NAME:..... ADM. NO.....

SCHOOL..... CANDIDATE'S SIGN.....

DATE.....

121/2
MATHEMATICS
FORM 4
MARCH/APRIL 2013
TIME: 2 1/2 HOURS

WESTERN ZONE JOINT EXAMINATIONS (WEZOJE) - 2013

The Kenya Certificate of Secondary Education

Instructions to Candidates

1. Write your name, class and admission number in the spaces provided at the top of this page.
2. This paper has two sections: Section I and Section II.
3. Answer all questions in Section I and any five questions in section II.
4. All answers and working must be written on the question paper in the spaces provided below each question.
5. Marks may be awarded for correct working even if the answer is wrong.
6. Non-programmable silent electronic calculators and KNEC Mathematical Tables may be used except where stated otherwise.

FOR EXAMINERS USE ONLY

Section I

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

Section II

17	18	19	20	21	22	23	24	Total

SECTION A (50 MARKS) ANSWER ALL QUESTIONS

1. Use logarithms to evaluate: (4marks)

$$\sqrt{\frac{(0.8524)^3 \times 24.86}{99.28 - 15.53}}$$

2. Solve the equation $2x^2 + 3x - 7 = 0$ using completing the square method. (3marks)

3. The position vectors of points A and B are $\underset{\sim}{a} = -2\underset{\sim}{i} + \underset{\sim}{j} - 8\underset{\sim}{k}$ and $\underset{\sim}{b} = -3\underset{\sim}{i} + 2\underset{\sim}{j} - 2\underset{\sim}{k}$ respectively. Find the magnitude of AB, correct to 4 significant figures. (3marks)

4. The length and width of a rectangle is stated as 12.40cm and 8.5cm respectively.

a) Determine the lower and upper limits of each measurement. (2mark)

b) Calculate the percentage error in the area of the rectangle. (3marks)

5. a) Write down the expansion of $(2 + ¼ x)^4$ (2mark)

b) Using the first three terms, find the value of $(2.052)^4$ correct to 3d.p (2marks)

6. Make y the subject in (3marks)

$$n = \frac{\sqrt{ay^2 + c^2}}{3y}$$

7. An arithmetic series has a common difference as $-\frac{1}{4}$ and first term as 3. Find the number of terms that would give a sum of zero. (2marks)

8. Evaluate without using tables

$\text{Log}_2 (3x + 8) - 3 = \text{Log} (x - 4)$ (3marks)

9. Using a ruler and a pair of compass only,

i) Construct triangle ABC in which BC = 8cm angle ABC = $67\frac{1}{2}^0$ and angle BCA = 60^0. (2marks)

ii) Drop a perpendicular from A to meet BC, hence find the area of the triangle. (2marks)

10. A house appreciates at a rate of 20% p.a. If it was valued at Ksh. 800,000 in January 2005; Calculate the value in January 2010. (2marks)

11. The area of a circle is $99m^2$. What is the arc length subtended by an angle 140^0. (Take $\pi = 3.142$). (2marks)

12. The angle of elevation of a top of a building from a point A on level ground is 26^0. The angle of elevation of the top of a building from another point B nearer the building which is 120m from A is 50^0. B is between A and the bottom of the building and the three points are collinear. Find the height of the building. (4marks)

13. Solve the follwing equation, giving your answer in radians for $0 \leq x \leq 2®^{c}$.

2 sin 2 (x + 30) = 1 (3marks)

14. The area of an object is 10 square units, calculate the area of the image after a transformation whose matrix is $\begin{pmatrix} 3 & -1 \\ 5 & 2 \end{pmatrix}$. (2marks)

15. A plane leaves an airport X (41.5^0N, 36.4^0W) and flies due North to airport Y on latitude 53.2^0N. Calculate the distance covered by the plane in km. (3marks)

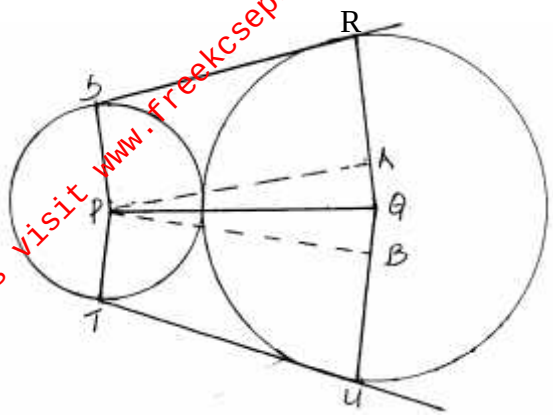
16. Simplify $\frac{\sqrt{7}}{\sqrt{3}-\sqrt{2}} - \frac{\sqrt{7}}{\sqrt{3}+\sqrt{2}}$ leaving your answer in form of $a + b\sqrt{c}$. State the values of a, b and c.

