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

SCHOOL: .... CANDIDATE SIGN: ....

DATE: ....

121/1

MATHEMATICS
PAPER 1
MAY/ JUNE-2016

TIME: 2 ½ HOURS

HEXAGON JOIN EXAMINATIONS
Kenya Certificate of Secondary Education (KCSE)

121/1
MATHEMATICS
PAPER 1
MAY/ JUNE-2016

TIME: 2 ½ HOURS

INSTRUCTION
   a) Write your name and index number in the spaces provided above.
   b) Sign and write the date of the examination in the spaces provided above.
   c) This paper consists of **TWO** sections: **section I** and **Section II.**
   d) Answer **ALL** the questions in **Section I** and only **five** questions from **section II.**
   e) **Show all the steps in your calculations, giving your answers at each stage in the stage in the spaces 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.

Section I

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

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

This paper consists of 16 printed pages.
Candidate should check the question paper to ascertain all pages are printed as indicated
And no questions are missing.

SECTION I (50 Marks)
Answer all the questions in this section.

1. Without using mathematical tables or calculator, evaluate (3mks)

$$\sqrt{\frac{2.56 \times 0.00625}{0.25 \times 0.08 \times 0.5}}$$

2. A book seller distribute cartons of books as follows, one school received 1/3 of the cartons he had in the stalk. A second school received a quarter of the remainder. A third school received a third of what the second school received. What remained were not more than 42 cartons. How many cartons did the second school receive? (3mks)

3. The length of a hollow cylindrical pipe is 6meters. Its external distance is 11cm and has a thickness of 1cm. calculate the volume in cm^3 of the material used to make the pipe.
Take (π as 3.142) (3mks)

4. A bank either pays simple interest as 5% p.a or compound interest as 5% p.a on deposits. Nekesa deposited Ksh. P in the bank for two years on simple interest terms, if she had deposited the same amount for two years on compound interest terms, she would have earned Ksh. 210 more. Find the value of P. (3mks)

5. Simplify completely (3mks)

$$\frac{3y^2 - 1}{y^2 - 1} - \frac{2y + 1}{y + 1}$$

6. The exterior angle of a regular polygon is equal to one third of the interior angle. Calculate the number of sides of the polygon and give its name. (4mks)

7. A and B are towns 360km apart. An express bus departs from A at 8a.m. and maintains an average speed of 90km/h between A and B. Another bus starts from B also at 8am and moves towards A making four stops at four equally spaced points between B and A. Each stop is of duration 5 minutes and the average between any two spots is 60km/h. Calculate the distance between the two buses at 10am. (3mks)

8. The table below shows heights of 50 students

Height (cm)	Frequency
140-144	3
145-149	15
150-154	x
155-159	11
160-164	2

a) Sate the modal class. (1mk)

b) Calculate the median. (3mks)

9.   A man walks directly from point A towards the foot of a tall building 240m away. After covering 180m he observed that the angle of the top of the building is 45°. Calculate the angle of elevation of the top of the building from A.   (3mks)

10.   A plug is made up of hemisphere cup of radius 4.9cm and a cylinder of diameter 42cm and height 6cm as shown in the diagram alongside. Calculate the volume of the plug. (Take π as $\frac{22}{7}$)

6cm

4.2cm

r = 4.9cm
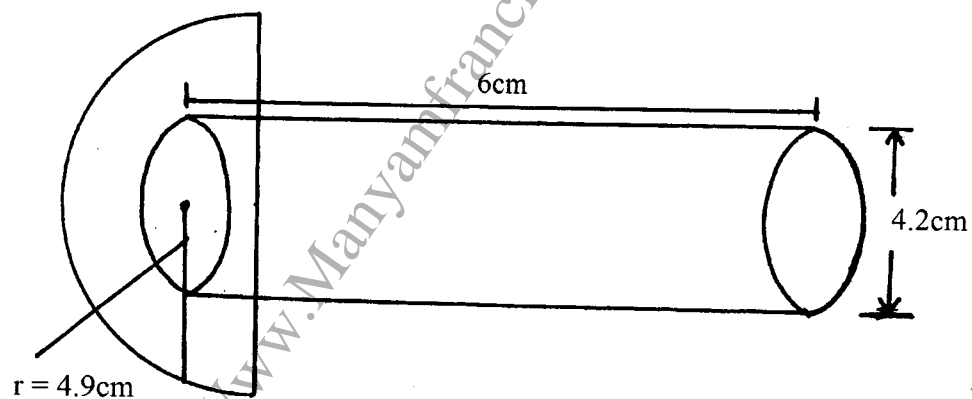
(3mks)

