CENTRAL KENYA NATIONAL SCHOOLS JOINT MOCK - 2015

Kenya Certificate of Secondary Education
MATHEMATICS ALT A
PAPER 1
TIME: 2½ HOURS

INSTRUCTION TO CANDIDATE’S:
(a) Write your name, index number in the spaces provided at the top of this page.
(b) Sign and write the date of examination in spaces provided above.
(c) This paper consists of TWO sections: Section I and Section II.
(d) Answer ALL the questions in Section I and any five questions from Section II.
(e) Show all the steps in your calculation, giving your answer at each stage in the spaces provided below each question.
(f) Marks may be given for correct working even if the answer is wrong.
(g) Non-programmable silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.
(h) This paper consists of 16 printed pages.
(i) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
(j) Candidates should answer the questions in English.

FOR EXAMINER’S USE ONLY:

SECTION I

|   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | TOTAL |
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SECTION II

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Grand Total
Mathematics Paper 1

SECTION I: (50 MARKS)

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

1. Evaluate: \[
\frac{44 - 28}{12 - 2} - \frac{8^2 \times -12 - 24}{96 - 12 \times 9}
\] (3 marks)

2. A basketball team plays 10 matches in a tournament. The following are scores in each match:
9, 15, 17, 16, 7, 20, 21, 15, 10, 12
Determine:
(a) the mode. (1 mark)
(b) the median. (2 marks)
3. A wholesaler sold a cell phone to a retailer making a profit of 20%. The retailer later sold the cell phone for Ksh.3120 making a profit of 30% calculate the amount of money the wholesaler had paid for the cell phone. (3 marks)

4. Given that \( \cos (\chi + 20^\circ) = 0.7660 \), find \( \chi \) for \( 0^\circ \leq \chi \leq 360^\circ \). (3 marks)

5. (a) Express 1050 in terms of its prime factors. (1 mark)

(b) Determine the smallest positive number such that 1050p is a perfect square. (2 marks)
6. The exterior angle of a regular polygon is $(\chi - 50)^\circ$ and the interior angle is $(2\chi + 20)^\circ$. Find the number of sides of the polygon. (3 marks)

7. A line P passes through the point (-2, 5) and has a gradient of $\frac{-3}{4}$. Another line Q is perpendicular to P and meets it at a point where $y = \frac{1}{2}$ find equation of Q. (4 marks)

8. Simplify the expression completely.

$$\frac{(\chi + 2y)(\chi - 2y) - (\chi - 2y)^2}{\chi^2 - 4y^2}$$

(3 marks)
9. The mass of two similar solids are 324g and 768g. Find
   (a) height of the smaller solid if the height of the bigger solid is 20cm. (2 marks)
   (b) the surface area of the smaller solid if the surface area of the bigger solid is
       40cm². (2 marks)

10. A cylindrical pipe 5 metres long has an internal diameter 28 millimetres and an external
diameter of 42 millimetres. The density of the material that makes the pipe is
1.45g/cm³. Calculate the mass of the pipe in kilograms. \( \left( \text{Take } \pi = \frac{22}{7} \right) \). (4 marks)
11. Simplify: \( \frac{32^{\frac{3}{2}} \times 8100^{\frac{3}{4}}}{8^{\frac{1}{2}} \times 5^{\frac{3}{4}} \times 4^{\frac{3}{4}}} \). (3 marks)

Mathematics Paper 1

12. In the figure below PQRS is a rhombus, \( \angle SQR = 55^\circ \), \( \angle QST \) is a right angle and TPQ is a straight line.

Find the size of the angle STQ. (3 marks)

13. The mass of a mixture A of beans and maize is 72kg. The ratio of beans to maize is 3: 5 respectively. Find the mass of maize in the mixture. (3 marks)
14. A square toilet is covered by a number of whole rectangular tiles of sides 60cm by 48cm. Calculate the least possible area of the room in square metres. (3 marks)

15. Form the inequalities represented by region R.

16. A point C is on a line PQ where PQ = 9cm. C divides PQ such that \( PC = \frac{4}{7} PQ \).

By construction locate C. (3 marks)
17. A construction company requires to transport 288 tonnes of stones to sites P and Q. The company pays 48,000 to transport 48 tonnes of stones for every 28km. Joyce transported 96 tonnes to site P, 49km away.

(a) Find how much she was paid. (3 marks)

(b) Joyce spends Ksh.6000 to transport every 8 tonnes of stones to site P. Calculate her total profit. (3 marks)
(c) Kimani transported the remaining stones to site Q, 84km away. If he made 44% profit, find his transport cost. (4 marks)

Mathematics Paper 1

18. (a) A square carpet is laid on the floor of a room so that one of its sides is against a side of a room. If leaves strips of uncovered floor 1m wide along the two opposite sides and 2m wide along the remaining side. If the area of the room is 64m², find the dimensions of the carpet. (6 marks)
(b) Solve the equation: \( \frac{y + 3}{24} = \frac{1}{y - 2} \). (4 marks)
The trader sold the animals he had bought making a profit of 40% per low and 45% per goat.

