

0015771

Name Index Number /

121/1
 MATHEMATICS ALT A
 Paper 1
 Oct./Nov. 2012
 2½ hours

Candidate's Signature

Date



THE KENYA NATIONAL EXAMINATIONS COUNCIL

Kenya Certificate of Secondary Education

MATHEMATICS ALT A

Paper 1

2½ hours

121/1 – Mathematics Alt A	
Tuesday	8.00 am – 10.30 am
06/11/2012	(1st Session)

Instructions to candidates

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) This paper consists of **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 workings 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 **18 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

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SECTION I (50 marks)

Answer *all* the questions in this section in the spaces provided.

- 1 Without using a calculator, evaluate

$$\frac{1\frac{1}{5} - 1\frac{1}{3}}{\frac{1}{8} - (-\frac{1}{2})^2} - \frac{7}{15} \text{ of } 2.$$

(4 marks)

- 2 Find the reciprocal of 0.216 correct to 3 decimal places, hence evaluate

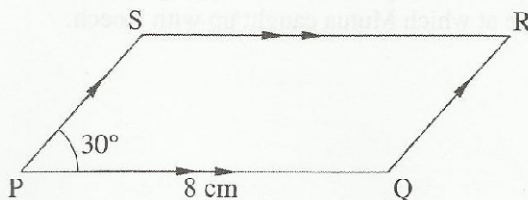
$$\frac{\sqrt[3]{0.512}}{0.216}$$

(3 marks)

- 3 Expand and simplify the expression $(2x^2 - 3y^3)^2 + 12x^2y^3$

(2 marks)

- 4 In the parallelogram PQRS shown below, $PQ = 8$ cm and angle $SPQ = 30^\circ$.



If the area of the parallelogram is 24 cm^2 , find its perimeter. (3 marks)

- 5 Given that $9^{2y} \times 2^x = 72$, find the values of x and y . (3 marks)

- 6 Three bells ring at intervals of 9 minutes, 15 minutes and 21 minutes. The bells will next ring together at 11.00 pm. Find the time the bells had last rang together. (3 marks)

- 7 Koech left home to a shopping centre 12 km away, running at 8 km/h. Fifteen minutes later, Mutua left the same home and cycled to the shopping centre at 20 km/h. Calculate the distance to the shopping centre at which Mutua caught up with Koech. (3 marks)

- 8 Using a pair of compasses and ruler only, construct a quadrilateral ABCD in which $AB = 4$ cm, $BC = 6$ cm, $AD = 3$ cm, angle $ABC = 135^\circ$ and angle $DAB = 60^\circ$. Measure the size of angle BCD. (4 marks)

- 9 Given that $\mathbf{OA} = 2\mathbf{i} + 3\mathbf{j}$ and $\mathbf{OB} = 3\mathbf{i} - 2\mathbf{j}$
Find the magnitude of \mathbf{AB} to one decimal place. (3 marks)

10 Given that $\tan x^\circ = \frac{3}{7}$, find $\cos (90 - x)^\circ$ giving the answer to 4 significant figures. (2 marks)

11 Given that $\mathbf{A} = \begin{pmatrix} 1 & 0 \\ -2 & 3 \end{pmatrix}$, $\mathbf{B} = \begin{pmatrix} 3 & 0 \\ 2 & 1 \end{pmatrix}$ and $\mathbf{C} = 2\mathbf{AB} - \mathbf{A}^2$. Determine matrix \mathbf{C} . (4 marks)

12 Without using mathematical tables or a calculator, solve the equation $2\log_{10}x - 3\log_{10}2 + \log_{10}32 = 2$. (3 marks)

- 13 A line L passes through point $(3,1)$ and is perpendicular to the line $2y = 4x + 5$. Determine the equation of line L . (3 marks)

- 14 A Forex Bureau in Kenya buys and sells foreign currencies as shown below:

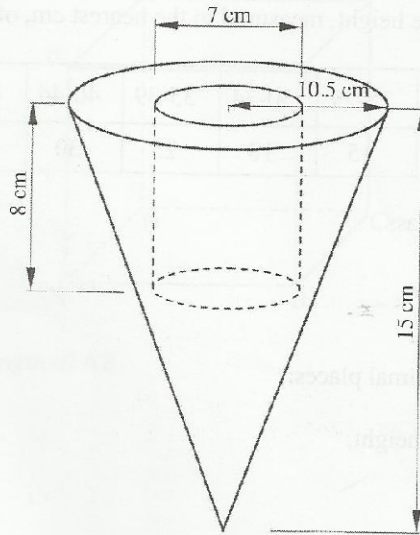
Currency	Buying (Ksh)	Selling (Ksh)
Chinese Yuan	12.34	12.38
South African Rand	11.28	11.37

A businesswoman from China converted 195 250 Chinese Yuan into Kenya shillings.