(3marks)

SECTION B. (50 marks)

Answer ANY five questions in this section.

17. The figure below shows two gears of radii 0.7m and 0.6m. A chain which is taut passes round them. What is the length of the chain. (10marks)



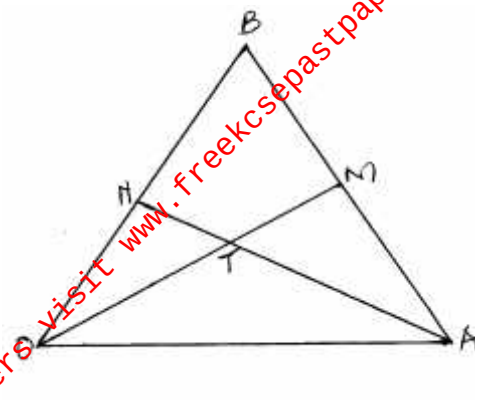
18. The vertices of triangle ABC are A(1,1), B(4,1) and C(3,4), A transformation represented by a matrix T $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ maps ΔABC onto triangle $A'B'C'$

A second transformation represented by U $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ maps $\Delta A'B'C'$ onto $\Delta A''B''C''$

a) On the same axes, draw the three triangles ABC, $A'B'C'$ and $A''B''C''$. (7marks)

b) Describe a single transformation which maps ΔABC on to $A''B''C''$ and find its matrix. (3marks)

19. In the triangle OAB below, OA = $\underset{\sim}{a}$ OB = $\underset{\sim}{b}$. ON: NB = 1 : 3 and AM : MB = 1 : 2 : Line OM and AN meet at T.



a) Express in terms if $\underset{\sim}{a}$ and $\underset{\sim}{b}$ only. The vectors.

i) $\vec{AB}$ (1mark)

ii) $\vec{AN}$ (1mark)

iii) $\vec{OM}$ (1mark)

b) Given that $\vec{OT} = h\vec{OM}$ and $\vec{AT} = K\vec{AN}$ express OT in two different ways and hence, find the values of h and k. (5marks)

c) Show that the points N, T and A are collinear. (2marks)

20. The table below shows the masses to the nearest kg of all students in a class.

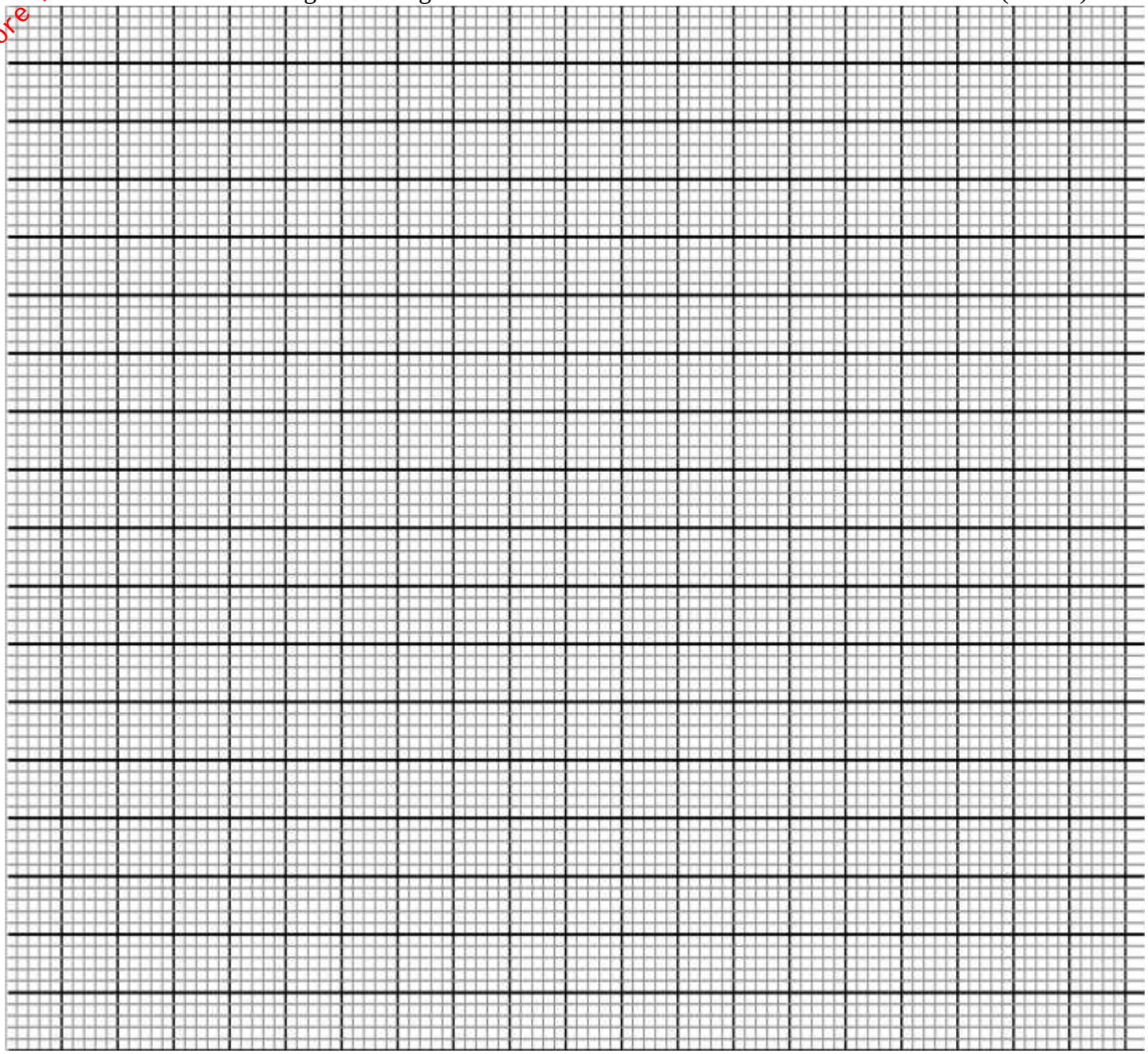
Masses (kg)	No. of students
30 – 34	5
35 – 39	7
40 – 44	8
45 – 49	10
50 - 54	15
55 - 59	5

