KCSE 2015 MATHEMATICS PAPER 1
SECTION I (50 marks)
*Answer **all** the questions in this section in the spaces provided*

1.(a)   Evaluate 540396 - 726450 ÷ 3.   (1 mark)

 (b)   Write the total value of the digit in the thousands place of the results obtained in (a) above.   (1 mark)

2. Muya had a $6\frac{2}{3}$ ha piece of land. He donated $\frac{7}{8}$ ha to a school and $1\frac{1}{2}$ ha to a children's home. The rest of the land was shared equally between his son and daughter. Find the size of land that each child got. (3 marks)

3. The volume of a cube is 1 728cm^3. Calculate, correct to 2 decimal places, the length of the diagonal of a face of the cube. (3 marks)

4. Use logarithms, correct to 4 significant figures, to evaluate

$$\sqrt{\frac{72.56 \times 0.64}{(1.845)^7}}$$

(4 marks)

5. A piece of wire is bent into the shape of an isosceles triangle. The base angles are each 48° and the perpendicular height to the base is 6cm. Calculate, correct to one decimal place, the length of the wire. (3 marks)

6. The density of a substance A is given as 13.6g/cm^3 and that of a substance B as 11.3g/cm^3. Determine, correct to one decimal place, the volume of B that would have the same mass as 50cm^3 of A. (3 marks)

7. Below is part of a sketch of a solid cuboid ABCDEFGH. Complete the sketch.
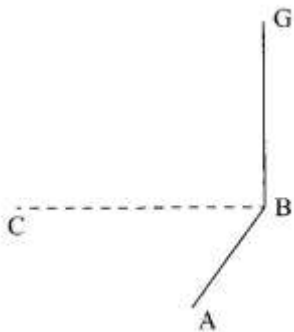
8. A salesman is paid a salary of Ksh 15 375 per month. He also gets a commission of $4\frac{1}{2}\%$ on the amount of money he makes from his sales. In a certain month, he earned a total of Ksh 28 875. Calculate the value of his sales that month. (3 marks)

9. The sum of interior angles of a regular polygon is 24 times the size of the exterior angle. (
 (a)   Find the number of sides of the polygon. (3 marks)
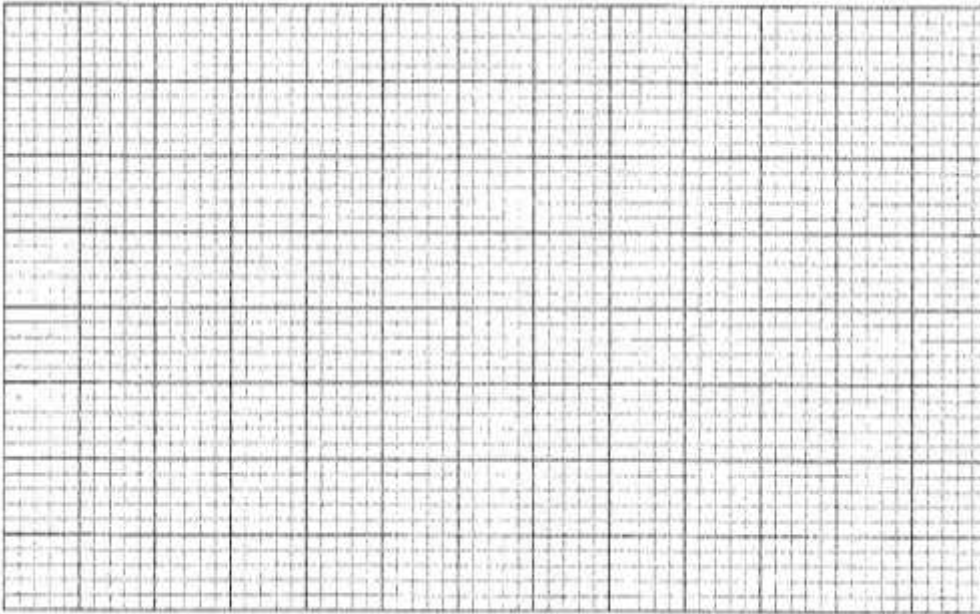 (b)   Name the polygon.   (1mark)

