

MAKUENI COUNTY CLUSTER PREPARATORY EXAMINATION 2016

Kenya Certificate of Secondary Education (K.C.S.E)

MATHEMATICS

Paper 2

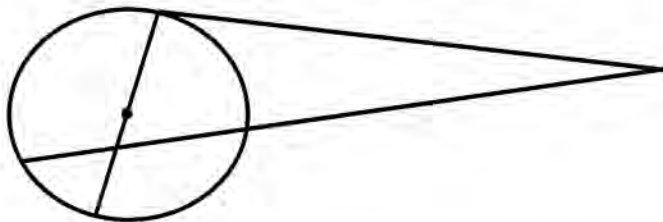
July/August 2016

Time : 2 ½ Hours

SECTION I (50 MARKS)**Answer all questions in this section.**

- Use logarithms to evaluate (4 marks)

$$\frac{0.03989 \times \sqrt[3]{0.6736}}{(0.08976)^3}$$
- A certain two-digit number is equivalent to five times the sum of the digits. It is found to be 9 less than the number formed when the digits are interchanged. Find the number. (3 marks)
- Six men working 3 hours a day can lay 240 bricks. How many more bricks can 12 men lay working 2 hours per day. (3 marks)
- In the figure below, PQ is a tangent to the circle at point Q. PQ meets chord SU produced at point P. QR is a diameter of the circle. O is the centre of the circle. QR meets SU at point T.



- Given that QP = 15cm and UP = 10cm. Calculate the length of line SU (2 marks)
 - If RT = 2.5cm and ST: TU = 5:3. Calculate the length of line QT (2 marks)
- Find the greatest value of x if $\log_4 x + \frac{3}{2} = \log_x 4$ (4 marks)
 - Simplify $\frac{3\sqrt{7} + 6\sqrt{2}}{4\sqrt{2} + 2\sqrt{7}}$ as far as possible, leaving your answer in the simplified form possible (3 marks)
 - Expand $(2 - \frac{1}{4}x)^5$ and use the first three terms to find the value of $(1.975)^5$ to four significant figures. (4 marks)
 - The points P(-6,-4) and Q(2,2) are the end points of the diameter of a circle.
 - Find the co-ordinates of the centre of the circle. (1 mark)
 - Hence find the equation of the circle giving your answer in the form $ax^2 + by^2 + cx + dy + k = 0$ (2 marks)
 - A financial institution charges compound interest on money borrowed. A business woman borrowed Sh.16, 000 from the financial institution. She paid back Sh. 25,000 after 2 years. Find the interest rate per annum (3 marks)
 - Factorise completely (2 marks)
 $45 - 5x^2$
 - Make n the subject of the formula (3 marks)

$$m = \sqrt[3]{\frac{ax^2n}{w-n}}$$
 - Given that $\overrightarrow{OA}$ is the position vector of A and $\overrightarrow{OA} = 3i - \frac{2}{3}j + \frac{1}{2}k$, while m is the midpoint of the line AB and $\overrightarrow{OM} = -i + \frac{5}{6}j$ determine vector AB. (3 marks)
 - The first, the third and the seventh terms of an increasing arithmetic progression are three consecutive terms of a G.P. If the first term of the A.P is 10. Find the common difference of the A.P (3 marks)
 - A triangle ABC is such that AB = 6cm, BC = 7cm and AC = 8cm. Calculate the size of angle ACB correct to 2 decimal places. (2 marks)
 - ABCD is a square of side 5cm. A point P moves inside this square so that $AP \leq PB$ and $\angle APB \geq 90^\circ$. Show by construction, the locus of P. (4 marks)

16. Mr. Mutua sold an article at 15% discount to a customer who paid Sh. 520 for it. What was the marked price of the article in shillings only. (2 marks)

SECTION II (50 MARKS)

(Answer any five questions)

17. In a certain year income tax for all the income earned was charged at the rate shown below.

Monthly taxable pay in KShs	Rate of tax % in each KShs
1-9680	10%
9681-18800	15%
18801-27920	20%
27921-37040	25%
Excess over KShs 37040	30%

Mrs. Mumo earned a basic salary of KShs. 32,000 and a house allowance of KShs. 10,000 per month. She claimed a tax relief of KSh 1056 per month. She had a life insurance policy and she claimed the maximum relief of KSh. 3000

Calculate

- (a) The tax payable without relief (s) (5 marks)
 (b) The tax paid after relief (2 marks)

Other than tax, the following deductions are made

- (i) A service charge of Sh. 100
 (ii) Health insurance fund Sh. 320
 (iii) A co-operative loan of Sh. 3200
 (iv) Burial benevolent fund of KSh. 200
 (v) Risk fund KSh. 100
 Calculate
 (c) The total monthly deductions made from her income (2 marks)
 (d) Her net income from her employment. (1 mark)

