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| **AP Mathematics Trials****Paper 2** |
| **FORM 5****4 September 2019** |
| **TIME: 1 hour TOTAL: 100 marks** |
| **Examiner: Miss Eastes** |  **Moderated: Mrs. Gunning**  |
| **NAME:** |
| **PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE ANSWERING THE QUESTIONS.*** This question paper consists of 8 questions, 5 pages, plus an information booklet.
* Answer all questions on the answer booklet provided.
* Read and answer all questions carefully. Write legibly and present your work neatly.
* All necessary working which you have used in determining your answers **must** be clearly shown.
* Approved non-programmable calculators may be used except where otherwise stated. Where necessary give answers correct to **3 decimal places** unless otherwise stated.
* Ensure that your calculator is in **DEGREE** mode.
* Diagrams have not necessarily been drawn to scale.
* Give reasons for all Euclidean Geometry questions unless otherwise stated.
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| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Mark |  |  |  |  |  |  |  |  |
| Out of | 16 | 17 | 5 | 11 | 15 | 9 | 13 | 14 |

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| Total (100) |  | Percentage |  |

**QUESTION 1**

**Daniel and Tshepo are old boys of Ashton and they sometimes attend the Saturday home sports Fixtures.**

**The probability P(D), that Daniel attends a fixture is 0.60.**

**The probability P(T), that Tshepo attends a fixture is 0.5.**

**The probability that they both attend a fixture is 0.43.**

a) Find the probability that either Daniel or Tshepo or both attend a fixture. (3)

b) Find the probability of Daniel and Tshepo not attending a fixture. (2)

c) What is the probability that Daniel attends a fixture given that Tshepo is definitely

going to attend? (3)

d) Give a numerical justification for the following statement:

 “ Events D and T are not independent” (4)

**Jaryd and Craig are also old boys and they also sometimes attend the home fixtures.**

**The probability P(J), that Jaryd attends a fixture is 0.67.**

**The probability P(C), that Craig attends a fixture is 0.47.**

e) If the attendance of all four of these old boys at a fixture is independent of one another, what is the probability that all four attend a particular fixture? (2)

f) What is the probability that none of them attend a particular fixture? (2)

  **[16]**

question 2

2.1 In how many different ways can the letters of the word CORPORATION be arranged so that the vowels are all next to one another? Give the answer in simplest form. (5)

2.2 How many six-digit numbers can be formed if each number starts with 35 and no digit appears more than once? (You may use digits from 0 to 9) (2)

2.3 Nine men are to be selected for a team of four chess players. Two of them will not play together but each is prepared to play in the absence of the other. In how many different ways can the selection for the team be made? (5)

2.4 Kevin has three separate shelves in his bedroom cupboard for different CD’s, DVD’s and computer games. On each shelf he has 4 CD’s, 5 DVD’s and 8 Computer games respectively. Calculate the probability that if Kevin chooses 9 items at random,

there are 3 from each shelf? (5)

 [17]

question 3

Online orders are “incomplete” if they contain substitute items or have at least one item missing when delivered. The probability that an order is incomplete is 0.15

Determine the probability that the number of incomplete orders in a sample of 50 online orders will be more that 6 but fewer than 10.

 **[5]**

**QUESTION 4**

4.1 Let X be the number of matches won in a season: $X\~Bin(38;0,75)$

 A professional soccer team has a probability of 75% to win any given match. If the team is to play 38 games in a season calculate:

 4.1.1 The expected amount of matches the soccer team will win in a season (2)

 4.1.2 The standard deviation of the amount of matches the team will win. (3)

4.2 Using the normal distribution as an approximation to the binomial distribution in question 4.1 determine the following:

 $P(X\geq 25)$ (6)

  **[11]**

question 5

5.1 The length of aluminium baking foil on a roll may be modelled by a normal distribution with a mean of 91 metres and a standard deviation of 0.8 metres.

 Determine the probability that the length of foil on a particular roll is:

 5.1.1 less than 90 metres. (5)

 5.1.2 between 92 metres and 93 metres. (5)

5.2 The length of cling wrap on a roll may also be modelled by a normal distribution but with a mean of 153 metres and a standard deviation of $σ$ metres.

 It is required that 1% of the rolls of cling wrap should have a length less that 150 meters.

 Find the value of $σ$ that is needed to satisfy this requirement. (5)

 **[15]**

**QUESTION 6**

In a sample of 350 blood specimens it was discovered that 120 of them were infected with the EBOLA virus.

6.1 Is it appropriate to use the central limit theorem in the scenario above.

 Give a reason for your answer. (2)

6.2 Calculate the 95% confidence interval for this estimate.

 Give a conclusion for your answer. (7)

 **[9]**

QUESTION 7

A probability density function is defined as follows:

$f\left(x\right)=\left\{\begin{array}{c}q\left(4-x\right);0\leq x\leq 4\\\\0 elsewhere\end{array}\right.$ for some constant *q*

7.1 Show that $q=\frac{1}{8}$ (4)

7.2 Calculate $P(1\leq x\leq 2)$ (4)

7.3 Calculate the median of this distribution. (5)

 **[13]** **[13]**

Question 8

A company produces low-energy light bulbs.

The bulbs are described as using a mean of 8 watts of power, with a standard deviation of 1.2 watts.

The production manager is concerned that the new machine being used on the production line **has changed this** and he asks you to conduct a test at a 2% significance level to check whether his concern is valid.

You use a random sample of 120 bulbs of the latest batch produced and find that the mean of the sample is 8.3 watts.

8.1 Conduct the hypothesis test and provide the conclusion you would give to the production manager. (8)

8.2 If another sample is taken of 100 bulbs of the latest batch produced and it is found that the mean of the sample is 7.1 watts.

 The standard deviation of population changed to 5.

 Conduct a hypothesis test to test the claim that the mean of the bulbs will be less than 8 watts. (6)

 **[14]**