456/2

MATHEMATICS

Paper 2

July / Aug. 2022

2 ½ hours

UGANDA TEACHERS' EDUCATION CONSULT (UTEC)

Uganda Certificate of Education

MATHEMATICS

Paper 2

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer **ALL** *questions in section* ***A*** *and any* **five** *questions from section* ***B.***
Any additional question(s) answered will **not** *be marked.*
All necessary calculations ***MUST*** *be shown clearly with the rest of the answers.*
Therefore, no paper should be given for rough work.
Silent non-programmable scientific calculators may be used.
Mathematical tables, squared papers are provided.
State the degree of accuracy at the end of each answer attempted using a calculator or tables; and indicate ***Cal*** *for calculator,* ***Tab*** *for mathematical table.*

SECTION A

Answer **ALL** questions in this section

1. Without using mathematical tables or a calculator, evaluate;
$\frac{1}{5.52}(8.31^2 - 2.79^2)$

(04 marks)

2. The sets G *and* H are such that $n(G) = 9$, $n(H) = 20$ *and* $n(GUH) = 24$. Calculate $n(GnH)$.

(04 marks)

3. Given that $f(x) = \frac{x+1}{2}$ and $g(x) = 2x + 1$. Find $gf(9)$. *(04 marks)*

4. Given the points $A(5,1)$ *and* $B(2,5)$. Find;
   (a) AB as column vector.
   (b) Length of AB.

(04 marks)

5. Find the equation of a straight line through $(-2,3)$ and parallel to the line $2x + 7y = 18$.

(04 marks)

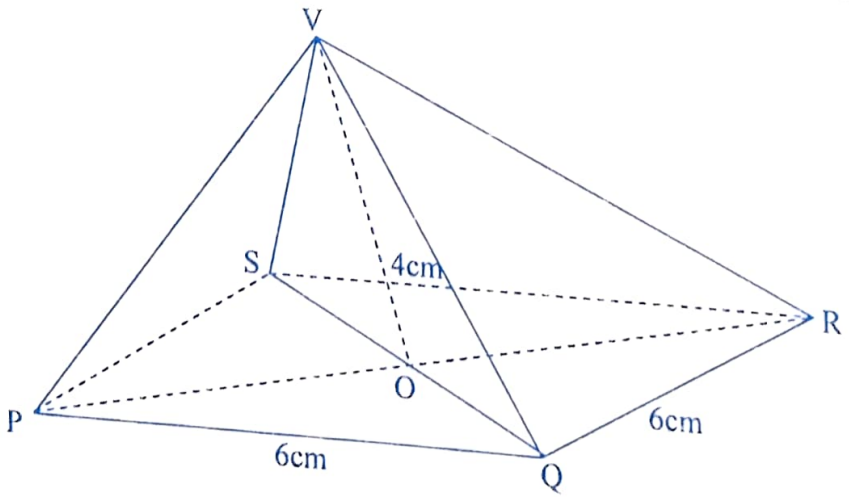
6. The bus fare from Amuria to Kampala was raised by 16½ %. The old fare was shs. 50,000. Find the new bus fare.

(04 marks)

7. A cylindrical tin of height 8cm has a volume of $220cm^3$. A similar tin has a height of 16cm. Find its volume.

(04 marks)

8. $V\,PQRS$ is a right pyramid on a square base with $PQ = 6cm$ *and* $QR = 6cm$, with height VO above the base being 4cm.



Calculate the surface area of the pyramid.

(04 marks)

9. Find the LCM and HCF of 84, 126, 210. *(04 marks)*

10. Suppose A *is* $(-2, 4)$ and M is $(3, -1)$, where M is the midpoint of AB. Use equal steps method to find the coordinates of B. *(04 marks)*

SECTION B (60 MARKS)

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

11. (a) Two pyramids are similar. The smaller pyramid has a surface area of $27\sqrt{265}cm^2$ while a bigger pyramid has a surface area of $1728\sqrt{265}cm^2$. The smaller pyramid has a volume of $24cm^3$. Find the volume of the bigger pyramid. *(06 marks)*

(b) When drilling for gas under water, the time t taken to drill a hole varies as the square of its depth, $d, metres$. Given that $t = 105$ hours when $d = 30\ metres$. Find t *when* $d = 60\ metres$. *(06 marks)*

12. The following information is about selected farmers in TESO sub – region.

$\varepsilon = \{all\ farmers\ in\ Teso\}$
$A = \{farmers\ who\ grow\ apples\}$
$M = \{farmers\ who\ grow\ mangoes\}$
$P = \{Farmers\ who\ grow\ pawpaws\}$
$n(\varepsilon) = 55, \quad n(A) = 25, n(P) = 35.$
$n(M \cap A^1 \cap P^1) = 4$
$n(A \cap P \cap M^1) = 16$
$n(A \cap M^1 \cap P^1) = 1$
$n(P \cap A^1 \cap M^1) = 8$
$n(A \cup M \cup P)^1 = 12$

(a) Represent this information on a venn diagram. *(04 marks)*
(b) Find $n(A \cap M \cap P)$ *(02 marks)*
(c) If a farmer is selected at random from the group, find the probability that the farmer grows only two of the crops. *(02 marks)*

13. Given that $h(x) = ax^2 - b$, $h(2) = 12$ *and* $h(3) = 32, find;$
(a) The values of a *and* b. *(05 marks)*
(b) $h(6)$ *(02 marks)*
(c) $h^{-1}(x)$ *(02 marks)*
(d) $h^{-1}(60)$ *(03 marks)*

14. Toilet paper is sold in cylindrical rolls of diameter 12cm and height 11cm. The card cube at the centre of the roll is 5cm in diameter.

