456/2
MATHEMATICS
Paper 2
7 August 2023
2 ½ hours

ENTEBBE JOINT EXAMINATION BUREAU

Uganda Certificate of Education

MATHEMATICS

Paper 2

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Attempt **all** *questions in* Section **A** *and any* **five** *in* Section **B.**

Any additional question(s) answered shall not be marked.

All necessary calculations must be done in the answer booklet provided. Therefore, no paper should be given for rough work.

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

Graph papers **are** *provided.*

SECTION A: 40 MARKS

Attempt **all** *questions*

1. $P(-2,0), Q(1,-2)$ and $R(5,1)$ are three of the vertices of a parallelogram $PQRS$

   Find the;

   (i) column vector of $\underline{\boldsymbol{PS}}$ *(02 marks)*
   (ii) coordinates of S. *(02 marks)*

2. If $x * y = xy - (2x + y)$, find $4 * 1$. *(04 marks)*

3. $103n + 26n = 131n$. Find the value of n. *(04 marks)*

4. Express $0.06\bar{3}$ as a rational number in its simplest form. *(04 marks)*

5. Three friends share *shs* x in the ratio 3:4:5. If the smallest share is *shs* 60,000, find x. *(04 marks)*

6. Given $f(x) = \frac{2x+4}{3}$, find $f^{-1}(7)$. *(04 marks)*

7. A map is drawn to a scale of 1:200,000. Find the area in km^2 represented by a rectangle $2cm \times 2.5cm$. *(04 marks)*

8. A car travels $3600m$ in 1 *minute* 48 *seconds*. Calculate the speed in km/hr. *(04 marks)*

9. A television set can be bought for *shs* 1,175,000 paying cash or by a deposit of *shs* 550,000 and 10 monthly payments, first five each of 78,500 and the remaining five each of 70,000. By what percentage does the hire-purchase price exceed the cash price? *(04 marks)*

10. A cylindrical roller has a diameter of $40cm$ and it is $70cm$ wide. Calculate in m^2, the area covered in 100 revolutions. *(04 marks)*

SECTION B

Attempt **five** *questions in this* Section

11. A printing press has two machines A and B. The press is required to print a certain number of advertisement papers. Machine A is working twice as fast as B.

    (a) If the two machines working together for one hour can print 36000 papers, how many papers are printed by each machine in 1 minute?

    (b) If it takes $3hours\ 20minutes$ to complete the job, how many papers were to be printed?

    (c) Unfortunately after $1\ hour\ 45\ minutes$ machine A developed some mechanical problem and stopped working. Machine N had to complete the job. Find the total time that machine B worked to complete the job.

    (12 marks)

12. A random sample of 100 women was taken to find out how many were literate (L), married (M), or had an income generating project (P). The findings were as follows; $n(L) = 47, n(M) = 59, n(P) = 52, n(L \cap M) = 30, n(L \cap P) = 24, n(M \cap P) = 34$. 14 of the women were illiterate, unmarried and without an income generating project.

(a) Find the number of women who were;

(i) literate, married and had an income generating project.
(ii) neither literate nor married.

(b) If a woman is selected at random from the group, find the probability that she belonged literate only or married only or income generating project only. *(12 marks)*

13. Two functions are such that $f(x) = \frac{8}{x} + 4$ and $g(x) = x - 2$.

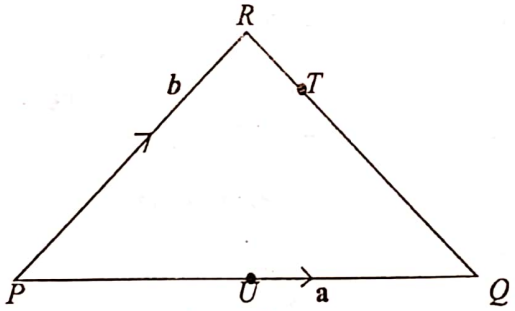
(a) Solve for x if $f^{-1}(x) = g(x)$.

(b) Find $fg(x)$ and $gf(4)$.

(c) Find the value of x for which $f^{-1}(x)$ is undefined. *(12 marks)*

14. In the figure below, vector $PQ = \boldsymbol{a}, PR = \boldsymbol{b}, 2QT = 3TR, PU:UQ = 2:3$.

Fig.1



(a) Find in terms of $\boldsymbol{a}$ and $\boldsymbol{b}$, vectors;

(i) QR
(ii) QT
(iii) PT

(b) Show that UT is parallel to PR. *(12 marks)*

15. In a quadrilateral ABCD, the points A, B and D are at $(3,3), (0,-1)$ and $(6,2)$ respectively. The line BD bisects the line AC at right angles at the point M.

(a) Find the equation of BD and of AC

(b) Calculate the coordinates of M and C

(c) State the name of the figure ABCD. *(12 marks)*

16. The figure represents a rectangular box with square ends PSNK and QRML. Given that $\overline{PK} = 30$cm and $\overline{KL} = 40$cm.

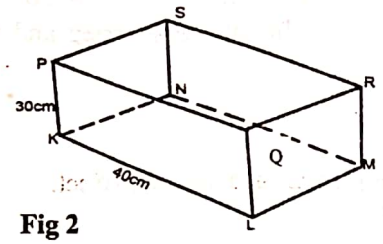


Fig 2

Calculate:
(a) SL
(b) the angle between the diagonal SL and the plane KLMN
(c) the angle between the planes QMS and QRML. *(12 marks)*

17. A man earns a gross monthly income of ***shs*** **875,000**. He is entitled to the following monthly allowance;

Children : ***shs*** **20,000** for each child aged **12** and below
shs **15,000** for each child between age **13** and **19** inclusive.
Lunch : Shs 60,000
Medical : $\frac{1}{10}^{th}$ of gross monthly income.
Transport: Shs 100, 000
Housing : $\frac{1}{25}^{th}$ of gross monthly income
Marriage: $\frac{1}{100}^{th}$ of the gross annual income.

The man is married with five children two of whom are aged 12 and below, the other two aged 20 and 22 and the other aged 17. The following tax structure is applicable on the taxable income in excess of Shs **30,000.**

Taxable income (Shs)	**Rate (%'*ges*)**
1 – 30,000	Free
30,001 – 130,000	8.0
130,001 – 260,000	14.5
260,001 – 380,000	23.0
380,001 – 490,000	28.5
490,001 – 590,000	35.0
590,001 and above	42.5

Calculate;

(a) The man's
  (i) total monthly allowance.
  (ii) monthly taxable income.
  (iii) monthly income tax.

(b) The percentage of his gross annual income that goes to tax. *(12 marks)*

END