



KEARSNEY COLLEGE
Founded in 1921

KEARSNEY COLLEGE TRIAL EXAMINATION

29 AUGUST 2018

ADVANCED PROGRAMME MATHEMATICS: PAPER II

MODULE 2: STATISTICS

Time: 1 hour

100 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 5 pages and an Information Sheet. Please check that your question paper is complete.
 2. Read the questions carefully.
 3. Answer ALL the questions.
 4. You may use an approved non-programmable and non-graphical calculator, unless otherwise stated.
 5. All necessary calculations must be clearly shown and writing should be legible.
 6. It is in your own interest to write legibly and to present your work neatly.
 7. Round off to **FOUR** decimal places unless otherwise stated.
-

QUESTION 1

A group of 80 athletes were asked which of the three sprint events (100 m, 200 m and 400 m) they intended to enter at the next inter-high athletics meeting.

- 21 athletes entered none of these events
- 6 entered all three events
- 10 entered the 100 m and 200 m
- 11 entered the 200 m and the 400 m
- Of the 21 athletes who entered the 100 m, 10 entered nothing else
- 27 athletes entered the 400 m

- 1.1 Represent the above situation using a Venn-diagram. (8)
- 1.2 How many athletes entered the 200 m event? (2)
- 1.3 What is the probability of an athlete, selected at random, running in at least 2 of the 3 sprint events? (4)

[16]**QUESTION 2**

- 2.1 A and B are independent events where $P(A) = 0,40$ and $P(A \cup B) = 0,70$. Calculate $P(B)$. (4)
- 2.2 E and F are events where $P(F) = 0,60$, $P(E \cup F) = 0,80$ and $P(E | F) = 0,20$. Calculate $P(E)$. (4)

[8]**QUESTION 3**

Four married couples have bought 8 seats in a row for a concert.

- 3.1 In how many ways can they be seated, with no restrictions? (4)
- 3.2 What is the probability that each couple sits together? (4)
- 3.3 What is the probability that all the men sit together on the right of all the women? (4)

[12]

QUESTION 4

- 4.1 James has 12 friends, seven girls and five boys. He is only allowed to invite five friends to his birthday party. What is the probability that three of the friends he randomly invites to his party are boys? (6)
- 4.2 Arieb notes that in his suburb, 70% of households have an electric fence on the perimeter of their property. Find the probability that in a random sample of 10 households in his suburb, 7 of them have an electric fence. (5)
- 4.3 Three identical cups of coffee, two identical cups of latte and two identical cups of hot chocolate are arranged in a row. Calculate the number of arrangements of the seven cups of hot drinks if:
- (a) the first and last cups in the row are the same type of hot drink. (6)
- (b) the three cups of coffee are all next to one another and no other hot drink is next to the same type of hot drink. (6)

[23]**QUESTION 5**

Consider the following dataset used to illustrate the common problem of “correlation vs causation” i.e. *Just because data sets correlate, does not mean that there is any causative link between them.*

Number of Pirates (approx)	35000	45000	20000	15000	5000	400	17
Global Mean Sea Temp (°C)	14,3	14,4	14,6	14,8	15,2	15,4	15,7

- 5.1 Calculate and describe the correlation co-efficient for this data set. (3)
- 5.2 Calculate the values of a and b in the least squares regression formula $y = a + bx$. (Round off to 6 decimal places) (3)
- 5.3 How many pirates would have sailed the high seas, rounded to the nearest 1000, when the sea temperature was a mean 15°C? (3)

[9]

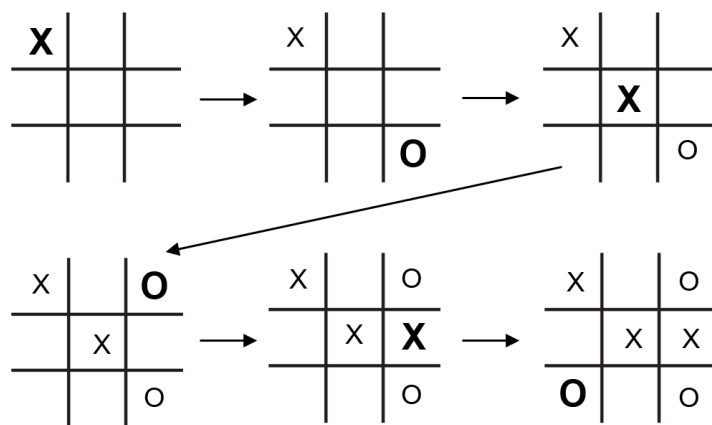
QUESTION 6

At a fishing contest, people win prizes for catching the biggest fish. To add to the prizes available to the competitors, the organisers tag 20 randomly caught fish which, if caught by a competitor, will win them a bonus prize. All fish caught during the competition are returned, alive, to a *different* dam, and no longer form part of the competition.

