NAME ..... ADM NO ..... CLASS .....

121/1

MATHEMATICS ALT A
Paper 1
4th July 2014

Candidate's signature .....

Date .....

TIME: 2 ½ HRS

ALLIANCE GIRLS HIGH SCHOOL MOCKS EXAMS

Kenya Certificate of Secondary Education

Instructions to candidates

(a) *Write your name and index number in the spaces provided above.*

(b) *Sign and write the date of the examination in the spaces provided above.*

(c) *The 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) *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.*

(i) *This paper consists of 15 printed pages.*

(j) ***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 1 (50 marks)

*Answer **all** the questions from this section*

1 Without using mathematical tables or a calculator, evaluate

$$\frac{^{-}12 \div (^{-}3) \times 4 - (^{-}15)}{^{-}5 \times 6 \div 2 + (^{-}5)}$$

(3 marks)

2 In this question, mathematical tables should **not** be used.

A Kenyan bank buys and sells foreign currencies as shown below.

	Buying(ksh)	Selling (ksh)
1 Euro	96.15	96.75
100 Japanese Yen	72.35	73.25
1 US $	78.59	79.45

A Japanese traveling from the United States of America via France arrives in Kenya with 8 400 Euros and 5 600 US $. He converts all the foreign currencies into Kenyan shillings at the bank. While in Kenya, he spends a total of ksh 1 182 132 and then converts the remaining Kenyan shillings into Japanese Yen at the bank. Calculate the amount in Japanese Yen he receives.

(3 marks)

3 Given that $Q = \begin{pmatrix} 3 & -1 \\ 1 & 2 \end{pmatrix}$ and $R = \begin{pmatrix} 5 & 3 \\ 13 & 5 \end{pmatrix}$ and that $PQ = R$, find P^{-1}. *(4marks)*

4 An artisan has 81 kg of a metal of density 9 g/cm^3. She intends to use it to make a cuboid with a square cross section whose side is 10 cm. Calculate the length of the cuboid in centimeters. *(3 marks)*

5 Simplify $\dfrac{x - 4xy + x^2 - 4y}{4y^2 - x^2y - xy + 4xy^2}$ *(3 marks)*

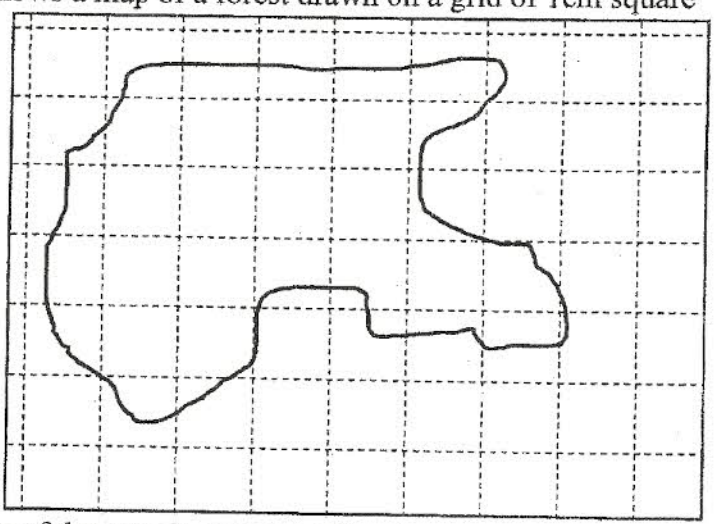
6 The size of an interior angle of a regular polygon is 144°. Find the number of sides of the polygon and hence the sum of its interior angles. *(3 marks)*

7 The surface areas of two similar spheres are 528 cm^2 and 1 188 cm^2. If the volume of the larger sphere is 1 350 cm^3, find the volume of the smaller sphere. *(3 marks)*

8 The quadratic curve $y = ax^2 + bx - 10$ intersects with the straight line $y = 2x - 5$ at the points $A(^-1, ^-7)$ and $B(2.5, 0)$. Determine the values of a and b. *(3 marks)*

9 Evaluate $\dfrac{3^{n+3} - 3\times3^{n-1}}{4\times3^{n+2}}$ *(3 marks)*

10 The figure below shows a map of a forest drawn on a grid of 1cm square



(a) Estimate the area of the map in square centimetres *(2 marks)*

(b) If the scale of the map is 1 : 50 000 estimate the area of the forest in hectares

