Name: ……………………………………………………… Index No.:…………………….................

School.: ……………………………………………………. Candidate's Sign:…………………...

Date:…..……………..………………………….......................

121/2
MATHEMATICS ALT.A
PAPER 2
JULY/AUGUST - 2015
TIME: 2 ½ HOURS

TRANS-NZOIA COUNTY JOINT EVALUATION EXAM – 2015
Kenya Certificate of Secondary Education (K.C.S.E)

MATHEMATICS
PAPER 2
2 ½ HOURS

INSTRUCTIONS TO THE CANDIDATES
a) Write your *name* and *index* number in the spaces provided above.
b) Sign and write *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 *Only Five questions* from *section II.*
e) Show **all** the steps in your calculations, giving answers at each stage in the spaces provided 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.
h) This paper consists of 15 printed pages. Candidates should check the question paper to ascertain that all pages are printed as indicated. And that no questions are missing.
i) Candidates should answer questions in **English.**

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	

Answer all the questions in this section in the spaces provided

1.   Simplify without using mathematical tables or a calculator

(2 mks)

$$\frac{\log 16 + \log 81}{\log 8 + \log 27}$$

2.   Given that: $\dfrac{3}{3+\sqrt{5}} + \dfrac{3\sqrt{5}}{3-\sqrt{5}} = a + b\sqrt{5}$. Find the values of **a** and **b**

(3 mks)

3.   Form the quadratic equation whose roots are $x = -\frac{5}{3}$ and $x = 1$ (2 mks)

4. Write the expansion of $\left(2 - \frac{1}{5}x\right)^6$ up to the term in x^4. Hence use the expansion to find the value of $(1.96)^6$ correct to **3** decimal places. (3 mks)

5. A bank either pays simple interest at 5% p.a. or compound interest at 5%p.a on deposits. Nekesa deposited Kshs. 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 Kshs. 210 more. Calculate without using mathematical tables, the values of P. (4 mks)

6. Kipketer can cultivate a piece of land in 7 hours while Wanjiku can do the same work in 5 hours. Find the time they would take to cultivate the piece of land when working together. (3 mks)

7. Find the value of x that satisfies the equation.

Log (x + 5) = log4 – log (x +2) (3 mks)

8. Line BC below is a side of a triangle ABC and also side of a parallelogram BCDE.
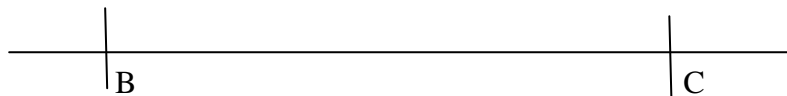
Using a ruler and a pair of compasses only construct:

(i) The triangle ABC given that $\angle ABC = 120^0$ and AB = 6 cm. (1 mk)

(ii) The parallelogram BCDE whose area is equal to that of the triangle ABC and point E is on line AB. (3 mks)

9. Make **x** the subject of the formula: $p = \left(\dfrac{xy}{z+x}\right)^{1/2}$ (3 mks)

10. Two teachers are chosen randomly from a staff consisting of 3 women and 2 men to attend a HIV/AIDS seminar. Calculate the probability that the two teachers chosen are:-

a) Of the same sex. (2 mks)

b) Of the opposite sex. (2 mks)

11. AB is the diameter of the circle. Given that the co-ordinates of A and B are (2, -3) and (4, -7) respectively, find the equation of the circle in the form: $x^2 + y^2 + ax + by + c = 0$ (3 mks)

12. Given that **OA** = 2**i** + 5**k** and **OB** =7**i** – 5**j**; a point T is on **AB** such that 2**AT** = 3**TB.** Calculate the magnitude of **OT** to 4 significant figures. (3 mks)

13. Transformations M and N are represented by the matrices; $\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$ and $\begin{pmatrix} 3 & 0 \\ 1 & 3 \end{pmatrix}$

respectively. Point R has co-ordinates (3, -2), find the co-ordinates of R^1 the image of R under transformation represented by MN (R) (3 mks)

14. A mixture of sand, cement and ballast is in the ratio 5:2:3. If the cost of 7 tonnes of sand is Sh. 3,000, 5 tonnes of cement Sh. 50,000 and 8 tonnes of ballast Sh. 4,000, find the cost of 7 tonnes of the mixture. (4 mks)

15. A stone is thrown vertically upwards from a fixed point **O.** After **t** seconds, the stone is **S** metres from **O**. Given that $S = 29.4t – 4.9t^2$.

Find the maximum height reached by the stone. (3 mks)

16. Find the exact area enclosed by the curve $y = x^2 + 4x$, the x axis and the lines $x = 0$ and $x = 3$ (3mks)

SECTION II (50 MARKS)

Answer only five questions in this section in the spaces provided.

