JINJA MODERN VOCATIONAL AND SECONDARY SCHOOL

Senior Five End of Term One Mathematics Paper 1 2026

2 Hours and 20 minutes

Instructions

- *This paper consists of three (3) sections; A, B and C with a total of five examination items.*
- *Section A is compulsory, Attempt one item in section B and one item in Section C.*
- *All in all, a total of 3 items should be attempted. Any additional item(s) attempted will not be given any score(s).*
- *Begin each item on a fresh page and clearly number them as they appear in the examinations paper.*
- *Silent, non-programmable calculators and mathematical tables are allowed. Where necessary, graph paper is provided.*
- *Tidy handwriting, clear presentation of work and meaningful mathematical judgements or conclusions will increase your chances of excelling*

SECTION A

This item is compulsory

Item 1

Alice, a farmer in Mbale district is planning to plant sorghum in parallel lines. The first proposed line is to pass through the earth coordinates (10, 50) and (30, 10), while the second line is to pass through the earth coordinates (15, 60) and (25, 40). However, she is not sure whether these lines are actually parallel to each other.

To ensure access to sunlight a reasonable distance between these lines is needed. The minimum distance needed between them is 100 cm, but Alice does not know if the given coordinates do not meet this requirement.

Task

Help Alice find

a) The equations of the first and second lines. Convince Alice that these lines are surely parallel to each other.
b) Whether Alice should increase the distance between these lines.

SECTION B

Item 2

There has been a scout's camp at your school and one of the activities is treasure hunt. To find the treasure, the scouts are required to solve the following statements in order to generate a 4 digit passcode key to open the treasure box;

- $2^{2x} + 2 = 3 \times 2^{x}$ **statement one**
- $\frac{3\sqrt{2}-2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}}$ **statement two**

Rules of the game:

1. Solving for values of x in **statement one** generates the first two digits of the passcode with the **least number** in the solution in **position one**.
2. Expressing the second equation in the form of $\boldsymbol{a - b\sqrt{c}}$ generates the **third digit as value of $\boldsymbol{a}$** and **fourth digit as value of $\boldsymbol{b}$**

Assuming you manage to open the treasure box and you find the following note;

"If $\boldsymbol{\log_a n = x}$ and $\boldsymbol{\log_c n = y}$ prove that $\frac{x-y}{x+y} = \frac{\log_b c - \log_b a}{\log_b c + \log_b a}$ to take the treasure"

Tasks

a) As the scout's leader help your team members to come up with the four digit passcode key
b) Pave all the possible ways to see that your team takes the treasure.

Item 3

The National Water and Sewerage Corporation (NWSC) is designing a water distribution system for three neighboring communities in Mitooma district. Each community has different water requirements and infrastructure constraints. A consultant engineer working on this project wants to determine the optimal flow rates for each community. The water distribution system is modelled by the following equations;

$\boldsymbol{x} + 2\boldsymbol{y} + \boldsymbol{z} = 2400$ *(Total available water supply in litres per minute)*

$2\boldsymbol{x} + \boldsymbol{y} + 3\boldsymbol{z} = 3900$ *(Pressure balancing Equation)*

$3\boldsymbol{x} + 4\boldsymbol{y} + 2\boldsymbol{z} = 5100$ *(Flow optimization Equation)*

Where x, y and z represent the flow rates in litres per minute in communities A, B and C.

The polynomial equation; $P(x) = x^3 - 7x^2 + 14x - 8$ models the operational efficiency of the pumping systems to be used.

Tasks:

a) Help the Engineer to determine the optimal flow for each community.
b) If the community A's water requirements increase by 200 litres per minute, what adjustments should be made to other communities to maintain the system balance?
c) Determine all the possible values of where the efficiency of the pumping system is zero

SECTION C

Item 4

A farmer in Mukono wants to create a rectangular enclosure for chickens next to a long, straight existing wall. He has 100 meters of fencing wire available for the other three sides of the rectangle. He wants to maximize the area enclosed for his chickens. Let the side parallel to the wall have length *x* meters, and the other two sides perpendicular to the wall have length *y* meters each.

Tasks:

a) Help the farmer to express the total length of the fencing used in terms of *x* and *y* and formulate an equation based on the available wire.
b) Express the area A of the enclosure (A = *xy*) as a function of only one variable *x*. Hence, find the value of *x* that maximizes the area.
c) Determine the maximum possible area of the enclosure and confirm it is a maximum.

Item 5

A scientist has a spherical balloon is which being inflated. Its radius *r* is increasing at a constant rate of 0.1 cm per second. The volume of a sphere is given by $V = \frac{4}{3}\pi r^3$. He wants to find the rate at which the volume is increasing when the radius is 5 cm. He also wants to estimate the approximate increase in volume as the radius increases from 5 cm to 5.1 cm.

Tasks:

a) Help the scientist to determine the rate at which the volume of the bowl is changing with respect to the radius.
b) Determine the rate at which the volume is increasing when the radius $r = 5$ cm.
c) Estimate the approximate increase in volume (δV) as the radius increases from $r = 5$ cm to $r = 5.1$ cm.

END