11. In the figure below AB is parallel to DI and FD is parallel to CB. Angle EAJ = 30° and angle EDC = 63°. Find angle ACB.
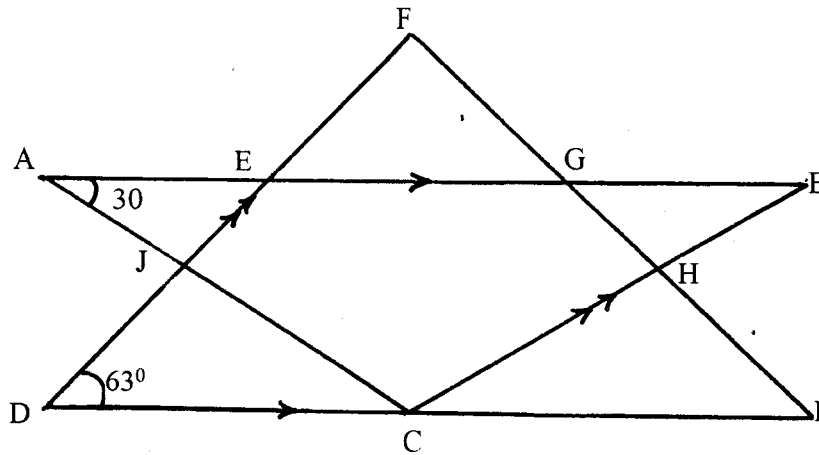
(3mks)

12. The position vectors of point $\vec{X}$ and $\vec{Y}$ are $x = 2i + j - 3k$ and $y = 3i + 2j - 2k$, respectively.
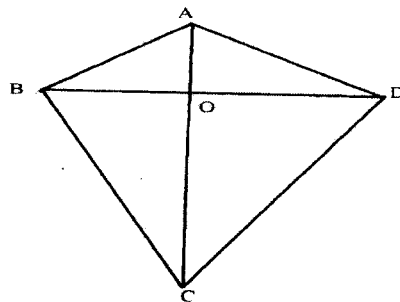
Find $/\vec{XY}/$ (3mks)

13. The figure below represent a kite ABCD, AB = AD = 15cm. the diagonals BD and AC intersect at O. AC = 30cm and AD = 12cm.
    Find the area of the kite   (3mks)

14. If takes 30 workers 6 days working 8 hours a day to harvest maize in a farm. How many days would 50 workers working 6 hours a day take to harvest the maize? (3mks)

15. Given that sin $(x + 30) = $ Cos $3x$ find the value of tan $(x-45)$ correct to 4 significant figures. (3mks)

16. Without using mathematical tables or calculation, evaluate: (3mks)

$$27^{\frac{2}{3}} + \left(\frac{81}{16}\right)^{-\frac{1}{4}}$$

SECTION II 50 marks

17. In the year 2001 the price of a sofa set in a shop was Ksh. 12,000

    a) Calculate the amount received from the sales of 240 sofa sets that year. (2mks)

    b) In the year 2002 the price of each sofa set increased by 25% while the number of sets sold decreases by 10%

    i) Calculate the percentage increase in the amount received from the sales. (3mks)

    ii) If at the end of the year 2002, the price of each sofa set changed in the ratio 16:15. Calculate the price of each sofa set in the year 2003. (1mk)

    c) The number of sofa sets sold in the year 2003 was P% less than the number sold in the year 2002. Calculate the value of P given that the amount received from sales in the years were equal. (4mks)

18. Four towns K,L,M and N are such that L is 94km directly to the north of K and M is on a bearing of 295° from K at a distance of 60km. N is on a bearing of N50°W.
   a) Make an accurate scale drawing to show the relative scale positions of the towns. (4mks)

   b) Find
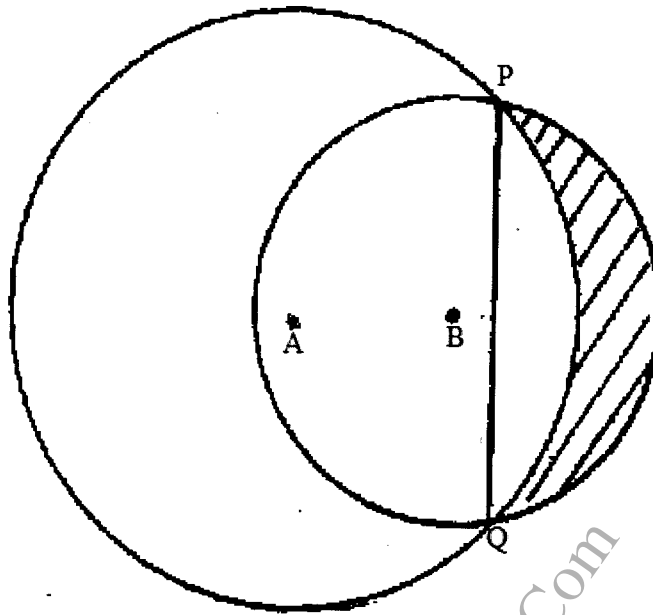   i) The distance and bearing of L from M   (2mks)