10. The marks scored by a group of students in a test were recorded as shown in the table below.

Marks	30-34	35-39	40-44	45-49	50-54	55-59	60-64
No. of Students	3	6	5	12	8	9	7

On the grid provided, and on the same axes, represent the above data using
(a)   a histogram;   (3 marks)

(b)   a frequency polygon.   (1 mark)

11   Given that $\mathbf{P} = 5\mathbf{a} - 2\mathbf{b}$ where $a = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ and $b = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$. Find:

   (a)   column vector **P**;   (2 marks)

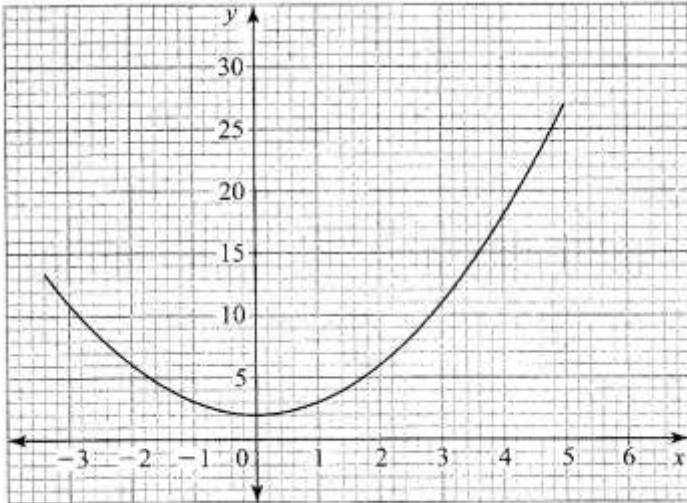   (b)   **P'**, the image of P under a translation vector $\begin{pmatrix} -6 \\ 4 \end{pmatrix}$.   (1 mark)

12   Given that $a = 3, b = 5$ and $c = -\frac{1}{2}$, evaluate $\dfrac{4a^2 + 2b - 4c}{\frac{1}{4}\left(b^2 - 3a\right)}$ (3 marks)

13.   The figure below represents the curve of an equation.


Use the mid-ordinate rule with 4 ordinates to estimate the area bounded by the curve, lines
$y = 0$, $x = -3$ and $x = 5$.   (3 marks)

14. The cost of 2 jackets and 3 shirts was Ksh 1 800. After the cost of a jacket and that of a shirt
     were increased by 20%, the cost of 6 jackets and 2 shirts was Ksh 4 800. Calculate the new
     cost of ajacket and that of a shirt. (4 marks)

15.   A tailor had a piece of cloth in the shape of a trapezium. The perpendicular distance between
      the two parallel edges was 30cm. The lengths of the two parallel edges were 36 cm and
      60cm. The tailor cut off a semi circular piece of the cloth of radius 14cm from the 60cm edge.
      Calculate the area of the remaining piece of cloth. (Take $\pi = {}^{22}/_7$) (3 marks)

