NAME……. **INDEX NUMBER**……..…

SCHOOL…… **CANDIDATE'S SIGNATURE**……

DATE…….

121/1
MATHEMATICS
PAPER 1
JULY/AUGUST, 2014
TIME: 2½ HOURS

TRANS-NZOIA COUNTY JOINT EVALUATION EXAMINATION-2014

Kenya Certificate of Secondary Education

MATHEMATICS
PAPER 1
TIME: 2½ HRS.

INSTRUCTION TO CANDIDATE'S:

1. Write your **name**, **index number** and **school** in the spaces provided at the top of this page.
2. **Sign** and write the **date** of examination in spaces provided above.
3. This paper consists of **two** Sections; Section **I** and Section **II**.
4. Answer all the questions in Section **I** and any **FIVE** questions from Section **II**.
5. All answers and working must be written on the question paper in the spaces provided **below** each question.
6. Show all the steps in your calculation, giving your answer at each stage in the spaces provided **below** each question.
7. Marks may be given for correct working even if the answer is wrong.
8. Non-programmable silent electronic calculators and **KNEC** Mathematical tables **may be** used, except where stated otherwise.
9. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

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 I: (50 MARKS)

Answer all the question in this section in the spaces provided:

1. Evaluate without using a calculator or Mathematical tables leaving your answer in the simplest form.

$$\frac{\frac{4}{11} \text{ of } \left(\frac{3}{4} - \frac{1}{20}\right)}{\left(3 + \frac{1}{3}\right) \div \left(1 + \frac{1}{10}\right)}$$

(2 marks)

2. Three similar 21 inch television sets and five similar 17 inch television cost Ksh.129,250. The difference between the cost of two 21 inch television sets and four 17 inch television sets is Ksh.22,000. Calculate the price of a 21- inch television set and that of 17-inch television set. (3 marks)

3. Find the value of χ which satisfies the equation.

$16^{\chi^2} = 8^{4\chi - 3}$ (3 marks)

4. A Kenya bank buys and sells foreign currencies as shown.

	Buying (Ksh)	**Selling (Ksh)**
1 Euro	84.15	84.26
100 Japanese Yen	65.37	65.45

A Japanese traveling from France to Kenya had 5000 Euros. He converted all the 5000 Euros to Kenya shilling at the bank. While in Kenya, he spent a total of Ksh.289850 and then converted the remaining Kenya shilling to Japanese Yens at the bank. Calculate the amount in Japanese Yen that he received. (3 marks)

5. Use tables of cubes, square roots and reciprocals to evaluate.

$$\frac{3}{(0.3375)^3 - \sqrt{337.5}}$$

(4 marks)

6. Line L_1 passes through the points (1, -2) and (3, -4). Find the equation of line L_2 which is a perpendicular bisector of L_1 leaving the answer in the form $a\chi + by + c = 0$. (4 marks)

7. Fifteen men working eight hours a day can complete a certain job in exactly 24 days. For how many hours a day must sixteen men work in order to complete the same job in exactly 20 days. (2 marks)

8. The curved surface area of a cylindrical container is 1980cm². If the radius of the container is 21cm, calculate to one decimal place the capacity of the container in litres (Take $\pi = \frac{22}{7}$). (4 marks)

9. Calculate the value of $\int_{-2}^{2}\left(\frac{3i^2 + 2i^3}{i^2}\right)di$. (4 marks)

10. The following were marks scored by a student in eight subjects: 36, 22, 48, 56, 32, 50, 43, 51.
Find the quartile deviation. (3 marks)

11. State all the integral values of **a** which satisfy the inequality.
$\frac{3a + 2}{4} \leq \frac{2a + 3}{5} \leq \frac{4a + 15}{6}$ (3 marks)

12. The coordinates of P and Q are P(5, 1) and Q(11, 4) point M divides line PQ in the ratio 2 : 1. Find the magnitude of vector OM. (3 marks)

13. (a) Using a pair of compasses and a ruler only construct a triangle ABC such that AB = 6cm, BC = 8cm and ∠ABC = 135°. (2 marks)

(b) Construct the height of triangle ABC in (a) above taking BC as the base and measure the height. (2 marks)

14. One interior angle of a polygon is equal to 80° and each of the other interior angles are 128°.
Find the number of sides of the polygon. (3 marks)

15. The sum of the first 16 terms of an A.P is 2000. The sum of the next four terms is 900.
Calculate the first term and the common difference. (3 marks)

16. Solve the equation: $\text{Sin}\ \frac{5}{2}- = \frac{1}{2}$ for $0° \leq \theta \leq 180°$. (3 marks)

SECTION II: (50 MARKS)

Attempt **ONLY FIVE** questions from this section.

