456/2
MATHEMATICS
Paper 2
July/Aug. 2023
2 ½ hours

UGANDA TEACHERS' EXAMINATIONS SCHEME

Uganda Certificate of Education

JOINT MOCK EXAMINATIONS

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) attempted will **not** *be marked.*

All *necessary working must be shown clearly.*

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** *questions in this section.*

1. Given that A: B = 2:3, B:C = 2:5. If three people A, B and C shared shs 750,000. Find;

   (a) A: B: C *(02 marks)*

   (b) The amount B received. *(02 mark*

2. The relation $n \rightarrow n^2 + 3$, maps set P onto set Q = {4,12}. Find set P. *(04 marks)*

3. In a Cartesian plane, the points P (2,5), Q (4, -1), R (0,5) and T are such that PQ is parallel to RT. Find the equation of line RT *(04 marks)*

4. In a given group of 11 students, 8 students eat matooke (M), and some students eat Rice (R),5 students eat both M and R. 4 students do not eat Rice. How many students eat Rice but not Matooke? *(04 marks)*

5. Given that $\frac{\sqrt{3}+n}{\sqrt{27}} = 1$ find n in the form $a\sqrt{b}$. *(04 marks)*

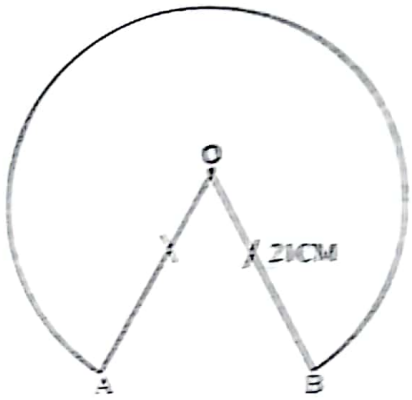
6. Given that $\mathbf{p} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$, $\mathbf{q} = \begin{pmatrix} 6 \\ 1 \end{pmatrix}$ and $\mathbf{c} = \mathbf{3p}$ find $|\boldsymbol{q} + \mathbf{3}\boldsymbol{c}|$ *(04 marks)*

7. The buying price of 1£ in Bank A is shs 3,871. This price is 2% less than that of Bank B. Calculate the buying price of 1£ in Bank B. *(04 marks)*

8. A cylindrical cup has a volume of $214cm^3$ and a surface area of $188cm^2$. Find the volume of a similar cup whose surface area is $1692cm^2$. *(04 marks)*

9. The line $x = -5$ meets the line $x + 2y = 19$ at M. Find the distance of M from the origin. *(04 marks)*

10. The figure below shows a net of a cone. The major sector OAB has an area of $924cm^2$, and a radius of 21cm. *(04 marks)*



(a) Draw the cone formed from the net. *(02 marks)*

(b) Calculate the radius of the cone formed (use $\pi = \frac{22}{7}$) *(02 marks)*

SECTION B

Answer any **five** *questions from this section.*

All *questions carry equal marks.*

11. (a) Solve for x and y in the following equations $3^x \times 9^y = 3^{xy}$

$\frac{8 \times 4^x}{2^y} = 1$ *(08 marks)*

(b) The unit cost (C) of printing a book varies directly as the number (P) of pages in the book and inversely as the number (n) of copies printed. If the unit cost of printing 75 books of 300 pages each is shs 200. Find the unit cost of printing 40 books of 100 pages each. *(04 marks)*

Turn Over

12. The distance between town A and town B is 276km. At 6:00am, a Bus left town A for town B and travelled at a speed of 90km/h. at 7:30am, the Bus stopped for 45 minutes. The Bus then increased its original speed by 51km/h until it arrived at town B. At 6:45am, a drone taxi left town B for town A and covered 81km in 1¼ hours. The taxi suddenly increased the speed and arrived in town A at 8:48am.

