NAME: ……INDEX NO: ……

SCHOOL:……SIGNATURE: ……

121/2
MATHEMATICS
PAPER 2
JULY / AUGUST 2014
TIME: 2½ HOURS

NANDI CENTRAL DISTRICT JOINT MOCK 2014

Kenya Certificate of Secondary Education (KCSE)
MATHEMATICS
PAPER 2
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 strictly any FIVE questions in 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 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

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

GRAND TOTAL

SECTION 1: (50 MARKS)

Answer ALL the Questions in this section in the spaces provided.

1. Work out the following: (3mks)

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

2. Find all the integral values of x which satisfy the inequalities. (4mks)

$3(3 - x) < 5x - 9 < 2x + 8$

3. Given that log 3 = 1.583 and log 5 = 2.322. Without using tables or calculators, evaluate:

(a) log 135 (2mks)

(b) log 5.4 (2mks)

4. The first and the last terms of an arithmetic progression is -5 and 270 respectively.
   (a) Find the number of terms; if the common difference is 2.75. (2mks)

   (b) How many terms will be able to give the same last term, if the common difference is 5. (2mks)

5. Two towns ELVIRA and MAKITU are such that their local times differ by 3 hours. If ELVIRA is on 20^0W, 10^0N, find two possible positions of MAKITU town. (3mks)

6. Mr. Bett wants to buy a flat screen TV set on hire purchase. The cash price is sh. 28,000. He can pay the cash Price or make a down payment of sh. 8,000 and 15 monthly installments of sh. 2000 each. Calculate the rate of interest charged per month. (3mks)

7. Solve for x if $O \leq X \leq 2\pi^c$ in: (3mks)

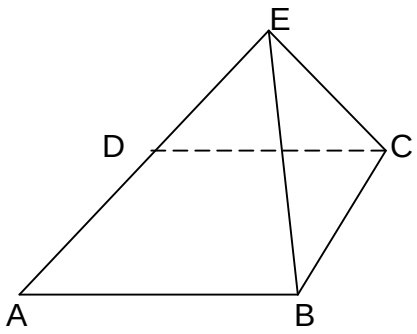
   $2 \sin (x - {}^{\pi}/_{6})^c = -\sqrt{3}$

8. If $\underset{\sim}{a} = -i + 3j$, $\underset{\sim}{b} = i + 6j$ and $\underset{\sim}{c} = 5i + 12j$. Show that the points are collinear. (3mks)

9. Expand and simplify the binomial $(x + {}^{1}/_{x})^6$ up to the constant term. Hence use your expansion to find the value of $(2½)^6$ (3mks)

10. Find the co-ordinates of a point at which the gradient of the curve $y = x^2 - 3x + 3$ is seven. (2mks)

11. A solid has a base in the shape of a rhombus whose diagonals AC and BD are 32cm and 24cm respectively. The height CE which is perpendicular to AC, BC and DC is 24cm.



Calculate: the angles between the planes EBD and ABCD. (2mks)

12. The capacity of milk in Kapsabet Dairies is given to the nearest 10ml. Find the relative error in $\frac{a+b}{c-d}$, given that a = 77ml, b = 23ml, c = 36ml and d = 16ml. (3mks)

13. Mr. Kogo bought 5 physics books and 6 mathematical books for a total of Kshs. 2440.
Mr. Ali bought 7 physics books and 9 mathematics books for a total of Ksh. 3560.

(i) Form a matrix equation to represent the above information. (1mk)

(ii) Use matrix method to find the price of a physics book and that of a mathematics book. (3mks)

14. A poultry farmer in Lelmokwo vaccinated 540 of his 720 chicken against a disease. Two months later 5% of the vaccinated and 80% of the unvaccinated chicken contracted the disease. Calculate the probability that the chicken chosen at random contracted the disease. (3mks)

