

**MATHEMATICS PAPER 2**

**121/2**

**JULY/AUGUST, 2015**

**TIME: 2½ HOURS**

**KAHURO/KIHARU DISTRICT JOINT EXAMINATION - 2015**

**SECTION I: (50 MARKS)**

**Answer all the questions in this section in the spaces provided.**

1. Kamoni bought four pens and three books for a total of Shs.17 while Jane bought five similar pens and two books for Shs.16. Find the cost of a pen and an exercise. (3 marks)
2. A shopkeeper mixes rice worth Kshs.47 and Kshs.55 per kg, how many kilograms of each should be used to obtain 24kg of the mixture worth Kshs.52 per kg. (3 marks)
3. Solve for  $\chi$  in  
 $\text{Log}_2 (\chi^2 - 9) = 3 \log_2 2 + 1$  (3 marks)
4. John deposits Shs.24000 in a fixed account. After 4 years the money accumulated to Kshs.45,000. If the bank paid compound interest of  $r\%$  p.a compounded semi annually find  $r$ . (3 marks)
5. If  $4\chi^2 + 3\chi - 20 + K$  is a perfect square find value of  $K$ . (3 marks)
6. A triangle whose area is  $6.5\text{cm}^2$  is mapped onto a triangle whose area is  $13\text{cm}^2$  by a matrix  
 $\begin{pmatrix} \chi + 4 & 6 \\ 5 & \chi \end{pmatrix}$ . Find the possible values of  $\chi$ . (4 marks)
7. Given that  $\chi$  is an acute angle and  $\text{Cos } \theta = \frac{2\sqrt{5}}{5}$  find without Mathematical tables or calculator  $\tan (90 - \theta)$ . (2 marks)
8. The diameter AB of a circle passes through points A (-4, 1) and B(2, 1). Find the equation of the circle and leave your answer in the form  $\chi^2 + y^2 + a\chi + by = c$  where a, b and c are constants. (4 marks)
9. Expand  $\left(1 + \frac{\chi}{4}\right)^5$  up to the term in  $\chi^4$ . Hence evaluate  $(0.95)^5$  giving your answer correct to 4s.f. (3marks)
10. Two variables are such that A is partly constant and partly varies as the square root of B. Given that A = 27 when  $B = \frac{1}{4}$  and A = 18; when B = 25, find A when  $B = 12\frac{1}{4}$ . (3 marks)
11. A curve passes through the point (3, -3), if its gradient function is  $5\chi^2 + 1$ , find its equation. (2 marks)
12. Pipe A can fill an empty water tank in 3hrs while Pipe B can fill the same tank in 6hrs. When the tank is full it can be emptied by Pipe C in 8hrs. Pipe A and B are opened at the same time when the tank is empty. If one hour later Pipe C is also opened, find the total time taken to fill the tank. (3 marks)
13. Make  $\chi$  the subject of the formula:  
 $\sqrt{\frac{(2\chi + r)^2}{4}} = \chi + r$  (3 marks)
14. The 16<sup>th</sup> term of an A.P. is seven times the 8<sup>th</sup> term. The sum of the first ten terms is -35. Find the first term and the common difference. (4 marks)
15. The following were recorded on a field note book by a surveyor. Taking the base line as 550M find the area in  $\text{M}^2$ . (3 marks)

		B			
		550	120	TO	A
C	150	450			
		250	90	TO	D
E	60	40			
		F			

16. Given that  $\frac{1}{1 + \sqrt{2}} - \frac{3}{1 - \sqrt{2}} = P + Q\sqrt{R}$  find the values of P, Q and R. (4 marks)

**SECTION B: (50 MARKS)**

Answer any FIVE questions from this section.