16 . Musa cycled from his home to a school 6km away in 20 minutes. He stopped at the school for
     5 minutes before taking a motorbike to a town 40km away. The motorbike travelled at 75
     km/h. On the grid provided, draw a distance-time graph to represent Musa's journey. 3 marks)
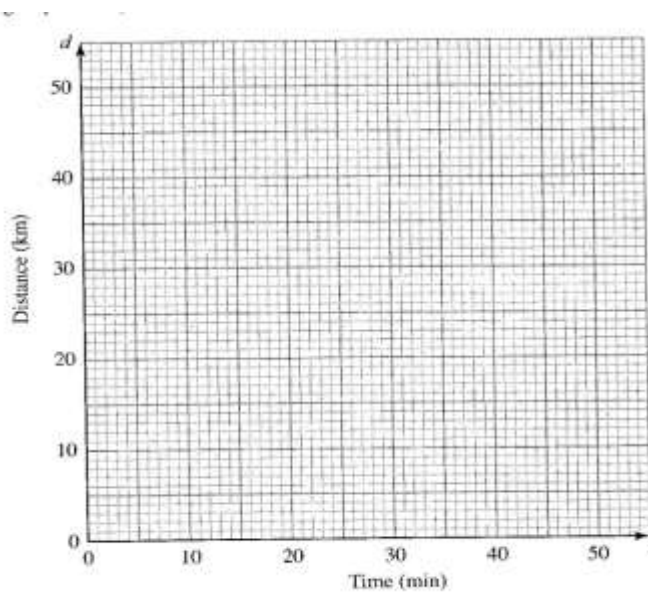
SECTION II (50 marks)
*Answer any five questions in this section in the spaces provided.*

17. Three partners Amina, Bosire and Karuri contributed a total of Ksh 4800000 in the ratio 4:5:7 to buy an 8 hectares piece of land. The partners set aside $\frac{1}{4}$ of the land for social amenities and sub-divided the rest into 15 m by 25 m plots.
 (a) Find:
  (i) the amount of money contributed by Karuri; (2 marks)
  (ii) the number of plots that were obtained. (3 marks)
 (b) The partners sold the plots at Ksh 50000 each and spent 30% of the profit realised to pay for administrative costs. They shared the rest of the profit in the ratio of their contributions.
  (i) Calculate the net profit realised. (3 marks)
  (ii) Find the difference in the amount of the profit earned by Amina and Bosire.(2 marks)

18. Two shopkeepers, Juma and Wanjiku bought some items from a wholesaler. Juma bought 18 loaves of bread, 40 packets of milk and 5 bars of soap while Wanjiku bought 15 loaves of bread, 30 packets of milk and 6 bars of soap. The prices of a loaf of bread, a packet of milk and a bar of soap were Ksh 45, Ksh 50 and Ksh 150 respectively.
 (a) Represent:
  (i) the number of items bought by Juma and Wanjiku using a 2 X 3 matrix. (1 mark)
  (ii) the prices of the items bought using a 3 X 1 matrix. (1 mark)
 (b) Use the matrices in (a) above to determine the total expenditure incurred by each person and hence the difference in their expenditure. (3 marks)

 (c) Juma and Wanjiku also bought rice and sugar. Juma bought 36 kg of rice and 23 kg of sugar and paid Ksh 8 160. Wanjiku bought 50kg of rice and 32kg of sugar and paid Ksh 11 340. Use the matrix method to determine the price of one kilogram of rice and one kilogram of sugar. (5 marks)

19. Line AB drawn below is a side of a triangle ABC.

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+————————————————————+
A                     B
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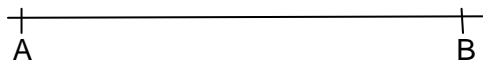
 (a) Using a pair of compasses and ruler only construct:
  i) triangle ABC in which BC = 10cm and ZCAB – 90^0; (2 marks)
  (ii) a rhombus BCDE such that ZCBE = 120°; (2 marks)
  (iii) a perpendicular from F, the point of intersection of the diagonals of the rhombus, to meet BE at G. Measure FG; (2 marks)
  (iv) a circle to touch all the sides of the rhombus. (1 mark)

 (b) Determine the area of the region in the rhombus that lies outside the circle. (3 marks)

