

**ADVANCED PROGRAMME MATHEMATICS**

**TRIALS EXAMINATION 2019**

**STATISTICS**

**TIME: 1 HOUR 1**  **00 MARKS**

**EXAMINER: Mrs T Thorne**

**MODERATOR: Mrs D Bolton**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY.**

* This question paper consists of 5 pages.
* Read the questions carefully.
* **ALL** questions must be answered in the answer book provided.
* Number your answers exactly as the questions are numbered.
* Diagrams are **NOT** necessarily drawn to scale.
* All answers must be given correct to **four decimal places** where necessary,

 unless stated otherwise.

* Approved calculators may be used, unless stated otherwise.
* All the necessary working details must be clearly shown.

**QUESTION 1**

Daniella and Thandi are College old girls. Both ladies enjoy attending the Carol service at the end of the year.

The probability P(D), that Daniella attends the service is 0.60.

The probability P(T), that Thandi attends the service is 0.5.

The probability that they both attend the service is 0.43.

a) Find the probability that either Daniella or Thandi or both attend the service. (4)

b) Find the probability of Daniella and Thandi not attending the service. (2)

c) What is the probability that Daniella attends the service given that Thandi is definitely

going to attend? (3)

d) Give a numerical justification for the following statement:

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

Jade and Christy are also old girls and they also enjoy attending the Carols service.

The probability P(J), that Jade attends is 0.67.

The probability P(C), that Christy attends is 0.47.

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

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

  **[17]**

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? (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? (4)

2.4 Kevna has three separate shelves in her bedroom cupboard for different items. On each shelf she has 4 books, 5 magazines and 8 photo-albums respectively. Calculate the probability that if Kevna chooses 9 items at random, there are 3 from each shelf? (4)

 [15]

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:

 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. (4)

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

 (7)

  **[13]**

 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 toilet paper on a roll may also be modelled by a normal distribution but with a mean of 153 metres and a standard deviation of metres.

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

 Find the value of 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 IBOLA 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:

7.1 Show that (4)

7.2 Calculate (3)

7.3 Calculate the median of this distribution. (6)

 **[13]**

**QUESTION 8**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Temperature (°C), x | 25 | 26 | 16 | 24 | 18 | 21 | 18 | 19 | 28 | 23 |
| Ice-cream sales, y | 305 | 373 | 77 | 316 | 130 | 186 | 148 | 180 | 406 | 162 |

A Ballito beach vendor kept the records of the number of ice-creams sold and the midday temperatures over a 10 day period.

8.1 By calculating the correlation coefficient ‘r’, discuss the correlation between the midday

temperatures and the number of ice-creams sold. (4)

8.2 Determine the equation of the least squares regression line for this data. (5)

8.3 Estimate the ice-cream sales on the day when the midday temperature is 20°C.

Comment on your answer, in terms of its reliability as an estimate.

 (4)

 **[13]**