FORM TP 2017142

TEST CODE **02105032**

MAY/JUNE 2017

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.
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 lined 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.**
7. You may use a silent, non-programmable calculator.

Examination Materials:

A list of mathematical formulae and tables (Revised 2012)

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

"*"Barcode Area"*"
Sequential Bar Code

SECTION A

MODULE 1: COLLECTING AND DESCRIBING DATA

1. (a) A set of 25 observations was found to have a mean of 15. It was subsequently realized that one data item was erroneously recorded as 23 instead of 32. Calculate the revised value of the mean.

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[4 marks]

(b) The following table shows the value and number of purchases (to the nearest $) made in a weekend.

Value of Purchases ($) ($x$)	**Number of Purchases (y)**
10–19	22
20–29	13
30–39	15
40–49	12
50–59	9
60–69	4

(i) Construct a cumulative frequency table for these data.

[3 marks]

(ii) **On the graph paper provided on page 7**, draw a frequency curve to show the data in (b) (i). **[4 marks]**

(iii) Use the graph from (b) (ii) to estimate the

median

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[1 mark]

interquartile range of the values

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[3 marks]

number of purchases worth more than $55.

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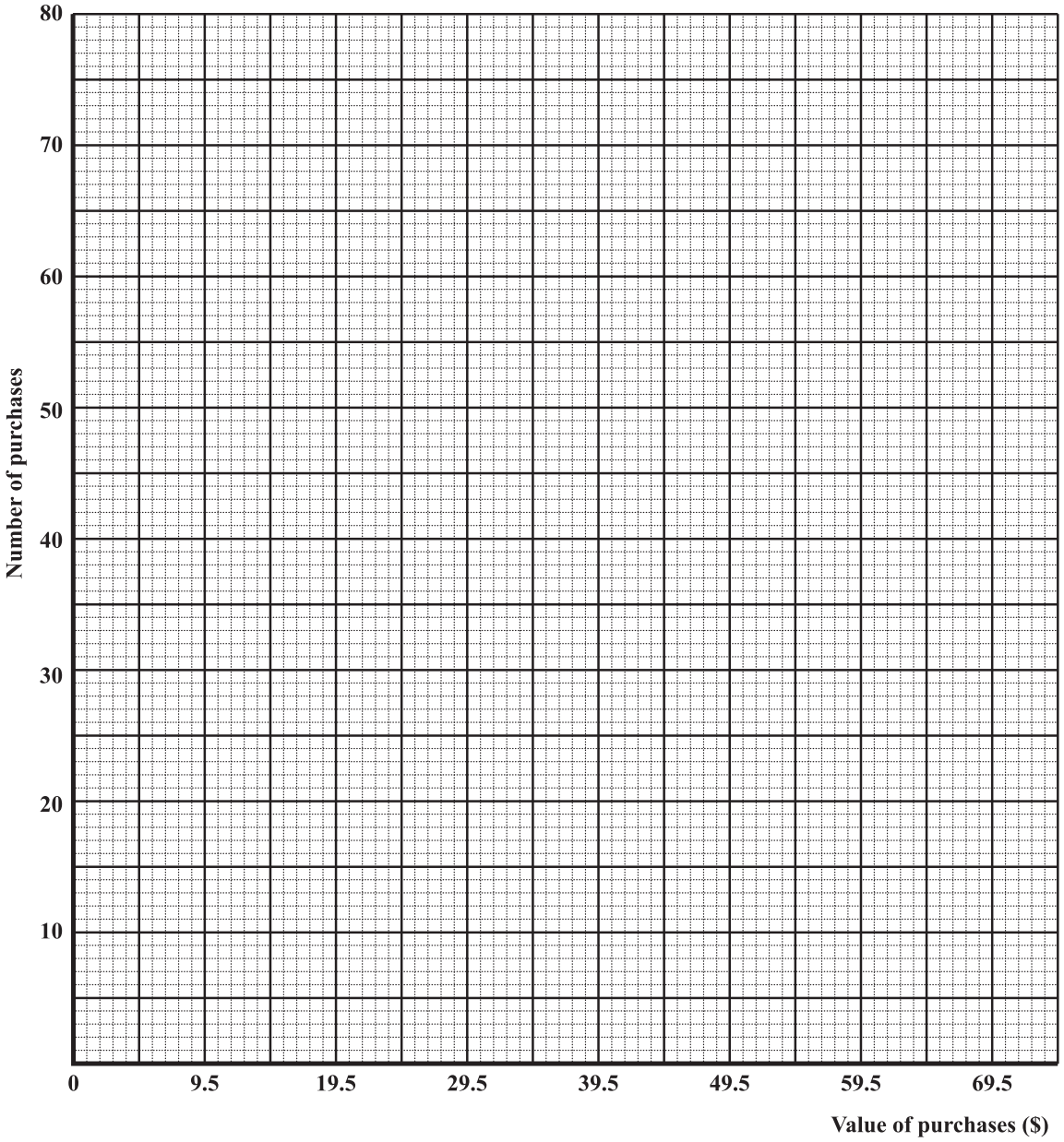
[2 marks]