17. (a) A matatu traveling at 99km/hr passes a checkpoint at 9.00am. A police patrol car traveling at 132km/hr in the same direction passes through the police check point at 9.15am. If the matatu and the police patrol car continue at their uniform speeds, calculate at what time the police car will overtake the matatu. (6 marks)

(b) Two passenger trains A and B which are 240m apart and travelling at 164km/h and 88km/h respectively approach one another on a straight railway line. Train A is 150 metres long and train B is 100m long. Determine the time in seconds that elapses before the two trains completely pass each other. (4 marks)

18. Complete the table **below** for $y = 2\chi^3 + \chi^2 - 5\chi + 2$ for the interval $-3 \leq \chi \leq 3$. (2 marks)

χ	-3	-2	-1	0	0.5	1	2	3
$2\chi^3$	-54		-2		0.25		16	
χ^2	9	4			0.25	1		
-5χ			5	0	-2.5	-5	-10	
+2	2	2	2	2	2	2	2	2
y			6		0			50

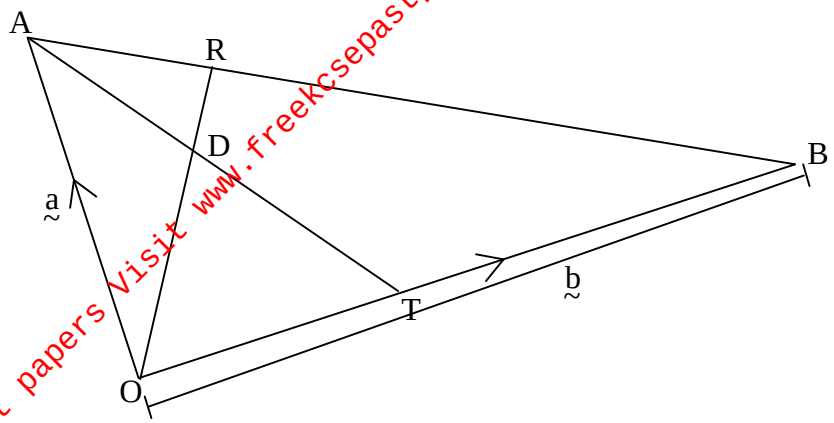
(b) Draw the graph of $y = 2\chi^3 + \chi^2 - 5\chi + 2$ for the interval $-3 \leq \chi \leq 3$. (3 marks)

(c) Use your graph to solve equation $y = 2\chi^3 + \chi^2 - 5\chi + 2$. (1 mark)

(d) Use your graph to solve equation $y = 2\chi^3 + \chi^2 - 11\chi - 10$. (2 marks)

(e) Find the gradient of the curve at $\chi = 2$. (2 marks)

19. The figure **below** is a triangle OAB where $\overrightarrow{OA} = \underset{\sim}{a}$ and $\overrightarrow{OB} = \underset{\sim}{b}$. A point R divides AB in the ratio 2: 5 and a point T divides OB in the ratio 1: 3. $\overrightarrow{OR}$ and $\overrightarrow{AT}$ intersect at D.



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

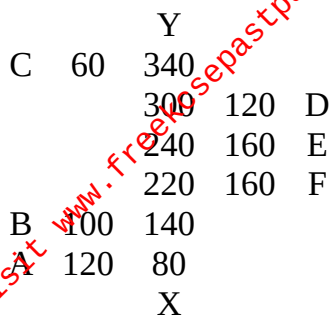
(a) $\overrightarrow{BT}$. (1 mark)

(ii) $\overrightarrow{OR}$ (2 marks)

(iii) $\overrightarrow{AT}$ (2 marks)

(b) Given that $\underset{\sim}{AD} = K\underset{\sim}{AT}$ and $\underset{\sim}{RD} = h\underset{\sim}{RO}$ where K and h are scalars. Find the values of K and h. Hence express $\underset{\sim}{AD}$ in term of $\underset{\sim}{a}$ and $\underset{\sim}{b}$. (5 marks)