(a) Find the volume of the paper. *(07 marks)*

(b) Each rectangular sheet of paper measures 11cm x 13cm and 0.003cm thick. Find the number of sheets of paper in the roll, to the nearest sheet.
$\left(take\ \pi\ =\ \frac{22}{7}\right)$. *(05 marks)*

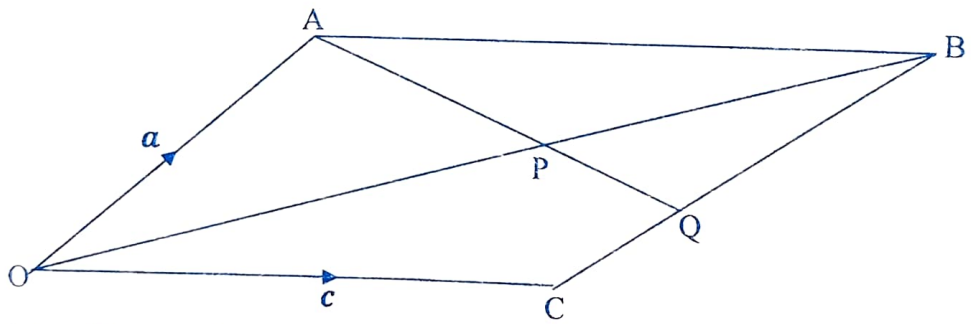
15. (a) Amega buys a mini bus on a loan amounting to shs. 60,000,000 at a compound interest rate of 15% per annum. He is to clear the loan and interest within a period of 2 years in 8(eight) equal installments.
Determine the;

(i) Interest that Amega pays. *(05 marks)*

(ii) Amount he pays per installment. *(02 marks)*

(b) A car that costs ug. Shs. 20 million is charged an import tax at a rate of 110% per car. A car dealer imports 9 of these cars. If the exchange rate is 1 dollar = Ug. Shs. 3,600, find how much tax the dealer will pay in dollars. *(05 marks)*

16. In the parallelogram $OA, BC, \overrightarrow{OP} = \frac{3}{4}\overrightarrow{OB}$ and $A\ P\ Q$ is a straight line.
$\overrightarrow{OA} = \boldsymbol{a}, and\ \overrightarrow{OC} = \boldsymbol{c}.$



(a) Express in terms of **a** and **c** the vectors:

(i) $\boldsymbol{OB}$

(ii) $\boldsymbol{OP}$

(iii) $\boldsymbol{AP}$

(b) Writing $\overrightarrow{AQ} = K\overrightarrow{AP}\ and\ \overrightarrow{CQ} = m\ \overrightarrow{CB}$ where $k\ and\ m$ are scalars. *(04 marks)*
Express OQ in terms of;

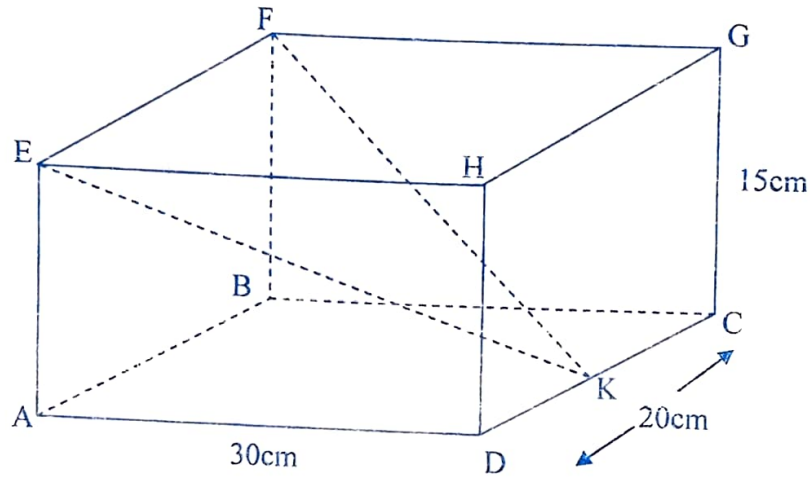
(i) $\boldsymbol{a},\ \boldsymbol{k}\ and\ \boldsymbol{c}$

(ii) $\boldsymbol{a}, \boldsymbol{m}\ and\ \boldsymbol{c}$

Hence find the values of $\boldsymbol{k}\ \ and\ \boldsymbol{m}$.

(08 marks)

17. The figure below shows a cuboid with dimensions as given. K is the mid – point of sides $\overline{DC}$.



Calculate the;

(a) Angle $F\,K\,B$

(b) Angle between plane $E\,F\,K$ *and* $A\,B\,C\,D$.

(c) Angle EKF

(03 marks)

(05 marks)

END