   ii) The distance and bearing of N from L.   (2mks)

   iii) The distance and bearing of K from N.   (2mks)

19.   The figure below shows two intersecting circles with their centres A and B on one side of the chord PQ.

Given that the radius AP is 4cm, radius BP is 3cm and the chord PQ is 5.1cm. Line AB meets chord PQ at 90°.

a) Calculate the length of AB   (3mks)
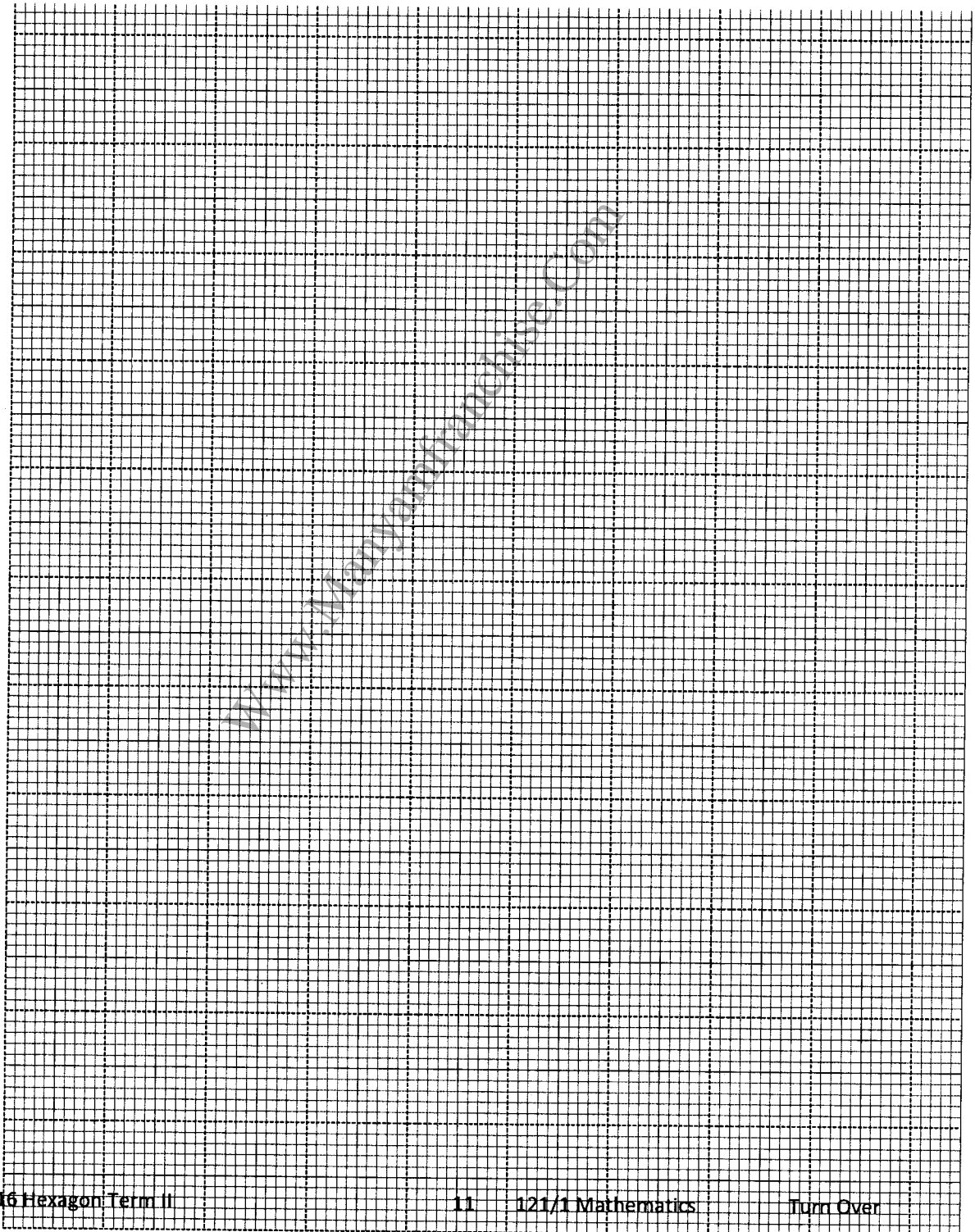
b) The area of the shaded region   (7mks)

