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MATHEMATICS
Paper 1
AUGUST, 202
$2\frac{1}{2}$ *hours*

JINJA JOINT EXAMINATIONS BOARD

Uganda Certificate of Education

MOCK EXAMINATIONS – AUGUST, 2022

MATHEMATICS

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer **ALL** *questions in Section* **A** *and* ***not more than*** **FIVE** *from section* **B.**

Any additional question(s) answered will not be marked.
All necessary calculations must be shown and should be done on the same page as the rest of the answer.

Mathematical tables and graph papers are provided.

Silent, non-programmable scientific calculators may be used.

SECTION A (40 MARKS)

Answer all questions in this section.

1. Solve the equation $\frac{1}{4x} = \frac{5}{6x} - 7$
2. Simplify $\sqrt{2^x x 5^{2x} - 2^{-x}}$
3. Factorise $a^2 - b^2$

   Hence find the exact value of $2557^2 - 2547^2$
4. Find the integral values of X which satisfy the inequalities $9(2-x)<4x-9<x+11$
5. The image of P(0,2) under an enlargement with a scale factor 3 is P'(4,6).

   Find the centre of enlargement.
6. Determine the values of x for which the matrix below has no inverse

$$\begin{pmatrix} 2x & x^2 \\ 2 & 1 \end{pmatrix}$$

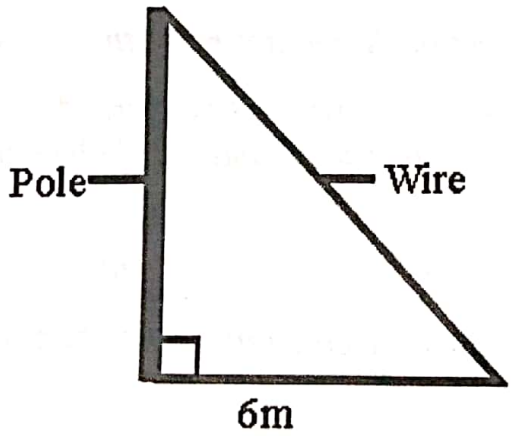
7. The size of each interior angle of a polygon is five times the size of the exterior angle.

   Find the number of the sides of the polygon.
8. The table below shows the masses to the nearest kilogram of 40 students.

Mass (kg)	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64
Frequency	3	8	17	10	2

   (a) State the median class

   (b) Calculate to 2 decimal places the median mass.
9. An electronic pole is supported to stand vertically on a level ground by a light wire. The wire is pegged at a distance of 6 metres from the foot of the pole as shown.



The angle which the wire makes with the ground is twice the angle it makes with the pole. Calculate the length of the wire.

10. A two digit number is formed using the numerals 6, 7, and 8 without repeating any numeral.

(a) Write down the possibility space

(b) Find the probability that the two digit number is a multiple of three.

SECTION B (60 MARKS)

11. (a) The difference between the squares of two numbers is 39. If the larger number exceeds the smaller number by 3, find the two numbers. (6 marks)

(b) A man is now four times as old as his son. Eight years ago, the product of their ages was 220 years. Find the son's present age. (6 marks)

12. The table below shows the weight of 40 goats at Victoria farm institute.

155	172	164	157	179	148	166	153
161	176	159	151	165	154	160	172
156	163	169	171	170	160	168	158
173	146	156	167	157	167	150	162
161	159	167	163	152	157	162	164

(a) Starting with the class of 145-149, 150-154, 155-159 and so on, construct a frequency table for the above information (2 marks)

(b) Use your frequency table to calculate the

(i) mean weight

(ii) Median weight

(iii) Modal weight

13. Copy and complete the table below in which $y = x^2-4x+2$

X	-2	-1	0	1	2	3	4	5	6
X^2	4								
-4X	8	4	0	-4	-8			-24	
+2	+2		+2						

(4 marks)

Y 14 14

(a) Using a scale of 2cm to represent 1 unit on the horizontal axis and 1cm to represent 1 unit on the vertical axis, draw the graph of $y = x^2-4x+2$ for the domain $-2 \leq x \leq 6$ (6 marks)

(b) Use your graph to estimate the roots of the equation $x^2 - 4x + 2 + 0$ (2 marks)

(c) Draw the line of symmetry for the curve above and write down its equation. (2 marks)

14. Given the matrices

(a) $A=\begin{pmatrix} 1 & -1 \\ 0 & 2 \end{pmatrix} and B = \begin{pmatrix} 2 & -4 \\ 4 & 6 \end{pmatrix}$

