

P456/1
MATHEMATICS
PAPER ONE
 $2\frac{1}{2}$ HOURS



NDEJJE SENIOR SECONDARY SCHOOL
UGANDA CERTIFICATE OF EDUCATION
MOCK SET IV EXAMINATIONS 2017

$2\frac{1}{2}$ HOURS

INSTRUCTIONS

Answer all questions in Section A and Not more than five in section B

All working must be shown clearly.

Silence, non-programmable calculators may be used.

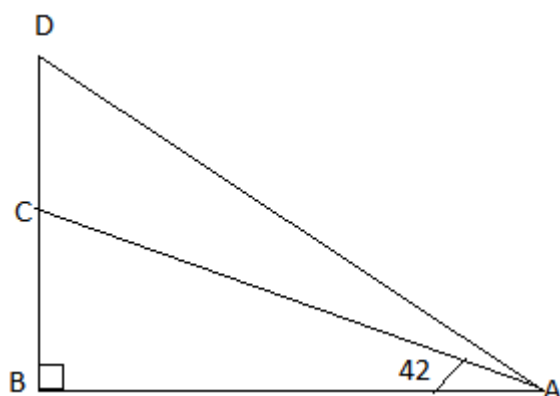
SECTION A (40 MARKS)

1. Make y the subject of the equation: $\log_2(x + y) = t$
2. Solve simultaneously: $x = 6 - y$ and $2y + x = 8$
3. Find the integral solution set of; $1 \leq 2x - 3 < 7$
4. Given that $m * n = 3m - n$, find the value of y for which: $(2 * 1) * y = 0$
5. The school chaplain has shs 780,000 to spend on Bibles and gift bags, whose unit costs are Shs 20,000 and 1,500 respectively. If he is to buy at least more Bibles than gift bags, write three inequalities for this situation.
6. Nsyobya calculated the area of a circle of radius 100cm, using $\pi = 3.14$ instead of $\frac{22}{7}$. What was the percentage error in his answer?
7. Use the points $I(1,0)$ and $J(0,1)$ to find the matrix representation for reflection in the line $y = x$. Hence find the coordinates for the image of point $A(2,1)$ under this transformation.
8. An isosceles triangle has one side of its interior angles as 50° . Find the possible sizes of the remaining two angles of the triangle.

9. P and Q are two points such that the bearing of Q from P is 130° . Calculate the bearing of point P from Q.
10. A point in the Cartesian plane is transformed by matrix $P = \begin{pmatrix} 2 & 0 \\ 3 & 1 \end{pmatrix}$ followed by $R = \begin{pmatrix} -2 & 6 \\ -1 & 9 \end{pmatrix}$. Find the single matrix of transformation that would map the final image back to the original position.

SECTION B (60 MARKS)

- 11.
- Given that $3\cos\theta = 1$ and that $0^\circ \leq \theta \leq 90^\circ$, find the value of $\sin\theta$ and $\tan\theta$, without using tables or a calculator (leave your answer in surds).
 - In the diagram $BC = 5.9$ cm, $\angle ABC = 90^\circ$, $\angle BAC = 42^\circ$ and $\angle BAD = 60^\circ$. Calculate the lengths of AB and CD.



12. Two fair dice are designed in such a way that the first one is green in colour with its six faces numbered 1, 1, 2, 2, 3 and 4; while the second one is yellow in colour with its faces numbered 1, 2, 3, 4, 4, and 5.
- Show the possibility space when both dice are rolled once.
 - Hence, find the probability that the two scores will:
 - Be the same
 - Have a sum of more than 8.

13.

- i. Using a scale of 1cm: 1 unit on the x-axis and 2cm:1 unit on the y- axis, plot ΔOPR with vertices at $O(0, 0)$, $P(1, 2)$ and $R(2, 0)$.
- ii. Find matrix N , which represents Enlargement with scale factor 2 and centre $(0,0)$
- iii. Find, and state the coordinates of the successive images of ΔOPR under transformation $M = \begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$ followed by N .
- iv. Write down the matrix of a single transformation that would map ΔOPR directly onto $\Delta O''P''R''$.

14. (a). Find the inverse of $A = \begin{pmatrix} 1 & 1 \\ 2 & 4 \end{pmatrix}$.

