NAME: …………………………………….……. INDEX NO: …………………………….……

SCHOOL:………………………………………….SIGNATURE: …………………………….……

DATE : ……………………………………..……

121/1
MATHEMATICS
PAPER 1
JULY / AUGUST 2013
TIME: 2½ HOURS

NANDI CENTRAL DISTRICT JOINT MOCK 2013

Kenya Certificate of Secondary Education (KCSE)
MATHEMATICS
PAPER 1
TIME: 2½ HOURS

INSTRUCTIONS TO CANDIDATES

a) Write your Name and Index Number in the spaces provided at the top of this page.
b) Sign and write the date of examination in the spaces provided above.
c) This paper contains TWO sections: section I and section II
d) Answer all the questions in Section I and any FIVE questions from section II.
e) All answers and working must be written on the question paper in the spaces provided below each question.
f) Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.
g) Marks may be given for correct working even if the answer is wrong.
h) Non-programmable silent electronic calculators and KNEC mathematical tables may be used except where stated otherwise.

FOR EXAMINER'S USE ONLY:

Section I

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

Section II

GRAND TOTAL

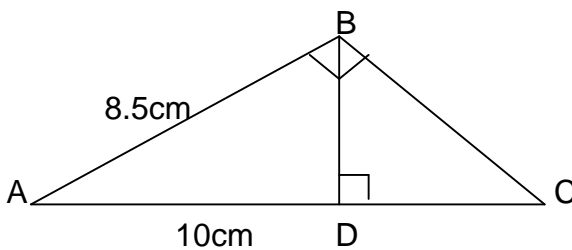| 17	18	19	20	21	22	23	24	**TOTAL**

Answer ALL Questions in this section

1. Evaluate: (3mks)

   $2 \left\{ (\frac{3}{4} + 1\frac{5}{7} \div \frac{4}{7} \text{ of } 2\frac{1}{3}) \div (1\frac{3}{7} - \frac{5}{8}) \text{ of } \frac{2}{3} \right\}$

2. In the triangle, AB = 8.5cm, AC = 10cm and ABC = BDC = 90^0. (3mks)

   Calculate:
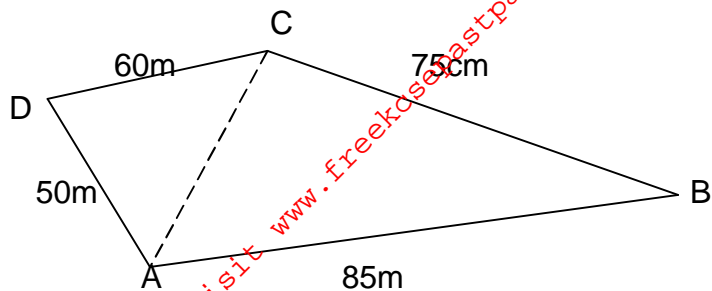   (i)   The length of BC. (1mk)

   (ii)   The length of BD. (2mks)

3. A minibus covered a distance of 200km at an average speed of 100km/hr. It traveled at a speed of 80km/hr for $\frac{3}{5}$ of its journey. At what speed did it travel the remaining part of the journey. (3mks)

4. The figure below represents a plot of land ABCD such that AB=85m, BC=75m, CD=60m, DA=50m and angle ACB = 90^0. (Not drawn to scale).

Determine the area of the plot, in hectares, correct to two decimal places. (4mks)

5. Solve the equation $8x^2 + 2x - 3 = 0$ hence solve the equation $8\cos^2 y + 2\cos y - 3 = 0$ for the range $0^0 < y < 180^0$. (4mks)

6. Simplify the expression: $\dfrac{3x^2 - 4xy^2 + y}{9x^2 - y^2}$ (3mks)

7. A rectangular tank has a hole in it such that 41cm^3 of water leaks out every 5 seconds. Using as 3.142. Calculate:-

(i) The capacity of the water lost from the tank every hour. (2mks)

(ii) The time it takes to till a cylindrical tank of radius 30cm and height 30cm into which the leaking water drains; in hours to 4 significant figures. (2mks)