20 In the figure below, AC = 12 cm, AD- 15cm andB is point on AC. ZBAD - ZADB - 30^C
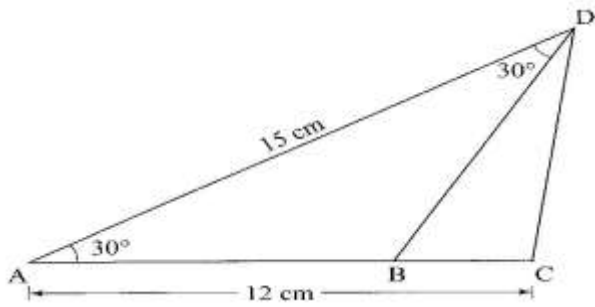
Calculate, correct to one decimal place:
- (a)   the length of CD;   (3 marks)
- (b)   the length of AB;   (3 marks)
- (c)   the area of triangle BCD;   (2 marks)
- (d)the size of $\angle$ BDC.   (2 marks)

21. (a) A straight line L_1 whose equation is *3y - 2x = -2* meets the x-axis at R. Determine the co-ordinates of R.   (2 marks)
  (b) A second line L_2 is perpendicular to L_1 at R. Find the equation of L_2 in the form *y = mx + c,* where *m* and *c* are constants.   (3 marks)
  (c)   A third line L_3 passes through (-4,1) and is parallel to $L_1.$ .Find:
      (i) the equation of L_3 in the form *y = mx + c,* where *m* and *c* are constants. (2 marks)
      (ii)   the co-ordinates of point S, at which L_3 intersects L_2. (3 marks)

22.On the grid below, an object T and its image T' are drawn.
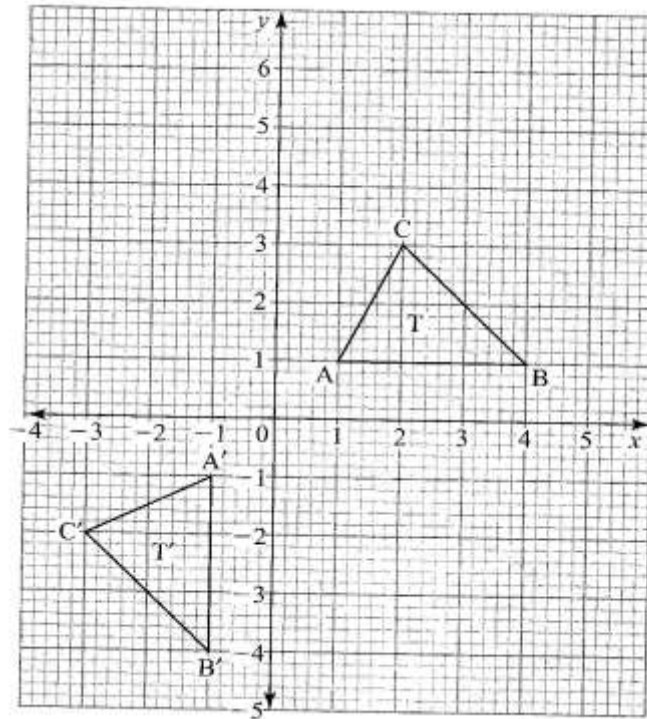
- (a)   Find the equation of the mirror line that maps T onto T'.   (1 mark)
- (b)   (i)   T' is mapped onto T" by positive quarter turn about (0,0). Draw T".   (2 marks)
           (ii)   Describe a single transformation that maps T onto T".   (2 marks)
- (c)   T" is mapped onto T" by an enlargement, centre (2,0), scale factor -2. Draw T'".(2 marks)
- (d)   Given that the area of T"' is 12 cm^2, calculate the area of T.   (3 marks)

24. The gradient of the curve $y = 2x^3 - 9x^2 + px - 1$ *at* $x = 4$ is 36.

   (a)   Find:

      (i)   the value of p;   (3 marks)

      (ii)   the equation of the tangent to the curve at $x = 0.5$.   (4 marks)

   (b)   Find the co-ordinates of the turning points of the curve. (3 marks)

MATHEMATICS PAPER 2

SECTION I (50 marks)

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

1.The length and width of a rectangular piece of paper were measured as 60 cm and 12 cm respectively. Determine the relative error in the calculation of its area. (4 marks)
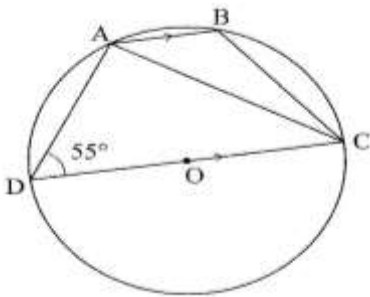
2.

