

Name:

Index No:

School:

Candidate's Signature.....

Date:

121/2

MATHEMATICS

Paper 2

July/August 2013

Time: 2 ½ Hours

TRANS-MARA WEST ASSESSMENT TEST (TWAT)

Kenya Certificate of Secondary Education (K.C.S.E)

MATHEMATICS

Paper 2

July/August 2013

Time: 2 ½ Hours

INSTRUCTION TO CANDIDATE'S:

- Write your **Name** and **Index Number** in the spaces provided at the top of this page.
- This paper consists of two Sections; Section **I** and Section **II**.
- Answer all the questions in Section I and **ONLY** five questions from Section II.
- All answers and working must be written on the question paper in the spaces provided below
- each question.
- Show all the steps in your calculation, giving your answer at each stage in the spaces provided **below**
- each question.
- Marks may be given for correct working even if the answer is wrong.
- 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

This paper consists of 14 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

SECTION A (50MARKS)

Answer all questions in this section in the spaces provided.

1. Use logarithms correct to 4 decimal places to evaluate.

(3mks)

$$\sqrt{\frac{0.3698 \sin 56}{2.548}}$$

2. Solve the equation below.

$$7^{2x} - 8 \times 7^x + 7 = 0$$

(3mks)

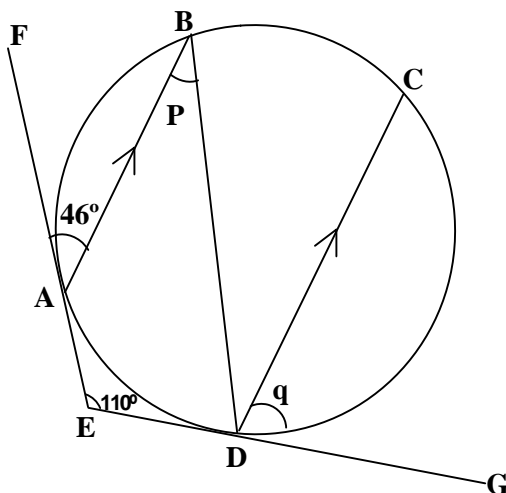
3. If $\frac{\sqrt{14}}{\sqrt{7} - \sqrt{2}} + \frac{\sqrt{14}}{\sqrt{7} + \sqrt{2}} = a\sqrt{7} + b\sqrt{2}$. Find the value of a and b where a and b are rational numbers.

(3mks)

4. The initial salary of Mr. Lutta is sh. 42, 000 per annum. His salary increases by 13% each year. Determine his total earnings after 15 years. Give your answer to the nearest thousands. (3mks)

5. A map has a scale of 1 : 2500 and on it is square plot of land which has an area of 4cm². Calculate the actual area in hectares of the land. (3mks)

6. In the figure below, **EAF** and **EDG** are tangents to the circle. **AB** is parallel to **DC**, $\angle FAB = 46^\circ$ and $\angle AED = 110^\circ$.



Find the values of angles **P** and **q**. (3mks)

7. Two grades of coffee one costing sh.42 per kilogram and the other costing sh.47 per kilogram are to be mixed in order to produce a blend worth sh.46 per kilogram in what proportion should they be mixed. (3mks)

8. Solve for θ in the equation $\sin(\theta + 120)^\circ = \frac{\sqrt{3}}{2}$ for $0^\circ \leq \theta \leq 180^\circ$. (3mks)

9. T is a transformation represented by the matrix $\begin{pmatrix} 5x & 2 \\ -3 & x \end{pmatrix}$. Under T, a square of area 10cm^2 is mapped onto a square of area 110cm^2 find the value of x. (3mks)

10. Differentiate with respect to x

$$y = \frac{x^3 + x}{x}$$

(3mks)

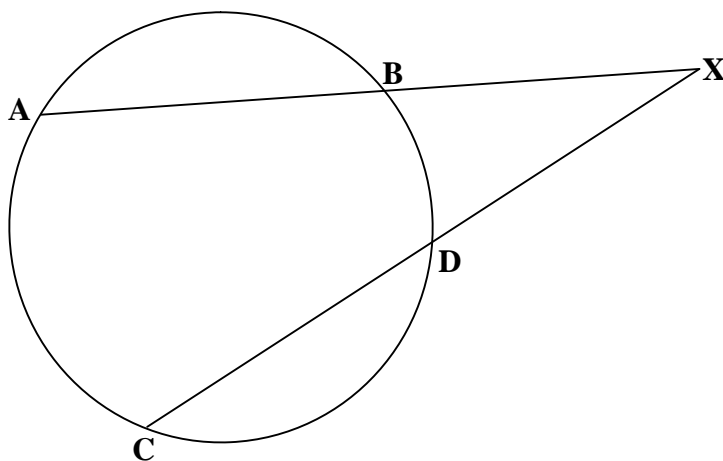
11. Given that $P = QX$ make n the subject of the formula and simplify your answer.

