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(v) Which of the following terms BEST describes the distribution of the data?

a) Negatively skewed

b) Positively skewed

c) Symmetric

[1 mark]

Total 20 marks

2. (a) A bag contains 6 blue markers and 8 red markers, all identical except for colour. A marker is chosen from the bag, its colour noted and it is replaced in the bag. This is done three times. The random variable X is the number of blue markers drawn.

(i) List ALL the possible outcomes of this experiment. **[2 marks]**

(ii) Calculate the probability that EXACTLY two of the markers noted are blue. **[3 marks]**

(iii) Calculate the probability that AT LEAST one of the markers is blue. **[3 marks]**

(b) A leisure centre which offers facilities such as snorkelling, deep-sea diving, submarine tours and other such activities to visitors. The centre estimated that the distribution of visitors is approximately normal with a mean of 230 visitors per day and a standard deviation of 27.

Determine the probability that on any given day the centre will have more than 270 visitors. **[6 marks]**

(c) The number of attempts at shooting goals made by a netballer in a tournament can be modelled by a binomial distribution with a probability of success equal to 0.35.

(i) In a sample of 12 attempts at shooting goals, calculate the probability that EXACTLY 4 were successful. **[4 marks]**

(ii) Given that the netballer made a total of 120 attempts at shooting goals in a tournament, calculate the expected number of successful shoots. **[2 marks]**

Total 20 marks

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3. (a) In a dental survey carried out among nursery school children, it was found that in a sample of 250 children, 62 of them had cavities. Construct an approximate 95% confidence interval for the proportion of nursery school children with dental cavities. **[4 marks]**
- (b) (i) Explain briefly, the Central Limit Theorem. **[2 marks]**
- (ii) A sample of 75 patties had a mean mass of 48g and a standard deviation of 12g. Write down fully a distribution for the sample mean, \bar{X} . **[3 marks]**
- (iii) Calculate $P(\bar{X} < 45)$. **[6 marks]**
- (c) In a manufacturing process the useful life, y hours, of a cutting machine is related to the speed, x metres per minute, at which the machine can be operated. The regression equation $y = 6.6 - 0.08x$ shows the relationship between the two variables.
- (i) Interpret the value 6.6 in the equation as it relates to the data. **[1 mark]**
- (ii) Interpret the value -0.08 in the equation as it relates to the data. **[2 marks]**
- (iii) Calculate the life of the tool when the speed of the machine is 40 metres per minute. **[2 marks]**

Total 20 marks

END OF TEST

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