(i) Calculate the total amount of money he received. (2 marks)

(ii) Determine his profit in Kenya shillings. (2 marks)

Mathematics Paper 1

20. A truck left town X at 11.45am and travelled towards town Y at an average speed of 60km/hr. A car left town X at 2.15pm on the same day and travelled along the same road at an average speed of 100km/hr. The distance between the two towns is 500km.

(a) Calculate the time of the day when the car overtook the truck. (4 marks)
(b) The distance from Y when the car overtook the truck. (3 marks)

(c) After overtaking the bus, both vehicles continued towards Y at their original speeds. Find how long the car had to wait at town Y before the truck arrived. (3 marks)

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21. The displacement $S$ metres of a moving particle after $t$ seconds is given by
   \[ S = 2t^3 - 5t^2 + 4t + 2 \]
   Determine
   (a) the velocity of the particle when $t = 2$. (3 marks)

(b) the value(s) of $t$ when the particle is momentarily at rest. (3 marks)
(c) the displacement when the particle is momentarily at rest. (2 marks)

(d) the acceleration of the particle when $t = 5$. (2 marks)

Mathematics Paper 1  
Cekenas Joint Mock

22. In the figure below, $OA = a$, $OB = b$ and $OC = 3OB$.

(a) Express in terms of $a$ and $b$. 
(i) \( \overline{AB} \)  

(ii) \( \overline{AC} \)  

(b) Given that \( \overline{AM} = \frac{3}{4} \overline{AB} \) and \( \overline{AN} = \frac{1}{2} \overline{AC} \), express \( \overline{OM} \) and \( \overline{ON} \) in terms of \( a \) and \( b \).  

(c) Hence show that \( O, M \) and \( N \) are collinear.  

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Mathematics Paper 1  

23. Triangle \( ABC \) has vertices \( A (1, 2), B (2, 3) \) and \( C (4, 1) \) while triangle \( A'B'C' \) has vertices \( A'(1, -2), B'(2, -3) \) and \( C'(4, -1) \).  

(a) Draw triangle \( ABC \) and \( A'B'C' \) on the same grid.  

(b) Describe fully a single transformation that maps triangle \( ABC \) onto triangle \( A'B'C' \).  

(c) On the same grid draw triangle \( A''B''C'' \) the image of triangle \( ABC \) under a reflection in line \( Y = -\chi \).  

(d) Draw \( \Delta A''''B''''C'''' \) such that it can be mapped onto triangle \( ABC \) by a negative quarter turn about the origin.
(e) Find the matrix of transformation that maps triangle ABC onto triangle $A'\!B'\!C'$. (2 marks)

24. Arc of a circle of radius 40cm subtends an angle of 126° at the centre of the circle.
   (a) Calculate:
   (i) the length of the arc. (2 marks)
(ii) the area of the sector. (2 marks)

(b) The sector is folded to form a cone. Calculate:
(i) the radius of the base of the cone. (2 marks)

(ii) the height of the cone. (2 marks)

(iii) the capacity of the cone in litres. (2 marks)
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SECTION I: (50 MARKS)

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1. Simplify: \[ \frac{\frac{2}{4} - \frac{1}{3}}{\frac{1}{6} - \left(\frac{-1}{3}\right)} - \frac{5}{8} \text{ of } 3. \] (4 marks)

2. (a) Expand \((2 + \chi)^4\). (1 mark)

(b) Use the expansion in (a) above to find the value \((2.01)^4\) to 4d.p.

3. Solve for \(y\) in the equation.
\[ \log_{10} (3y + 2) - 1 = \log_{10} (y - 4). \] (3 marks)
4. Make P the subject of the formula.

\[ E + \chi = \chi + \frac{P - 3\mu}{\sqrt{y - 3\chi P}}. \]

5. Points P, Q and R are points on the circumference of a circle. If PQ = PR = 13cm and QR = 10cm, what is the radius of the circle.

6. Find the radius and the centre of the circle whose equation is:

\[ 3\chi^2 + 3y^2 - 6\chi + 12y + 3 = 0. \]

7. Find C that divide AB externally in the ratio 5: 2, given that A (3, -6, 9) and B (-15, 3, 12).
8. A two digit number is formed from the first four prime numbers.
   (a) Draw the table to show the possible outcomes. (2 marks)

   (b) Calculate the probability that a number chosen from the two digits is even number. (2 marks)

9. A dam containing 4158m³ of water is to be drained. A pump is connected to a pipe of radius 3.5cm and machine operate for 8 hours per day. Water flows through the pipe at the rate of 1.5m per second. Find the number of days it takes to drain the dam. (4 marks)

10. The population of two town Kana and Jane for three years were as follows:

    Kana  40,000,  48000,  56000
    Jane  40,000,  48000,  57600

    Calculate the difference in population of the two after six years.
11. The gradient of a curve at any point given by $2\chi - 1$. Given that the curve passes through point $(1, 5)$. Find the equation of the curve. (3 marks)

12. Simplify: $\frac{3}{\sqrt{7} - \sqrt{2}} - \frac{2}{\sqrt{7} + \sqrt{2}}$. (3 marks)

13. Given that $AB = 6$cm construct locus of P such that angle $\angle APB = 90$. (2 marks)

14. A car valued at Ksh.500,000 in January 2008. Each year, it value depreciates at 12% p.a. Find after how long would the value depreciate to Ksh.250,000. (3 marks)
15. In the below figure PT = 4cm and TQ = 5cm and TS = 2.5cm find TR by calculation. 

