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

SCHOOL: …………………………….… DATE : ………………………………..

CANDIDATE'S SIGNATURE:……………………

121/1
MATHEMATICS
PAPER 1
JULY / AUGUST 2014
TIME: 2½ HOURS

NANDI NORTH SUB-COUNTY JOINT EVALUATION 2014

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**

1. Without using a calculator, evaluate: (3mks)

$$\frac{8\frac{1}{2} - 6^2/_3 \div {}^4/_9}{{}^2/_5 \text{ of } 6\frac{1}{4} + 1\frac{1}{4}}$$

2. A tourist visited Kenya with 2500 U.S dollars and changed the U.S dollars into Kenya Shillings at a local bank in Kenya when the exchange rates at the time were as follows:

	Buying	Selling
1 U.S. Dollar	Shs. 78.45	Shs. 78.55
1 Sterling pound	Shs. 120.25	Shs. 120.45

(a) How much did he get in Kenya shillings? (2mks)

(b) While in Kenya, he used Shs. 80,000 and after his stay he converted the remaining amount into sterling pounds. Calculate, to 2 decimal places, the Sterling Pounds that he got.

(2mks)

3. The size of an interior angle of a regular polygon is 5 times the size of its exterior angle. Find the number of sides of this polygon. (3mks)

4. Given that in a right angled triangle, sin = $^5/_{12}$, find: (2mks)
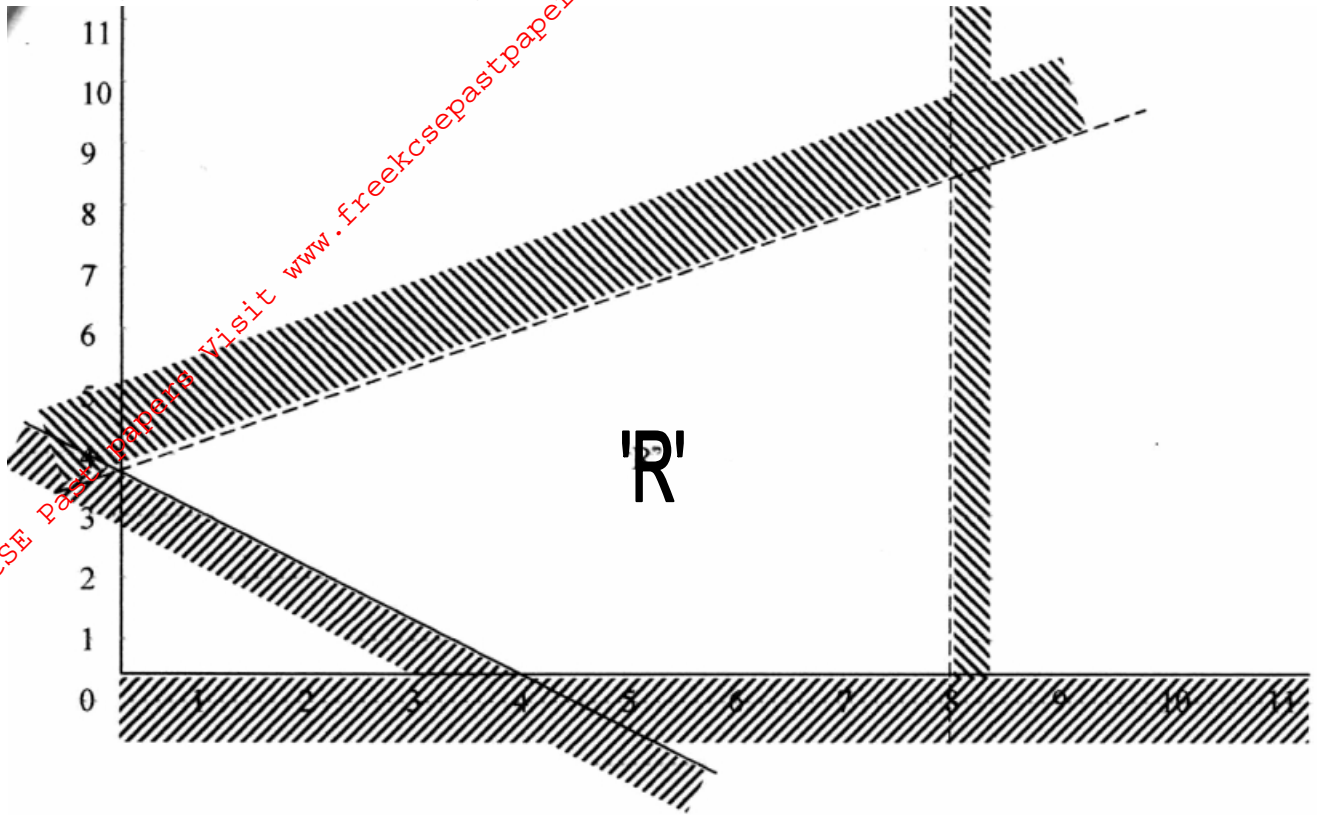   Cos ($90^0 -$)