8. Factorise the expression: $2s^2t^2 - 5st - 12$. (2mks)

9. Use ruler and pair of compasses only to draw a parallelogram PQRS in which PQ = 8cm, QR = 6cm and angle QPS = 75^0. By construction, determine the perpendicular distance between PQ and RS. (3mks)

10. The table below shows marks scored by 40 students in a mathematics test.

Marks	30 – 39	40 – 49	50 – 59	60 – 69	70 – 79
No. of students	2	9	14	7	8

Calculate the median mark. (2mks)

11. Mr. Kirui earns a basic salary of sh. 12,000 per month. In addition he is also paid a commission of 2½ % for sales above sh. 15,000. In a certain month, he sold goods worth sh. 140,000 at a discount of 5%. Calculate his total earning that month. (3mks)

12. Three vertices of a parallelogram PQRS are P(-1,2), Q(8,-5) and R(5,0).
    (i) On the grid provided below, draw the parallelogram PQRS.   (1mk)

    (ii) Determine the length of the diagonal QS.   (2mks)

13. Three people Felix, Evans and Eunice contributed money to start a business. Felix contributed
    a quarter of the total amount and Evans two fifths of the remainder. Eunice's contribution was
    one and a half times that of Felix. They borrowed the rest of the money from the bank which
    was Kshs. 60,000 less than Eunice's contribution. Find the total amount required to start the
    business.   (3mks)

14. All prime numbers between ten and twenty are arranged in descending order to form a number.

   (i)   Write down the number.   (1mk)

   (ii)   State the total value of the third digit of the number formed in (i) above.   (1mk)

15. A solid object is formed by a cylinder and a cone such that the cone of base radius 1.5 and slant height 4.8m is attached to the cylinder whose height is 12.6m. Using =3.142, calculate the total surface area of the solid, leaving your answer to 2 decimal places.

16. Mrs. Tabut bought 4 spoons and 6 plates for Kshs. 660 and Mrs. Koross bought 2 spoons and 1 plate less than Mrs. Tabut for Kshs. 510.
   (i)   Find the price of each item.   (2mks)

   (ii)   Mrs. Lagat spent Kshs. 2280 to buy the same type of spoons and plates. If the number of plates she bought were 4 more than the number of spoons, find the number of spoons bought by Mrs. Lagat.   (1mk)

17. The table below shows how income tax was charged on income earned in a certain year.

Taxable income per year (Kenya Pounds)	Rate (Shilling per Kenya Pound)
1 – 3630	2
3631 – 7260	3
7261 – 10890	4
10891 – 14520	5

Mr. Gideon is an employee of a certain company and earns a salary of Ksh. 15,200 per month. He is housed by the company and pays a nominal rent of Ksh. 1050 per month. He is married and is entitled to a family relief of Kshs. 450 per month.

(i) Calculate his taxable income in k£ p.a. (2mks)

(ii) Calculate his gross tax per month. (4mks)

(iii) Calculate his net tax per month. (2mks)

(iv) Calculate his net salary per month. (2mks)

18. Coast bus left Nairobi at 8.00a.m. and traveled towards Mombasa at an average speed of 80km/hr. at 8.30am, Lamu bus left Mombasa towards Nairobi at an average speed of 120km/h. Given that the distance between Nairobi and Mombasa is 400km; determine:

(i) The time Lamu Bus arrived in Nairobi. (2mks)

(ii) The time the two buses met. (4mks)

(iii) The distance from Nairobi to the point where the buses met. (2mks)

(iv) How far Coast Bus is from Mombasa when Lamu bus arrives in Nairobi. (3mks)

19. (a) Find the inverse of the matrix: (1mk)

$$A = \begin{bmatrix} 4 & 3 \\ 3 & 2 \end{bmatrix}$$

(b) Rose bought 20 bags of oranges and 15 bags of mangoes for a total of sh. 9,500. Chumo bought 30 bags of oranges and 20 bags of mangoes for a total of sh. 13,500. If he price of a bag of oranges is X and that of mangoes is y:

   (i) Form two equations to represent the information above. (2mks)