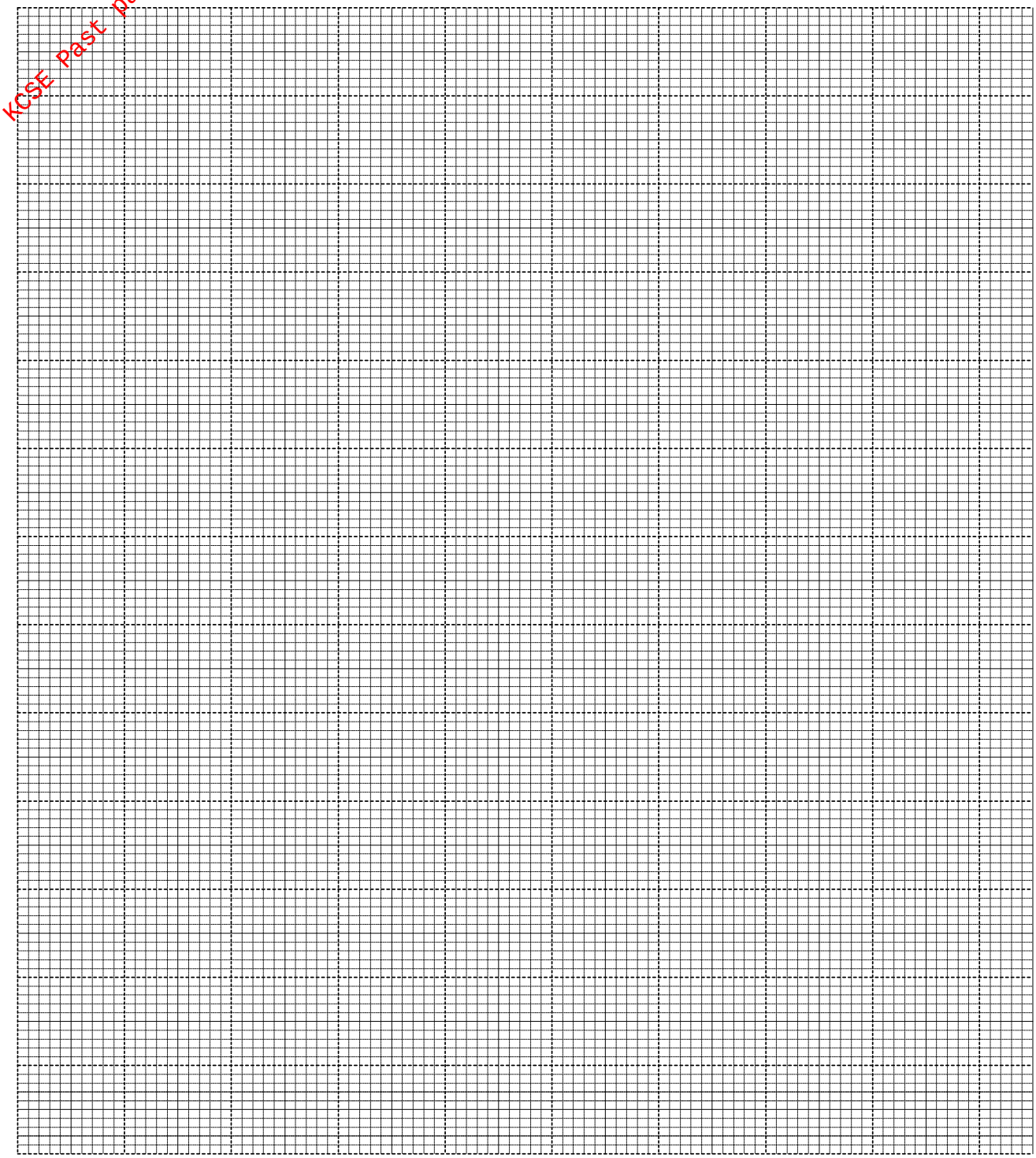
15. How much water must be added to 36 litres of a liquid containing 65% alcohol to obtain a liquid containing 45% alcohol? (3mks)

16. Nelly drew a square ABCD of sides 5cm accurately. While refilling her pen, a drop of ink (I) landed inside the square ABCD.
Given that IA $\leq$ 5cm, IA $\geq$ IC and the area of triangle DCI > 10cm2.
Locate by construction the region I. (4mks)

SECTION II (50 MARKS)

Answer any five questions in this section

17. A triangle ABC has the verticals A(-5, -2), B(-3, -2) and C(-5,-5). The triangle is rotated through a positive quarter turn about the origin to obtain the image A'B'C'. The triangle A'B'C' is then reflected on the line y + x = 0 to get triangle A''B''C''.
    (a) On the grid provided, plot triangles ABC, A'B'C' and A''B''C''. (4mks)
    (b) Describe a single transformation that maps ABC onto A''B''C'' and the matrix of transformation. (3mks)
    (c) Find the co-ordinates of the image of ABC under a stretch, scale factor 2 parallel to the x-axis and y-axis invariant. (3mks)



18. The table below shows the analysis of examination marks scored by 160 candidates.

Marks (%)	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
No. of candidates	2	6	15	22	36	34	20	15	6	4