18. Seeds are collected and weighed to the nearest gram. The frequency distribution is given below.

Weight (gram)	10-13	14-17	18-21	22-25	26-29	30-33	34-37
Number of seed pods	20	25	32	48	35	27	23

Calculate to 1 decimal place

- (a) The median height (3 marks)
 (b) Using an assumed mean of 23.5
 Calculate to 2 decimal places

- (i) The mean height (4 marks)
 (ii) The standard deviation (3 marks)

19. OABC is a parallelogram with vertices O (0, 0), A (2, 0), B (3, 2) and C (1, 2). O'A'B'C' is the image of OABC under the transformation matrix $\begin{pmatrix} -3 & 0 \\ 0 & -3 \end{pmatrix}$

- (a) (i) Find the co-ordinates of O'A'B'C' (2 marks)
 (ii) On the grid provided draw OABC and O'A'B'C' (2 marks)
 (b) (i) Find the O''A''B''C'', the image of O'A'B'C' under transformation matrix $\begin{bmatrix} 1 & 0 \\ 0 & -3 \end{bmatrix}$ (2 marks)
 (ii) On the grid draw O''A''B''C'' (1 mark)
 (c) Find a single matrix that maps O''A''B''C'' onto OABC (3 marks)

20. The probability of passing KCSE depends on the performance in the KCPE. If the candidate passes the KCPE, the probability of passing KCSE is $\frac{4}{5}$. If the candidate fails in the KCPE, the probability of passing KCSE is $\frac{3}{5}$. If a candidate passes KCSE the probability that, he/she will get employed is $\frac{5}{8}$. If she/he fails KCSE, the probability of getting employed is $\frac{1}{3}$. The probability of passing KCPE is $\frac{2}{3}$.

- (a) Draw a well labelled tree diagram to represent the above information. (2 marks)
 (b) Using the tree diagram, find the probability that a candidate
 (i) Passes KCSE (2 marks)
 (ii) Gets employed (2 marks)
 (iii) Passes KCSE and gets employed. (2 marks)
 (iv) Passes KCPE and does not get employment (2 marks)

21. (a) Complete the table below, giving the values correct to 2 decimal places.

x°	0	30	60	90	120	150	180	210	240	270	300	330	360
$\sin 2x$	0		0.87		-0.87		0	0.87	0.87				0
$3\cos x - 2$	1	0.6			-3.5			-4.60			-0.5		1

(b) On the grid provided, draw the graphs of $y = \sin 2x$ and $y = 3\cos x - 2$ for $0^\circ \leq x \leq 360^\circ$ on the same axis. Use a scale of 1cm to represent 30° on the x-axis and 2cm to represent 1 unit on the y axis.

(c) Use the graph in (b) above to solve the equation $3\cos x - \sin 2x = 2$ (2 marks)

(d) State the amplitude of $y = 3\cos x - 2$ (1 mark)

22. The velocity v metres per second of a particle projected into space is given by the formula $v = 4t^2 - 2t + 9$, where $t =$ time in seconds. Determine

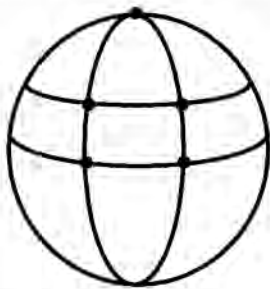
(a) Acceleration of the particle when $t = 2$ sec (3 marks)

(b) The value of t when acceleration is minimum. (2 marks)

(c) The velocity when the acceleration is minimum (2 marks)

(d) The distance covered between the 1st and 2nd seconds. (3 marks)

23. Four points P, Q, R and S are shown on the surface of the earth and point N is the North pole.



(a) Calculate the shortest distance in nautical miles between P ($0^\circ, 35^\circ\text{W}$) and Q ($0^\circ, 50^\circ\text{E}$) measured along the equator. (2 marks)

(b) A helicopter flies from Q to N, then to P and finally back to Q using the shortest distance between any two points. Find the total distance travelled in kilometres. (3 marks)

(c) Another helicopter travels from P due north to S then due east to R and finally due south to Q. Calculate

(i) the total distance travelled in kilometres (3 marks)

(ii) the total time taken to the nearest hour if the helicopter flies at a speed of 200km/hr (2 marks)

(Take $\pi = \frac{22}{7}$ and Radius of the earth 6370km)

24. The manager of a cinema wishes to divide the seats available into two classes A and B. He has the following constraints.

(i) There are not more than 120 seats available.

(ii) There must be at least twice as many B class seats as there are A class seats.

(iii) Class A seats are priced at Sh. 30 each and class B at Sh. 20 each and at least Sh. 2000 should be collected at each show to meet the expenses.

(a) Write inequalities from the constraints listed above. (3 marks)

(b) On the grid provided plot the inequalities. (4 marks)

(c) Find the number of seats of each kind which will give the maximum profit and calculate this maximum profit. (3 marks)