   (ii) Hence use the matrix A^{-1} above to find the price of one bag of each item. (3mks)

(c) The price of each bag of oranges was increased by 10% and that of mangoes reduced by 10%. The businesswomen (Rose and Chumo) bought as many oranges and as many mangoes as they bought earlier. Find by matrix method the total cost of oranges and mangoes that the businesswomen bought after the percentage change. (4mks)

20. The figure below represents a quadrilateral piece of land ABCD divided into three triangular plots. The lengths BE and CD are 100m and 80m respectively. Angle ABE = 30^0, ACE = 45^0 and   ACD = 100^0.
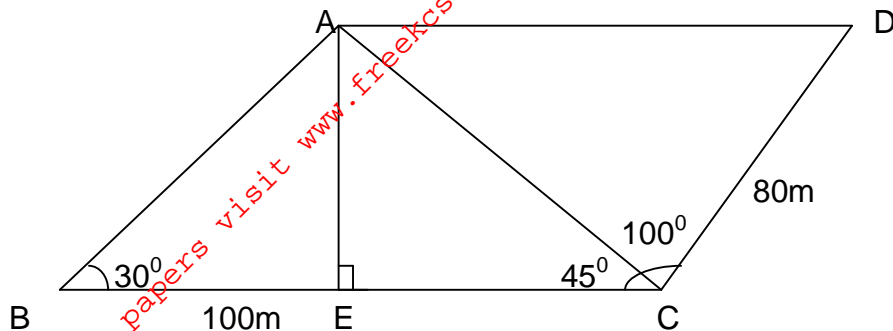
(a) Find to four significant figures:
   (i)   The length of AE.   (2mks)

   (ii)   The length of AD.   (2mks)

   (iii) The perimeter of the piece of land.   (3mks)

(b)   The plots are to be fenced with five strands of barbed wire leaving an entrance of 2.8m wide to each plot. The type of barbed wire to be used is sold in rolls of lengths 480m. Calculate the number of rolls of barbed wire that must be bought to complete the fencing of the plots.   (3mks)

21. (a) Sketch the graph of the function: $y = 4x^3 + 2x^2 - 5$ (2mks)

(b) Find the area under the graph of the function: $y = 4x^3 + 2x^2 - 5$ between lines $y = 0$, $x = 1$ and $x = 3$ by:
  (i) Using the trapezium method taking intervals of 0.5 of a unit. (3mks)

  (ii) Integration. (3mks)

(c) Express the error in (b) (i) above as a percentage of the area obtained in (b) (ii) above. (2mks)

22. A particle starts from rest and moves with an acceleration, a, given by $a = (10-t)$ m/s^2.
Given that velocity, V m/s is 2m/s; when time, t seconds is 1 sec.

(a) Express in terms of t;
  (i) Its velocity after t seconds.   (3mks)

  (ii) Its displacement after t seconds.   (2mks)

(b) Calculate its velocity when t = 3 seconds.   (2mks)

(c) Calculate the maximum velocity attained.   (3mks)

23. Two points P and Q are found on the earth's surface. The position of P is (52^0S, 66^0W) and Q (52^0S, 114^0E). Using earth's radius = 6370km:
   (a) Find the difference in longitude between two points P and Q.   (1mk)

   (b) Calculate the shortest distance between points P and Q along:-
      (i)   The Latitude in km (to 1 whole number).   (2mks)

      (ii) The Longitude in km (to one whole number).   (3mks)

   (c) A plane travelling at 800km/hr leaves point P at 10.00am and sails through South Pole to point Q. Find the local time the plane arrives at point Q to the nearest minutes.   (4mks)

24. The table below shows marks obtained by 120 candidates. Frequencies for all the groups and also the area and height of the rectangle for the group 30 – 60 marks are shown.