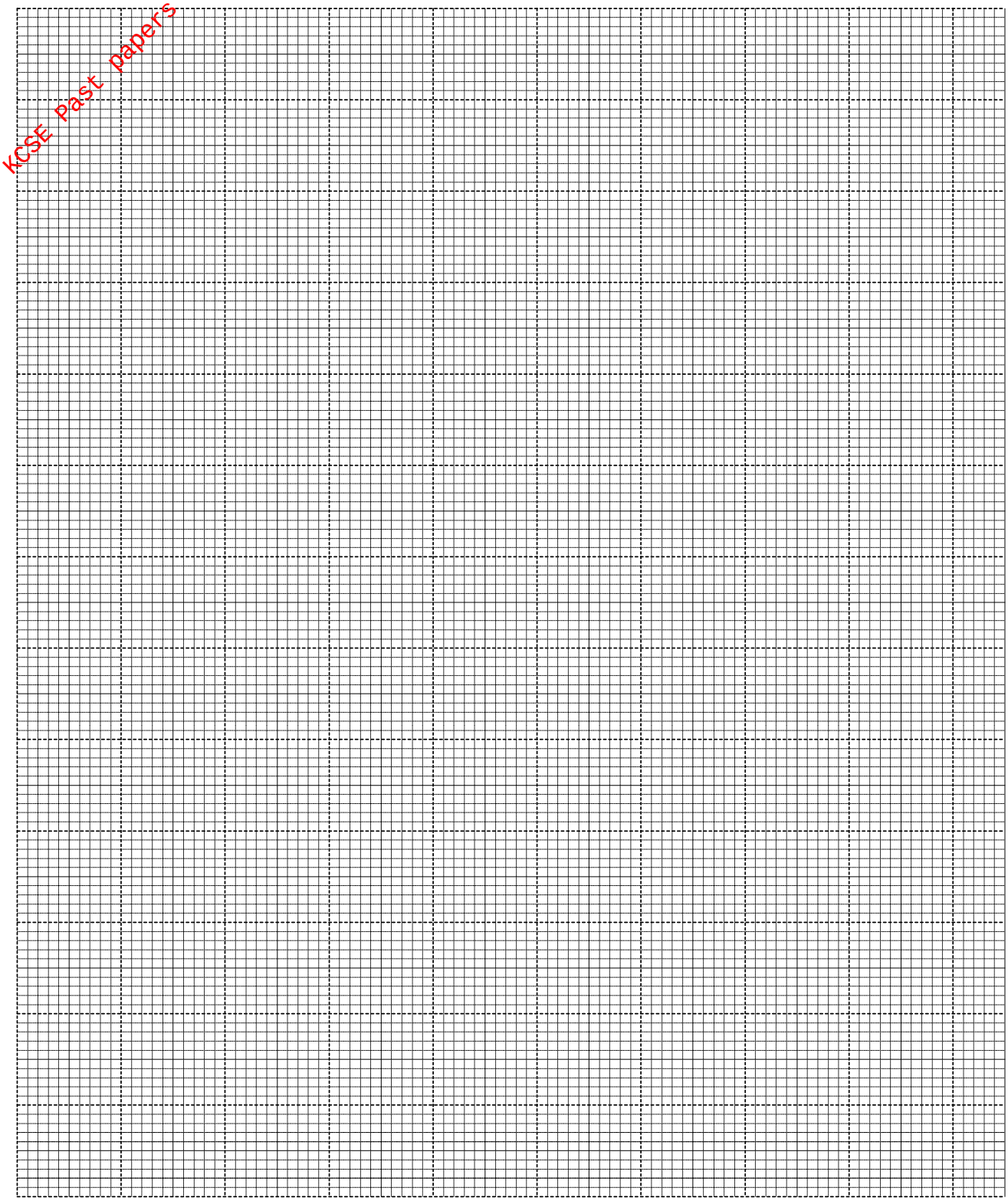
(a) Draw a cumulative frequency curve for the data. (4mks)

(b) State the modal class. (1mk)