20. a) Complete the table below for the function $y = x^3 + 6x^2 + 8x$ (3mks)

x	-5	-4	-3	-2	-1	0	1
x^2	-125	-64		-8	-1	0	1
$6x^2$		96	54		6	0	6
8x	-40		-24	-16		0	8
y			3	0	-3	0	15

b) Draw the graph of the function $y = x^3 + 6x^2 + 8x$ for $-5 \leq x \leq 1$ use a scale of 2cm to represent 1 unit on the x-axis and 1cm to represent 2units on the y-axis. (3mks)

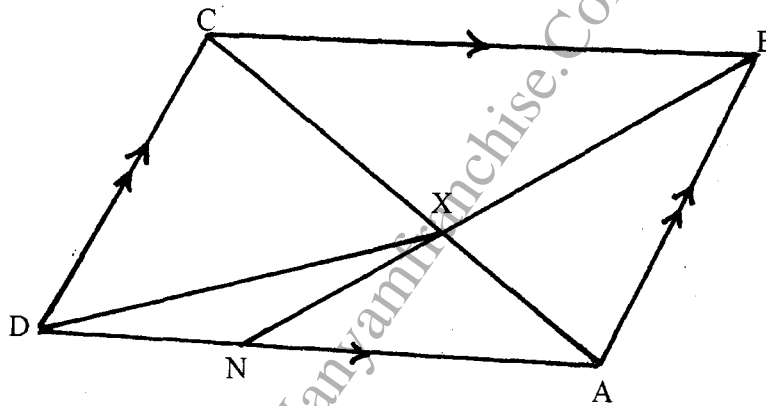c) Use your graph to estimate the roots of the equations;

    i) $x^3 + 6x^2 + 8x = 0$ (1mk)

    ii) $x^3 + 5x^2 + 4x = -x^2 + 3x - 1$ (3mks)

21.   In the parallelogram below OA = $\underset{\sim}{a}$, and AB = $\underset{\sim}{b}$, N is a point on OA such that ON:NA = 1:2

a) Find in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$

    i) AC   (1mk)

    ii) BN   (2mks)

b) The lines AC and BN intersect at x, AX = hAC and BX = kBN.

i) Express OX in terms of $\underset{\sim}{a}, \underset{\sim}{b}$ and h   (1mk)

ii) Express OX in terms of $\underset{\sim}{a}, \underset{\sim}{b}$ and k   (1mk)