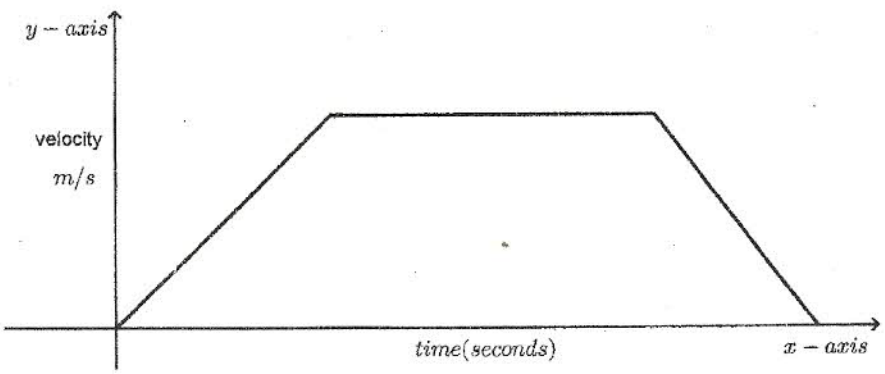
(2marks)

11 The coordinates of points P and Q are $(2, -1)$ and $(14, 7)$ respectively. Point T is the midpoint of line PQ. Determine the

(a) The coordinates of T. *(1 mark)*

(b) Equation of the perpendicular bisector of the PQ. Leave your answer in the form $y = mx + c$. *(3 marks)*

12 The diagram below shows the velocity – time graph for a particle moving in a straight line moves from point P to point Q, a distance of 168 metres. It starts from rest and accelerate uniformly for 5 seconds. It then travels at a constant speed for 10 seconds and finally decelerates uniformly for 3 seconds.



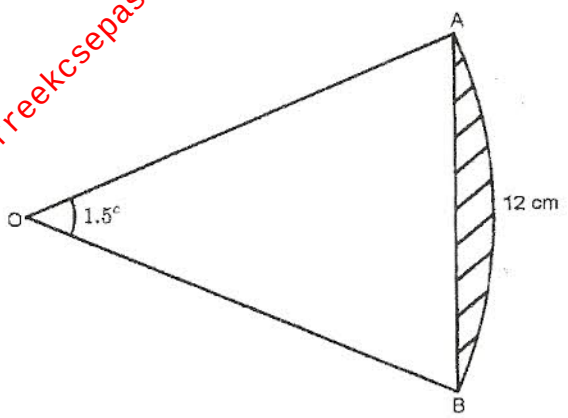
Calculate the maximum speed in km/h attained. *(3 marks)*

13 A plane leaves airport P(60°N, 38°W) at 9 a.m local time and flies due east at a speed of 400 knots to airport Q. The distance from P to Q is 3 000nm. Determine the local time at airport P when the aircraft lands there. *(3 marks)*

14 Use a ruler and a pair of compasses only in this construction.
The line AB drawn below is of length 7.5 cm. Construct Δ ABC such that ∠BAC = 105° and BC = 10 *cm*. Drop a perpendicular from C to meet BA produced at point N. Measure the length of CN. *(3 marks)*

A 7.5cm B

15 The diagram below shows a sector AOB of a circle, centre O. $\angle AOB = 1.5^{c}$ and arc AB is of length 12 cm.



(a) Determine the radius OA of the circle. *(1 mark)*

(b) Calculate the area of the shaded segment. Give your answer to 3 S.F *(2 marks)*

16 A ship sails 22 km from P on a bearing of 045° to R. From R, it sails a further 30 km on a bearing of 095° to arrive at Q. Calculate the area bounded by P, R and Q in km^2.

(3 marks)

SECTION 2 (50 marks)

*Answer **only five** questions from this section*

17 A businessman bought x bags of maize at a cost of shs. 960 per bag. He spent shs. 85 per bag on transport. He later sold the maize at shs. 39 per tin making a profit of shs. 515 per bag.

(i) Calculate the number of tins in one bag *(3 marks)*

(ii) If the businessman made total sales of shs. 29 640. How many bags had he sold? *(2 marks)*

(iii) The businessman later used the total sales to buy more maize at shs.926.25 per bag. He sold half the bags of the maize to millers at the rate of shs.1 390 per bag and retailed the remaining at his stall to consumers at sh.39 per tin.