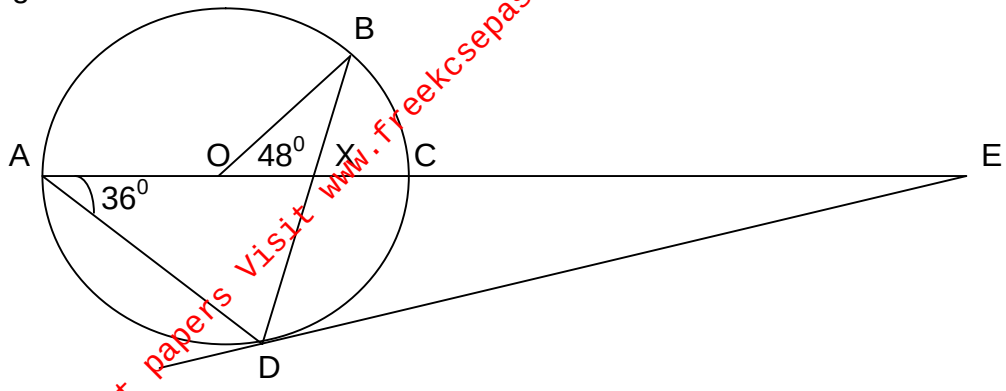
(c) Use the graph to estimate:

(i) The quartile deviation.

(ii) How many candidates passed if a mark of 35% and above was a pass? (2mks)



19. In the figure below, O is the centre of the circle. A, B, C and D are points on the circumference of the circle. A; O, X and C are points on a straight line. DE is a tangent to the circle at D. Angle BOC = 48^0 and CAD = 36^0.



(a) Giving reasons in each case, find the value of the following angles:

(i) Angle CBA. (2mks)

(ii) Angle BDE (2mks)

(iii) Angle CED (2mks)

(b) It is also given that AX = 12cm, XC = 4cm and DB = 14cm and DE = 15cm. Calculate

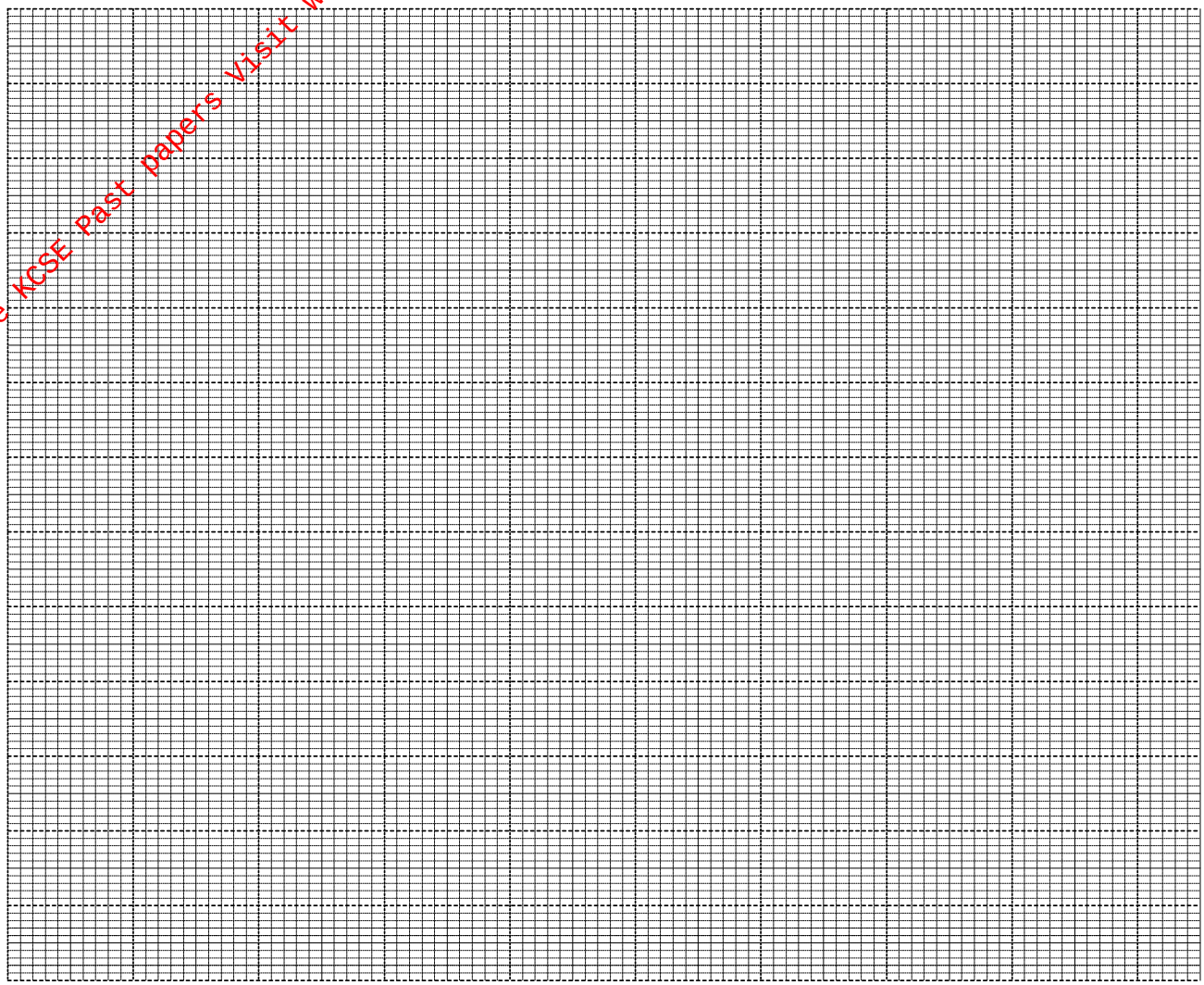
(i) DX (2mks)

