# ST BENEDICT'S COLLEGE

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| **SUBJECT** | **AP Mathematics Paper 2 STATISTICS** | | 12 JULY 2017 |
| **GRADE** | 12 | **MARKS** | 100 |
| **EXAMINER** | Mrs MH Povall | **MODERATORS** | Mrs H Rademeyer<br>Mr N Benecke |
| **NAME** | | **DURATION** | 1.5 Hours |
| **TEACHER** | | | |

**READ THE FOLLOWING INSTRUCTIONS CAREFULLY:**

| QUESTION NO | DESCRIPTION | MAXIMUM MARK | ACTUAL MARK |
|---|---|---|---|
| 1 | Least squares regression line | 10 | |
| 2 | Probability | 14 | |
| 3 | Probability | 10 | |
| 4 | Probability | 10 | |
| 5 | Probability Mass and Density Functions | 16 | |
| 6 | Confidence Intervals | 18 | |
| 7 | Normal Distribution | 12 | |
| 8 | Hypothesis Testing | 10 | |
| TOTAL | | 100 | |

1. This question paper consists of 5 pages and a formula sheet is supplied.
2. Read the questions carefully.
3. All the necessary working details must be clearly shown.
4. Approved non-programmable calculators may be used except where otherwise stated.
5. It is in your own interest to write legibly and to present your work neatly.
6. Where necessary, round off to four decimal places.

## QUESTION 1

**10 MARKS**

Sue did a survey on second-hand car prices. For a particular type of car, she surveyed the ages x (in years) and the prices Ry (in thousands) of 10 second-hand cars.

The data collected is summarized as follows :

$\sum x = 67$ $\sum y = 2745$ $\sum xy = 13472$ $\sum x^2 = 553$ $\sum y^2 = 1\,038\,765$

(a) Prove that $\bar{x} = 6,7$ and $\bar{y} = 274,5$ (2)

(b) Hence determine the equation of the least squares regression line of y on x. (6)

(c) Estimate the initial value of a vehicle of this type. Comment on the validity of the prediction. (2)

## QUESTION 2

**14 MARKS**

5 boys and 4 girls are to be seated randomly in a row, what is the probability that:
(round off to 4 decimal places if necessary)

a) All the girls are sitting next to each other. (3)

b) All the boys sit next to each other, given that all the girls are sitting next to each other (4)

c) The boys and girls sit in alternate positions. (3)

d) Two of the girls that have had an argument won't sit next to each other. (4)

## QUESTION 3 — 10 MARKS

John Statsdud is a student taking Stats in Matric. Unfortunately, John is not a good student. He does not read the textbook, does not do homework and is regularly late for 6am classes. John intends to rely on luck to pass the next test. The test consists of 10 multiple choice questions, each of which has 5 possible answers.

What is the probability that John will get either five or six answers correct?

## QUESTION 4 — 10 MARKS

A shipping company owns 150 trucks, of those 150 trucks 25 are red and 30 are blue. If a random sample of 10 trucks is selected, what is the probability that:

(round off to 4 decimal places if necessary)

a) 3 trucks are red and 4 trucks are blue (5)

b) At least 2 trucks are red (5)

## QUESTION 5 — 16 MARKS

The time, *T* hours, spent by people on a visit to a museum has the following probability density function:

$$f(t)=\begin{cases} kt\left(16-t^2\right) & \text{for } 0\le t\le 4 \\ 0 & \text{otherwise} \end{cases}$$

where $k$ is a constant.

a) Show that $k=\frac{1}{64}$. (6)

b) Calculate the probability that a randomly chosen person spends less than 1 hour on a visit to the museum. (5)

c) Determine the median time spent on a visit to the museum. (5)

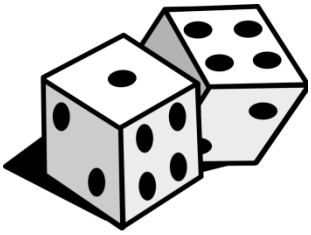
## QUESTION 6 — 18 MARKS

a) 1) A random sample of 20 soccer teams is found, on average, to spend R200 million. Assume that the spending of soccer teams is normally distributed with a standard deviation of R65 million. Find a 90% confidence interval for the mean. (6)

2) Explain, in words, what the answer above is actually telling you. (2)

b) 1) A biased dice was thrown 600 times and 22 sixes were obtained. Calculate a symmetric 98% confidence interval of *p,* the probability of obtaining a six in a single throw of a dice. (5)

2) Estimate the smallest number of times the dice should be thrown for the width of the symmetric 98% confidence of *p* to be at most 0.08. (5)



## QUESTION 7 — 12 MARKS

DSTV are doing market research on a new channel and how much people spend watching the channel. Extensive testing shows that 5% of the people tested watch more than 21 hours per week while 12% watch for less than 13 hours per week.

1) Illustrate this information in a simple normal distribution sketch. (2)

2) Find $\mu$ and $\sigma$. (10)

**QUESTION 8** **10 MARKS**

The blood pressure of a group of hospital patients with a certain type of heart disease has a mean of 85.6. A random sample of 25 of these patients volunteered to be treated with a new drug and a week later their mean blood pressure was found to be 80.4. Assuming a normal distribution, with standard deviation 15.5 for blood pressure, and using a 2% significance level, conduct a hypothesis test to decide whether the mean blood pressure for all patients treated with the new drug is less than 85.6.