Calculate his percentage profit *(5 marks)*

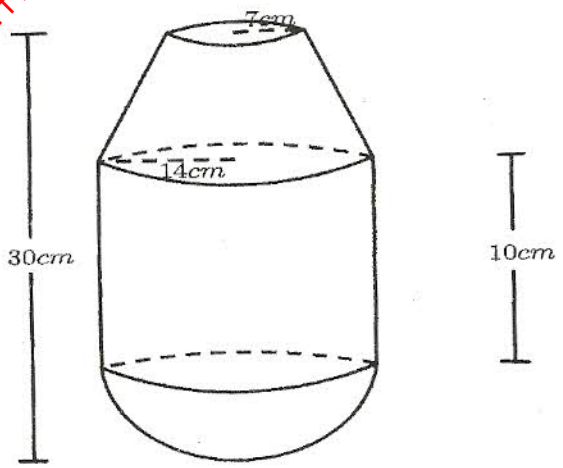
18 Betty and Joan entered into a business partnership in which they contributed sh 320 000 and sh 400 000 every year respectively. After one year, Kevin joined the business and contributed sh 240 000.

(a) Calculate the ratio of their investment after 3 years of business. *(3marks)*

(b) It was agreed that 30% of the profits after 3 years be used to cater for the costs of running the business, while the remaining would be shared proportionally. Calculate each persons share, if the pro fit made after 3 years was sh 561 000. *(4 marks)*

(c) If each of them re-invested their shares back in the business, find their new individual investments at the beginning of the fourth year. *(3 marks)*

19 The diagram below is a model representing an open water tank. The model whose total height is 30 cm is made up of a conical frustum, hemispherical bottom and the middle part is cylindrical. The radius of the base of the cone and that of the sphere is 14 cm. The top radius of the cone is 7 cm and the height of the cylindrical part is 10 cm.



(a) Calculate the:

(i) Volume of the conical part *(3 marks)*

(ii) Total volume of the model *(3 marks)*

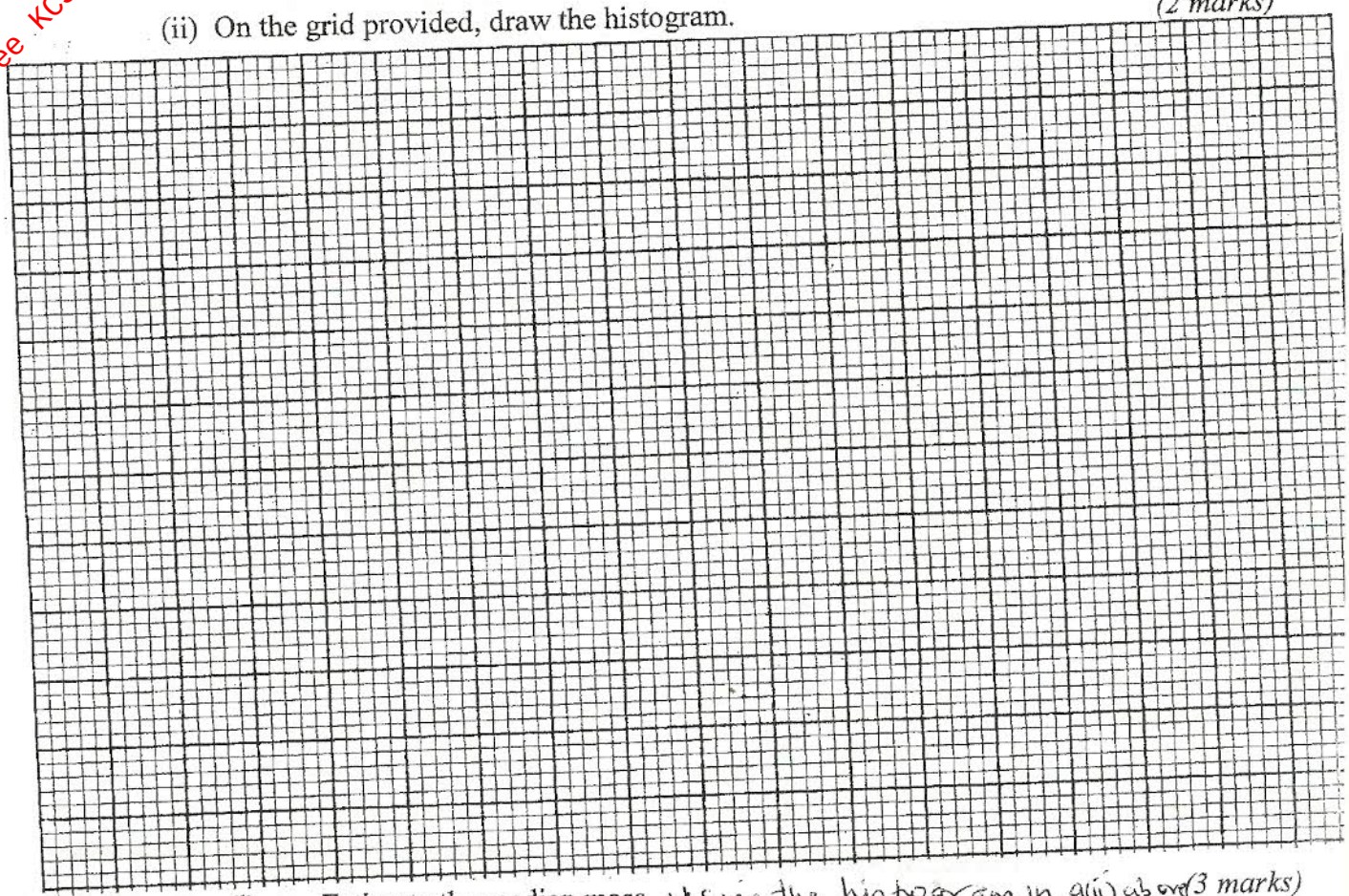
(b) The actual water tank has a total height of 4.5 metres. The actual tank is empty and has to be filled with water using a 20 litre container. Calculate the number of of such containers that can be used to fill the tank. *(4 marks)*