a) Taking the assumed mean to be 42; calculate

i) The actual mean mass of the students.

ii) The standard deviation of the distribution.

b) Draw a cumulative frequency curve and use it to estimate the number of students whose masses lies between 39.5kg and 49.5kg. (4marks)



21. A school has three buses A, B and C. On any day the probability of the buses operating are 0.75, 0.4 and 0.5 respectively. Using a tree diagram, find the probability that;

a) i) All the buses are not operating. (2marks)

ii) Only one bus is operating. (2marks)

iii) At least one bus is working. (2marks)

b) A bag contains 5 red cups and 3 white ones. If two cups are picked one at a time, find the probability that a red and a white cup is picked.

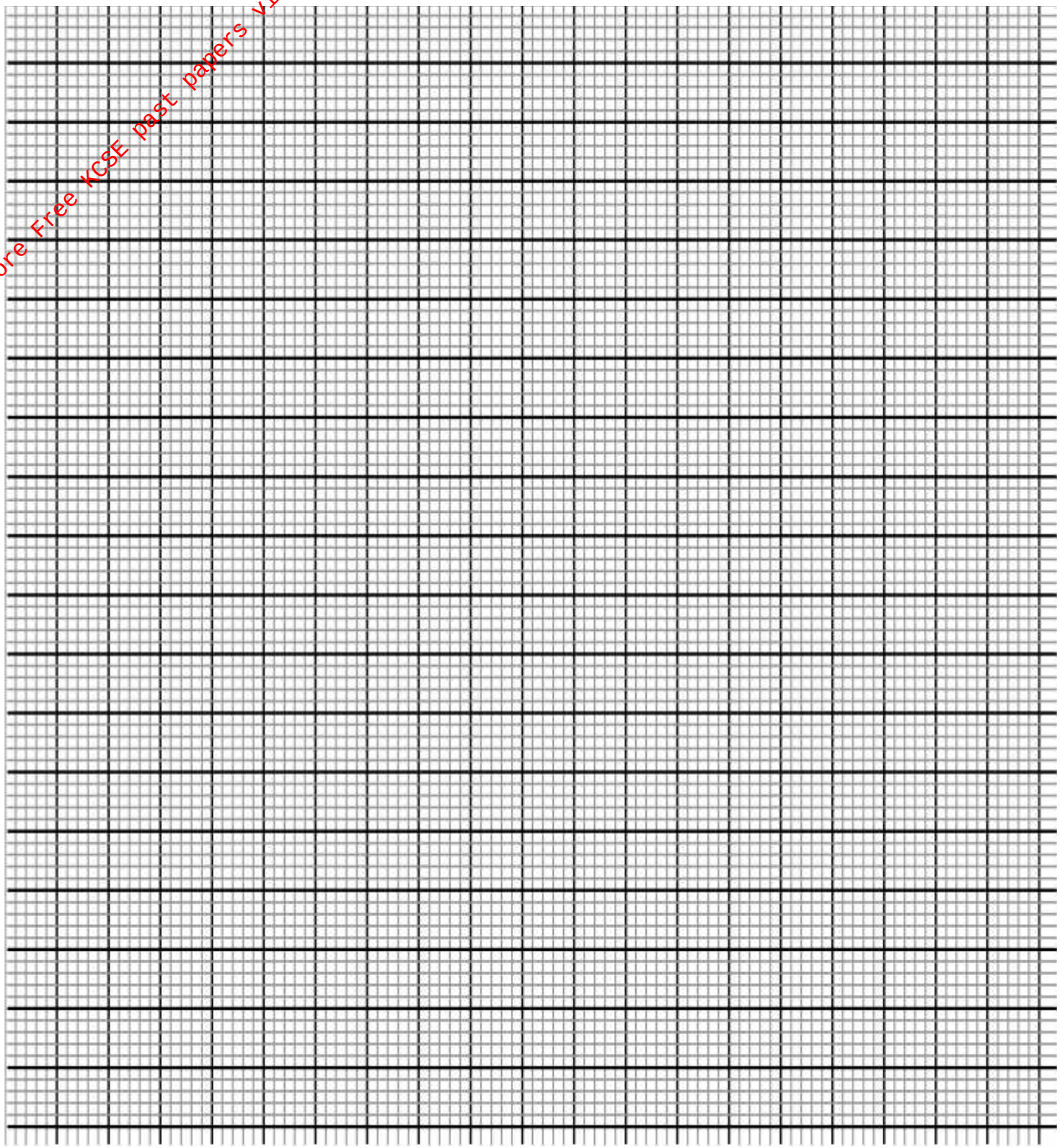
i) Without replacement. (2marks)