17. The table below shows the rates at which income tax is charged on annual income.

Annual taxable income (K£)	Rates (Shs. Per K£)
1 – 2800	3
2801 – 4600	5
4601 – 7200	6
7201 – 9000	7
9001 – 11800	9
11801 – 13600	10
Over 13600	12

A company employee earns a gross monthly salary of Ksh.18600. He is housed by the company and as a result, his taxable income is increased by 15%. If the employee is married and claims a monthly family relief of Shs.250, calculate

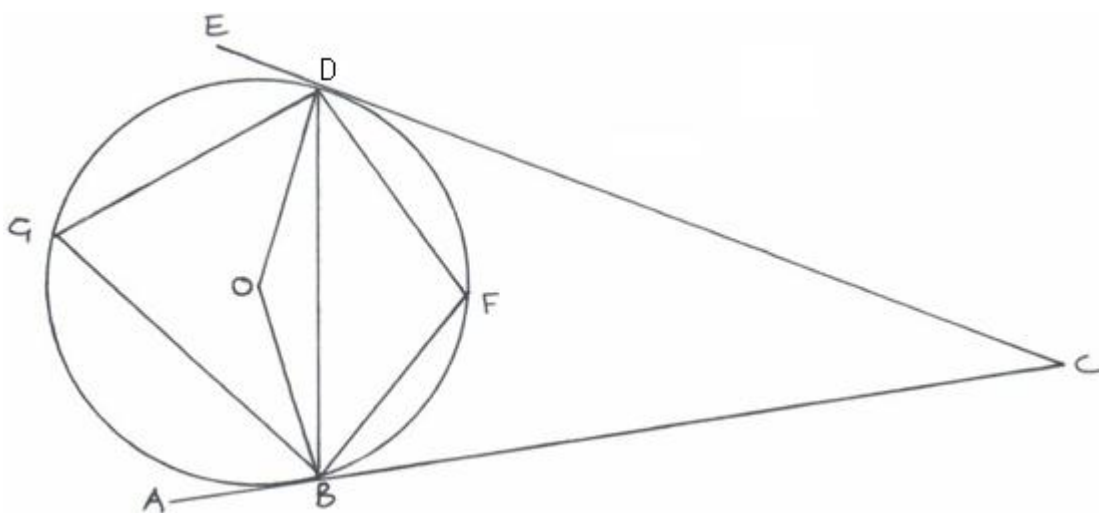
- (a) his taxable income. (2 marks)  
 (b) his net salary per month. (8 marks)
18. (a) Complete the table below for the function  $y = \sin 2\chi$  and  $y = 3 \cos \chi$  for  $-180^\circ \leq x \leq 180^\circ$ . (2 marks)

$\chi^\circ$	-180	-150	-120	-90	-60	-30	0	30	60	90	120	150	180
$\sin 2\chi$	0			0	-0.87				0.87	0			0
$3 \cos \chi$	-3	-2.6		0		2.6					-1.5		

- (b) On the same axes, draw the graph of  $y = \sin 2\chi$  and  $y = 3 \cos \chi$   $-180^\circ \leq x \leq 180^\circ$ . (5 marks)

Use the graph in (b) above to find:

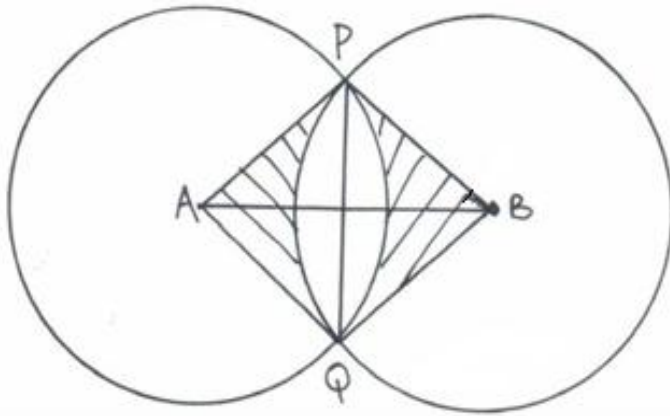
- (i) the value of  $\chi$  such that  $3 \cos \chi - \sin 2\chi = 0$ . (1 mark)  
 (ii) the difference in value of  $y$  when  $\chi = 45^\circ$ . (1 mark)  
 (iii) Range of values of  $\chi$  such that  $3 \cos x > 1.5$ . (1 mark)
19. In the diagram below  $\angle EDG = 36^\circ$ ,  $\angle ABG = 42^\circ$  line EDC and ABC are tangents to the circle at D and B respectively.