Simplify $\dfrac{\sqrt{11}}{\sqrt{11}-\sqrt{7}}$

(2 marks)

3. An arc 11 cm long, subtends an angle of 70° at the centre of a circle. Calculate the length, correct to one decimal place, of a chord that subtends an angle of 90° at the centre of the same circle. (4 marks)

4. In the figure below, 0 is the centre of the circle. A, B, C and D are points on the circumference of the circle. Line AB is parallel to line DC and angle ADC = 55°.

Determine the size of angle ACB.   (3 marks)

5. Eleven people can complete $^3/_5$ of a certain job in 24 hours. Determine the time in hours, correct to 2 decimal places, that 7 people working at the same rate can take to complete the remaining job.   (3 marks)

6. The length and width of a rectangular signboard are *(3x +12)* cm and *(x — 4)* cm respectively. If the diagonal of the signboard is 200cm, determine its area. (4 marks)

7. Find the value of *x* given that log *(x - 1)* + 2 = log (3x + 2) + log 25.   (3 marks)

8. Use the expansion of *(x - y)^5* to evaluate (9.8)^5 correct to 4 decimal places.   (3 marks)

9.The diameter of a circle, centre O has its end points at M(-1, 6) and N(5, -2). Find the equation of the circle in the form $x^2 + y^2 + ax + by = c$ where a, b and c are constants. (4 marks)

10. Below is a line AB and a point X. Determine the locus of a point P equidistant from points A and B and 4 cm from X. (3 marks)

X

X

.

_____
A   B

11.   In a nomination for a committee, two people were to be selected at random from a group of 3 men and 5 women. Find the probability that a man and a woman were selected. (2 marks)

12. A school decided to buy at least 32 bags of maize and beans. The number of bags of maize were to be more than 20 and the number of bags of beans were to be at least 6. A bag of maize costs Ksh 2500 and a bag of beans costs Ksh 3500. The school had Ksh 100000 to purchase the maize and beans. Write down all the inequalities that satisfy the above information.   (4 marks)

13   Evaluate

$$\int_{2}^{4} x^2 + 2x - 15 \, dx.$$

(3 marks)

14   The positions of two points P and Q, on the surface of the earth are P(45 °N, 36 °E) and Q(45°N, 71°E). Calculate the distance, in nautical miles, between P and Q, correct to 1 decimal place. (3 marks)

15. Solve the equation $\sin(\frac{1}{2}x - 30^0) = \cos x$ for $0 < x < 90°$.   (2 marks)

16   The position vectors of points P, Q and R are $\mathbf{OP} = \begin{pmatrix} -3 \\ 6 \end{pmatrix}$, $\mathbf{OQ} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$, $\mathbf{OR} = \begin{pmatrix} 4 \\ -1 \end{pmatrix}$. Show that P, Q and R are collinear. (3 marks)

SECTION II (50 marks)
Answer any five questions from this section in the spaces provided.