5. The column vectors of b, c and d are given as:

$$\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \qquad \begin{bmatrix} 4 \\ -2 \\ 3 \end{bmatrix} \quad \text{and} \quad \begin{bmatrix} 0 \\ 3 \\ -2 \end{bmatrix} \quad \text{respectively and}$$

that P = b + 2c – d
Express vector P as a column vector and hence calculate the magnitude of P. (3mks)

6. The diagram below shows the region enclosed by inequalities.

Determine the inequalities that defines the regions R. (3mks)

7. The diagonal of a rectangular flower garden is 20m. If the width of this garden is 8m, calculate its length and perimeter to 4 s.figures. (3mks)

8. Expand $(\sqrt{5} + \sqrt{3})(\sqrt{5} - \sqrt{3})$ hence or otherwise simplify by rationalising the denominator of

$$\frac{\sqrt{2}}{\sqrt{5} + \sqrt{3}}$$

9. Given the matrix $\quad y \quad = \quad \begin{pmatrix} c & 0 \\ 4 & d \end{pmatrix}$

(a) Determine y^2 (1mk)

(b) If $y^2 = I$, determine the possible values of c and d.   (2mks)

10. Change $0.2\dot{4}$ and $3.0\dot{4}$ into fractions hence evaluate:

$$\frac{411}{44} \left(0.2\dot{4} \div 3.0\dot{4} \right)$$ leaving your answer as a fraction in its simplest form. (3mks)

11. Factorise $xy - zy - xw + zw$ hence simplify the expression completely. (3mks)

$$\frac{(xy - zy - xw + zw (y + w)}{W^2 - y^2}$$

12. Pipe Q and R can fill a tank in 20 minutes and 30 minutes respectively. Pipe T can empty the full tank in 40 minutes. Starting with an empty tank, how long does it take to fill the tank if:
    (a) All the three pipes are open? (1mk)

    (b) Pipe R is closed after 10 minutes? (3mks)