(b). Hence, use the matrix method to solve simultaneously:

$$x + y = 3 \text{ and } 4y + 2x = 8$$

(c). Given the matrices $K = \begin{pmatrix} 2 & -1 \\ 3 & 0 \end{pmatrix}$ and $L = \begin{pmatrix} 0 & 3 \\ -1 & 1 \end{pmatrix}$, work out:

- i. K^2
- ii. $2L + 3K$

15. The cumulative frequency table below shows the marks obtained 50 students in a test.

Marks	20-29	30-39	40-49	50-59	60-69	70-79	80-89
Cumulative Frequency	2	10	22	28	36	46	50

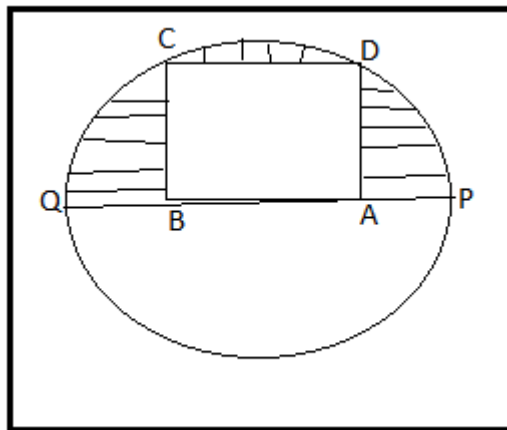
- i. Draw a cumulative frequency curve to represent the above information
- ii. Use your graph to estimate the median mark for the class
- iii. Using an assumed mean of 54.5, calculate the mean mark.

16. The winning house in the recently concluded sports day events of Ndejje SS prepared for a victory party, with a budget of shs 240,000 for snacks, Soda and special juice. The organising committee planned to buy at least 5 boxes of juice and not more than 8 crates of soda. The number of crates of soda were also to be more than the boxes of juice. At wholesale price, each box of juice and crate of soda cost Shs 15,000 and shs 18,000 respectively. If x boxes of juice and y crates of soda were bought.

- Write down the inequalities to represent the given information
- Plot the graph of the above inequalities, by shading the unwanted region
- List down the eight possible combinations of the drinks that could be bought.
- Find the maximum number of crates of soda and boxes of juice that could be bought.

17.

- A room whose width is 3 meters less than the length has an area of 108cm^2 . Find the dimensions and perimeter of the room.
- In the given diagram QP is the diameter of circle PQCD; and ABCD is a



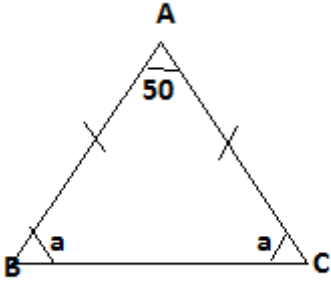
rectangle with $AB = 12\text{ cm}$ and $CB = 8\text{ cm}$. Calculate the area of the shaded region (correct to 2 d.p).

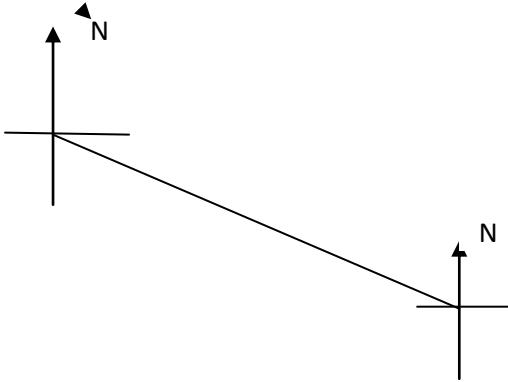
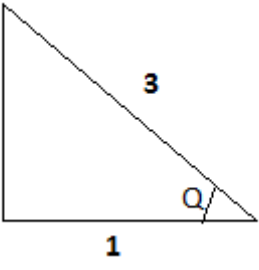
P456/1
MATHEMATICS
PAPER ONE
 $2\frac{1}{2}$ HOURS



