

GATAGA SUB COUNTY FORM FOUR END OF TERM II EXAMINATION 2016
Kenya Certificate of Secondary Education (K.C.S.E)

121/2

MATHEMATICS

PAPER 2

JULY / AUGUST 2016

2 ½ HOURS

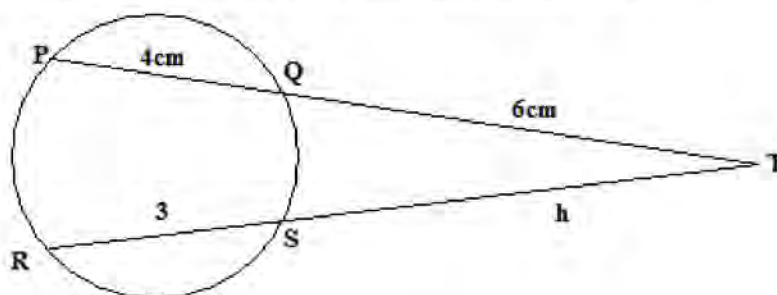
Section A (50 mks)**Answer all the questions in this section in the spaces provided.**

1. Use logarithms to evaluate. (3 mks)

$$\frac{8.2 \times 61.5 \times 4.07}{3.14 \times 10.9^2}^{1/4}$$

Leave your answer 4 d.p.

2. A rectangular flower garden measures 15.2m long and 10.56m wide. Find the percentage error in calculating the area of the garden to 3d.p. (3 mks)
3. Use matrix method to solve the equations; (4 mks)
- $$\log_2(2x + y) = 4$$
- $$\log_{17}(3x + 4y) = 1$$
4. In the figure below, chords PQ and RS intersect externally at T.



Given that PQ = 4cm, QT = 6cm and RS = 3cm, find RT. (3 mks)

5. Make P the subject of the formula in the simplest form. (3 mks)

$$\frac{1}{H} = \frac{\sqrt[3]{RP + GP}}{2}$$

6. Solve the equation $6x^2 - 10x - 2 = 0$ by completing the square method. Leave your answer in surd form. (3 mks)

7. Expand $(1 - \frac{1}{3}x)^5$ upto the fourth term. Hence evaluate $(0.97)^5$ correct to 4d.p. (4 mks)

8. Solve the equation $\cos \theta - 2\sin^2 \theta + 1 = 0$ for $-\pi^c \leq \theta \leq \pi^c$ (4 mks)

9. Evaluate (2 mks)

$$\left[\frac{\text{Evaluate}}{x^2 - 2x - 5} \right]_2^1$$

10. M(30^0 N, 75^0 W) and N(30^0 N, 105^0 E) are two points on the earth's surface. Find the shortest distance between them in km. (Take $R = 6370$ km and $\pi = \frac{22}{7}$). (3 mks)

11. A tailor intends to buy a sewing machine which costs sh. 52,000. he borrows money from the bank. The loan has to be repaid at the end of the second year. The bank charges an interest of 24% p.a compounded semi-annually calculate the total amount payable to the bank to the nearest 10 shilling. (3 mks)

12. A quantity P is partly constant and partly varies as the square of Q. When $Q = 2$, $P = 40$ and when $Q = 3$, $P = 65$. Determine the value of P when $Q = 4$. (3 mks)

13. A coffee trader buys two grades of coffee at sh. 80 and sh. 100 per packet. Find the ratio at which she should mix them so that by selling the mixture at sh. 120 per packet, a profit of 25% is realised. (3 mks)

14. Your school is to participate in the County ball games finals. The probability of winning football and volleyball is $\frac{2}{3}$ and $\frac{1}{4}$ respectively. Find the probability of winning atleast one game. (3 mks)

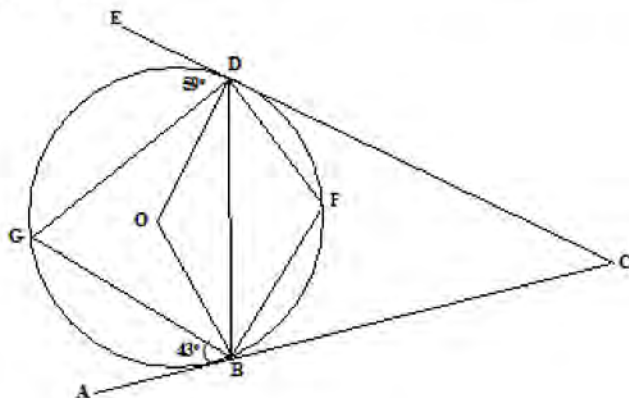
15. The first term of A.P is -3. If the sum of the first five terms is 25.

