NAME ..... INDEX NUMBER .....

Adm ..... SIGNATURE .....

School ..... DATE .....

121/1
MATHEMATICS
PAPER 1
TIME: 2½ HRS
JULY/AUGUST 2016

WESTLANDS SUB-COUNTY JOINT EXAMINATION

KENYA CERTIFICATE OF SECONDARY EDUCATION (K.C.S.E)

Paper 1
July/August 2016
Time: 2½ hours

INSTRUCTIONS TO CANDIDATES

a) Write your name, Adm number, index number and Class.
b) This paper consists of **two** sections: Section **I** and section **II**
c) Answer **all** questions in Section **I** and only **five** questions in Section **II**.
d) All working and answers must be written on the question paper in the spaces provided below each questions.
e) Marks may be awarded for correct working even if the answer is wrong.
f) Negligence and slovenly work will be penalized.
g) Non programmable silent electronic calculators and K.N.E.C Mathematical tables are allowed for use.
h) This paper consists of **16** printed pages.
i) Candidates should check the question paper to ascertain that all the pages are printed as indicates and that no questions are missing.

FOR EXAMINER'S USE ONLY

SECTION I

QUESTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
MARKS																	

SECTION II

QUESTION	17	18	19	20	21	22	23	24	TOTAL
MARKS									

GRAND TOTAL

SECTION I (50 MARKS)
Answer ALL the questions in this Section in the spaces provided

1. Evaluate without using calculator; (3 marks)

$$\frac{-2(3-5)+7\div -2+4}{5\times -3 of\ 2-6}$$

2. Find the acute angle formed between the lines y + 2x = 5 and 2y - 6x + 8 = 0. (3 marks)

3. A water tank 10m high stands on a tower. Mrs. Kamau observes the angles of elevation of the top and bottom of the tank to be 40° and 25° respectively. Calculate the height of the tower. (4 marks)

4. Evaluate without using mathematical tables or a calculator. (3 marks)

$$100\left(\frac{\sqrt{8.41}}{\sqrt[3]{195.112}}\right)$$

5. Given that the matrix is singular, find the value of x. (2 marks)

$$\begin{pmatrix} 3 & 5 \\ (x+2) & x \end{pmatrix}$$

6. The exchange rates for a certain year were as follows:

	Buying (Kshs)	Selling (Kshs)
Chinese Yuan	12.34	12.38
1 US Dollar	80.24	80.44

A Kenyan businessman had 100,000 dollars which he converted into Kenyan shillings. He spends 5 million Kenyan shillings to import goods from China. How much is his balance in Chinese Yuan. (3 marks)

7. Find the value of y which satisfies the equation.

$2^{2y} - 3(2^{y+1}) + 8 = 0$ (3 marks)

8. Solve $\frac{2(2-x)}{5} < 3x + 2 \leq \frac{x}{2} + 9$, and state the integral values of x that satisfy the inequalities. (3 marks)

9. On one side of line AB below, use a ruler and a pair of compasses only to construct the locus of a point P such that $\angle APB = 67.5^{\circ}$ (3 marks)

10. Using tables of cubes, square roots and reciprocals, evaluate; (4 marks)

$$\frac{5}{\sqrt{0.876}} - (23.59)^3$$

11. Given that $P_1(6, 4)$ is the image of P(1, -2) under an enlargement with scale factor ½. Find the centre of enlargement. (3 marks)

12. Simplify completely; (3 marks)

$$\frac{3x - 12x}{2x^2 + 10x + 12}$$

13. The masses of two similar containers are 23.2g and 185.6g. If the surface area of the smaller container is 40cm², find the surface area of the larger one. (3 marks)

14. Find the value of y in the equation

$2 - \log (3x + 2) = \log 25 - \log (x - 1)$ (3 marks)

15. Find the equation of the normal to the curve;

$y = \frac{2x^3 + 4x^2 - 3x - 6}{x + 2}$ at the point y = 5. (4 marks)