NDEJJE SENIOR SECONDARY SCHOOL
UGANDA CERTIFICATE OF EDUCATION
SOLUTIONS TO MOCK SET IV EXAMINATIONS 2017

1.	$\log_2^{(x+t)} = t$ $2^t = x + y$ $y = 2^t - x$	
2.	$x = 6 - y \dots\dots\dots 1$ $2y + x = 8 \dots\dots\dots 2$ $\Rightarrow 2y + 6 - y = 8$ $y = 2$ $x = 6 - 2 = 4$	
3.	$1 \leq 2x - 3$ $4 \leq 2x$ $2 \leq x$ <i>also</i> $2x - 3 < 7$ $2x < 10$ $x < 5$ $2 \leq x < 5$ <i>int egralsolutionset = {2,3,4}</i>	
4.	$2 * 1 = 3(2) - 2(1) = 4$ $(2 * 1) * y = 4 * y$ $= 3(4) - 2(y) = 0$ $12 - 2y = 0$ $y = 6$	
5.	<i>Let x = bibles</i> <i>Y = gift bags</i>	

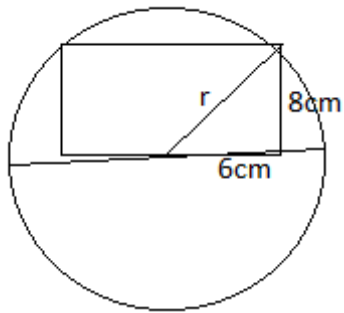
	$20,000x + 1500y \leq 780,000$ $40x + 3y \leq 1560 \dots\dots\dots 1$ $x \geq y \dots\dots\dots 2$ $x + y \geq 0 \dots\dots\dots 3$	
6.	Area using 3.14 $= 3.14(100)^2$ $= 31400cm^2$ $u \sin g \frac{22}{7} = \frac{22}{7}(100)^2$ $= 31,428.5714cm^2$ $error = 31,428.5714 - 31400$ $= 28.5714cm^2$ $\%error = \frac{28.5714}{31,428.5714} \times 100\%_a$ $= 0.0909\%$	
7.	$I(1,0) \rightarrow I'(0,1)$ $J(0,1) \rightarrow J'(1,0)$ $let m = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ $\begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ $\begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} A \\ 2 \\ 1 \end{pmatrix} = \begin{pmatrix} A' \\ 1 \\ 2 \end{pmatrix}$ $\therefore A'(1 \ 2)$	
8.	 <i>let the other angles be a</i>	

	$2a + 50 = 180$ $2a = 130 \quad \text{the remaining angles are } 65^\circ$ $a = 65^\circ$	
9.	 $= 90^\circ + 90^\circ + 90^\circ + 40^\circ = 310^\circ$ Therefore the required bearing is 310°	
10.	$O \rightarrow I_{finalmatrix} = RP$ $= \begin{pmatrix} -2 & 6 \\ -1 & 9 \end{pmatrix} \begin{pmatrix} 2 & 0 \\ 3 & 1 \end{pmatrix}$ $= \begin{pmatrix} 14 & 6 \\ 25 & 9 \end{pmatrix}$ $\sin glematrix = \frac{1}{-24} \begin{pmatrix} 9 & -6 \\ -25 & 14 \end{pmatrix}$ $= \begin{pmatrix} \frac{-9}{24} & \frac{1}{4} \\ \frac{25}{24} & \frac{-12}{7} \end{pmatrix}$	
11.	i.  $3 \cos \theta = 1$ $\cos \theta = \frac{1}{3}, \tan \theta = \sqrt{8} = 2\sqrt{2}$ $\sin \theta = \frac{\sqrt{8}}{3} = \frac{2\sqrt{2}}{3}$ ii.	

14.	a) $A^{-1} = \frac{1}{\det(A)} \times (AdjA)$ $= \frac{1}{2} \begin{pmatrix} 4 & -1 \\ -2 & 1 \end{pmatrix}$ $= \begin{pmatrix} 2 & -0.5 \\ -1 & 0.5 \end{pmatrix}$ b) $\begin{pmatrix} 2 & -0.5 \\ -1 & 0.5 \end{pmatrix} \begin{pmatrix} 1 & 1 \\ 2 & 4 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 2 & -0.5 \\ -1 & 0.5 \end{pmatrix} \begin{pmatrix} 3 \\ 8 \end{pmatrix}$ $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ c) i. $K^2 = K \times K$ $= \begin{pmatrix} 2 & -1 \\ 3 & 0 \end{pmatrix} \begin{pmatrix} 2 & -1 \\ 3 & 0 \end{pmatrix}$ $= \begin{pmatrix} 1 & -2 \\ 6 & -3 \end{pmatrix}$ ii. $2L + 3K = 2 \begin{pmatrix} 0 & 3 \\ -1 & 1 \end{pmatrix} + 3 \begin{pmatrix} 2 & -1 \\ 3 & 0 \end{pmatrix}$ $= \begin{pmatrix} 6 & 3 \\ 7 & 2 \end{pmatrix}$	
15.		