(2 marks)

16. Given that $2 \leq A \leq 4$ and $0.1 \leq B \leq 0.2$. Find the minimum value of $\frac{AB}{A-B}$. (3 marks)
Ask any FIVE questions from this section in the spaces provided.

17. Two towns A and B lie on the same parallel of latitudes 60°N. If the longitudes of A and B are 42°W and 29°E respectively.
   (a) Find the distance between A and B in nautical miles along the parallel of latitude. (2 marks)

   (b) Find the local time at A if at B is 1.00pm. (2 marks)

   (c) Find the distance between A and B in km. \( \left( \text{Take } \pi = \frac{22}{7} \text{ and } R = 6370 \text{km} \right) \). (2 marks)

   (d) If C is another town due South of A and 10010km away from A, Find the co-ordinate of C. (4 marks)
18. In the figure below AOC is a diameter of the circle centre O. AB = BC and \( \angle ACD = 35^\circ \), EBF is a tangent to the circle at B. G is a point on minor arc CD.

Calculate the size of the following angles giving reasons in each case.

(a) \( \angle BCD \).

(b) Obtuse angle BOD.

(c) \( \angle BAD \).

(d) \( \angle CGD \).
(e) \( \angle AEB. \) (2 marks)

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**Mathematics Paper 2**

**Cekenas Joint Mock**

19. (a) Complete the table below for the function \( y = 3\chi^2 - 2\chi - 1 \) for \(-3 \leq \chi \leq 4\).

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<th>-1</th>
<th>0</th>
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<td>( y = 3\chi^2 - 2\chi - 1 )</td>
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(2 marks)

(b) Draw the graph of \( y = 3\chi^2 - 2\chi - 1 \). (3 marks)
(c) Draw the line \( y = 3\chi + 1 \) on the same axis hence find the values of \( \chi \) for which \( y = 3\chi + 1 \) and \( 3\chi^2 - 2\chi - 1 \) are equal. (3 marks)

(d) Write down the simplified quadratic equation whose roots are the solutions of the simultaneous equation in (c) above. (2 marks)
20. The diagram below shows a right pyramid VPQRS with V as the vertex and a rectangular base PQRS. PQ = 3cm, QR = 4cm. The height of the pyramid is 6cm. PM = MQ and OQ = NR.

(a) Calculate.
(i) the length PV.  

(ii) the angle between face VPQ and the base.
(b) (i) the slant height VM and VN. \hspace{1cm} \text{(2 marks)}

(ii) What is the surface area of the pyramid? \hspace{1cm} \text{(3 marks)}

\text{Mathematics Paper 2} \hspace{1cm} 11 \hspace{1cm} \text{Cekenas Joint Mock}

21. On the same axes, draw this graph of \( y = 2 \sin \chi \) and \( y = 3 \sin (\chi + 30^\circ) \) for the domain \(-360^\circ \leq \chi \leq 360^\circ\). \hspace{1cm} \text{(5 marks)}
From your graph determine.

(a) the period of each of the functions. 

(b) the amplitude of each of the functions. 

(c) the solution to $2 \sin \chi = 3 \sin (\chi + 30^\circ)$. 
(d) the transformation that maps the graph of \( y = 2 \sin \chi \) onto the graph of \( y = 3 \sin (\chi + 30^\circ) \). (2 marks)

22. The diagram below shows a histogram marks obtained in a certain test.

(a) Develop a frequency distribution table for the data if the first class 5-9 has a frequency of 8. (3 marks)
23. The cost $C$, of producing $n$ items varies partly as $n$ and partly as the inverse of $n$. To produce two items it cost 50Sh and to produce six items it costs 70Sh. Find
(a) the constants of proportionality and hence write the equation connecting $C$ and $n$. (5 marks)

(b) the cost of producing 12 items. (2 marks)
24. An auto spare dealer sells two types of lubricant A and B in his shop. While purchasing type A cost Sh.40 per 100ml tin and type B cost Sh.60 per 100ml tin. He decided to buy at least 30 tins altogether of type A and B with Sh.1500 available. He decides that at least one third of the tins should be of type B. He buys $x$ tins of type A and $y$ tins of type B.

(a) Write down three inequalities, which represent the above information. (3 marks)

(b) On a graph paper, draw a graph to show the three inequalities (a) above. (3 marks)
(c) Determine how many tins of each type that he should buy to maximize his profit if he makes a profit of Sh.10 of each type A and a profit of Sh.20 on each type B tin. (2 marks)

(d) Calculate maximum possible profit. (2 marks)