16. Calculate the surface area of a solid hemisphere of radius 7cm, giving your answer to 3 significant figures. (3 marks)

SECTION II (50 MARKS)
Answer only FIVE questions from this section in the spaces provided

17. On a certain day, a matatu left Nakuru for Nairobi at 8am travelling at 80km/hr while a personal car left Nairobi for Nakuru at 8.15am, travelling at 100km/hr. Given that the distance between Nairobi and Nakuru is 200km;

a) Calculate;

i) the time when the two vehicles met. (3 marks)

ii) the distance of Nakuru from their meeting point. (2 marks)

b) At the meeting point the matatu stopped for 30 minutes and continued to Nairobi, while the personal car broke down and the owner took a taxi back to Nairobi, 20 minutes after the matatu left. If the taxi moves at 150km/h, calculate;

i) the time the taxi caught up with the matatu. (2 marks)

ii) the difference of their arrival in Nairobi. (2 marks)

18. Four points ABCD are positioned in a garden such that point B is 200m on a bearing of 063° from point A and 320° and 300m from point C. Point D is due North of C and 250m from B.

a) Using a scale of 1cm to represent 50m, show the positions of the four points. (4 marks)

b) From your diagram in (a) above, find;

i) the distance of D from C.

ii) the true bearing of D from B.

iii) the distance of A from C.

iv) the compass bearing of A from D. (6 marks)

19. P, Q, R and S are vertices of a parallelogram. Find the co-ordinates of S, given that P(-1, 1), Q(2, 2 and R(3, 5) (3 marks)

b) i) Given that **OT** = **i** + 3**j**, show that P, R and T are collinear. (3 marks)

ii) State the ratio OT:TR (1 mark)

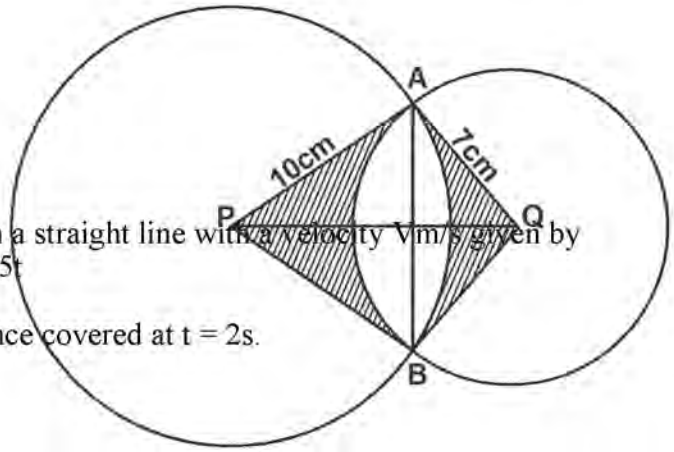
c) Calculate the magnitude of PR to 2 significant figures. (2 marks)

d) Find vector QS in terms of **i** and **j**. (1 mark)

20. The figure below shows two intersecting circles with centres P and Q and radii 10cm and 7cm respectively.

Given that the distance between the centres is 15cm, calculate;
a) the length of the common chord AB. 4 marks)

b) the area of the shaded region. (6 marks)



21. A particle moves in a straight line with a velocity Vm/s given by

$V = t^3 - 4t^2 + 5t$

If at $t = 0$, $S = 4m$

i) Find the distance covered at $t = 2s$. (4 marks)

ii) Find the acceleration of the particle at $t = 3s$. (3 marks)

iii) Find the maximum velocity attained. (3 marks)

22. The table below represents marks scored by 50 students in a test.

a) Calculate the mean mark. (3 marks)

b) Calculate the median (3 marks)

c) On the grid provided, draw a frequency polygon to represent the data. (4 marks)

23. In the figure below, PQR is a tangent to the circle at Q. TS is a diameter and TSR and QUV are straight lines. QS is parallel to TV. Angles SQR = 40° and TQR = 55°