13. The gradient of the curve is $ax^2 + 3x$ at $x = 2$ is 8. Find the value of a. (2mks)

14. The graph below is a velocity time graph.
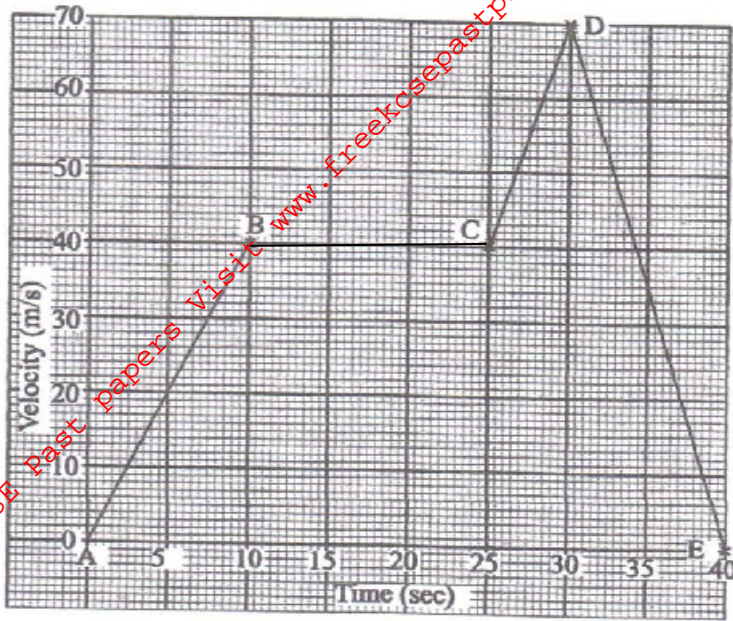
Determine the acceleration in the sections:

(a) (i) CD   (1mk)

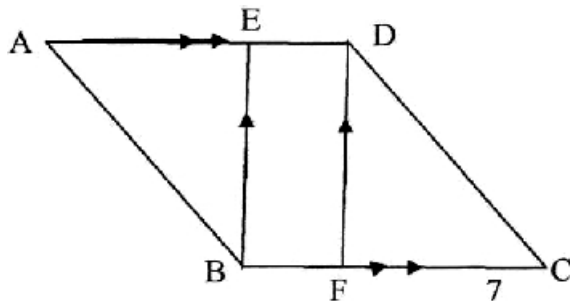(ii) DE   (1mk)

(b) Calculate the total distance covered.   (2mks)

15. How many terms of the arithmetic series 2, 5, 8, 11 …. May be added to make their sum 301? (3mks)

16. The diagram ABCD is a parallelogram. Line BE is parallel to line FD. Show that triangles ABE and CDF are congruent. Show that triangles ABE and CDF are congruent. (3mks)
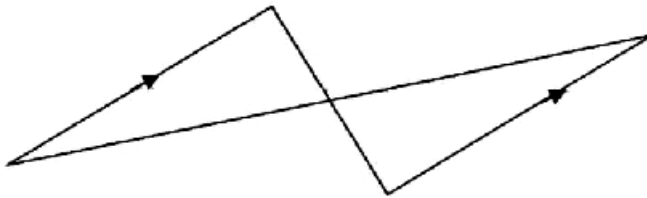
17. The ratio of a spherical balloon increases by 4%. Find the percentage increase in its;
   (a)   Surface area.   (2mks)

   (b)   Volume   (2mks)

   (c)   In the figure below, SP is parallel to QR.

   (i)   Show that triangles SPX and RQX are similar.   (2mks)

   (ii) If PS = 8cm, PX = 6cm, SX = 4cm and RX = 3cm, find the length of RQ and QX.   (4mks)

9

18. A and B are two points 10cm apart.
    (a) Draw a circle centre A, radius 2cm and a circle centre B, radius 4cm.   (2mks)

    (b) Draw a transverse common tangent to the two circles.   (5mks)

    (c) Find by calculation the length of a direct common tangent correct to 3 significant figures.
    (3mks)

19. A metallic cuboid 8cm by 10cm by 4cm is melted. Half of it is used to make a cylinder of radius 4.2cm, the remaining is used to make a sphere. Determine using $\pi = {}^{22}/_7$:-

(a) The height and surface area of the cylinder to 1 decimal place.   (5mks)

(b) The radius and surface area of the sphere correct to 1 decimal place.   (5mks)