iii) Find the value of h and k   (2mks)
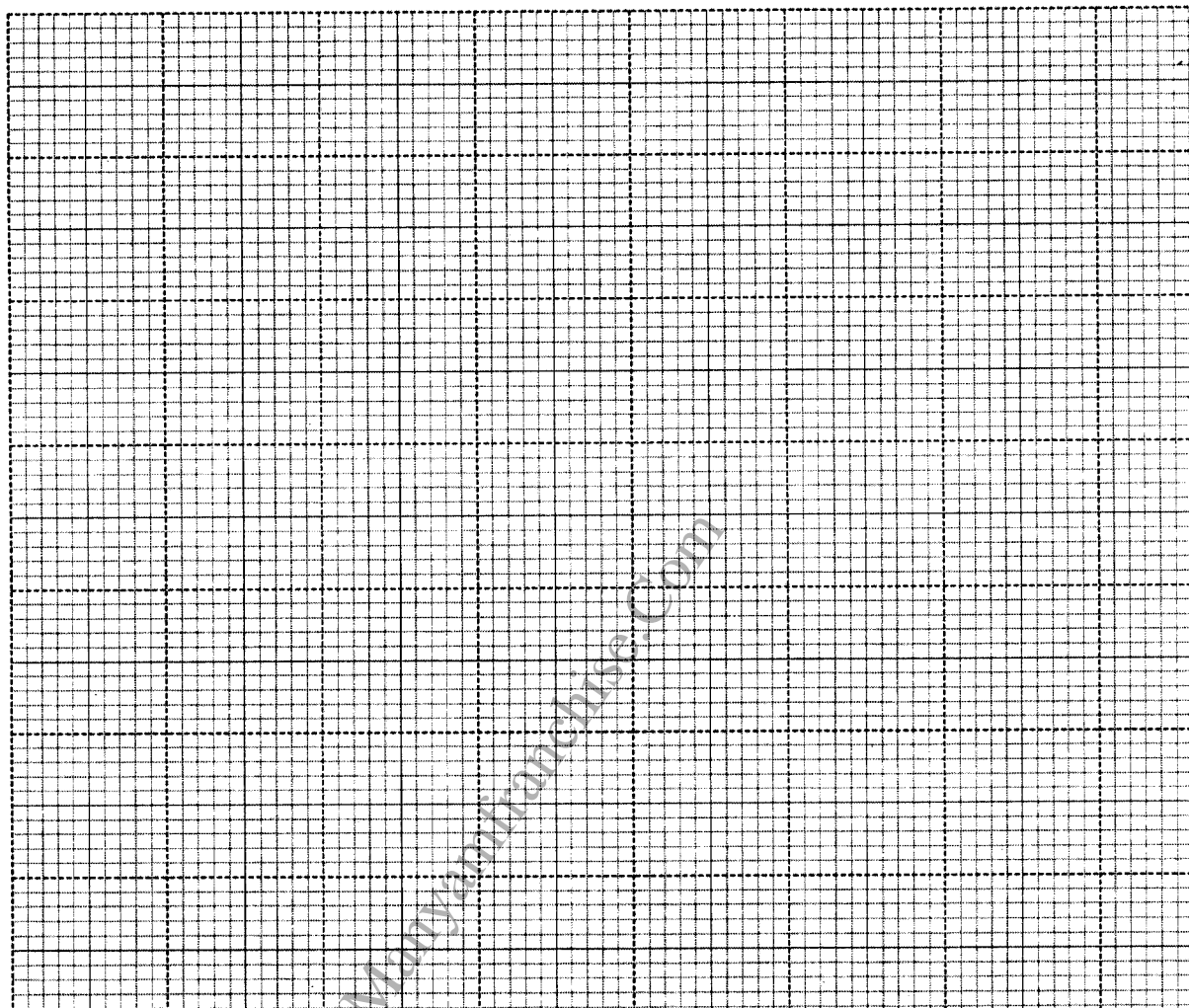
iv) Express OX in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$ (1mk)

c) Show that B, X and N are Collinear.   (2mks)

22.   a) A triangle with vertices A(-4, 2), B(-6, 6) and C(-6,2) is enlarged by a scale factor -1 and centre (-2, 6) to produce triangle A'B'C'. Draw triangle ABC and its image on the grid provided. State the coordinates of A'B'C'   (3mks)

b) Triangle A'B'C' in (a) above is reflected in line y = x to give triangle A"B"C" and draw it on the same grid as in 'a'   (3mks)

c) Triangle A"B"C" in 'b' above is mapped onto A'''B''' and C''' whose coordinates are A'''(0, -2), B'''(4, -4) and C'''(0, -4) by a rotation. Find the centre and angle of rotation (4mks)

23. In the figure below (not drawn to scale) AB = 8cm, AC = 6cm, AD = 7cm, CD = 2.82cm and angle CAB = 50°.
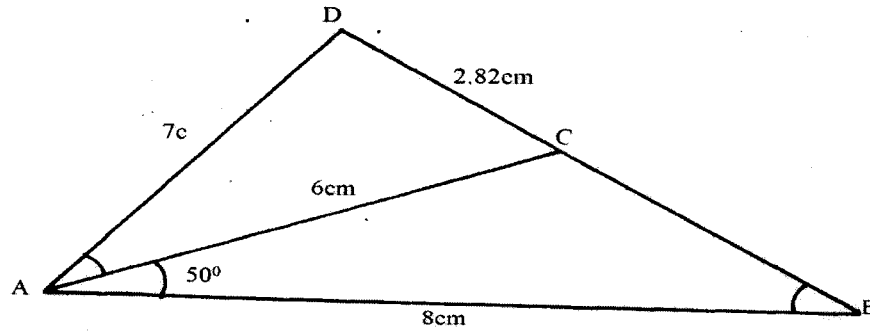
Calculate to 2 decimal places;
a) The length BC (2mks)

b) The size of angle ABC (3mks)

c) The size of angle CAD (3mks)

d)The area of triangle ACD (2mks)

24. A particle moves a long straight line such that its displacement S meters from a given point is

S = $t^3 - 6t^2 + 2t + 3$ where t is the time in seconds. Find;

a) The displacement of the particle at t= 3 (2mks)

b) The velocity of the particle where t = 4. (3mks)

c) The value of t when the particle is momentarily at rest. (3mks)

d) The acceleration of the particle when t= 4. (2mks)