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MATHEMATICS
PAPER 2
JULY 2023
2 ½ hours

ASK INTERGRATED TEACHERS' MOCK EXAMINATIONS BURREAU

AITEL JOINT MOCK EXAMINATION

UGANDA CERTIFICATE OF EDUCATION

MATHEMATICS

Paper 2

2 hours 30 minutes

INSTRUCTIONS

- *Answer **all** questions in **Section A** and **any five** questions from **Section B**.*
- *Any additional question(s) **will not** be marked.*
- *All necessary calculations must be shown clearly.*
- *Non- programmable calculators may be used.*

SECTION A : (40MARKS)
Attempt all questions in this Section.

1. Simplify; $\frac{4}{7}+\frac{1}{3}\ of\ \frac{9}{14}\div 3\frac{1}{7}$. (4marks)

2. Determine the range corresponding to the domain $\left\{-\frac{1}{2},0,\frac{1}{2},1\right\}$ for the mapping $x \to 4x+1$. (3marks)

3. Find the equation of a line that passes through the point $(-2,4)$ and is parallel to the line $y-2x=6$. State the y-intercept of the new line. (5marks)

4. $P$and$Q$ are two points with position vectors $\overrightarrow{OP}=\begin{pmatrix}5\\3\end{pmatrix}$ and $\overrightarrow{OQ}=\begin{pmatrix}-2\\5\end{pmatrix}$ respectively. Find;
i) $\overrightarrow{QP}$ ii) the angle $\overrightarrow{QP}$ makes with the x-axis. (4marks)

5. Given that A=$\{Triangular\ numbers\ less\ than\ 25\}$
B=$\{Prime\ numbers\ less\ than\ 20\}$
Find $n(A\cap B)$. (4marks)

6. Muzee sold a bicycle at shs. 150,000, making a loss of 25%. Find the cost price of the bicycle? (3marks)

7. On a map, a swamp of area $75km^2$ is represented by $12cm^2$, find the representative fraction of the map. (4marks)

8. A certain amount of money was shared between Joseph(J), Peter(P) and Zaida(Z) in the ratio 2:3:6 respectively. If Zaida got shs 28,000 more than Joseph how much did Peter get? (5marks)

9. A car covered 60km at a speed of 30kmh^{-1}, and then the next 150km were covered in 1½ hours. What was the average speed for the whole journey? (5marks)

10. The angle of elevation of the top of a building $42m$ tall from a point A, due East of the building is 30^0. Find the distance of point A from the building. (3marks)

SECTION B: (60MARKS)
*Answer any **five** questions from this Section.*

11. a) Given that $P(x)=3x-5$, find $p^{-1}(10)$. (5marks)

b) The functions $h(x) = x + 4, g(x) = x^2$ *and* $f(x) = -2x$. Find the value(s) of x for which $gh(x) = f(x)$. (7marks)

12. Maya SS has 1020 students. According to the school rules and regulations, students should bath everyday(B), wash their clothes every week(W) and iron their clothes(C). During a certain month it was found out that out of 102 senior four students, 41 obeyed B, 35 obeyed W and 52 obeyed C. 9 students obeyed B and W, 10 students obeyed C and W and 24 students obeyed B and C. If 17 students obeyed neither rules,

a) Represent this information on a Venn diagram.

b) From the Venn diagram, find the number of students who;

i) obeyed all the three rules

ii) ironed clothes only

c) If a student is picked at random from senior four, find the probability that he obeyed at least two of the rules. (12marks)

13. Four students; Kale, Linda, Musa and Naana went to a stationery shop.
Kale bought 4 pens, 6 counter books and 1 graph book.
Linda bought 10 pens and 5 counterbooks.
Musa bought 3 pens and 3 graph books.
Naana bought 5 pens,2 counter books and 8 graph books. The cost of a pen, a counter book and a graph book were shs.400, shs. 1200 and shs.1000 respectively.

(a) (i) write down a 4x3 matrix for the items bought by the four students
(ii) write a 3x1 matrix for the costs of each item. (3marks)

(b) use the matrices in (a) above to calculate the amount of money spent by each student. (6marks)

(c) if each student was to buy 4 pens, 10 counter books and 6 graph books, how much money would be spent by all the four students? (3marks)

14. Three solids, a sphere, aright cone and a right cylinder are of equal surface area and the radii of their circular sections are also equal. Given that the volume of the sphere is $288\pi cm^3$. Find the

(i) radius of the sphere.

(ii) height of the cylinder.

(iii)length of the slant side of the cone.

Hence calculate the volume of the

(iv) cylinder

(v) cone. {take $\pi = 3.142$; volume of the sphere=$\frac{4}{3}\pi r^3$; volume of the cone=$\frac{1}{3}\pi r^2 h$; surface area of a sphere=$4\pi r^2$ surface area of a cone (curved surface area)=πrl ;where l is the length of the slant side.} (12marks)

15. A community organization gives the following allowances to its employees.

Transport	40,000/= per month
Insurance	120,000/= per month
Housing	65,000/= per annum
medical	180,000/= per annum
Yaka electricity	20,000/= per month

The tax structure used by the organization is;

Taxable income(sh)	**Rate(%)**
150,001 – 300,000	10
300,001 – 500,000	15
500,001 – 750,000	20
750,001 and above	30

Given that Charles paid *shs* 164,900 of tax, find

a) Total monthly allowances

b) Charles' gross salary
c) The percentage of the gross paid as tax. (12marks)

16. a) Express $\frac{7}{2\sqrt{3}-\sqrt{5}}$ in the form $a\sqrt{b}+c$ where, a, b and $c$are intergers and state the value of b.

b) Find the value of $log_3 27 - \frac{1}{2} log_3 \frac{1}{9} + log_3 81$.

c) Given that $125_n = 85_{ten}$, find the value of n. (12marks)

17.(a) The difference between the values of y when$x = 6$ and when $x = 10$ *is* 16. Given that y is inversely proportional to the square of x, find the equation relating x and y. hence determine the value of y when x is 100 (7marks)

(b) Shs.60000 is to be shared among David, Daniel and Diana. Daniel is to get one and half times as much as David, while Diana is to get three and half times as much as David. Determine the ratio in which the money is to be shared. (5marks)

END