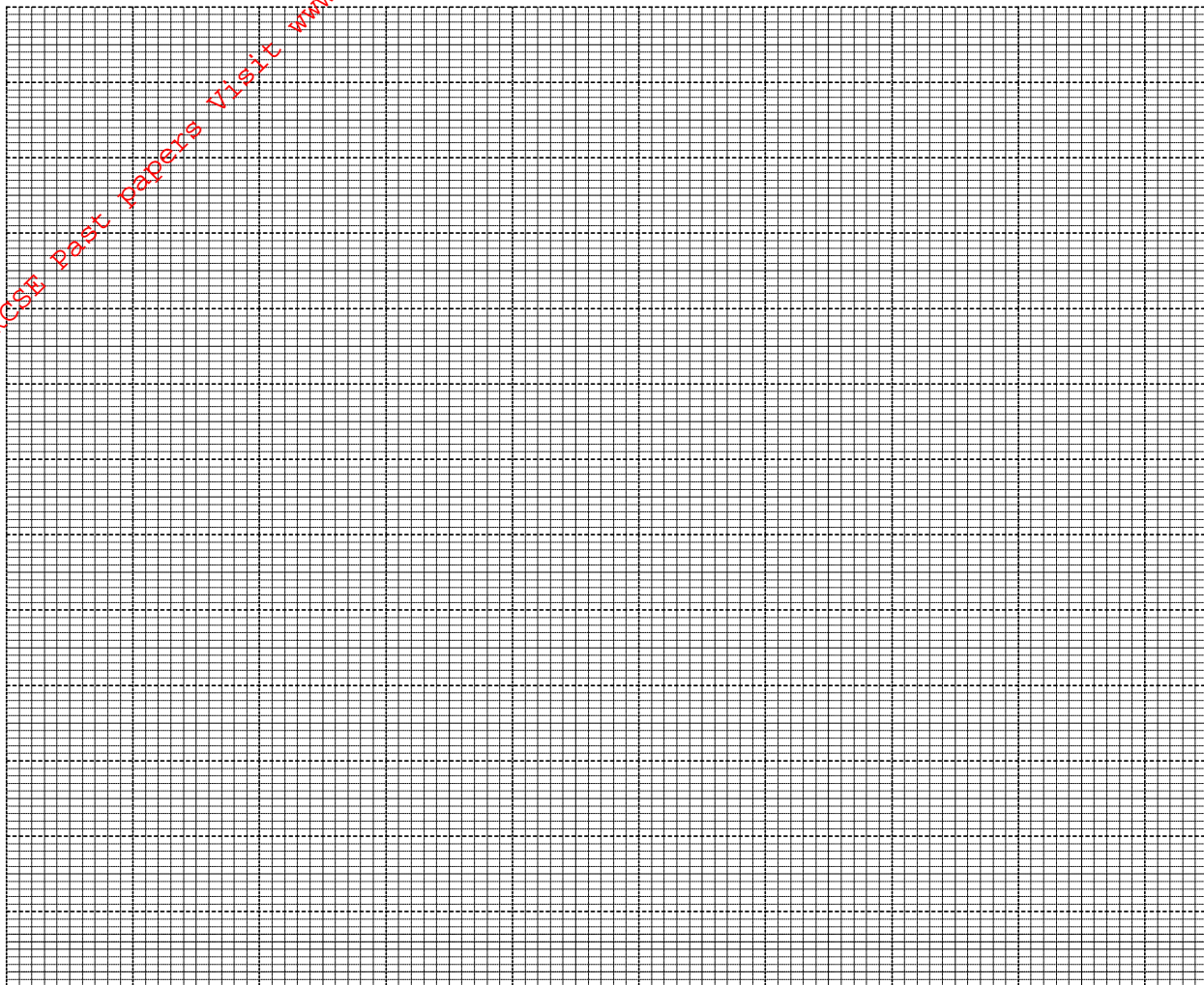20. (a) Complete the table below to 2 decimal places for

$y = -x^3 - x^2 + 3x + 1$

x	-4	-3	-2.5	-2	-1.5	-1.0	-0.5	0	0.5	1.0	1.5	2.0
y						-2						

(2mks)