- 6.1 In the competition, 80 fish were caught, which included 13 tagged fish. Estimate the total number of fish in the dam, to the nearest integer. (3)
- 6.2 The organisers know that the dam was stocked with exactly 120 fish. If a competitor catches 10 fish during the competition, what is the probability that she will not win a bonus prize? (5)
- 6.3 The competition rules state that a maximum of 20% of the fish in the dam may tagged for bonus prizes. If a competitor were to catch 15 fish under these circumstances, what is the probability that they would win at least two bonus prizes? (6)

[14]**QUESTION 7**

In a game of noughts-and-crosses, each player chooses a symbol ("O" or "X") and takes turns placing their symbol on a three-by-three grid, shown below. The game is won when a player places three of their symbols in a straight line (vertical, horizontal or diagonal). If the board is filled and neither player has three symbols in a row, then the game ends in a draw. The boards below show a sequence of random moves where Player X has started. The game below has not yet been won. The new move is shown in **bold** in each case.



It is Player X's turn next. If the remaining moves in this game **are played at random**,

- 7.1 What is the probability of Player O winning? (4)
- 7.2 What is the probability that the game ends in a draw? (2)

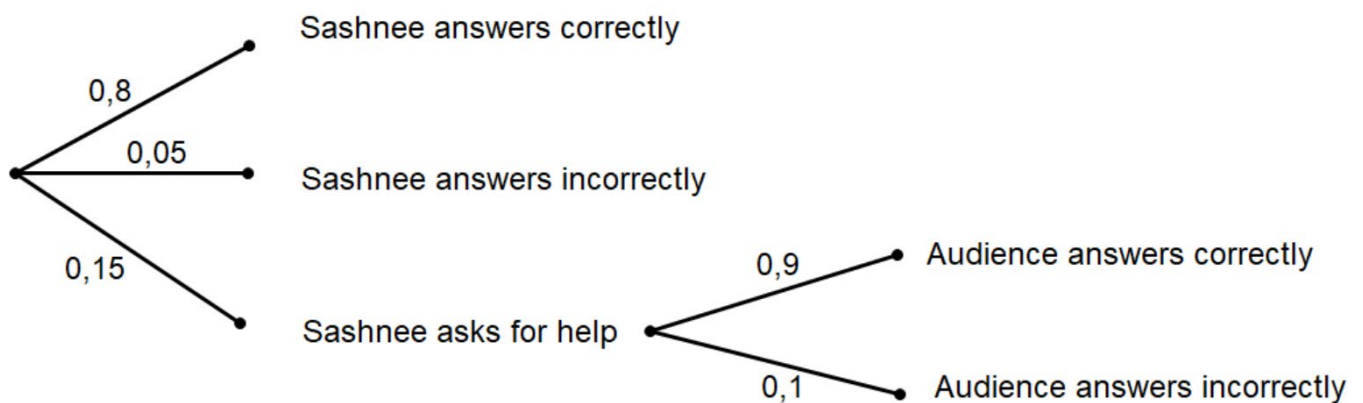
[6]

QUESTION 8

Sashnee is attempting the *Who Wants To Be A Millionaire* TV quiz. He has to answer questions one after another. The quiz ends when a question is answered incorrectly.

- The probability that Sashnee, himself, gives the correct answer to any question is 0,8.
- The probability that Sashnee, himself, gives a wrong answer to any question is 0,05.
- The probability that Sashnee decides to ask for help for any question is 0,15.

On the first occasion that Sashnee decides to ask for help, he asks the audience. The probability that the audience gives the correct answer to any question is 0,9. The information is shown in the tree diagram below.



- 8.1 Find the probability that the first question asked is correctly answered. (4)
- 8.2 On the second occasion that Sashnee decides to ask for help, he phones a friend. The probability that his friend gives the correct answer to any question is 0,7. Looking at all the possible options, calculate the probability of getting the first two questions correct. (8)

[12]