(3mks)

12. $2X^2 + 2y^2 - 6X + 10y + 9 = 0$ is the equation of a circle. Find the radius and the centre of the circle.

(4mks)

13. Chords **AB** and **CD** of a circle meet at **X**.



If **AB** = 8cm, **BX** = 5cm and **DX** = 6. Calculate the length of chord **CD**.

(3mks)

14. (i) Expand $\left(5 + \frac{x}{2}\right)^6$ to the term in x^3 . (2mks)

(ii) Use your expansion to estimate the value of $\left(\frac{11}{2}\right)^6$. Correct to one decimal place. (2mks)

15. Atieno is now four times as old as her daughter and six times as old as her son. Twelve years from now, the sum of the ages of her daughter and son will differ from her age by 9 years. What is Atieno's present age? (3mks)

16. A dam containing 4158m^3 of water is to be drained. A pump is connected to a pipe of radius 3.5cm and the machine operates for 8 hours per day. Water flows through the pipe at the rate of 1.5m per second. Find the number of days it takes to drain the dam. (3mks)

SECTION II (50 MARKS)

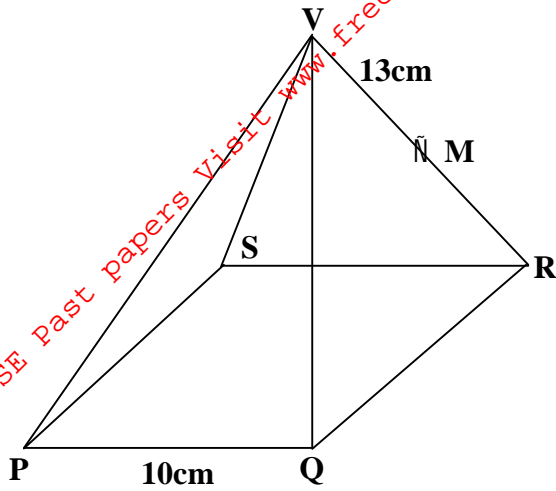
Answer any five questions from this section in the spaces provided.

17. (a) (i) Taking the radius of the earth, $R = 6370\text{km}$ and $\omega = \frac{22}{7}$, calculate the shortest distance between the two cities $P(60^\circ\text{N}, 29^\circ\text{W})$ and $Q(60^\circ\text{N}, 31^\circ\text{E})$ along the parallel of latitude. (3mks)

- (ii) If it is 1200hrs at **P**, what is the local time at **Q**. (3mks)

- (b) An aeroplane flew due south from a point A ($60^\circ\text{N}, 45^\circ\text{E}$) to a point B. the distance covered by the aeroplane was 8000km. determine the position of B. (4mks)

18. The diagram below shows a square based pyramid **V** vertically above the middle of the base. **PQ = 10cm** and **VR = 13cm**. **M** is the midpoint of **VR**.



Find

- (a) (i) the length \overline{PR} . (2mks)
- (ii) The height of the pyramid. (2mks)
- (b) (i) the angle between **VR** and the base **PQRS**. (2mks)
- (ii) The angle between **MR** and the base **PQRS**. (2mks)
- (iii) The angle between the planes **QVR** and **PQRS**. (2mks)

19. (a) Complete the table for $y = \sin x + 2\cos x$. (2mks)

x	0	30	60	90	120	150	180	210	240	270	300
Sin x	0			1.0		0.5		-0.5			-0.87
2cos x	2			0		-1.73		-1.73			1.0
y	2			1.0		-1.23		-2.23			0.13