17   In a retail shop, the marked price of a cooker was Ksh 36000. Wanandi bought the cooker on hire purchase terms. She paid Ksh 6400 as deposit followed by 20 equal monthly instalments of Ksh 1750.
(a)   Calculate:
(i)   the total amount of money she paid for the cooker. (2 marks)
(ii)   the extra amount of money she paid above the marked price. (1 mark)

(b)   The total amount of money paid on hire purchase terms was calculated at a compound interest rate on the marked price for 20 months. Determine the rate, per annum, of the compound interest correct to 1 decimal place. (4 marks)

(c)   Kaloki borrowed Ksh 36000 from a financial institution to purchase a similar cooker. The financial institution charged a compound interest rate equal to the rate in (b) above for 24 months. Calculate the interest Kaloki paid correct to the nearest shilling.
(3 marks)

18. Mute cycled to raise funds for a charitable organisation. On the first day, he cycled 40km. For the first 10 days, he cycled 3km less on each subsequent day. Thereafter, he cycled 2km less on each subsequent day.

(a) Calculate:
(i) the distance cycled on the 10th day; (2 marks)
(ii) the distance cycled on the 16th day. {3 marks}
(b) If Mute raised Ksh 200 per km, calculate the amount of money collected. (5 marks)

19. The equation of a curve is given by $y = 1 + 3 \sin x$.

(a) Complete the table below for $y = 1 + 3 \sin x$ correct to 1 decimal place. (2 marks)

x°	0	30	60	90	120	150	180	210	240	270	300	330	360
$y = 1 + 3 \sin x$	1		3.6				1	-0.5			-1.6		

(b) (i) On the grid provided, draw the graph of $y = 1 + 3 \sin x$ for $0 \le x \le 360°$.   3 marks)
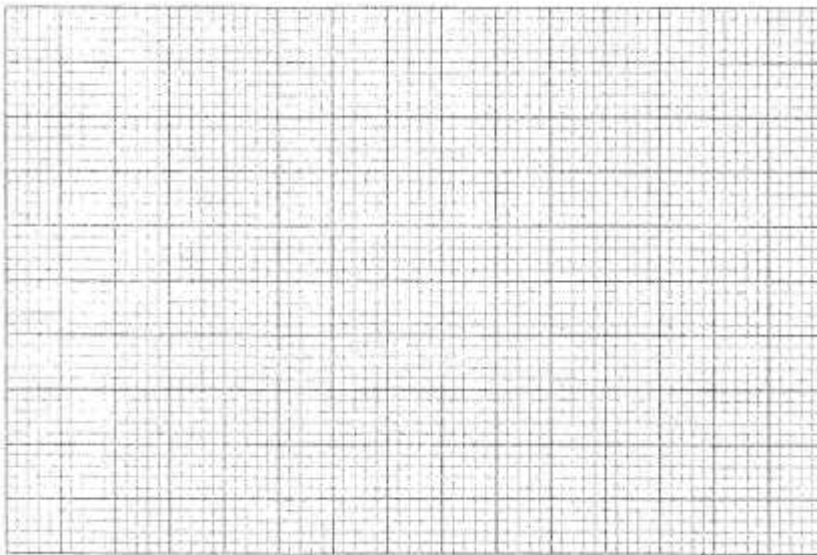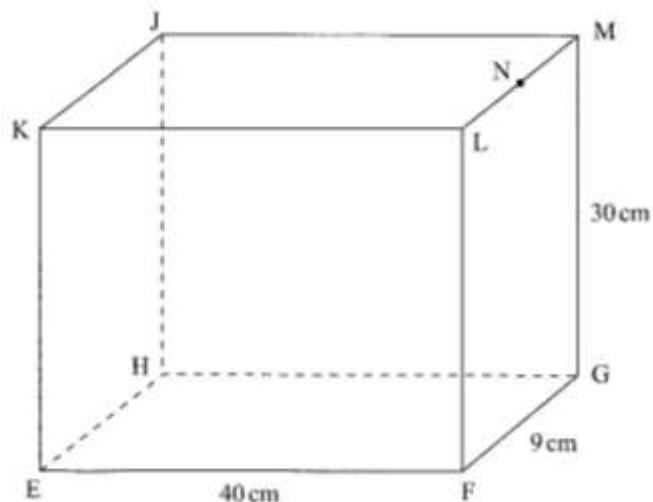

