

456/1
MATHEMATICS
Paper 1
July/August 2019
2½ hours



MUKONO EXAMINATION COUNCIL

Uganda Certificate of Education

MATHEMATICS

Paper 1

2hours 30 minutes

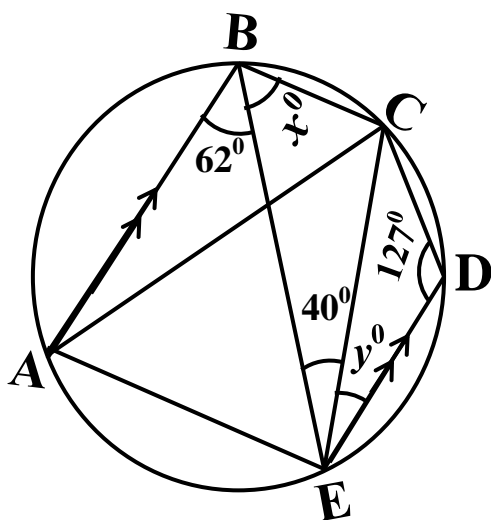
INSTRUCTIONS TO CANDIDATES:

- 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 done in the same answer booklet/sheets provided, with the rest of the answers. Therefore no paper should be given for rough work.
- Graph paper is provided.
- Silent non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

SECTION A (40 marks)

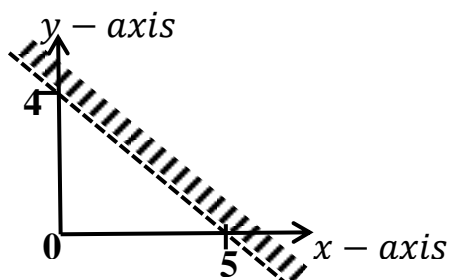
Answer all questions in this section.

1. If $a * b = \frac{(a-b)}{2}$ and $r \wedge s = \frac{(r+s)}{5}$, find the value of x such that $(3 * 1) \wedge x$ (04 marks)
2. Make s the subject of the formula: $p = \frac{4s^2}{3s^2-4}$ (04 marks)
Hence find the values of s when $p = 2$
3. Tickets to a play cost 9 dollars for adults and 5 dollars for children. If the show sold 180 tickets and earned 1380 dollars, how many of each type of tickets were sold? (04 marks)
4. Given the matrices $A = \begin{pmatrix} 4 & -2 \\ 5 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & -5 \\ 4 & 1 \end{pmatrix}$. Find the determinant of $(3B - A)$ (04 marks)
5. In the diagram below A, B, C and D lie on the circle. \overline{AB} is parallel to \overline{ED} , Angle $ABE = 62^\circ$, angle $CDE = 127^\circ$ and angle $BEC = 40^\circ$. (04 marks)



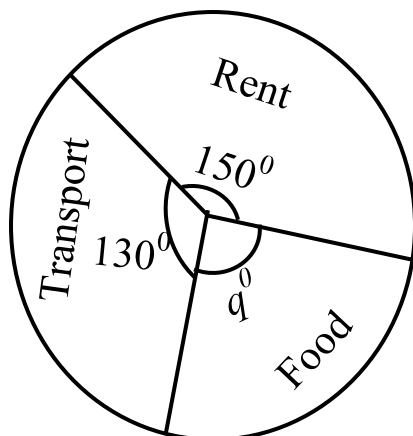
Find the size of the angle marked x° and y° (04 marks)

6. The image of $A(8, -7)$ under a reflection in the mirror line is $A'(-7, 8)$. By calculation, find the equation of the mirror line. (04 marks)
7. Calculate the area of a triangle ABC , where $\overline{AB} = 14\text{cm}$, $\overline{AC} = 17\text{cm}$, angle $ABC = 110^\circ$ and angle $BCA = 47^\circ$. (04 marks)
8. Determine the inequality which is represented by the un-shaded region.



(04 marks)

9. A bag A contains 3 black and 2 white beads while Bag B contains 2 black and 4 white beads. A bead is chosen at random from bag A and placed in bag B. A bead is then chosen at random from bag B. Find the probability that a black bead is taken from bag B. (04 marks)
10. The pie-chart below represents Ssali monthly expenditure.



- (a) Find the value of q in degrees
- (b) If Ssali spends shs, 36,000 more on rent than on transport, calculate his monthly income. (04 marks)

SECTION B (60 marks)

Attempt any five questions from this section.

