NAME .....STREAM .....

MENGO SENIOR SCHOOL
END OF TERM TWO ASSESSMENT 2025
SENIOR FIVE APPLIED MATHEMATICS (PAPER B)
TIME 3HOURS

INSTRUCTIONS

Attempt **all** the **eight** questions in **SECTION A** and attempt **three** from **SECTION B**, choosing **one** from **each** of the three **parts** of **SECTION B**

SECTION A
(Attempt all the eight questions)

1. The table below shows the grades that Allen got in the six tests she did in mathematics and Physics

Subject	G	R	A	D	E	S
Maths	B	E	D	A	C	A
Physics	A	F	E	C	D	B

By calculating the Spearman's rank correlation coefficient, comment about the correlation between the subjects

2. A bus and a taxi are travelling with velocities $(6\boldsymbol{i} - 6\boldsymbol{j} + 3\boldsymbol{k})ms^{-1}$ and $(4\boldsymbol{i} + a\boldsymbol{j} + (a+3)\boldsymbol{k})ms^{-1}$ Find the possible values of a if the two vehicles have the same speed
3. Two types of emails A and B are sent to customers. The probability that:
   a customer received only one of these emails is $\frac{11}{30}$
   a customer received none of these emails is $\frac{3}{10}$
   never received email B is $\frac{7}{15}$
   Find the probability that a customer received
   (i) Both emails (ii) email A
4. In an attempt to determine the height of a building, Dibya throws a stone vertically upwards with a speed of $25ms^{-1}$ from the top of the building and it takes 6 seconds to reach the ground.
   Find the (i) height of the building (ii) time taken to reach the maximum height
5. A student has two alternative routes M and N to reach school. The probability that he student passes through M is 0.6 and that he passes through N is 0.4, The probability that he arrives to school late given that he passed via root M is 0.16 and the corresponding probability if he passed via route N is 0.06. Find the probability that

(i) he arrived to school late
(ii) he passed via route N given that he never arrived late to school

6. Three forces of magnitudes 12N, 12N and P N acting in the directions $S30^0E$, due west and $N\theta^0E$ respectively, cause a body to move in the direction $N30^0E$ with an effective force of $10N$. Find the values of P and θ

7. The mean and standard deviation of the monthly salaries of the employees of a certain company are sh 400,000 and sh 10,000. If each one's salary is increased by 30% plus a basic pay of sh 150,000, determine the new mean and standard deviation

8. Ssali walks for 3.5 $hours$ at a constant speed of $4kmh^{-1}$ due west from town A to town B, then walks for 1.5 $hours$ at a constant speed of $32kmh^{-1}$ due north to town C. What is the magnitude of his average velocity for entire journey A to C?

SECTION B

Attempt three questions from this section

PART I

(choose one question from this part)

9. Traffic officers measured the speeds of 60 vehicles on the road where the speed limit is atleast $47kmh^{-1}$ but not exceeding $70kmh^{-1}$. The speed limit data was grouped as shown below

~~Marks~~ Speed	20−< 30	30−< 35	35−< 45	45−< 55	55−< 60	60−< 75	75−< 80
Number of vehicles	10	6	4	13	8	12	7

Tasks

Help the officers to

(a) Calculate the (i) average speed (ii) most frequent speed on the road

(b) Draw a suitable graph and use it to determine

(i) The percentage of drivers who comply with the speed limit

(ii) The number of drivers who are too fast

10. The table below shows the data collected by a concerned citizen in a certain area about the number of vehicles (x) bought in the area and the number of accidents

x	35	65	80	90	85	65	50	75	80	60	70	45
y	41	32	21	22	26	30	38	28	31	35	29	43

The citizen wishes to

(i) Determine the correlation between x and y using Kendall's correlation analysis

(ii) Estimate some unknown values using a suitable graph

Tasks

a. **By calculating Kendall's correlation coefficient, state the nature of the correlation between x and y**

b. Using a suitable graph determine

(i) x when $y = 25$

(ii) y when $x = 82$

PART II

(choose one question from this part)

11. A study was conducted to examine two **independent** preventive actions A and B where

Event A is 'a person is vaccinated against a new virus'

Event B is 'a person wears a mask regularly'

The probability that a person is both vaccinated and wears a mask is twice the probability that the person is **only** vaccinated. The probability that a person is either vaccinated or wears a mask is $\frac{71}{75}$

Tasks

(a) Explain to someone who does not understand probability symbols, the meaning of

(i) $P(A' \cap B')$ (ii) $P(A \cap B')$

(b) Prove that A' and B' are also independent

(c) By determining the individual probabilities of $A$and B state with a reason which action is most likely taken by the people of the area

(d) What percentage of people take **only** one of the preventive actions?

12. *Lec Tech company LTD* deals in computers and their major parts namely *The CPU* (C), *The Monitor* (M) and *The Key board* (K). Experience has it that, on delivery, experience has it that, the probability that C works correctly is 0.98, the probability that M works correctly is 0.95 and the probability that K works correctly is 0.97

Given that

p_3 is the probability that all the three parts work correctly

p_2 is the probability that only two of them work correctly

p_0 is the probability that none of them works correctly

The procurement manager of the company will make a new order if

$p_3 \leq 0.9$ or $p_2 \leq 0.09$ or $p_0 \geq 0.1$

To maintain the quality of the employees, the employees regularly answer questions which are randomly and automatically generated by the computer. The probability that first question is answered correctly is 0.75. If a question is answered correctly, the probability of answering the next question correctly reduces by 0.05 but if question is answered wrongly, the probabilities of answering the next question remain unchanged.

Tasks

By determining

(a) the probabilities p_3, p_2, p_0 state whether or not the manager should make a new order of the computer parts

(b) the probability that second question is answered correctly and the probability that third question is answered correctly, explain to the manager which of the questions 1^{st}, 2^{nd} or 3^{rd} that is most likely given a correct response to.

PART III

(choose one question from this part)

13. A traffic police officer is monitoring a highway when an overloaded taxi travelling at $90kmh^{-1}$ passes him at point A. Two seconds later the officer starts his car from rest and begins the chase accelerating uniformly at $6ms^{-2}$, until the police car catches up with the taxi at B.

After meeting at B, the officer suddenly applies the brakes and decelerates uniformly at $12ms^{-2}$ until it comes to rest at C, while the taxi keeps going at the same speed for 3 more seconds and then applies the brakes and decelerates uniformly for a further 6 seconds before coming to rest at C

For record purposes, just in case there is need to invoke the law, the officer needs to take of all the necessary information

Tasks

Help the officer to provide the following

(a) How long does it take the police car to travel from A to B

(b) Determine the distance AB

(c) At what speed was police travelling when it just reached at B?

(d) How long does the police car take to travel from B to C?

(e) At what rate did the taxi decelerate before coming to rest at C?

14. An engineer is designing a steel rectangular gate frame ABCD for a drawbridge system. The frame has dimensions AB = 4m and BC = 3m. various mechanical forces due different sources of magnitudes 9N, 3N, 8N, 12N and 30N act along AB, BC, CD, DA and AC respectively in the directions given by the order of the letters. Take AB and AD as the reference axes

Task

By writing each of the forces into vector form, help the engineer to determine the magnitude of one single effective force acting on the frame and the direction in which the frame will move if nothing is done to stop it.

END