- (a) Calculate the amount of money, in Kenya shillings, that she received. (1 mark)

- (b) While in Kenya, the businesswoman spent Ksh 1 258 000 and then converted the balance into South African Rand. Calculate the amount of money, to the nearest Rand, that she received. (3 marks)

- 15 The figure below represents a solid cone with a cylindrical hole drilled into it. The radius of the cone is 10.5 cm and its vertical height is 15 cm. The hole has a diameter of 7 cm and depth of 8 cm.



Calculate the volume of the solid.

(3 marks)

- 16 Bukra had two bags A and B, containing sugar. If he removed 2 kg of sugar from bag A and added it to bag B, the mass of sugar in bag B would be four times the mass of the sugar in bag A. If he added 10 kg of sugar to the original amount of sugar in each bag, the mass of sugar in bag B would be twice the mass of the sugar in bag A. Calculate the original mass of sugar in each bag.

(3 marks)

SECTION II (50 marks)

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

- 17 The table below shows the height, measured to the nearest cm, of 101 pawpaw trees.

Height in cm.	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59
Frequency	2	15	18	25	30	6	3	2

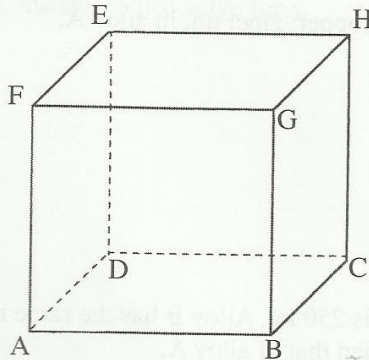
- (a) State the modal class. (1 mark)

- (b) Calculate to 2 decimal places:

- (i) the mean height; (4 marks)

- (ii) the difference between the median height and the mean height. (5 marks)

- 18 The figure below represents a solid cuboid ABCDEFGH with a rectangular base.
 $AC = 13$ cm, $BC = 5$ cm and $CH = 15$ cm.



- (a) Determine the length of AB. (1 mark)
- (b) Calculate the surface area of the cuboid. (3 marks)
- (c) Given that the density of the material used to make the cuboid is 7.6 g/cm^3 , calculate its mass in kilograms. (4 marks)
- (d) Determine the number of such cuboids that can fit exactly in a container measuring 1.5 m by 1.2 m by 1 m. (2 marks)

- 19 Two alloys, A and B, are each made up of copper, zinc and tin. In alloy A, the ratio of copper to zinc is 3:2 and the ratio of zinc to tin is 3:5.

(a) Determine the ratio, copper: zinc: tin, in alloy A. (2 marks)

Height in cm	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59
Frequency	2	5	18	25	30	15	3	2

- (b) The mass of alloy A is 250 kg. Alloy B has the same mass as alloy A but the amount of copper is 30% less than that of alloy A.

Calculate:

(i) the mass of tin in alloy A; (2 marks)

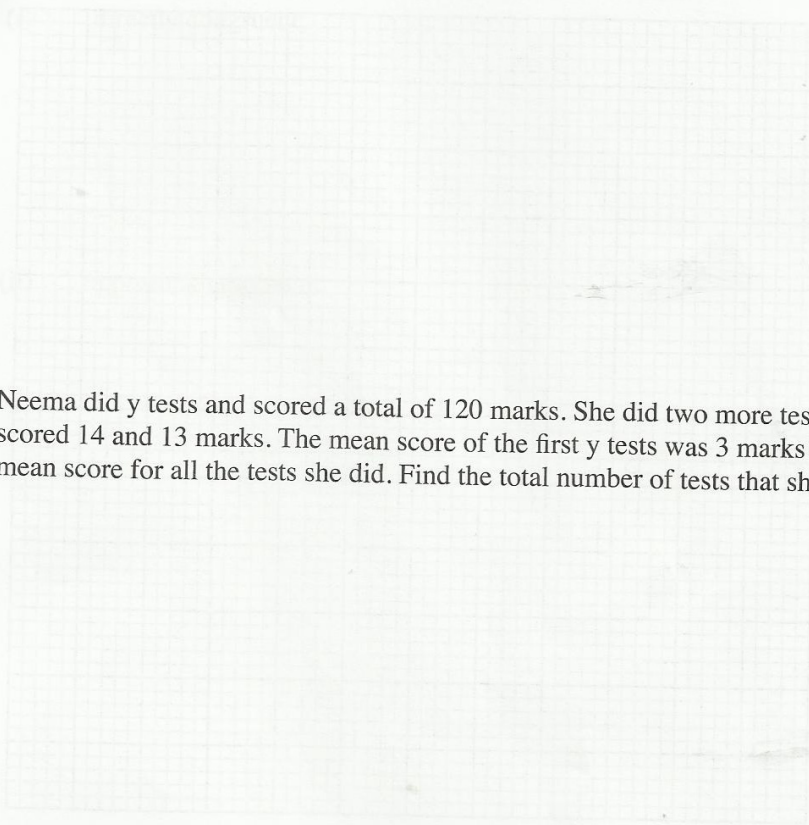
(ii) the total mass of zinc and tin in alloy B. (3 marks)

- (c) Given that the ratio of zinc to tin in alloy B is 3:8, determine the amount of tin in alloy B than in alloy A. (3 marks)

20 (a) Express $\frac{1}{x-2} - \frac{2}{x+5} = \frac{3}{x+1}$ in the form $ax^2 + bx + c = 0$,

where a, b and c are constants hence solve for x.