17. The mass of 40 babies in a certain clinic were recorded as follows;

| Mass in Kg	No. of babies
1.0 – 1.9	6
2.0 – 2.9	14
3.0 – 3.9	10
4.0 – 4.9	7
5.0 – 5.9	2
6.0 – 6.9	1

Calculate:

(a) The inter-quartile range of the data. (6 mks)

(b) The standard deviation of the data using 3.45 as the assumed mean. (4 mks)

18. 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 angle CAD = 36^0.
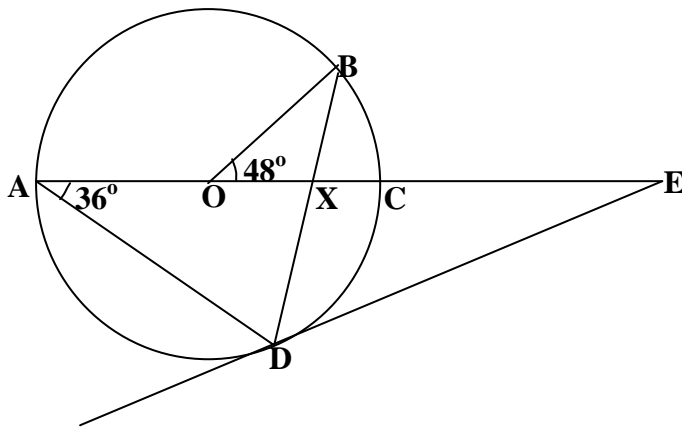
(a) Giving reasons or otherwise, find the value of the following angles:-

   (i)   Angle CBA   (1 mk)

   (ii)   Angle BDE   (2 mks)

   (iii)   Angle CED   (3 mks)

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

   Calculate:

   (i)   DX   (2 mks)

   (ii)   AE   (2 mks)

19. Three consecutive terms of a geometric progression are 3^{2x+1}, 9^x and 81 respectively.

(a) Calculate the value of **x**. (3 mks)

(b) Find the common ratio of the series. (2 mks)

(c) Calculate the sum of the first 10 terms of the series. (2 mks)

(d) Given that the fifth and the seventh terms of this G.P form the first two consecutive terms of an arithmetic sequence. Calculate the sum of the first 20 terms of the arithmetic sequence. (3 mks)

20. A globe representing the earth has a radius of 0.5m; points A $(0^0, 10^0 W)$, B$(0^0, 35^0 E)$, P$(60^0 N, 110^0 E)$ and Q$(60^0 N, 120^0 W)$ are marked on the globe.

a) Find the length of arc AB, leaving your answer in terms of π (3 mks)

b) If O is the centre of the latitude 60^0 N, find the area of the minor sector OPQ.   (4 mks)

c) If the local time at Q is 10.30 a.m. on Monday. Determine the local time at P.   (3 mks)

21. (a) Complete the table for the function $y = \frac{1}{2} Sin\, 2x$, where $0^0 \le x \le 360^0$ (2 mks)

x	0^0	30^0	60^0	90^0	120^0	150^0	180^0	210^0	240^0	270^0	300^0	330^0	360^0
2x	0^0	60^0	120^0	180^0	240^0	300^0	360^0	420^0	480^0	540^0	600^0	660^0	720^0
Sin 2x	0^0	0.866			0^0				0.866		-0.866		
$\sin\frac{1}{2} Sin\, 2x$	0^0	0.433			0^0								