20 A frequency distribution of the masses of 60 patients who visited a hospital on a certain day is to be represented in a histogram. The table below shows the grouped masses, frequencies for all the groups and also the area and height for the $35 \leq m < 45$ group.

Mass (m kg)	$30 \leq m < 35$	$35 \leq m < 45$	$45 \leq m < 60$	$60 \leq m < 75$	$75 \leq m < 95$
Frequency	6	16	18	12	8
Area of rectangle		80			
Height of rectangle		8			

(a) (i) Complete the table *(4 marks)*

(ii) On the grid provided, draw the histogram. *(2 marks)*



(i) Estimate the median mass using the histogram in a(ii) above *(3 marks)*

(ii) On the same grid, draw a frequency polygon. *(1 mark)*

21 A square floor is fitted with identical rectangular tiles. The length of the floor is 9.6 m. The perimeter of each of the tiles is 220 cm. Each row (tile lengthwise) carries 20 less tiles than each column (tiles breadthwise). Taking x to represent the width of the tile,

(a) Write the expression in x the number of tiles on both row and column. *(2 marks)*

(b) Calculate the dimensions of the tiles. *(4 marks)*

(c) Find the number of tiles needed to cover the whole floor of the room. *(1 mark)*

(d) Find the cost of fitting, if the tiles are sold in dozen at sh 1 500 per dozen and the labour cost is sh 300. *(2 marks)*

22 Town X is 1 620m from a school A on a bearing 056°. Town Y is 1 250m from the school A on a bearing of 185°. Town Z is 1 620m from town X on a bearing of 152^0.

(a) Make the drawing or a sketch of the positions of school A and towns X, Y, Z. *(2 marks)*

(b) Find by calculation the distance of town X from Y to 1 decimal place. *(3 marks)*

(c) Calculate the bearing of

(i) X from town Y to 1 decimal place. *(3 marks)*

(ii) Town Z from school A *(2 marks)*

23 (a) On the Cartesian plane below, draw the quadrilateral PQRS with vertices $P(4, 6)$, $Q(6, 3)$, $R(4, 4)$ and $S(2, 3)$. *(1 mark)*

(b) Draw $P'Q'R'S'$ the image of PQRS under the transformation defined by the translation vector $\bar{T} = \begin{pmatrix} -7 \\ -6 \end{pmatrix}$. Write down the coordinates of $P'Q'R'S'$ *(2 marks)*

(c) $P''Q''R''S''$ is the image of $P'Q'R'S'$ when reflected in the line $y = 1$. On the same plane, draw $P''Q''R''S''$ *(2 marks)*

(d) Draw $P'''Q'''R'''S'''$ the image of $P''Q''R''S''$ when reflected in the line $y - x = 0$ *(2 marks)*

(e) Find by construction the centre of the rotation that maps $P'''Q'''R'''S'''$ onto PQRS and hence determine the coordinates of the centre of the rotation and the angle of the rotation. *(3 marks)*

24 A curve is represented by the function $y = x^3 - 4x^2 + 5x - 2$.

(a) Find $\frac{dy}{dx}$ *(1mark)*

(b) (i) Determine the values of stationary points of the curve. *(4 marks)*

(ii) For each stationary point, determine whether it is a minimum, a maximum or a point of inflection. *(2 marks)*

(c) In the space provided, sketch the curve of the function $y = x^3 - 4x^2 + 5x - 2$ *(3 marks)*