20. The following measurements were recorded in a field book using XY as the base line. XY = 400m.

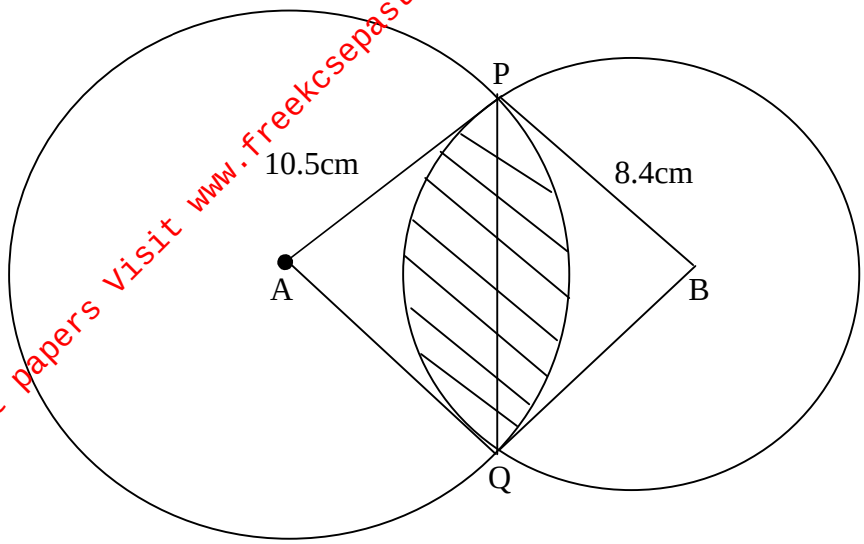


(a) Using a scale of 1: 4000, draw an accurate map of the farm. (4 marks)

(b) Determine the actual area of the farm in hectares. (4 marks)

(c) If the farm is on sale at sh.80000 per hectare, find how much the farm costs. (2 marks)

21. The figure **below** shows two circles of radii 10.5 and 8.4cm and with centres A and B respectively. The common chord PQ = 9cm.



(a) Calculate angle PAQ. (2 marks)

(b) Calculate angle PBQ. (2 marks)

(c) Calculate the area of the shaded part. (6 marks)