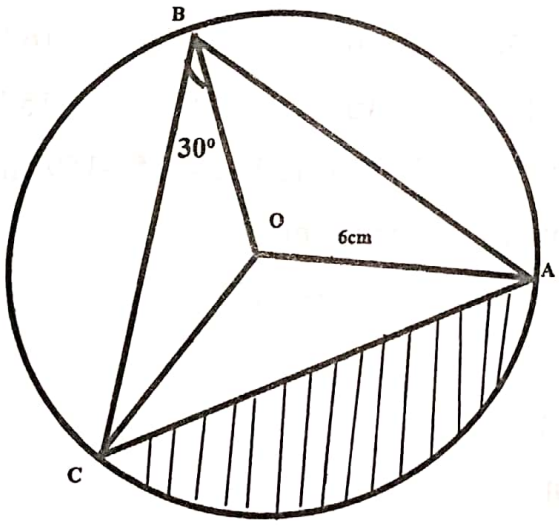
Find another matric C such that $C = A^2 - \frac{1}{2} B$ (6 marks)

(b) Use matrix method to solve the simultaneous equations

$3x - 4y = 2$

$6x + y = 13$ (6 marks)

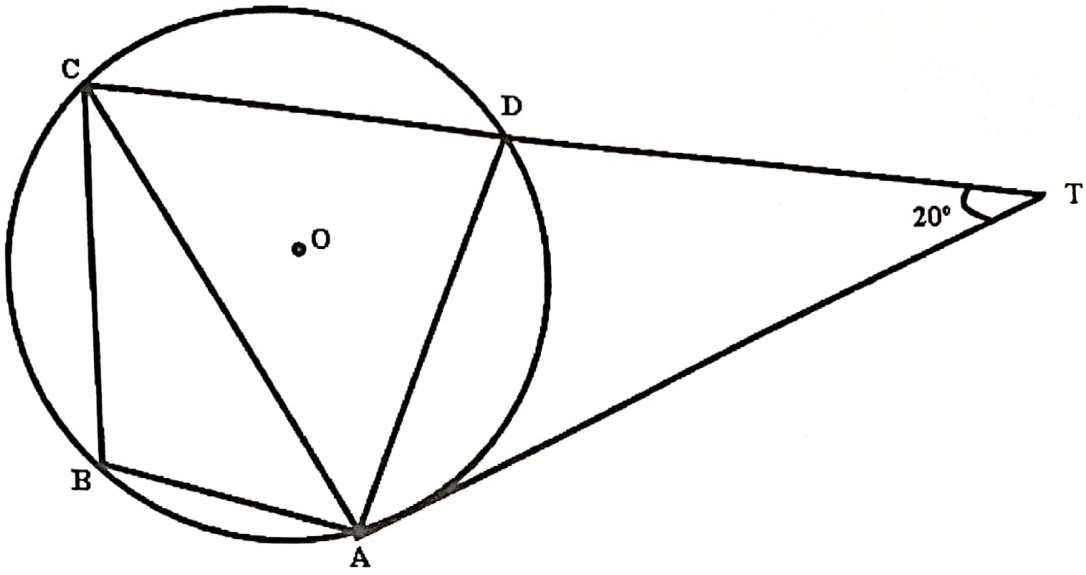
15. (a)



In the figure above, O is the centre of the circle

$\overline{OA} = 6cm, \overline{OB}$ bisects angle ABC and angle $OBC = 30^0$.

Calculate the perimeter of the shaded region. [take $\pi = 3.142$ and correct your answer to 3 significant figures (6 marks)



(b) In the diagram above $\overline{AT}$ is a tangent to the circle with centre O. CDT is a straight line. Given that angle ATD = 20° and angle DAT is twice angle CAD, find:

(i) Angle DAT (3 marks)

(ii) Angle ABC (3 marks)

16. Nabakka intended to buy x kg of tomatoes and y kg of onions. The total mass of tomatoes and onions was not to exceed 15kg. The cost of tomatoes was shs 3,000 per kg while that of onions was shs 2,000 per kg. She intends to buy at least less tomatoes than onions and she had at least shs 30,000 to spend.

(a) Write down all the inequalities to represent the given information. (3 marks)

(b) Represent the inequalities in (a) above graphically. (4 marks)

(c) Find the maximum mass of each commodity Nabakka bought and the maximum amount of money she spent. (5 marks)

17. A quadrilateral OPQR was transformed into a parallelogram O'P'Q'R' by the matrix $\begin{pmatrix} 2 & 1 \\ 1 & 1 \end{pmatrix}$ where O'(0,0) P'(6,3) Q'(8,7) and R'(2,4) Find the

(a) Matrix which maps the parallelogram O'P'Q'R' back onto the quadrilateral OPQR (3 marks)

(b) Coordinates of OPQR (3 marks)

(c) Area of the quadrilateral OPQR and hence the area of the parallelogram O'P'Q'R' (6 marks)

End