ST BENEDICT'S

SUBJECT	**AP Mathematics**	**PAPER**	**2 - Statistics**
GRADE	**12**	**DATE**	7 September 2020
EXAMINER	MH Povall	**MARKS**	100
NAME		**MODERATOR**	Cluster Moderated
TEACHER	**MH Povall**	**DURATION**	1 Hour

QUESTION NO	MAXIMUM MARK	ACTUAL MARK
1		
2		
3		
4		
5		
6		
7		
8		
9		
TOTAL		

INSTRUCTIONS:

1. This paper consists of 9 questions and 7 pages.

2. A four-page information Booklet is provided.

3. Read the questions carefully.

4. Answer all questions.

5. Number your answers clearly and use the same numbering as in the question paper.

6. You may use an approved non-programmable and non-graphical calculator, unless otherwise stated.

7. **Round off your answers to FOUR decimal places, unless otherwise stated.**

8. All necessary working details must be shown. Answers only, without the relevant calculations will not be given marks. Equations may not be solved solely with a calculator.

9. It is in your interest to write legibly and present your work neatly.

10. Diagrams have not been drawn to scale.

QUESTION 1 — 8 MARKS

The random variable X can only take the values $-1; 1; 2; 3$. The probability that X takes the value x is kx^2, where k is a constant.

a) Draw up the probability distribution table for X, in terms of k, and find the value of k. (4)

b) Hence, calculate E(X) and Var(X). (4)

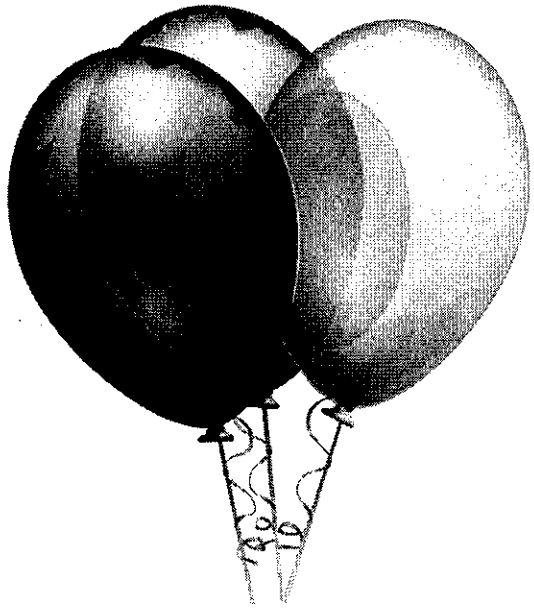
QUESTION 2 — 10 MARKS

A bag contains 10 red balloons, 12 blue balloons and 9 yellow balloons.

7 balloons are selected at random, without replacement.

a) Find the probability that exactly 1 blue balloon is selected. (4)

b) Find the probability that the third balloon selected is blue. (6)



QUESTION 3 — 18 MARKS

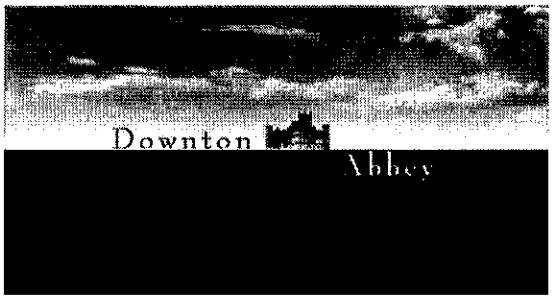
It is found that 10% of the population enjoy watching Historical Drama on television.

a) Five people are asked at random whether they enjoy watching Historical Drama on television.

1) Calculate the probability that exactly 2 answered that they did. (4)

2) Set up a probability mass function which will display all the possible probabilities if 5 people are asked at random whether they enjoy watching Historical Drama. (4)

b) Use an appropriate approximation to find the probability that, out of 160 people chosen randomly, more than 17 people enjoy watching Historical drama on television. (10)



QUESTION 4 — 14 MARKS

The probability density function for the mean time taken (in minutes) by students to complete a test is given by:

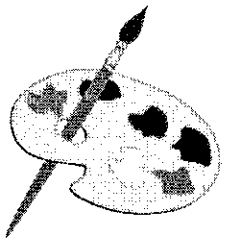
$$f(x) = \begin{cases} a(x-30)^2 & 30 \leq x \leq 60 \\ 0 & elsewhere \end{cases}$$

a) Show that $a = \frac{1}{9000}$. (7)

b) What is the median time taken by students to complete the test?
Round off your answer to the nearest minute. (7)

QUESTION 5 — 10 MARKS

In a group of students, the numbers of boys and girls studying Art, Music and Drama are given in the following table. Each of these 160 students is studying exactly one of these subjects.

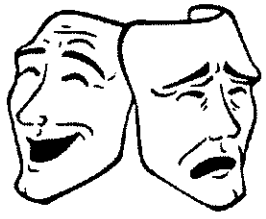


	Art	Music	Drama
Boys	24	40	32
Girls	15	12	37

a) Find the probability that a randomly selected student is studying Music. (2)

b) Determine whether the events 'a randomly chosen student is a boy' and 'a randomly chosen student is studying Music' are independent. Justify your answer. (5)

c) Find the probability that a randomly chosen student is not studying Drama, given that the student is a girl. (3)



QUESTION 6 — 12 MARKS

The lengths, in centimetres, of index fingers of women in Raneland have a normal distribution with mean μ and standard deviation 0,684.

a) Show that the mean is 8,34 if 17,5% of these women have Index fingers shorter than 7,7 cm. (6)

b) Five of these women are chosen randomly. Find the probability that exactly 3 of these women have index fingers shorter than 8,2 cm. (6)

QUESTION 7 — 10 MARKS

A survey is conducted to determine the mean mass of 64 women between the age of 30 and 40. The results produce a confidence interval of (59 kg; 63 kg) with a standard deviation of 9 kg.

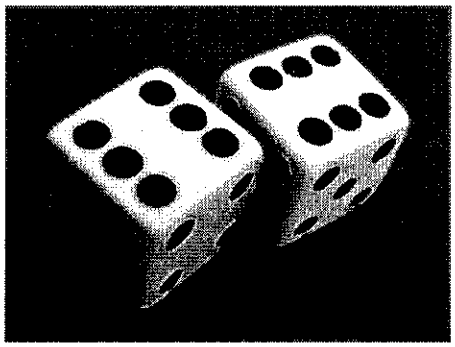
a) What is the sample mean? (2)

b) Determine the level of confidence, to the nearest percentage, that the interval contains the true mean. (8)

QUESTION 8 — 10 MARKS

a) A biased dice was thrown 600 times and 22 sixes were obtained.
Calculate a symmetric 99% confidence interval of p, the probability of obtaining a six in a single throw of a dice. (5)

b) Estimate the smallest number of times the dice should be thrown for the width of the symmetric 99% confidence of p to be at most 0,08. (5)



QUESTION 9 — 10 MARKS

The SHINEBRIGHT manufacturing company makes torches and uses batteries made by two different companies: EVERBRIGHT and EVERSTRONG.

A random sample of 100 of each type of battery was selected and tested.
The following data was gathered:

EVERBRIGHT: Mean battery life 58,5 minutes

Standard deviation 20 minutes

EVERSTRONG: Mean battery life 53,5 minutes

Standard deviation 19 minutes

a) Test at a 5% significance level if there is a difference between the mean life span of the two batteries. (7)

b) The SHINEBRIGHT manufacturing company would like to accept the claim that there is a difference between the two types of batteries. What should the significance level be in order to do this? (3)