Marks	0 – 10	10 – 30	30 – 60	60 – 70	70 - 100
Frequency	12	40	36	8	24
Area of rectangle			180		
Height of rectangle			6		

(a) (i) Complete the table. (4mks)

    (ii) On the grid provided below, draw he histogram to represent the distribution. (2mks)
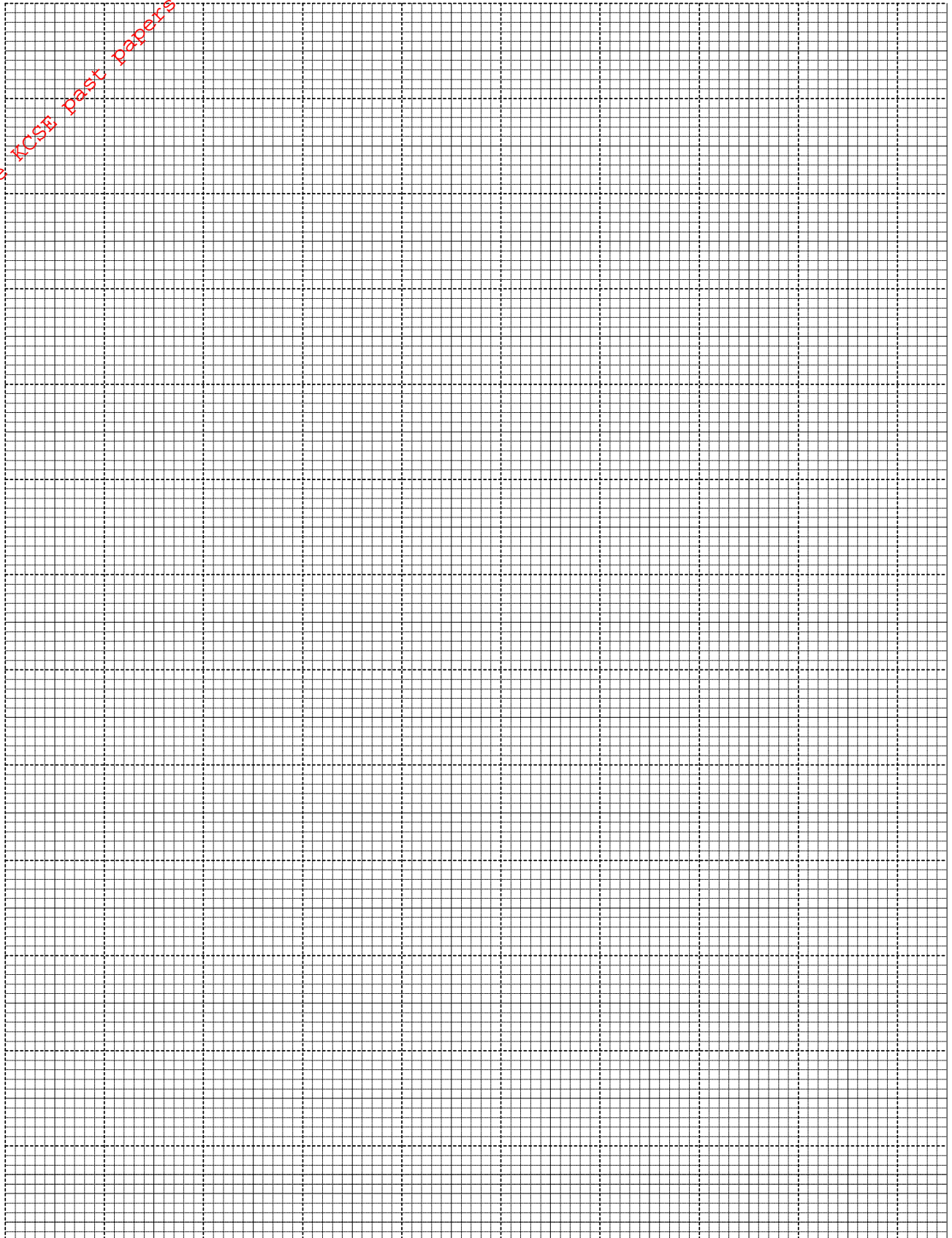
(i) State the group in which the median mark lies.   (1mk)

(ii) A vertical line drawn through the median mark divides the total area of the histogram into two equal parts. Using this information, estimate the median mark.   (3mks)