456/2
MATHEMATICS
Paper 2
Oct. / Nov. 2019
2½ hours

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Certificate of Education

MATHEMATICS

Paper 2

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

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

Any additional question(s) answered will **not** *be marked.*

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

Squared paper is provided.

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

Turn Over

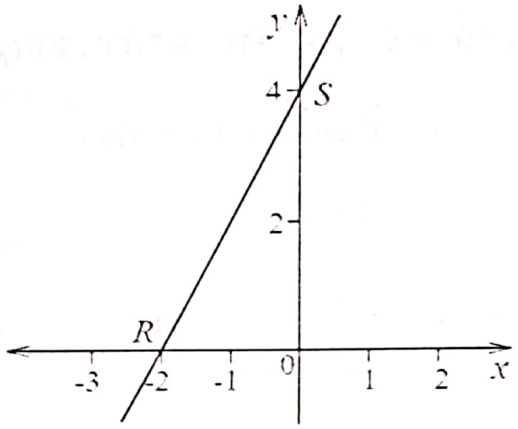
SECTION A: (40 MARKS)

Answer **all** *the questions in this section.*

1. If $7^y = 24$, find the value of y, correct to **2** decimal places. *(04 marks)*

2. Two sets A and B in the universal set $\mathcal{E}$, are such that $n(A \cap B) = 3$, $n(B) = 5$ and $n(A') = 7$. Use a Venn diagram to find $n(A \cup B)'$. *(04 marks)*

3. In the diagram below, the line RS cuts the x-axis at R and the y-axis at S.



Determine the equation of the line RS. *(04 marks)*

4. Express 0.84545 ... as a fraction in its simplest form. *(04 marks)*

5. The coordinates of points A and B are (-5,-3) and (1, 9) respectively. Find the:

(a) mid-point of AB. *(02 marks)*

(b) length of AB. *(02 marks)*

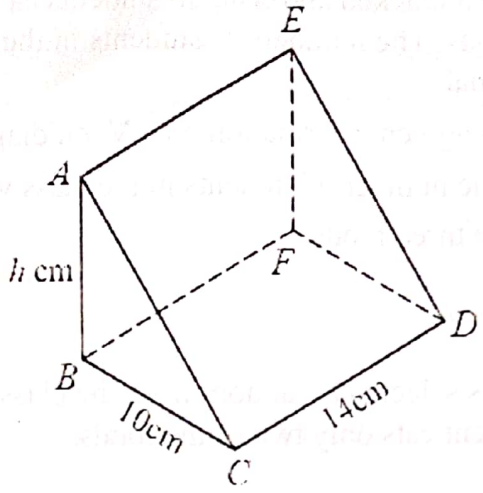
6. The function f is defined as $f: x \longrightarrow 3^x - 2x$. Determine the range if the domain is $\{0, 1, 2, 3\}$. *(04 marks)*

7. An open cylinder has a height of 15cm and a radius of 7 cm. Calculate the surface area of the cylinder. *(04 marks)*

8. Given that $\boldsymbol{a} = \begin{pmatrix} 4 \\ -5 \end{pmatrix}$ and $\boldsymbol{b} = 3\boldsymbol{a}$, find $|\boldsymbol{a} + \boldsymbol{b}|$. *(04 marks)*

9. Apili has Shs20,000,000 on her fixed deposit account in a bank. The bank gives a compound interest at a rate of 4% per annum. Calculate the amount Apili will receive after 2 years. *(04 marks)*

10. The volume of the prism below is 1190 cm^3, $AB = h$ cm, $BC = 10$ cm and $CD = 14$ cm.



Find the value of h. *(04 marks)*

SECTION B: (60 MARKS)

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

11. (a) Show that points A (-3,-2) , B (3,1) and C (5,2) lie on a straight line. *(06 marks)*

(b) Two points M and N have position vectors $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$ and $\begin{pmatrix} -2 \\ 5 \end{pmatrix}$ respectively.

If P is a point such that $3\boldsymbol{MN} = \boldsymbol{MP}$, find the coordinates of P. *(06 marks)*

12. The cost C (Shs) of a roll of cloth is partly constant and partly varies as the square of length l (metres) of the cloth. The cost of a roll of 50 m is Shs50,000. The cost of a roll of length 80 m is Shs96,800.

(a) Form an equation relating the cost, C and the length, l. *(08 marks)*

(b) Calculate the;

(i) cost of a roll of length 20 m.

(ii) length of a roll which costs Shs34,700. *(04 marks)*

13. In a class of 68 students, 2 of them do not eat any of the three foods of beef (B), chicken (C) and fish (F). 25 students eat beef and chicken, 19 eat beef and fish while 23 eat chicken and fish. 38 students eat fish. Some students eat all the three foods. The numbers of students in the class who eat only one of the foods are equal.

(a) Represent the given information on a Venn diagram. *(05 marks)*

(b) Determine the number of students in the class who eat;

(i) all the three foods.

(ii) beef.

(iii) fish. *(05 marks)*

(c) If a student is selected at random from the class, find the probability that the student eats only two of the foods. *(02 marks)*

14. A car travelling at 12 m/s accelerates uniformly and in 3 seconds its velocity is 30 m/s. It then continues at this velocity for another 4 seconds and finally decelerates uniformly to rest in 6 seconds.

(a) Draw a velocity- time graph for the motion of the car. *(05 marks)*

(b) Using your graph, determine the acceleration of the car. *(02 marks)*

(c) Calculate the distance travelled by the car in the 13 seconds. *(05 marks)*

15. (a) The functions $f(y)$ and $g(y)$ are defined as $f(y) = y + 2$ and $g(y) = \frac{y-4}{5}$.

Find;

(i) $fg(y)$

(ii) $fg(9)$ *(05 marks)*

(b) If the function $h(x) = \frac{x-4}{x-2}$, determine;

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

(ii) $h^{-1}(3)$ *(07 marks)*

16. The table below shows the income tax rates of government employees.

Taxable monthly income (Shs)	Tax rate
100,000 and less than 200,000	10%
200,000 and less than 300,000	20%
300,000 and less than 400,000	30%
400,000 and less than 500,000	40%
500,000 and over	55%

An employee has a gross monthly income of Shs703,900 including non-taxable monthly allowances as given below.

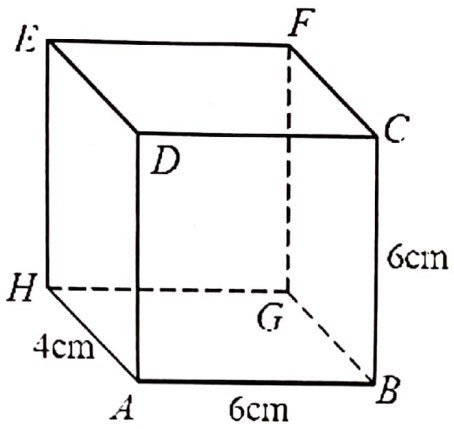
- Marriage allowance: Shs126,500 per month.
- Housing and transport: 15% of gross monthly income
- Medical care: Shs48,000 per month.

Find his;

(a) taxable income. (*04 marks*)

(b) net income. (*08 marks*)

17. In the figure below *ABCD* is a square, $AB = BC = 6$cm and $BG = 4$cm.



Calculate the;

(a) (i) length of *AF*.

(ii) angle between the line *AF* and plane *ABGH*. (*08 marks*)

(b) angle between planes *ABFE* and *ABGH*. (*04 marks*)

END