Calculate by giving reason.

- (a)  $\angle DGB$ . (2 marks)  
 (b) Obtuse  $\angle DOB$ . (2 marks)  
 (c)  $\angle GDB$ . (2 marks)  
 (d)  $\angle DCB$ . (2 marks)  
 (e)  $\angle DFB$ . (2 marks)
20. The position of two towns are A ( $30^\circ\text{S}$ ,  $20^\circ\text{W}$ ) and B ( $30^\circ\text{S}$ ,  $80^\circ\text{E}$ ) find
- (a) the difference in longitude between the two towns. (1 mark)  
 (i) the distance between A and B along parallel of latitude in km (take radius of the earth as 6370km and  $\pi = \frac{22}{7}$ ). (3 marks)

- (ii) in nm. (2 marks)
- (c) Find local time in town B when it is 1.45pm in town A. (4 marks)
21. In the figure below A and B are centres of the circle intersecting at point P and Q, angle PBQ = 97.2° while PAQ = 52°, PB = 4cm while AP = 10cm.



Determine:-

- (a) the length AB. (3 marks)
- (b) the area of sector APQ. (2 marks)
- (c) the area of the quadrilateral, APBQ. (3 marks)
- (d) area of the shaded region. (2 marks)

22. ABCD is a quadrilateral with vertices A (3, 1), B (2, 4), C (4, 3), D (5, 1).

- (a) Draw the image  $A^1B^1C^1D^1$  image of ABCD under transformation matrix  $M \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$  and write down the co-ordinates. (4 marks)

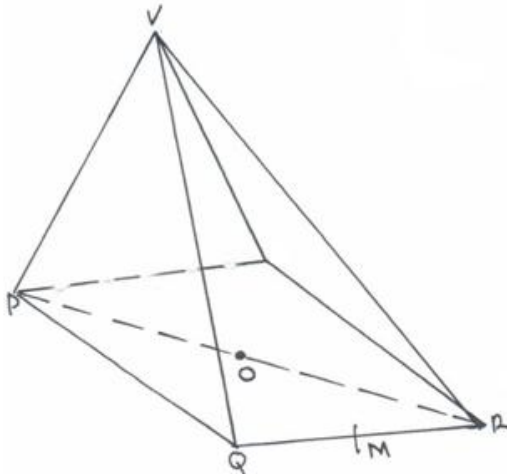
- (b) A transformation represented by  $P \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$  maps  $A^1B^1C^1D^1$  onto  $A^{11}B^{11}C^{11}D^{11}$  determine the co-ordinates of the image and draw  $A^{11}B^{11}C^{11}D^{11}$ . (3 marks)

- (c) Determine the single matrix of transformation which maps ABCD onto  $A^{11}B^{11}C^{11}D^{11}$  and describe the transformation. (3 marks)

23. (a) Without using a set square or a protractor, construct triangle ABC such that AB = AC = 5.4cm and angle ABC = 30°. (3marks)

- (b) Measure BC. (1 mark)
- (c) A point P is always on the same side of BC as A. Draw the locus of P such that angle BAC is always twice angle BPC. (2 marks)
- (d) Calculate the area of triangle ABC. (2 marks)
- (e) Draw a perpendicular from A to meet BC at D. Measure AD. (2 marks)

24. The figure below represent a right pyramid with vertex V and a rectangular base PQRS. VP = VQ = VR = VS = 18cm and QR = 12cm, M and O are midpoints of QR and PR respectively.



Find:

- (a) the length of the projection of VP on the plane PQRS. (3 marks)
- (b) size of angle between VP and plane PQRS. (3 marks)
- (c) size of angle between plane VQR and PQRS. (4 marks)