	<table><tr><th>marks</th><th>Mid(X)</th><th>f</th><th>d=(X-A)</th><th>f.d</th><th>CF</th><th>CB</th></tr><tr><td>20-29</td><td>24.5</td><td>2</td><td>-30</td><td>-60</td><td>2</td><td>19.5-29.5</td></tr><tr><td>30-39</td><td>34.5</td><td>8</td><td>-20</td><td>-160</td><td>10</td><td>29.5-39.5</td></tr><tr><td>40-49</td><td>44.5</td><td>12</td><td>-10</td><td>-120</td><td>22</td><td>39.5-49.5</td></tr><tr><td>50-59</td><td>54.5</td><td>6</td><td>0</td><td>0</td><td>28</td><td>49.5-59.5</td></tr><tr><td>60-69</td><td>64.5</td><td>8</td><td>10</td><td>80</td><td>36</td><td>59.5-69.5</td></tr><tr><td>70-79</td><td>74.5</td><td>10</td><td>20</td><td>200</td><td>46</td><td>69.5-79.5</td></tr><tr><td>80-89</td><td>84.5</td><td>4</td><td>30</td><td>120</td><td>50</td><td>79.5-89.5</td></tr><tr><td></td><td></td><td>$\sum f = 50$</td><td></td><td>$\sum fd = 60$</td><td></td><td></td></tr></table> iii. Median mark = 54.5 iv. Mean = $A + \frac{\sum fd}{\sum f} = 54.5 + \frac{60}{50} = 55.7$	marks	Mid(X)	f	d=(X-A)	f.d	CF	CB	20-29	24.5	2	-30	-60	2	19.5-29.5	30-39	34.5	8	-20	-160	10	29.5-39.5	40-49	44.5	12	-10	-120	22	39.5-49.5	50-59	54.5	6	0	0	28	49.5-59.5	60-69	64.5	8	10	80	36	59.5-69.5	70-79	74.5	10	20	200	46	69.5-79.5	80-89	84.5	4	30	120	50	79.5-89.5			$\sum f = 50$		$\sum fd = 60$			
marks	Mid(X)	f	d=(X-A)	f.d	CF	CB																																																											
20-29	24.5	2	-30	-60	2	19.5-29.5																																																											
30-39	34.5	8	-20	-160	10	29.5-39.5																																																											
40-49	44.5	12	-10	-120	22	39.5-49.5																																																											
50-59	54.5	6	0	0	28	49.5-59.5																																																											
60-69	64.5	8	10	80	36	59.5-69.5																																																											
70-79	74.5	10	20	200	46	69.5-79.5																																																											
80-89	84.5	4	30	120	50	79.5-89.5																																																											
		$\sum f = 50$		$\sum fd = 60$																																																													
16.	a) Let x be boxes of juice and y crates of soda $x \geq 5 \dots\dots\dots 1$ $y \leq 8 \dots\dots\dots 2$ $y > x \dots\dots\dots 3$ $15,000x + 18,000y \leq 240,000$ $5x + 6y \leq 80 \dots\dots\dots 4$ b) Graph work c) Combinations from graph are: (5,6), (5,7), (5,8), (6,7), and (6,8) d) Maximum number of crates are 8 maximum number of boxes of juice are 6																																																																
17.	i. $Area = x(x - 3) = 108$ $x^2 - 3x - 108 = 0$ $x(x - 12) + 9(x - 12) = 0$ $(x + 9)(x - 12) = 0$ $x = -9$ $x = 12$ $\therefore x = 12m$ Dimensions are: length = 12m $Width = 9m$ $Perimeter = 2(l + w) = 2(12 + 9)$ $= 42m$																																																																

ii) Shaded area = Area of semi circle - Area of rectangle



$$r^2 = 6^2 + 8^2 = 100$$

$$r = 10$$

$$= \frac{1}{2} \pi r^2 - (l \times w)$$

$$= \left(\frac{1}{2} \times \frac{22}{7} \times 10^2 \right) - (12 \times 8)$$

$$= 157.143 - 96$$

$$= 61.143 \text{ cm}^2$$