Marks	$0 \leq x < 10$	$10 \leq x < 20$	$20 \leq x < 30$	$30 \leq x < 40$	$40 \leq x < 50$	$50 \leq x < 60$	$60 \leq x < 80$
No. of students	4	7	10	6	9	12	2

a) Find the following angles, giving reasons in each case;

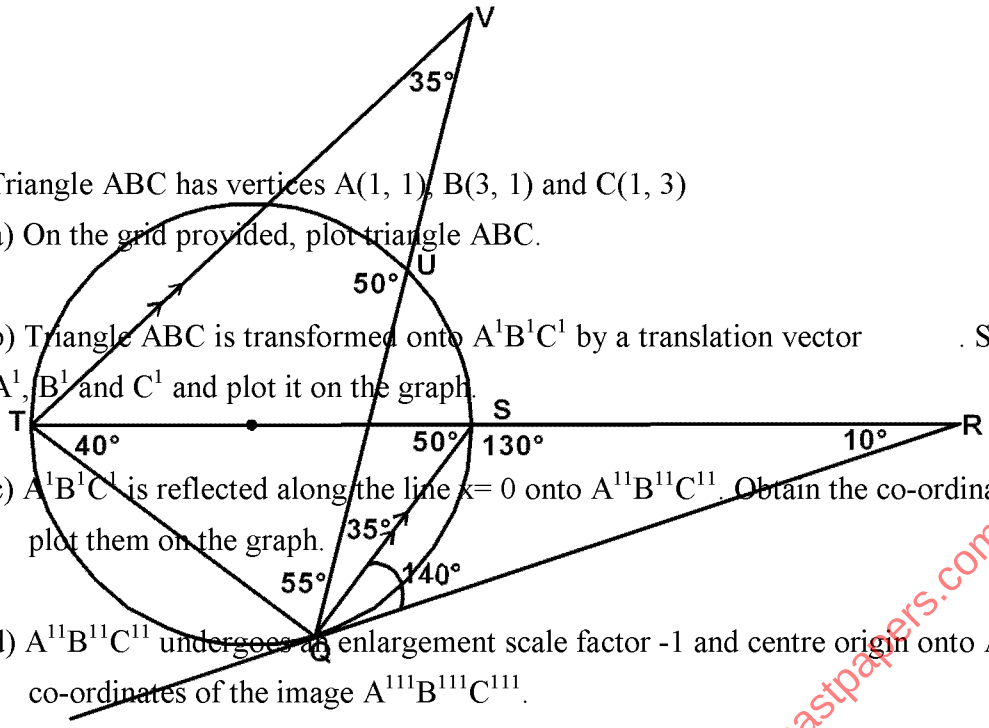
i) $\angle QTS$ (2 marks)

ii) $\angle QRS$ (2 marks)

iii) $\angle QVT$ (2 marks)

iv) $\angle QUT$ (2 marks)

b) Given that QR = 8cm and SR = 4cm, find the radius of the circle. (2 marks)



24. Triangle ABC has vertices A(1, 1), B(3, 1) and C(1, 3)

a) On the grid provided, plot triangle ABC. (1 mark)

b) Triangle ABC is transformed onto $A^1B^1C^1$ by a translation vector . State the co-ordinates of A^1, B^1 and C^1 and plot it on the graph. (2 marks)

c) $A^1B^1C^1$ is reflected along the line x= 0 onto $A^{11}B^{11}C^{11}$. Obtain the co-ordinates of $A^{11}B^{11}C^{11}$ and plot them on the graph. (2 marks)

d) $A^{11}B^{11}C^{11}$ undergoes an enlargement scale factor -1 and centre origin onto $A^{111}B^{111}C^{111}$. Obtain the co-ordinates of the image $A^{111}B^{111}C^{111}$. (2 marks)

e) $A^{111}B^{111}C^{111}$ undergoes a rotation of 120° about (1, -2). Obtain the co-ordinates of the final image $A^{iv}B^{iv}C^{iv}$. (3 marks)

$$\begin{pmatrix} 2 \\ 2 \end{pmatrix}$$