(b) On the grid provided, draw the graph of the function $y = \frac{1}{2}\sin 2x$ for $0^0 \le x \le 360^0$ using the scale 1 cm for 30^0 on the horizontal axis and 4 cm for 1 unit of axis. (3 mks)
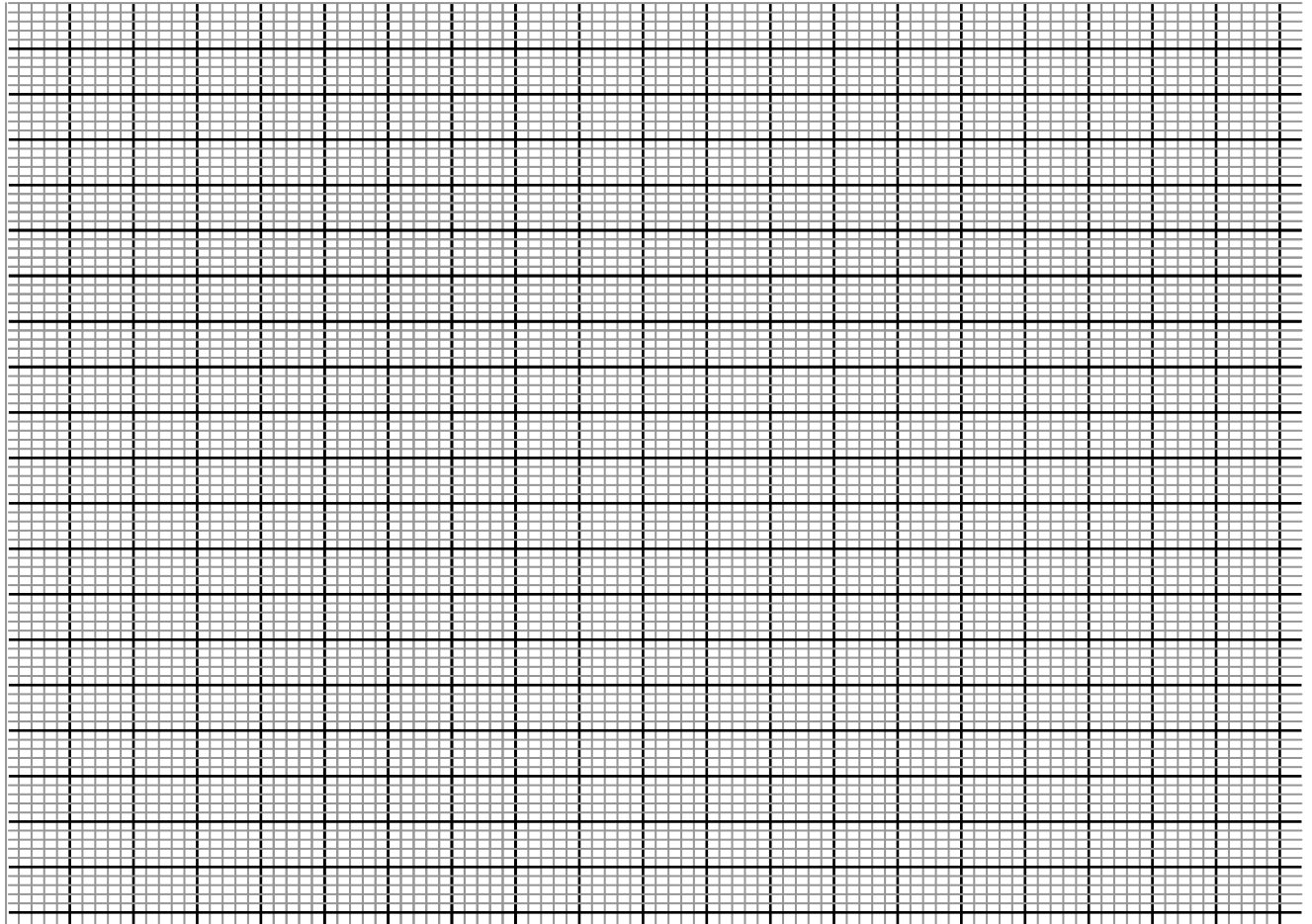
(c) Use your graph to determine the amplitude and period of the function $y = \sin\frac{1}{2}\sin 2x$

(2 mks)

(d) Use the graph to solve

(i) $\frac{1}{2}Sin\, 2x = 0$ (1 mk)

(ii) $\frac{1}{2}Sin\, 2x - 05 = 0$ (2 mks)

22. Three variables **p, q** and **r** are such that **p** varies directly as **q** and inversely as the square of **r.**
When **p** = 18, **q** = 24 and **r** = 4.

(a) Find **p** when **q** = 30 and **r** = 10 (4 mks)
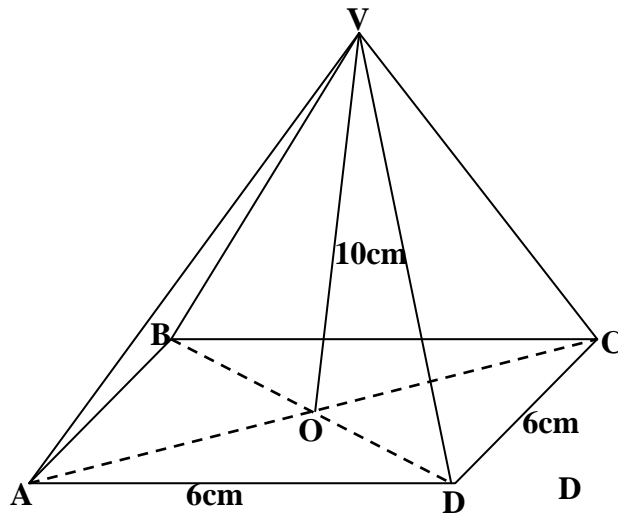
(b) Express **q** in terms of **p** and **r** (1 mk)

(c) If **p** is increased by 20% and **r** is decreased by 10%. Find:

(i)   A simplified expression for the change in **q** in terms of **p** and **r**. (3 mks)

(ii)   The percentage change in **q**. (2 mks)

23. The figure below is a square based pyramid ABCDV with AD = DC = 6cm, and height VO = 10 cm.

(a) State the projection of VA on the base ABCD. (1 mk)

(b) Find

  (i)   The length of VA (3 mks)

  (ii) The angle between VA and ABCD (2 mks)

  (iii) The angle between the planes VDC and ABCD (2 mks)

  (iv) Volume of the pyramid (2 mks)

24. A manager wishes to hire two types of machine. He considers the following facts.

Machine type	Number of men operators	Floor space	Hourly profit
A	4	2	4
B	3	3	8

He has a maximum of 24m^2 of floor space and a maximum of 36 men available. In addition he is not allowed to hire more machines of type B than type A.

