BE TRUE

PRE-REGISTRATION EXAMINATIONS, 2024

Uganda Certificate of Education

MATHEMATICS

TIME: 2 ½ HOURS

INSTRUCTIONS TO CANDIDATES

- ✓ *Attempt* **Four** *questions in this paper.*
- ✓ *Question* **One** *under Part I is compulsory,*
- ✓ *Attempt any* **One** *question from each Part (theme).*
- ✓ *All working* **must** *be shown clearly*
- ✓ *Begin* **each** *answer on a fresh sheet of paper.*
- ✓ *No paper should be given for rough work.*
- ✓ *Mathematical tables with list of formulae and squared paper are provided.*
- ✓ *Silent non programmable calculator may be used.*

Part I   (Numbers)

1.   (a)   The school plans to hold a Parents meeting and it expects 1000 parents.
It plans to hire tents of capacity 50 sitters, they are to serve soda, a boiled egg
and a piece of chicken.
A tent is hired at sh. 100,000, a crate of soda has 24 bottles and costs sh.20,000, a
tray of eggs consists of 30 eggs, each tray is at sh. 10,000, a chicken consists of 6
pieces, and each chicken costs sh.10,000.
As a senior four student, using a knowledge of number bases, help the school
come up with a budget flame work for the event.

(b)   Alex feeds the expression below in his calculator that solves equations.

$$32^x \times \frac{1}{8} \times 4^{x+3} = 2^{24}$$, but before the answer could be displayed, the calculator

blacked out. Alex got stuck. Guide Alex through the procedure and obtain the
value of x that will be displayed on the calculator's screen.

(c)   the calculator recovered but some parts of the screen were showing partial digits.
He used the same calculator and feed in the surd expression $\frac{1}{\sqrt{2}} - \frac{\sqrt{2}+1}{1+3\sqrt{2}}$ and the
result was given in the form in which a and b were partial digits and not clear
$a\sqrt{2} + b$, what are the exact values of a and b?

Part II   (Geometry and Measure)

2.   Bbula is an island found on lake Zzibi, there has been a serious problem of poor network
on the island for a long time. The government together with the Network providers are
planning to establish a Mast with the frequency that can cover the whole island.
According to Engineers, the island is in a shape of a triangle ABC with $AB = 10km$ as
the main landing site. Side $BC = 8km$ and $AC = 6km$.

(a)   By scale drawing, help Engineers to come up with an accurate drawing of the
island and use it to find;
(i)   The angle ABC
(ii)   Given that the Mast must be established where two perpendicular bisectors
meet, establish with point M where the mast must be and find its
perpendicular distance from the main landing site.
(iii)   It is known that the frequency must cover the island, draw the locus of the
frequency and measure its radius.

(b)   Two points P and Q are 1000m apart. The angles of elevation of the top of the
Mast from points P and Q are 60° and 30° respectively. Calculate the height of
the Mast if;
(i)   The points are on the same side of the Mast
(ii)   The points are on opposite side of the Mast.

3. (a) A senior four student, was given three points A(4,0), B(0,3) and C(4,3) of a triangle ABC and asked to enlarge by both a scale factor 2 and a scale factor -2 on the same axes with the center as the origin, the learner could not distinguish between a positive and negative scale factor! Guide the learner through and state the images;

        (i) Of triangle $A_1B_1C_1$, scale factor 2

        (ii) Of triangle $A_2B_2C_2$, scale factor -2

        If triangle $A_1B_1C_1$ is an image of triangle $A_2B_2C_2$ under enlargement, state the center and scale factor of enlargement.

    (b) You are given two cylinders one of length 12cm and volume $630cm^3$, another with length 14cm and volume $420cm^3$.

        State with reasons whether the cylinders are geometrically similar.

        What would have been the volume of the smaller one for the cylinders to be similar?

Part III   (Patterns and Algebra)

4. In a Physics practical attempted by a senior four class, The force Y needed to move the load X by a machine is determined by a law $Y = aX + b$, where a and b are constants. The table below shows results which were obtained by one of the students.

Load (X)	1	2	3	4	5
Force (Y)	4	4.8	5.5	6.7	7.2

    (a) Plot the scatter diagram from the table above i.e Force (y) against the Load (x)

    (b) Draw the line of best fit and use it to find;

        (i) The Force corresponding to a Load of 3.5

        (ii) The load corresponding to a force of 6.2

        (iii) The Force corresponding to the load of 0 (zero)

    (c) Take any two points on the graph and use them to find the slope/gradient of the line of best fit.

    (d) Compare your findings with the equation of the form $y = mx + c$, hence find the law connecting Y and X, where $a = m$ and $b = c$ and state $Y = aX + b$.

5. During football training, the coach marked three points on the ground forming a triangle OPQ, he labelled displacement OP as vector **p**, and displacement OQ as vector **q**. He further marked point R on OQ such that $OR:RQ = 3:1$, and S on OP such that $OS:SP = 1:2$. He stationed point T as the point of intersection of PR and SQ.

    (a) Using the knowledge of vectors, express PR and QS in terms of vectors **p** and **q**.

    (b) Given that $\textbf{\textit{PT}} = \lambda\textbf{\textit{PR}}$ and $\textbf{\textit{QT}} = \beta\textbf{\textit{QS}}$, express OT in terms of ;

        (i) λ , **p** and **q**

        (ii) β , **p** and **q**

    Hence find the value of λ and β

    Determine the ratios in which T divides SQ and PR.

PLEASE TURN OVER

Part IV   (Data and Probability)

6.   A private company was hired to administer an interview for World Food Program. 50 candidates sat for an aptitude test which was made up of Sections A, B and C. Two candidates did not attempt any question from any of the three sections. Three attempted questions from section A only, five from section B only four from section A and C only while 5 attempted questions from all the three sections. Those who attempted questions from A and B only were 3 less than those who attempted questions from sections B and C only and three times those who attempted questions from section C only.

As a senior four student, help;

(a)   Show the above information using an appropriate diagram

(b)   Find how many candidates attempted questions
    (i)   from each section
    (ii)   from section C only.

(c)   If a candidate is selected at random, what is the probability that he or she attempted questions from at least two sections?

(d)   Given that those who attempted at most one question, did not make it to oral interviews, how many candidates were they?

(e)   In your opinion, why do you think the World Food Program hired a private company to carry out interviews?

7.   The table below shows the cumulative frequency of marks obtained by a group of senior four students in a Mathematics test to be presented to the academic committee.
On the day of presentation, the teacher in charge could not make it.
You are asked to analyze the data further for the lay man's understanding with visual aid of a graphical representation.

Marks	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89
Cumulative frequency (F)	18	52	110	152	176	186	192	200

    Carry out the following for the committee

(a)   Find the mean and the modal mark.

(b)   The 80th percentile.

(c)   Draw a cumulative frequency curve and use it to estimate the;
    (i)   median
    (ii)   range of the middle 50% of the marks
    (iii)   number of students who would pass if the pass mark was fixed at 45.

END