　　(ii) State the amplitude of the curve $y = 1 + 3 \sin x$ (1 mark)

(c) On the same grid draw the graph of $y = \tan x$ for $90° \le x \le 270°$.   (3 marks)

(d) Use the graphs to solve the equation
　　$1 + 3 \sin x = \tan x$ for $90° \le x \le 270°$.   (1 mark)

20. The figure below represents a cuboid EFGHJKLM in which EF = 40 cm, FG = 9 cm and GM = 30 cm. N is the midpoint of LM.

Calculate correct to 4 significant figures:
(a) the length of GL; (1 mark)
(b) the length of FJ (2 marks)
(c) the angle between EM and the plane EFGH; (3 marks)

(d) the angle between the planes EFGH and ENH; (2 marks)
(e) the angle between the lines EH and GL. (2 marks)

21. A quantity P varies partly as the square of m and partly as n. When P = 3.8, m = 2 and n = -3 When P = -0.2, m = 3 and n = 2.

(a) Find:
 (i) the equation that connects P, m and n; (4 marks)
 (ii) the value of P when m = 10 and n = 4. (1 mark)
(b) Express m in terms of P and n. (2 marks)
(c) If P and n are each increased by 10%, find the percentage increase in m correct to 2 decimal places. (3 marks)

22. A particle was moving along a straight line. The acceleration of the particle after t seconds was given by (9 - 3t) ms^{-2}. The initial velocity of the particle was 7ms^{-1}.
Find:
 (a) the velocity (v) of the particle at any given time (t); (4 marks)
 (b) the maximum velocity of the particle; (3 marks)
 (c) the distance covered by the particle by the time it attained maximum velocity. (3 marks)

24. A quadrilateral with vertices at K(l, 1), L(4, 1), M(2, 3) and N(l, 3) is transformed by a matrix

$$T = \begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix}$$ to a quadrilateral K'L'M'N'

(a)   Determine the coordinates of the image.   (3 marks)

(b)   On the grid provided draw the object and the image.   (2 marks)
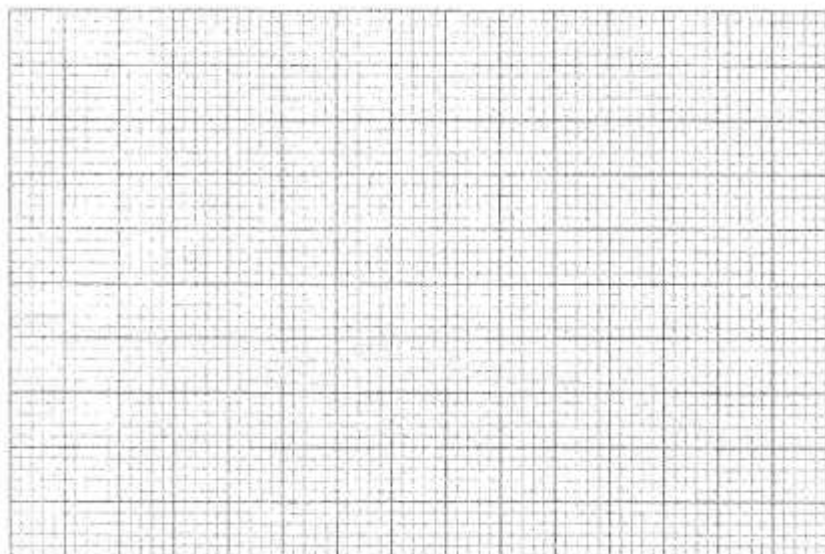
(c)   (i)   Describe fully the transformation which maps KLMN onto K'L'M'N'.   (2 marks)

       (ii)   Determine the area of the image. (1 mark)

   (d)   Find a matrix which maps K'L'M'N' onto K LMN.   (2 marks)