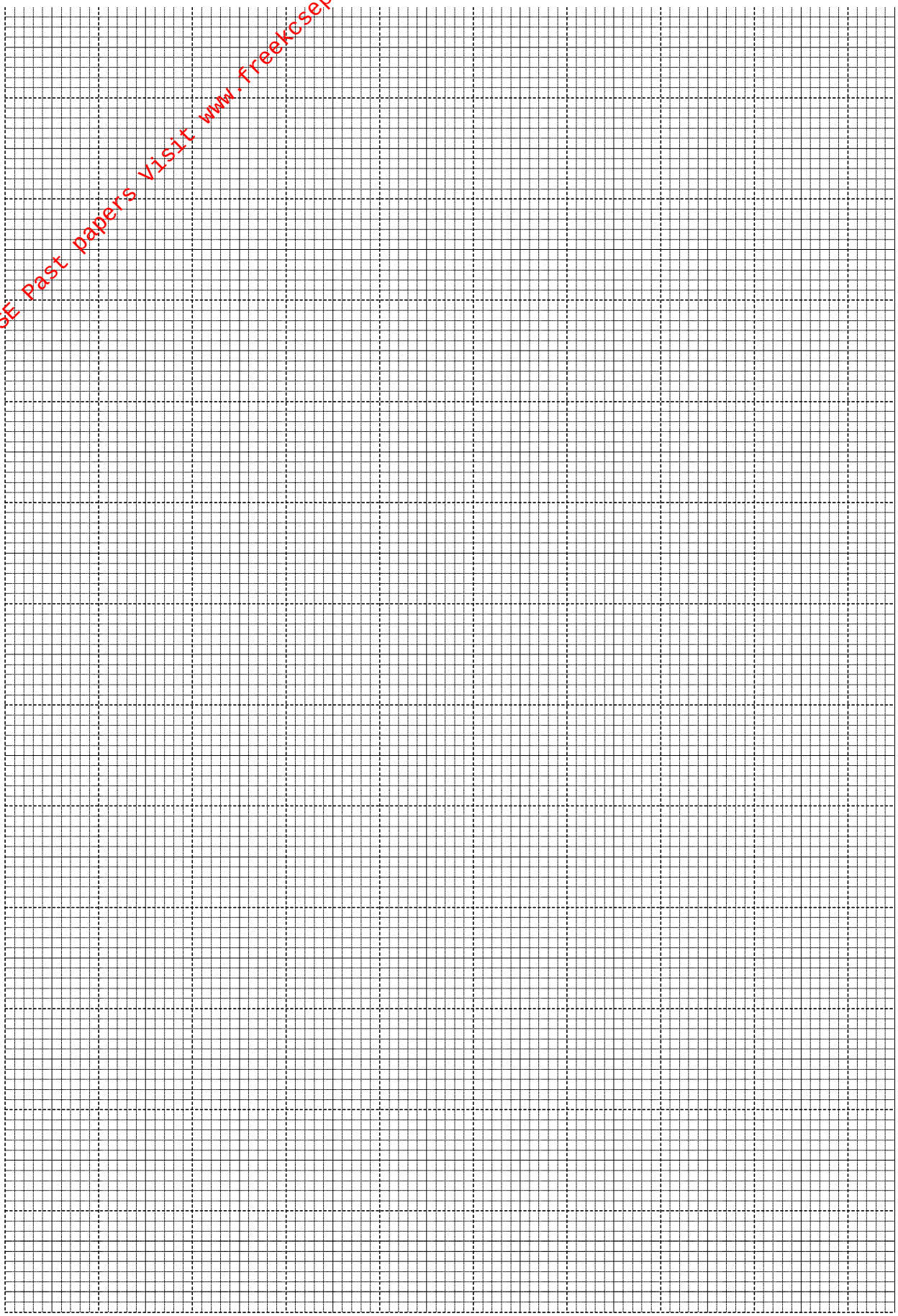
22. (a) A curve whose equation is in the form $y = m\chi^3 - n\chi$ where m and n are constants passes through the point (1, 2). Its gradient at the given point is 10. Find the values of m and n. (3 marks)

(b) Use the trapezium rule to find the area bounded by the curve $y = \chi^2 + 4$, the χ-axis and the lines $\chi = 0$ and $\chi = 4$. Use five ordinates. (3 marks)

(c) Calculate the exact area bounded by the curve, $y = \chi^2 + 4$, the χ-axis and the lines $\chi = 0$ and $\chi = 4$. Hence find the percentage error in (b) above. (4 marks)

23. The vertices of triangle PQR are P(0,0), Q(6, 0) and R(2, 4)

(a) Draw triangle PQR on the grid provided. (1 mark)



(b) Triangle $P^1Q^1R^1$ is the image of a triangle PQR under an enlargement scale factor $\frac{1}{2}$ and centre (2, 2). Write down the coordinates of triangle $P^1Q^1R^1$ and plot on the same grid. (2 marks)

(c) Draw triangle $P^{11}Q^{11}R^{11}$ the image of triangle $P^1Q^1R^1$ under a positive quarter turn about points (1, 1). (3 marks)

(d) Draw a triangle $P^{111}Q^{111}R^{111}$ the image of triangle $P^{11}Q^{11}R^{11}$ under reflection in the line y = 1. (2 marks)

(e) Describe fully a single transformation triangle $P^{111}Q^{111}R^{111}$ onto triangle $P^1Q^1R^1$. (2 marks)

24. The taxation rates for income earned in a certain year were as follows.

Income K£ p.a	Tax Rate Ksh. per £
1 - 4512	2
4513 - 9024	3
9025 - 13536	4
13537 - 18048	5
18049 - 22560	6
Over 22560	6.5

After a personal relief of Ksh.1056 per month Mrs. Wanjiru Njau paid tax amounting to Ksh.18152 that year.

(a) How much tax would she have paid if she did not have the personal relief. (2 marks)

(b) Find her taxable income in K£ that year. (5 marks)

(c) If Mrs. Wanjiru Njau receives allowances amounting to 18% of the taxable income, calculate his monthly basic salary to the nearest. (3 marks)