

NAME _____ STREAM _____

MENGO SENIOR SCHOOL
TERM TWO STARTING POINT ASSESSMENT
SENIOR FIVE MATHEMATICS, 2025

TIME: 3 HOURS

INSTRUCTIONS

Attempt ALL items in this paper

1. a) Three school clubs ; Drama, Science, and Maths are raising funds for a joint event. The following information is noted by the treasurer:
The total amount of money raised by all three clubs is Shs.600000. The Science club raised Shs.50000 less than the Drama Club and the product of the amounts raised by the Drama and Maths clubs is "two hundred fifty" squared, times the total amount contributed by the three clubs. Teachers of these clubs also added their contributions and it was found out that the Music, Science, and Maths teacher contributed two fifths, three quarters and a third respectively of what their respective clubs had contributed.
Help the Club patron to find out the exact amount of money that was contributed by each teacher given that no club contributed more than twice the other.
- b) Josephine is helping her community to set up solar panels in a rural village. Each panel generates power based on the formula: $P = k(2^{0.5t})$ watts, where ; P is the power output after t hours of sunlight, k is a constant depending on the panel type. She installs one panel and observes that after 4 hours of sunlight, the output 40 watts.
 - i) After how many hours will the pannel produce 160 watts?
 - ii) How much power had the pannel produced after 1 hour, write your answer in the form of \sqrt{a} .
2. Teacher Walugembe conducted a Mathematics test for a class of 50 students. After marking, he recorded the scores out of a mark equivalent to the total number of students in the class. The scores for the first 10 outstanding students whose marks were above 75% were recorded as; 43, 42, 43, 46, 45, 38, 38, 39, 40 and 38.
Scores for the remaining students were grouped and summarised in the

table below

Marks	0-5	6-9	10-14	15-17	18-20	21-25	26-29	33-37
Frequency	1	3	7	8	5	4	6	3

- a) Help Teacher Walugembe to find the differences between each corresponding pairs of scores for the measures of central tendencies between outstanding students and the rest of the students
- b) If all the students who scored 64% and above passed the test, find the number of students who scored between the average mark and the passmark
- c) Determine the highest mark for one to be rewarded if the last 12 students were rewarded as a sign of motivation by the teacher.
- d) determine the least mark that was considered for one to be given a scholarship if 30% of the students qualified.
3. a) Sam, Peter and John earn a living from pulling stones right a way from a quarry to customer's desired destinations with aid of ropes. One day, Sam and Peter pulled a heavy stone with aid of two ropes in the directions $N\beta^0W$ and $N\theta^0E$ respectively. The tensions in Sam's rope and Peter's rope T_1 and T_2 respectively. At some point, the two were exhausted and could not proceed with the task. John had to come in to do the equivalence of the job alone taking the stone to the destination using his rope with a tension T .

Task:

- i) Show that

$$T_1^2 + 2[T_2 \cos(\beta^0 + \theta^0)]T_1 + (T_2^2 - T) = 0$$

- ii) If John's rope was inclined at λ to Sam's initial rope direction, Show that

$$\tan \lambda = \frac{T_2 \sin(\theta^0 + \beta^0)}{T_1 + T_2 \cos(\theta^0 + \beta^0)}$$

- b) Three timber pieces on a roof are concurrent. The timber pieces are represented by vectors

$$\vec{AB}, \vec{AC}, \vec{AD}$$

respectively. A painter was instructed by the engineer to paint the three pieces of timber following a particular criterion to ease his future reference. Any two timbers which are perpendicular must get some red colour, any two inclined at an acute angle had to receive some blue

colour and any two inclined at an obtuse angle to receive some yellow colour.

Task

Help the painter to determine the different colour blends that must be painted on each of the three timber pieces.

Take the vectors;

$$\vec{AB} = \begin{pmatrix} 2 \\ -5 \\ 1 \end{pmatrix}, \vec{AC} = \begin{pmatrix} 6 \\ 2 \\ -2 \end{pmatrix}, \vec{AD} = \begin{pmatrix} 4 \\ 2 \\ -1 \end{pmatrix}$$

4. In a farming village, a group of young people use a solar-powered computer system to keep track of how much information (in gigabytes) they store every month. The amount of data after t weeks is given by the rule $P(t) = 2^{0.5t+3}$, one evening, the group checks a computer report and finds the following log entry; $\log P(t) = \log 8 + \log 10^{\sqrt{t}}$. Later, one of the students, Henry finds another part of the report that includes this strange expression $\sqrt{35 + 8\sqrt{6}}$. He is to simplify it into a summation of two different square roots.
- a) Help the group to interpret the log entry by giving them the exact values of t to the nearest years hence comment on your answers.
- b) Write down the simplified expression as the summation of two positive square roots hence write down the product of the numbers in the square roots
5. The overall average marks of students in S.3 class of a certain school in End of Term 1, 2025 were organised and shown in the table below.

Marks(%)	0 – < 30	– < 40	– < 55	– < 60	– < 80	– < 90	– < 95
Number of students	14	21	35	30	23	8	2

a) In order to improve performance, outstanding performers are rewarded and the school administration awards full bursaries to all students who score an average of at least 86% and half bursaries to students who score a average of at least 74% and less than or equal to 85%. The school administration organises a change of Grades Meeting (CHOGM) with the parents of the students with an average score of less or equal 50% to discuss the issues of helping these students perform better in the following term.

Task

- a) Help the administration to determine;

- i) number of students whose parents will be invited for CHOGM meeting
 - ii) number of students who qualify for half and full bursaries respectively
 - iii) mark scored by most students in the class
 - iv) any two measures of dispersion.
6. An information security analyst designs a system where encryption keys are generated using interactions of periodic functions $\cos 2x = \sin 3x$ where x is an acute angle. If in addition the analyst combines two sine waves to create a specific audio effect . The combined signal is modelled by; $y = \sin(x) + 2 \cos(x)$. This signal is used to modulate volume for background alarms.
- a(i) Determine the possible values of x for the periodic function
 - ii) determine the x -values at which the sound waves cross the horizontal axis, Take $-180^\circ \leq x \leq 180^\circ$
 - b) A robot arm moves such that the position of its end is described by; $x = a \sin \theta, y = b \cot \theta$ where θ is a rotation angle and a, b are constants.
 - a) Show that $x = \pm \frac{ab}{\sqrt{b^2 + y^2}}$
 - b) Given that at a certain point, $a = \frac{5}{3}, b = 6$, determine the smallest reflex value of θ if $xy = 8$.

ENJOY