(iv) On the same graph on page 7, draw a box-and-whisker diagram to show this information. **[3 marks]**

Total 20 marks



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SECTION B

MODULE 2: MANAGING UNCERTAINTY

2. (a) The following table shows the number of cakes classified by type and size that a bakery has available for sale.

Size	Type		
	Plain	**Fruit**	**Chocolate**
Small	20	15	25
Large	30	25	10

Calculate the probability that a randomly chosen cake is a

(i) chocolate cake or a large cake

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[3 marks]

(ii) fruit cake, given that it is a large cake.

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[3 marks]

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(b) A random variable X follows a binomial distribution with parameters n and $p = 0.8$. The variance of X is 2.24.

(i) Show that $n = 14$.

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[3 marks]

(ii) Hence, calculate

$E(X)$

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[2 marks]

$P(X = 12)$.

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[3 marks]

(c) A drawer contains 3 red ink pens and 7 black ink pens, all identical except for the colour of the ink. Three pens are randomly chosen from the drawer, without replacement. Calculate the probability that

(i) the third pen chosen has red ink, given that the first two pens have black ink

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[3 marks]

(ii) two of the three pens have red ink.

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[3 marks]

Total 20 marks

SECTION C

MODULE 3: ANALYSING AND INTERPRETING DATA

3. (a) A continuous random variable X is such that $E(X) = 20$ and $\text{Var}(X) = 40$. Samples of size 36 are taken from X.

(i) State the approximate distribution modelled by the sample mean, $\overline{X}$.

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[3 marks]

(ii) Calculate $P(\overline{X} > 22.5)$.

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[4 marks]

(b) A manufacturer claims that the mean mass of soap bars produced at his factory is 100 g. A consumer agency tests a random sample of 45 soap bars and finds that the mean mass is 98.5 g.

(i) Formulate null and alternative hypotheses to test whether the manufacturer is over-estimating the mean mass of his soap bars.

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[2 marks]

(ii) The test is carried out at the 5% level of significance. The agency finds that the z-value for the test is –2.012. State, with reason, a valid conclusion for the test.

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[2 marks]

(c) For a chi-square test involving a 3×4 contingency table, where all the expected frequencies are greater than 5, determine the critical value at the 5% level of significance.

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[3 marks]

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(d) A farmer uses different amounts of fertilizer, x, in each of 10 experimental beds of a certain vegetable. At harvesting time, he records the yield, y, of the vegetable for each garden bed. A summary of the results is $\sum x = 150$, $\sum y = 100$, $\sum xy = 1606$, $\sum x^2 = 2580$.

(i) Calculate the equation of the regression line of y on x, in the form $y = a + bx$.

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[4 marks]

(ii) Interpret the value of b in your regression line, as it relates to the data.

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[1 mark]

(iii) Use your regression line to estimate the yield when 13 g of fertilizer are used.

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[1 mark]

Total 20 marks

END OF TEST

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