- a) Find the common difference. (2 mks)
- b) Hence withe the 9th term. (1mk)

16. Find the centre and radius of a circle whose equation is $x^2 + y^2 - 4x + 6y + 4 = 0$. (3 mks)

SECTION B (50 MARKS)**ANSWER ONLY FIVE QUESTIONS IN THIS SECTION**

17. A ship leaves Island Q(15°N , 30°E) and sails due West to Island R taking 80 hours. Given that its average speed was 24 knots;
- Find the position of Island R. (3mks)
 - Calculate the distance between the two Islands in kilometres. (Take radius of the earth to be 6370km) (4 mks)
 - If the local time at Q is 2.00p.m, find the local time at R. (3 mks)
 - Find the circumference of the latitude 30°N in nautical miles to 2 decimal places. (2mks)
18. In the figure below $\angle \text{EDG} = 59^{\circ}$ and $\angle \text{ABG} = 43^{\circ}$. The lines EDC and ABC are tangents to the circle at D and B respectively and $\text{DF} = \text{BF}$.



Find giving reasons:-

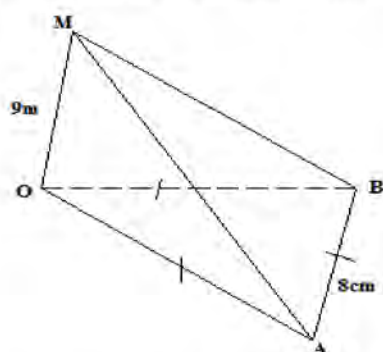
- $\angle \text{DGB}$ (2 mks)
- Obtuse angle DOB (2 mks)
- $\angle \text{DFB}$ (2 mks)
- $\angle \text{BCD}$ (2 mks)
- $\angle \text{GDF}$ (2 mks)

19. a) Complete the table below. (2 mks)

x	0	30	60	90	120	150	180	210	240	270	300	330	360
$y = \sin(x + 30^{\circ})$	0.50	-	-	-	-	0.00	-0.5	-	-	-	-	-	0.50
$y = 2\cos(x + 30^{\circ})$	1.73	-	0.00	-	-1.73	-	-	-	-	-	-	-2.00	1.73

- On the same axes, draw the graphs of $y = \sin(x + 30^{\circ})$ and $y = 2\cos(x + 30^{\circ})$. (4 mks)
- Use your graph to solve the equation.
 - $2\cos(x + 30^{\circ}) = \sin(x + 30^{\circ})$ (1 mks)
 - $\cos(x + 30^{\circ}) = -1/2$ (2 mks)
- State the amplitude of each curve. (1 mk)

20. An electric post OM, 9m high is held vertically by two wires MA and MB as shown below.



Points O, A and B are on the same level ground. Given that triangle OAB is equilateral with sides 8cm:-

- a) Find:-
 i) Angle AMB (3 mks)
 ii) The angle between planes AMB and OAB. (3 mks)
 b) If the four triangular shapes formed were covered with metallic plates, find the surface area of the metal used. (4 mks)
 21. The distribution of marks of 80 students is shown in the table below.

Marks	0 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100
Frequency	1	6	10	20	15	5	14	5	3	1

- a) Draw a cumulative frequency curve for the distribution above. (4 mks)
 b) From the graph, estimate;
 i) The median. (1 mk)
 ii) Semi-interquartile range. (3 mks)
 iii) The pass mark if 60% of the students are to pass. (2 mks)
 22. a) Use the trapezium rule with 10 strips to estimate the area bounded by the curve $y = x^2 - 3x - 4$ and the lines $x = -4$, $x = 1$ and the x axis. (5 mks)
 b) Calculate the exact area in (a) above and hence determine the percentage error in the estimate. (5 mks)
 23. a) Three quantities P, Q and R are such that
 i) P varies as the square of Q and inversely as the square root of R. Given that $P = 20$ when $Q = 5$ and $R = 9$. Find P when $Q = 7$ and $R = 25$. (4 mks)
 ii) If Q is increased by 20% and R decreased by 36% find the percentage changes in P. (3 mks)
 b) Two matrices M and N are such that $M = \begin{pmatrix} x & 2 \\ 1 & -3 \end{pmatrix}$ and $N = \begin{pmatrix} 1 & 2 \\ 3 & 0 \end{pmatrix}$ Given that the determinant of $MN = 48$.
 Find the value of x. (3 mks)
 24. A factory employs unskilled workers who earn sh. 6,000 per month and skilled workers who earn sh. 15,000 per month. The monthly wage bills must not exceed sh. 150,000. The machines require a maximum of 50 operators. Labour regulations demand that the number of skilled workers should be at most half the number of unskilled workers.
 a) If x is the number of unskilled workers and y the number of skilled workers, write down the inequalities for the above situation. (3 mks)
 b) Illustrate the results in (a) above on a graph. (5 mks)
 c) From your graph, obtain the range within which the number of unskilled labourers must lie. (2 mks)