456/2
MATHEMATICS
Paper 1
July/Aug. 2022
2½ hours

HOIMA DIOCESE EXAMINATIONS BOARD

UCE Mock Examination, 2022

MATHEMATICS

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer **all** *questions in section* **A** *and any* **five** *questions from section* **B**.

Any additional questions will **not** *be marked.*

All *necessary calculations* **must** *be done in the answer booklets provided.*

Therefore, no paper should be given for rough work.

Squared papers may be provided.

Neat work is a **must**.

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

Turn Over

SECTION A: (40 MARKS)

Attempt **all** *questions in this section.*

1. Solve for y if; $27^{y+1} = 3 \times 9^{2y}$ *(04 marks)*

2. In a group of 40 students, 14 do not eat meat (M) while 22 do not eat beans (B), 10 eat both meat and beans.
   (a) Represent the information on a Venn diagram.
   (b) How many eat meat but not beans? *(04 marks)*

3. An open-ended cylinder has a surface area of 140.76 cm^2. Find its radius if its height is 5.6 cm. (Take $\pi = 3.142$).

4. Given that $x = 3 + \sqrt{5}$ and $y = 3 - \sqrt{5}$, write the expression $\frac{x}{y}$ in the form $a + b\sqrt{c}$. *(04 marks)*

5. Given that A (-6, -18) and B (15, 10) are two points in a plane, determine the;
   (a) vector $\overrightarrow{AB}$
   (b) modulus of $\overrightarrow{AB}$ *(04 marks)*

6. Find the equation of a straight line passing through the point Q (-2, 1) and is parallel to the line joining the point A (8, 14) to the point B (3, -6) *(04 marks)*

7. Mr. Kaleebu has a farm with an area of 60 km^2 which is represented on a map by an area of 15 cm^2. Determine the representative fraction of the map. *(04 marks)*

8. Given that $g^{-1}(x) = \sqrt{x+9}$,
   Find the value of x for which $g(x) = 0$ *(04 marks)*

9. Simplify: $1 + 2log_{10}5 - log_{10}20 + 3log_{10}2$. *(04 marks)*

10. A quantity P is directly proportional to Q and inversely proportional to T.
    If $P = 50$, $Q = 30$ and $T = 144$, find the value of P when $Q = 35$ and $T = 3$.
    (04 marks)

SECTION B: (60 MARKS)

Attempt any **five** *questions from this section. All questions carry equal marks.*

11. The sports department of Buddo S. S has 80 students who play Football (***F***), Basketball (***B***) or Netball (***N***). It was found that 32 play ***F***, 28 play ***B***, 14 students play ***F*** and ***N***, 12 play both ***B*** and ***N***, 10 play both ***F*** and ***B***. It was also found that 28 students play at least two of the above games, while 14 students do not play any of the above games as they play volleyball only. X students play football, basketball and netball.

(a) Show the above information on a Venn diagram.

(b) Determine the number of students that play all the three games excluding volleyball.

(c) If a student is picked at random, what is the probability that he/she plays only one game? *(12 marks)*

12. (a) Use logarithm tables to evaluate: $\left(\frac{23.5 \times 0.146}{8.3}\right)^{\frac{1}{2}}$

(b) Given that $log_{10}x = 1.3917$ and $log_{10}y = 0.4791$, find the value of $log_{10}x^3y^{\frac{1}{2}}$ *(12 marks)*

13. The tax structure of WAKANDA is as follows:

Taxable income (shs)	Tax rate (%)
1 – 150,000	Free
150,001 – 400,000	5
400,001 – 700,000	8
Above 700,000	12

If Kagoro has an allowance of shs. 50,000 which is exempted from tax, but pays a tax of shs. 58,100; calculate Kagoro's

