

P425/1.

Principal Maths.

13th July 2026.

3 Hours.

GANGU SECONDARY SCHOOL
UGANDA ADVANCED CERTIFICATE OF EDUCATION
S.5 MID TERM TWO ASSESSMENT 2026
PRINCIPAL MATHEMATICS

PAPER 1

Time: 3 Hours.

INSTRUCTIONS TO CANDIDATES:

This paper consists of two sections **A** and **B**.

Section A has Seven Items, **Attempt ALL**.

Section B has Five Items, **Attempt Any Three** of your choice.

Any additional item(s) answered will not be marked.

All answers must be written in the answer sheets provided.

Begin each item in section B on a fresh sheet.

Silent non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

SECTION A (40 MARKS).

ITEM 1

Timothy and Sharon are in a relationship but when he tried to ask her age, Sharon just wrote a simple note “add 18 to the value of x after solving the equation $2^{2x} - 252(2^x) - 1024 = 0$ ”. Two weeks have passed now and Timothy does not know Sharon’s age.

He is approaching you as a math student today, please rescue him.

ITEM 2

During the installation of electric poles along a straight line, Mr. Kaddu an electrician remembers the first two coordinates as (1, 5) and (-2, -4). However, for the third pole, he is unsure of the vertical positioning and writes the coordinate as (4, w).

Help Mr. Kaddu determine the exact value of w .

ITEM 3

A structural engineer calculates a load stability factor represented by the expression $7 + 4\sqrt{3}$. To optimize the safety blueprint, she needs to find the square root of this value. Help the Engineer without using a calculator, verify that real numbers have two square root values by finding the exact square roots of $7 + 4\sqrt{3}$.

ITEM 4

A laboratory computer tracks chemical reaction rates using the polynomial model $P(x) = ax^2 + 3x + b$. The system reports that dividing $P(x)$ by $(x - 1)$ leaves a remainder of 16, while dividing it by $(x - 2)$ leaves a remainder of 34. Find the constants a and b , and calculate the remaining rate value when the model is divided by $(x + 3)$.

ITEM 5

An agricultural researcher modeling the growth rate of two different crops in Wakiso District establishes two growth indicators, n and m , related to a soil nutrient factor x such that:

$$n = \log_5 x \text{ and } m = \log_{15} x$$

Without using a calculator or mathematical tables, prove that the efficiency balance index of the crops, given by $\frac{n+m}{n-m}$, simplifies exactly to $\log_3 75$.

ITEM 6

A telecom drone inspecting a signal tower in Masaka measures the angle of elevation to the top of the tower as θ . A software analyst notes that the height safety index of the setup satisfies the equation $\sqrt{3} \tan \theta - 1 = 0$

Without using a calculator or mathematical tables, determine the exact angle of elevation θ . in the range $0^\circ \leq \theta \leq 90^\circ$.

ITEM 7

An agricultural analyst uses quadratic equations to model crop yield variations under different soil conditions. Without calculating the roots themselves, use a valid mathematical condition to predict the nature of the variations for each of the following model equations:

(i) $2x^2 - 3x + 7 = 0$

(ii) $x^2 - 7x = 12$

(iii) $25x^2 + 4 = 20x$

SECTION B (60 MARKS).

ITEM 8.

Nabuuma is a S.5 Geography student who analysed that the road from the school gate to her class is given by the equation $3x - y = 9$ whereas that from her class to the staffroom is represented by the equation $x + 2y + 4 = 0$. She also found out that the school library is located at a coordinate $(5,1)$ and that the road joining the library to the head teacher's office is elevated at an angle of approximately 45° with the horizontal ground.

Tasks

As a mathematics student with the knowledge of geometry help Nabuuma to;

- determine the coordinate for the location of her class.
- calculate the distance between the library and her class.
- find the perpendicular distance of the library from the road joining her class to the staffroom.
- obtain the equation that represents the road from the library to the head teacher's office.

ITEM 9.

a) Kigozi, a telecommunications engineer, is setting up a guy-wire to support a new network mast in Masaka. For maximum structural stability against heavy winds, the angle of inclination θ that the wire makes with the horizontal ground must satisfy the specialized engineering balance equation:

$$2\operatorname{Cosec}^2\theta + \cot\theta = 5$$

The field technician argues that setting the wire at an acute angle of 30° is completely sufficient.

Without using a calculator or mathematical tables, reduce this balance equation into a single quadratic function, determine all possible exact values of the inclination angle θ in the range of $0^\circ \leq \theta \leq 180^\circ$, and explicitly analyze the validity of the technician's claim.

b). To ensure precise calibration of the network equipment, technicians are required to memorize the geometric origins of standard trigonometric ratios without relying on memory tricks or devices.

By considering an equilateral triangle of side length 2 units split symmetrically down the center, prove from first principles that $\cos(30^\circ) = \frac{\sqrt{3}}{2}$ and $\cot(60^\circ) = \frac{1}{\sqrt{3}}$

Hence, without using a calculator or mathematical tables, evaluate the exact numerical values of $\cot(450^\circ)$ and $\cos(-210^\circ)$ to assist the engineering team with manual positioning.

ITEM 10.

Coffee is one of the main cash crops in Uganda, during the recent NRM party primaries in Masaka a contestant suggested that a land of 946400 Km^2 can be used following the partial fractions of;

$$\frac{11x + 12}{(2x + 3)(x + 2)(x - 3)}$$

and that the two positive partial fractions should be added and used for growing c and the remaining one has a negative sign meaning it is not for farming but house construction.

Tasks

- Express the fraction above into its partial fractions
- Put $x = 5$ and obtain the real fractions for growing coffee and house construction
- Determine the exact land in Km^2 meant for growing coffee and house construction
- Obtain the remaining land in Km^2 and with a reason suggest any activity that can be done on it.

ITEM 11.

A boat is sailing along a straight horizontal path directly towards a vertical cliff. From an initial position, the angle of elevation to the top of the cliff is measured as 10° . After the boat sails a distance of 50 metres closer to the cliff, the angle of elevation increases to 15° .

A football is kicked from ground level and just lands on top of a flat roof that is 5 metres high. To find the launch trajectory angle θ , Ahmed uses projectile motion principles to derive a safety clearance formula: $2 = 4\tan\theta - \sec^2\theta$. He is curious about the angle the ball was kicked at, with $0^\circ \leq \theta < 360^\circ$.

Tasks:

- Show that the height of the cliff is approximately $h \approx 25.783\text{m}$
- Help determine the possible angles.

ITEM 12.

BIGLAD farm located in Fort Portal is among the best producers of eggs and quality chicken in Uganda, its managing director Manyindo Allan has already received orders from three clients for the next month as illustrated below;

EVENT	Trays of eggs.	Number of Cocks.	Number of Hens.	Amount (UGX)
Joan's graduation.	5	3	6	405,000
Albert's wedding.	30	53	19	3,495,000
Seraphina's Birthday	12	9	5	771,000

Another client Henry submitted an order on only cocks for his “kuhingira ceremony”, and he just wrote a mathematical statement to the director reading

$$\log_2 x - \log_x 8 = 2$$

Note that the BIGLAD farm sells a whole chicken not just part!

Tasks:

- Make analysis to enable the clients know the costs of one tray of eggs, a cock and a hen.
- Help Mr. Manyindo to know the exact number of cocks that Henry wanted.
- Compute the amount that Henry will pay to the director.

END.

“The only way to learn mathematics is to do mathematics.”

— Paul Halmos.