(ii) AE (2mks)

20. (a) Complete the table below for y = sin2x and y = sin $(2x+30^0)$ giving values to 2dp.

x	0	15	30	45	60	75	90	105	120	135	150	165	180
Sin 2x	0				0.87				-0.87				0.0
$\sin(2x+30^0)$	0.5				0.50				-1.0				0.5

(b) Draw the graph of y = 2x and y = $(2x+30^0)$ on the same axis. (4mks)

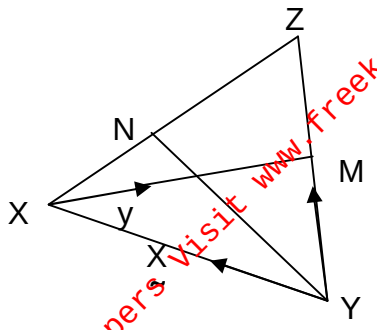


(c) Use your graph to solve $\sin(2x+30^0) - \sin 2x = 0$. (1mk)

(d) Describe the transformation which maps the wave sin 2x onto the wave of sin (2x + 30). (2mks)

(e) State the amplitude and period of y = a cos (bx + c). (2mks)

21. In the triangle XYZ, M is the midpoint of the side YZ and L is the midpoint of XM. The line YL produced meets XZ at N. Given that $\overrightarrow{YX} = \underset{\sim}{x}$ and $\overrightarrow{XL} = \underset{\sim}{y}$.



(a) Express YM in terms of $\underset{\sim}{x}$ and $\underset{\sim}{y}$. (2mks)

(b) Given that $\overrightarrow{YN} = q\overrightarrow{YL}$ and $\overrightarrow{XN} = r\overrightarrow{XZ}$. Use vector equation $\overrightarrow{YN} = \overrightarrow{YX} + \overrightarrow{XN}$ to find the value of q and r. (6mks)

(c) From (b) above, state the ratio in which:

(i) N divides line YL (1mk)

(ii) N divides XZ (1mk)

22. (a) The length of two shorter sides of a right angled triangle are (x+1)cm and (3x- 2)cm. While the length of the hypotenuse is (2x+1)cm, form a quadratic equation that can be used to solve for x in the triangle. (2mks)

(b) Complete the table below, for the function $y = 3x^2 – 7x + 2$. (2mks)

X	-1	0	1	2	3
$3x^2$	3	0	3	12	-
-7x	7	0	-	-14	-21
2	2	-	2	2	1
Y	-	2	-	-	8

(c) On the grid provided below, draw the graph of the function $y = 3x^2 – 7x +$ for $-1 \leq x \leq 3$ and use the graph to estimate the value of x in (a) above. (4mks)

(d) Use your graph above to solve the equation $O = 6x^2 – 16x + 5$ (2mks)

23. Three warships X, Y and Z are at the ocean such that ship Y is 500km on a bearing of 030^0 FROM SHIP x. Ship Z is 750km from ship Y and on a bearing of 140^0 from X. An enemy ship S is sighted 900km due East of ship Y. Calculate:

(a) The bearing of Z from Y. (3mks)

(b) The distance of X from Z. (2mks)

(c) The distance S from Z. (3mks)

(d) The shortest distance from X to the direct route between Y and Z. (2mks)

24. A particle moving in a straight line passes a fixed point O on the line with velocity 7m/s the acceleration 9m/s^2 of a particle t seconds after passing O is given by the equation a = 4 – 6t. Calculate:

(a) The velocity of particle 2 seconds after passing O. (4mks)

(b) The time taken to reach the maximum distance from O in the direction of the initial motion. (3mks)

(c) The value of the maximum distance. (3mks)