

HAMZA ISLAMIC SECONDARY SCHOOL - LUWEERO

S.6 SUBMATH ASSESMENT

MID-TERM ONE 2026

TIME: 3 HOURS

INTRODUCTIONS:

The paper consists of 6 items.

The paper has of four sections; A, B, C and D.

Section A and B are compulsory.

Answer four items in all choosing one from each section.

SECTION A

Item one

A group of tourist is stranded on a small island at point P in the Nile. A rescue boat starts its journey from base station at the Origin (0,0). The position of the island relative to the base station is given by the vector $OP = \begin{pmatrix} 12 \\ 5 \end{pmatrix}$ in km. Another rescue team is Patrolling a long straight path from point A to point B. Point A has a position vector $a = 3i - 2j$ and point B has a position vector $b = -i + 6j$ where units are in KM. A Helicopter is sent to point R such that $OR = OA + mAB$ to wait from there.

Task

- Determine the vector AB representing the patrol path of the second team
- Calculate the magnitude of the displacement from the base station to the island.
- Find the value of the scalar m if the helicopter is to be positioned such that its displacement from OR is perpendicular to the patrol path AB

SECTION B

Item two

You have a special tool that tells you the slope of a ramp at a point along the ground. The tool shows that the slope(s) changes basing on the distance (x) like this. $S = .x^2 - 2x + 4$

To build the ramp, you need to find its height (y) and you know that when the distance is 0 (x=0), the ramp is exactly 1 meter high (y=1).

Task

Find the equation for the height of a ramp. (Hint solve the D.E)

SECTION C

Item three

A local NGO is installing solar powered water pumps in a village in LUWEERO.

The power output, P (in km) and the cost of maintenance C (in millions), are determined by the length of the solar panel, x(in meters). The cost C is calculated using the formulas $C = \sqrt{75x} - \sqrt{27x} + \sqrt{12}$.

The power generated P follows the quadratic model $P = x^2 - 10x + 24$

The number of years(T), the panels remain efficient is given by the logarithmic equation $\log_2(T+2) + \log(x) = 5$.

Tasks

- Simplify the expression for C into the form $a\sqrt{3}x + b\sqrt{3}$ hence start the values of a and b.
- Find the two possible lengths (x) of the panels for which output P is exactly 0 kilowatts (break even point).
- using the larger value at x found in (b) above, calculate the number of years (T) the system will remain efficient.

Item four

At the annual science fair, the science club sells 10 tickets on the first day and increases sales by 5 tickets each following day.

They have also organized competition where by they need to choose a committee of 5 students from a group of 8 boy and 6 girls to act as judges.

During the competition they are to be given a word'' MATHEMATICS'' to write the number of ways it can be arranged basing on the competition guidelines.

Task

As a sub math student at your school, help them to:

- a) (i) Determine the number of tickets sold on the 12th day.
(ii) Determine the total number of tickets sold over 20 days
- b) Choose a committee of exactly 3 boys and 2 girls.
- c) Determine in how many ways letters the above word can be arranged in arrow
 - i. Without restrictions
 - ii. If E's are kept together
 - iii. If E's are separated.

SECTION D

Item five

A math teacher wants to see if students who score high in algebra(x) also perform well in calculation (y). To check this he records the final marks at 10 students in both constructs to see if there is a correlation between the two.

Students	A	B	C	D	E	F	G	H	I	J
Algebra	25	20	40	28	21	31	36	29	33	24
Calculus	30	20	40	28	22	35	35	27	31	23

Task

As a math student, help the teacher to:

- a) Plot the data on a suitable graph

- b) Draw a line of best fit and estimate Algebra score for a student who scored 37 in calculus.
- c) Compute the rank correlation coefficient and explain to the teacher what the answer means for the school's curriculum.

Item six

A class of 55 students sat for a math test and results were recorded in the following table.

Marks	10 -	20 -	30 -	40 -	50 -	60 -	70 -	80 - ≤ 90
Frequency	2	6	12	15	10	6	3	1

Then the marks were normally distributed. The teacher wants to know the number of students who got over 65 the mean mark.

Task

Help the teacher to determine;

- a. The mean mark
- b. The standard deviation

C(i) Find the probability that a student picked at random scored 52.8 or less marks

(ii) the number of students who scored over 55 marks.

END