ii) With replacement (2marks)

22. Complete the table below for the functiony = 2Sin ½ x and y = Cos $(2x - 15)^0$ in the range $-90^0 \leq x \leq 270^0$. (2marks)

X	-90	-60	-30	0	30	60	90	120	150	180	210	240	270
2sin ½ x	-1.41	-1.00	-0.52	0.00	0.52			1.73			1.93	1.73	
Cos $(2x - 15)^0$	-0.97			-0.97	0.71		-0.97		0.26	0.97			-0.97

a) Using a scale in which 2cm represents 30^0 along x-axis and 1cm represents 0.2units along the y -axis, draw the graph of y = 2 sin ½ x and y = cos (2x - 15) on the same set of axes. (5marks)



b) Using the graph drawn in (a) above;

i) State the amplitude and period of the graph (2marks)

$y = 2\sin\frac{1}{2}x$

$y = \cos(2x - 15)$

ii) Write down the value(s) of x of which $\sin\frac{1}{2}x - \frac{1}{2}\cos(2x - 15) = 0$. (1mark)

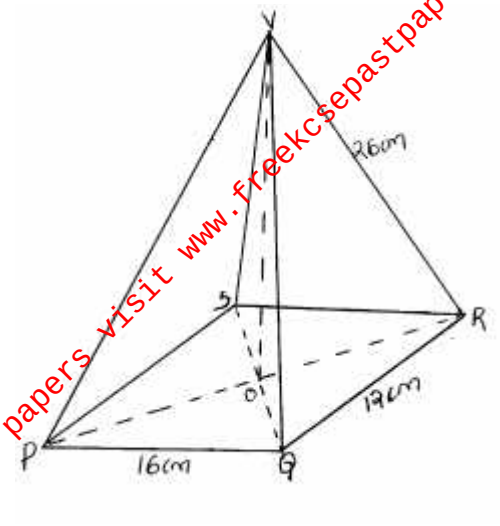
23. Water flows through a cylindrical pipe of radius 2.1cm at a speed of 25m/min

a) Calculate the volume of water delivered by the pipe per minute in litres. (3marks)

b) A cylindrical storage tank of depth 3m is filled by water from this pipe and at the same rate of flow. Water begins flowing into the empty storage tank at 9.00am and is full at 3.40pm. Calculate area of cross-section of this tank in m^2. (4marks)

c) A family consumes the capacity of this tank in one month, The cost of water is Sh. 40 per thousand litres plus a fixed basic charge of Sh. 1650. Calculate the cost of this family's water bill for a month. (3marks)

24. The diagram below show a rectangular pyramid with a horizontal rectangular base and vertex V.



a) Calculate the height of the pyramid. (3marks)

b) Calculate the angle in which ΔVQR makes with the base. (3marks)

c) Calculate the angle made by VR with the base. (2marks)

d) Calculate $\angle VPQ$. (2marks)