(a) If he hires **x** machines of type A and **y** machines of type B, write down all the inequalities that satisfy the above conditions. (3 mks)

(b) On the grid provided below, draw the inequalities in part (a), above and shade the unwanted region. (3 mks)
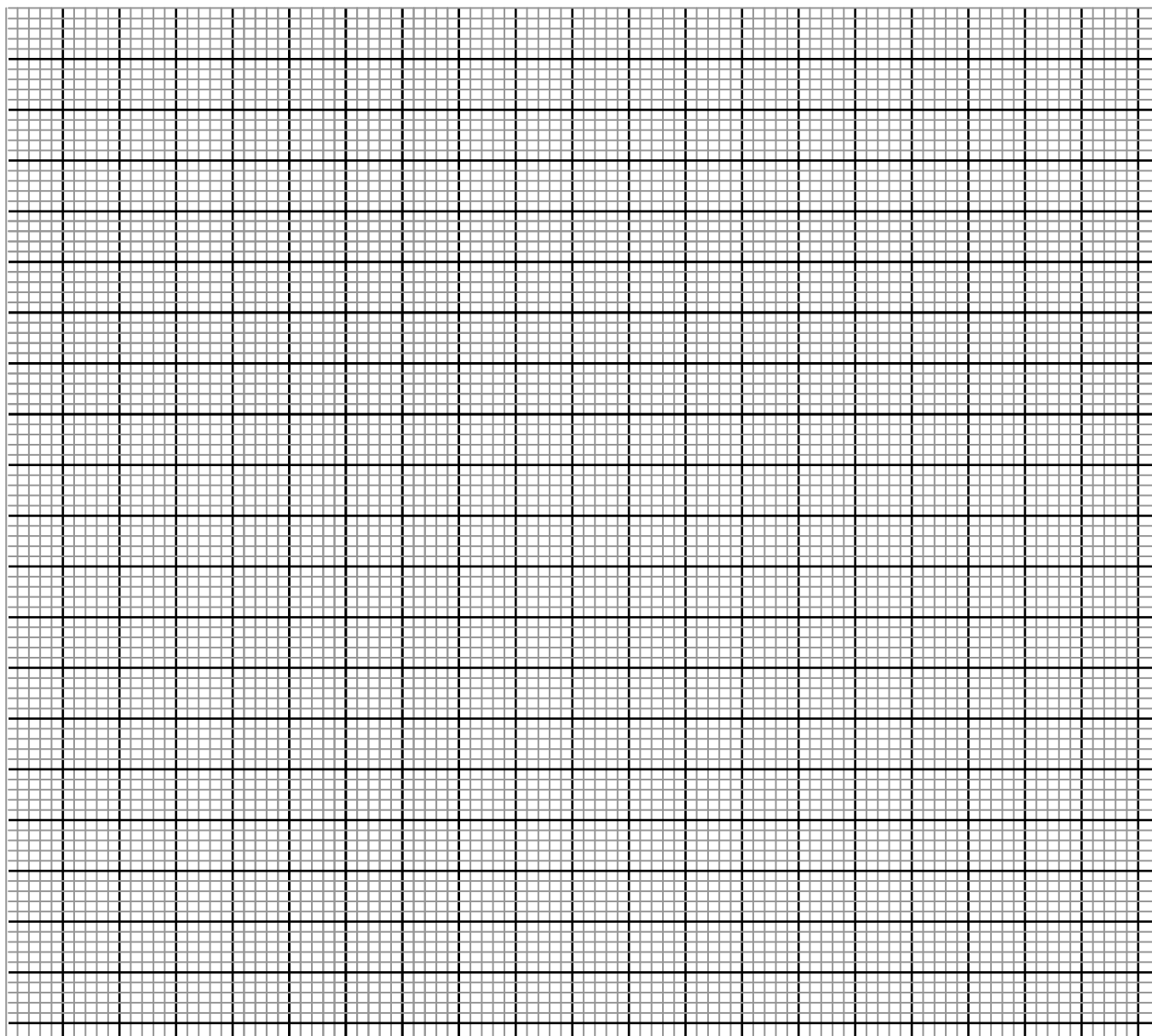
(c)   Determine the number of machines of each type that should the manager choose to give the maximum profit.   (4 mks)