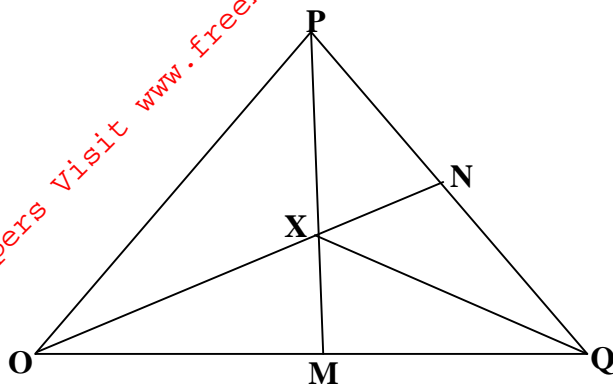
- (b) Draw the graph of $y = \sin x + 2 \cos x$ using a scale of 1cm to represent 30° on x-axis and 2cm to represent 1 unit on y-axis. (3mks)



- (c) Solve $\sin x + 2 \cos x = 0$ using the graph. (2mks)

- (d) Find the range of values of x for which $y \leq -0.5$. (3mks)

20. The diagram below shows a triangle OPQ in which M and N are points on OQ and PQ respectively such that $OM = \frac{1}{2} OQ$ and $PN = \frac{1}{4} PQ$. Lines PM and ON meet at X .



- (a) Given that $\vec{OP} = \underline{p}$ and $\vec{OQ} = \underline{q}$ express in terms of \underline{p} and \underline{q} the vectors.
- \vec{PQ} . (1mk)
 - \vec{PM} . (2mks)
 - \vec{ON} . (2mks)
- (b) You are further given that $\vec{OX} = k\vec{ON}$ and $\vec{PX} = h\vec{PM}$.
- Express \vec{OX} in terms of \underline{p} and \underline{q} in two different ways. (2mks)
 - Find the value of h and k . (2mks)
 - Find the ratio $PX : XM$. (1mk)

21. A particle **P** moves in a straight line such that t seconds after passing a fixed point **Q**, its velocity **V** m/s, is given by the equation $V = t^2 - 5t - 12$

Find;

(a) The value of t when **P** is instantaneously at rest. (2mks)

(b) An expression for the distance, **S** metres, moved by **P** after t seconds given that when $t = 0$, $s = 0$ (2mks)

(c) The total distance traveled by **P** in the first 3 seconds after passing point **Q**. (3mks)

(d) The distance of **P** from **Q** when the acceleration is zero. (3mks)

22. Mr. Kimutai a teacher from Tuiyotich Secondary School earns K 12000 per annum and lives in a house provided by the employer at a minimum rent of Ksh.2000 per month. He gets a family relief of K 1320p.a. and is entitled to a relief of 10% of his insurance of K 800p.a.

(a) Calculate his annual tax bill based on the table below. (6mks)

<u>Income slab in K p.a.</u>	<u>Rate</u>
1 – 2100	10%
2101 – 4200	15%
4201 – 6300	25%
6301 – 8400	35%
Over 8400	45%

(b) Kimutai other deductions include.

- W.C.P.S = sh 600.00pm

- NHIF = sh 500.00pm

Calculate Kimutai's net salary monthly. (4mks)

23. Auma, Hassan and Kamau competed in a game of darts. Their probabilities of hitting the target are $\frac{2}{5}$, $\frac{1}{5}$ and $\frac{3}{10}$ respectively.

(a) Draw a probability tree diagram to show all the possible outcomes. (2mks)

(b) Calculate the probability that
(i) No one hit the target. (2mks)

(ii) Only one of them hit the target. (2mks)

(iii) At least one of them hit the target. (2mks)

(iv) At least one of them missed the target. (2mks)

24. (a) A figure whose co-ordinates are **A**(-2, 2), **B**(-4, -1), **C**(-4, -3) and **D**(-2, -3) undergoes successive transformation **ERS**; where **E**, **R** and **S** are transformations represented by the matrices,

$$\mathbf{E} = \begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}, \mathbf{S} = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix} \text{ and } \mathbf{R} = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$$

On the grid provided, show the figure **ABCD** and its final image under the successive transformations **ERS**. (6mks)



- (c) Find the matrix representing the single transformation mapping the image found in (a) above back to the object figure **ABCD**. (2mks)

- (c) **A**(2,2), **B**(2,0) and **C**(3,2) are co-ordinates of the vertices of triangle **ABC**. Triangle **ABC** undergoes a shear factor 3 parallel to the x-axis. Determine the coordinates of **A'B'C'** (2mks)