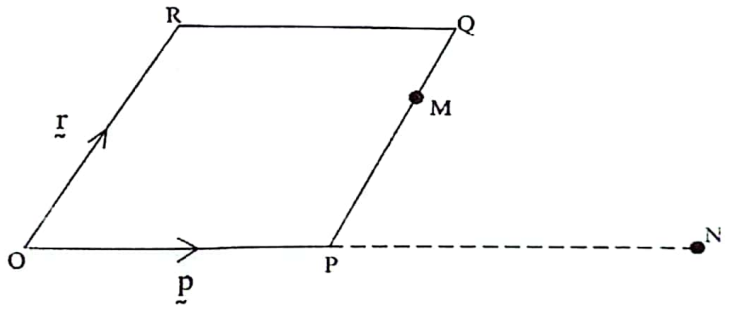
(a) Use a scale of 1cm to represent 15 minutes and 1cm to represent 15km, draw the distance time graph of the two vehicles on the same axes. *(07 marks)*

(b) Use your graph to find;

(i) The distance from B where the vehicle met *(02 marks)*

(ii) The average speed of the Bus. *(03 marks)*

13. The figure below, shows a parallelogram OPQR. **OP= p** , **OR= r** and M is a point on $\overline{PQ}$ such that PM : PQ= 2:3. Find point $\overline{OP}$ is produced to N, such that $\overline{OP} = ½\ \overline{PN}$



(a) Express the following vectors in terms of **p** and **r**.

(i) $\overrightarrow{OQ}$ *(02 marks)*

(ii) $\overrightarrow{OM}$ *(02 marks)*

(iii) $\overrightarrow{MN}$ *(03 marks)*

(b) Prove that the points N, M and Rare collinear *(05 marks)*

14. Given functions $h^{-1}(x) = ax + 3$ and $g(x) = \frac{1}{x^2}$

(a) Determine;

(i) The value of a if $h(17) = 2$ *(04 marks)*

(ii) $gh(x)$ *(02 marks)*

(iii) $gh(\frac{1}{2})$ *(02 marks)*

(b) Calculate the;

(i) Value of x if $gh(x)$ is undefined *(02 marks)*

(ii) Value of t if $gh(t) = 1$ *(02 marks)*

15. On a staff of 28 teachers. All the teacher belong to at least one of the committees. Disciplinary (D) Welfare (W) and Sports (S). 15 teachers belong to Disciplinary committee, 24 teachers belong to Sports committee and 7 teachers belong to all the three committees. The number of teachers who belong to W only is equal to those who belong to S only. All the teachers in Disciplinary committee are members of sports committee.

(a) Represent the given information in a venn diagram. *(06 marks)*

(b) Find the number of teachers on the welfare committee. *(04 marks)*

(c) Find the probability that a teacher picked at random, is non member of the Disciplinary committee. *(02 marks)*

16. The value of a TV is shs 720,000. The TV can be bought using a weekly hire purchase, monthly hire purchase or cash for which the discount is 5% of the value. Adupa bought the TV using weekly hire purchase and paid shs 76,000 more than the cash price. The TV can be bought on month hire purchase terms by deposit of 40% of the value and 3 monthly instalment of shs.150,000 each.

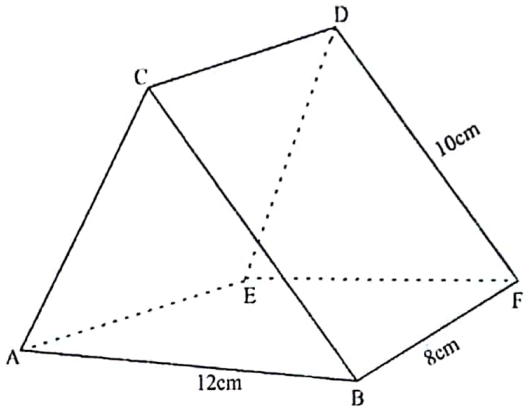
(a) Weekly hire purchase price *(05 marks)*

(b) Monthly hire purchase price. *(04 marks)*

(c) Percentage saving for paying cash rather than monthly hire purchase. *(03 marks)*

Turn over

17. The figure below shows a triangular prism ABCDEF in which $\overline{AB}$ = 12cm, BF = $\overline{CD}$ = AE = 8cm and $\overline{AC}$ = $\overline{BC}$ = $\overline{ED}$ = FD = 10cm.



(a) Calculate the;

(i) Perpendicular height of the prism *(03 marks)*

(ii) Volume of the prism *(04 marks)*

(b) Find the angle between

(i) Plane CBFD and the base *(02 marks)*

(ii) Planes ACDE and CBFD *(03 marks)*

E N D