(b) On the grid provided, draw the graph for $y = -x^3 - x^2 + 3x + 1$ for $-4 < x < 3$. (3mks)

(c) Use the graph to solve the equation $-x^3 - x^2 + 3x + 1 = 0$ (2mks)

(d) By drawing a suitable straight line on the graph, solve $-x^3 - x^2 + 3x + 1 = -2x$ (3mks)

21. The table below shows the masses of population randomly chosen in a certain town in kilogrammes.

Mass group	Number of people
0 – 2	3
2 – 5	6
5 – 12	12
12 – 20	24
20 – 35	30
35 – 60	20
60 – 90	5

(a) Represent this information on a histogram. (5mks)

(b) Draw a frequency polygon. (2mks)

(c) Calculate the mean of the population in this town. (3mks)

22. A school has two students whose age difference is 9. Twice the sum of their ages is equal to the age of their teacher.
   (a) By letting the age of the younger student be y, write an expression of the:
      (i) Age of the elder student. (1mk)

      (ii) Age of their teacher. (1mk)

   (b) If in 19 years time, the product of the ages of the two students is equal to 14 times the age of their teacher;
      (i) Form an equation in y and hence determine the present possible age of the younger student. (4mks)

      (ii) Determine the possible age of the elder student in 19 years time. (2mks)

      (iii) Find the possible age of the teacher. (2mks)

23. A quadrilateral ABCD has the coordinates A (1,1), B(4,1), C(5,3) and D(2,3).
   (a) On the graph provided draw the quadrilateral ABCD.

   (b) A^{I}B^{I}C^{I}D^I is the image of ABCD under a transformation matrix represented by:

   R = $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ write down the coordinates of A^{I}B^{I}C^{I}D^I and on the same

   grid draw quadrilateral A^{I}B^{I}C^{I}D^I. (3mks)

   (c) A^{II}B^{II}C^{II}D^{II} with coordinates A^{II}(1,-2), B^{II}(4,1), C^{II}(5,-4), D^{II}(2,-7) is the image of A^{I}B^{I}C^{I}D^I under transformation whose matrix is T. Find matrix T. (4mks)

   (d) (i) On the same grid, draw quadrilateral A^{II}B^{II}C^{II}D^{II}. (1mk)
      (ii) A single transformation matrix K maps ABCD onto A^{II}B^{II}C^{II}D^{II}. Determine the matrix K. (2mks)

15

24. The diagram below represents a community water tank made up of cylindrical and regular hexagonal parts. The diameter and the height of the cylindrical part are 7m and 5m respectively. The side of the regular hexagonal face is 2m and the height of the hexagonal part is 10m. (Take $\pi = \frac{22}{7}$)
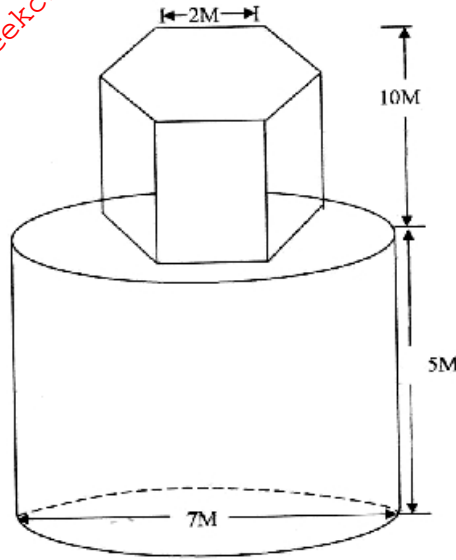
(a) Determine:-
   (i) Cylindrical part. (2mks)

   (ii) Hexagonal part. (3mks)

   (iii) The whole tank. (2mks)

(b) An identical structure is to be built with a hollow cross-sectional area of 1.5m² and mass of 440kgs. Calculate the density of this structure. (3mks)