(a) gross income

(b) net income *(12 marks)*

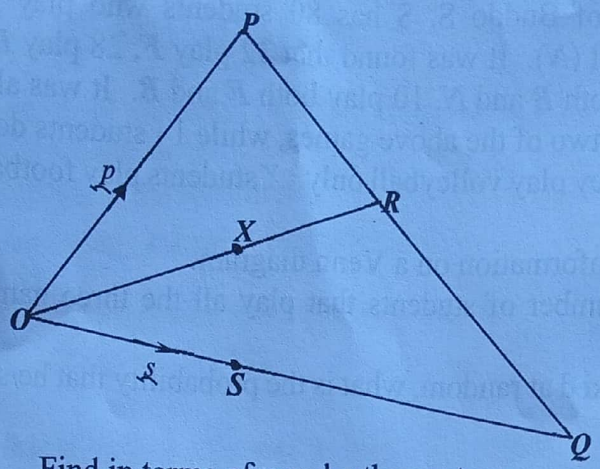
14. (a) Given that $f(x) = nx + m$, $f(3) = 11$ and $f(4) = 17$. Find

(i) $f^{-1}(x)$

(ii) $f^{-1}(20)$

(b) Given that $h(x) = \frac{9}{x+1}$ and $g(x) = 2x^2 - 1$, find the values of x for which $hg(x) = 2$. *(12 marks)*

15. In the figure below, R and S are the mid-points of $\overrightarrow{PQ}$ and $\overrightarrow{OQ}$ respectively. $\overrightarrow{OX} : \overrightarrow{OR} = 2 : 3$ and $\overrightarrow{OP} = \underline{p}$ while $\overrightarrow{OS} = \underline{s}$

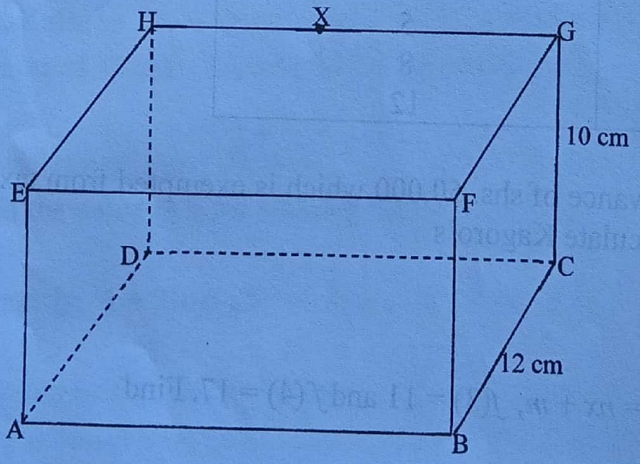


(a) Find in terms of $\underline{p}$ and $\underline{s}$ the vectors;

(i) $\overrightarrow{PQ}$
(ii) $\overrightarrow{OR}$
(iii) $\overrightarrow{XQ}$
(iv) $\overrightarrow{PS}$

(b) Show that P, X and S are collinear. *(12 marks)*

16. The figure below shows a cuboid ABCDEFGH in which $\overline{BC} = 12$ cm, $\overline{GC} = 10$cm. X is a midpoint of $\overline{HG}$ and the volume of the cuboid is 1920 cm^3.



(a) Determine the length of the lines;
(i) $\overline{AB}$
(ii) $\overline{AG}$

(b) Find the angle between;
(i) line AG and the base $ABCD$
(ii) plane AXB and the base $ABCD$ *(12 marks)*

17. Kampala (K) and Arua (A) are about 450 km apart. At 7:30 a.m., a bus starts from Arua and moves towards Kampala (K) at a steady speed of 100 km/hr while a lorry starts from Kampala (K) an hour later moving at an average speed of 60 km/hr to Arua (A).
At 10:00 a.m, the bus is stopped at town C by police and ordered to reduce speed. After 30 minutes at C, it resumes its journey at a reduced average speed of 50 km/hr until it reaches Kampala (K).

(a) Draw on the same axes, the distance – time graphs showing the journeys of the bus and the lorry.

(b) State the time when the two vehicles arrive at their destinations.

(c) Determine when and at what distance from Arua the two vehicles met.

(d) Find the average speed of the bus.

(*12 marks*)

END