11. Using a ruler, a pencil and a pair of compasses only:
- (a) Construct a triangle ABC , in which angle $BAC = 45^\circ$, angle $ABC = 60^\circ$ and $\overline{AB} = 7\text{ cm}$ (04 marks)
- (b) Measure and record the length AC and BC . (02 marks)
- (c) (i) Circumscribe triangle ABC
- (ii) Calculate the area of a circle to 2sf. (Take $\pi = 3.14$) (06 marks)
12. The masses of 50 babies born in Kumi hospital were recorded as below:

Mass(kg)	2.0-2.4	2.5-2.9	3.0-3.4	3.5-3.9	4.0-4.4	4.5-4.9	5.0-5.4	5.5-5.9
No of babies	4	6	10	12	9	4	3	2

- (a) Calculate the:
- (i) mean mass; (05 marks)
- (ii) median mass (03 marks)
- (b) Draw a histogram and use it to estimate the modal mass of the babies. (04 marks)

13. (a) Copy and complete the table below of $y = \cos 2\theta$ and $y = \sin 2\theta$.

θ	0°	15°	30°	45°	60°	75°	90°
2θ	0°			90°		150°	
$y = \cos 2\theta$	1			0		-0.9	
$y = \sin 2\theta$	0			1		0.5	

(03 marks)

- (b) Using 2cm for 15° on a horizontal axis and 1cm for 0.1units on vertical axis, on the same axes, draw graphs of $y = \cos 2\theta$ and $y = \sin 2\theta$ (06 marks)
- (c) Use your graphs to solve the equations:
- (i) $\cos 2\theta = \sin 2\theta$ (01 mark)
- (ii) $\sin 2\theta = 0.7$ (02 marks)

14. The vertices $A(3,4)$, $B(-3,5)$ and $C(4,0)$ of a triangle are mapped onto a triangle $A^I B^I C^I$ by a transformation matrix $M = \begin{pmatrix} 2 & 5 \\ 1 & -3 \end{pmatrix}$

- (a) Find the coordinates of the vertices of the image triangle $A^I B^I C^I$ (05 marks)

- (b) A triangle $A^I B^I C^I$ is mapped onto a triangle $A^{II} B^{II} C^{II}$ with vertices $A^{II}(78,43)$, $B^{II}(57,20)$ and $C^{II}(24,20)$. Find the matrix of this transformation (05 marks)

- (c) Determine the single transformation which maps a triangle ABC directly onto the triangle $A^{II} B^{II} C^{II}$. (02 marks)

15. (a) Given that the matrix $A = \begin{pmatrix} 1 & 5 & 2 \\ -4 & 7 & 1 \end{pmatrix}$ (02 marks)

$$B = \begin{pmatrix} 0 & -2 \\ 2 & 3 \\ 1 & -1 \end{pmatrix} \text{ and } P = AB, \text{ determine the}$$

- (i) order of P ; (01 mark)
- (ii) matrix P ; (02 marks)
- (iii) inverse of P . (03 marks)

- (b) Using matrix method, solve the simultaneous equations:

$$4x - 2y = 3$$

$$8y - 1 = 3x.$$

(06 marks)

16. The length of a rectangle exceeds the width by 7cm and its area is 60cm^2 .

- (a) Find the
- (i) dimensions of the rectangle (04 marks)
- (ii) perimeter of the rectangle (02 marks)

- (b) If the length and the width are both decreased by 10%:
- (i) Calculate the new dimensions of the rectangle and its new area.
(04 marks)
 - (ii) Express the new area as a percentage of the original area.
(02 marks)

17. A manufacturing company makes two models A and B of a product. Each piece of model A requires 9 labour hours for fabricating and *one* labour hour for finishing. Each piece of model B requires 12 labour hours for fabricating and 3 labour hours for finishing. For fabricating and finishing, the maximum labour hours available are 180 and 30 respectively. The company makes a profit of shs.80,000 on each piece of model A and shs 120,000 on each piece of model B . If x and y are numbers of pieces of model A and model B respectively:

- (a) Write down four inequalities to represent the given information,
(04 marks)
- (b) Represent the inequalities on a graph,
(04 marks)
- (c) Use the graph in (b) above to find the number of pieces of model A and model B that should be manufactured to realize a maximum profit. Hence find the maximum profit.
(04 marks)

END