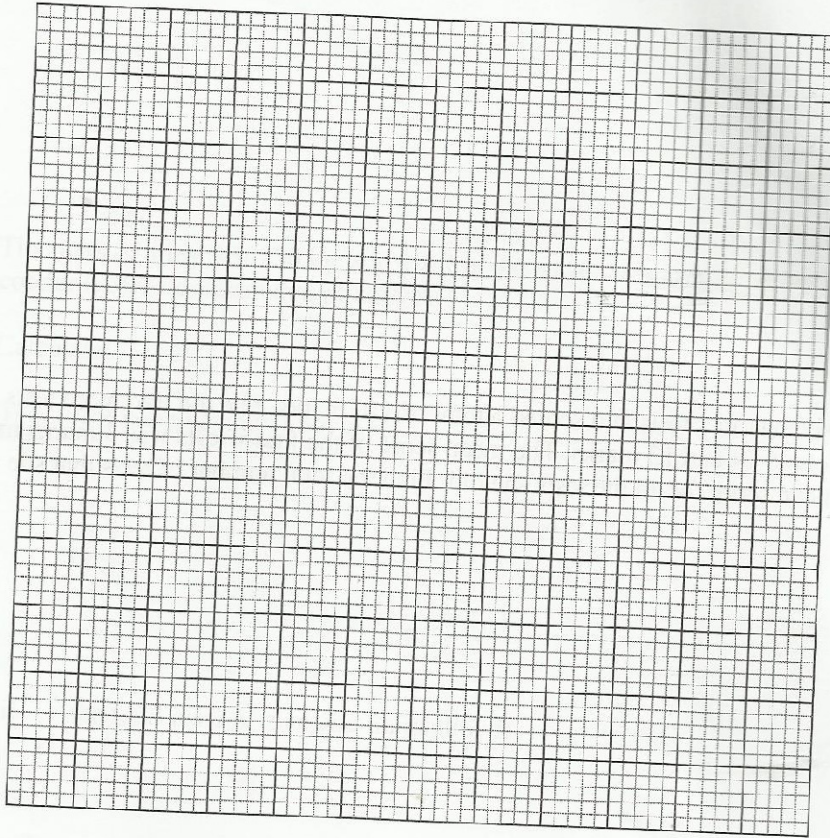
(4 marks)



- (b) Neema did y tests and scored a total of 120 marks. She did two more tests which she scored 14 and 13 marks. The mean score of the first y tests was 3 marks more than the mean score for all the tests she did. Find the total number of tests that she did. (6 marks)

- 21 The vertices of quadrilateral OPQR are $O(0, 0)$, $P(2, 0)$, $Q(4, 2)$ and $R(0, 3)$. The vertices of its image under a rotation are $O'(1, -1)$, $P'(1, -3)$, $Q'(3, -5)$ and $R'(4, -1)$.

- (a) (i) On the grid provided, draw OPQR and its image $O'P'Q'R'$. (2 marks)



- (ii) By construction, determine the centre and angle of rotation. (3 marks)

(b) On the same grid as (a)(i) above, draw $O''P''Q''R''$, the image of $O'P'Q'R'$ under a reflection in the line $y = x$. (2 marks)

(c) From the quadrilaterals drawn, state the pairs that are:

(i) directly congruent; (1 mark)

(ii) oppositely congruent. (2 marks)

22 The equation of a curve is $y = 2x^3 + 3x^2$.

(a) Find:

(i) the x - intercept of the curve; (2 marks)

(ii) the y - intercept of the curve. (1 mark)

(b) (i) Determine the stationary points of the curve. (3 marks)

(ii) For each point in (b) (i) above, determine whether it is a maximum or a minimum. (2 marks)

- (c) Sketch the curve. (2 marks)



- (a) Find the length of PT . (2 marks)

- (b) Use the scale drawing to determine

- (i) the distance between T and S in metres.

- (ii) Determine, correct to 2 significant figures,

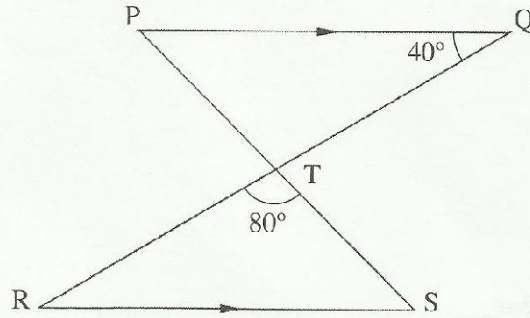
- (i) the perpendicular distance between PQ and RS .

- (ii) the bearing of T from S .

- (c) Find the area of the field, in hectares, correct to one decimal place.

- 23 Three pegs R, S and T are on the vertices of a triangular plain field. R is 300 m from S on a bearing of 300° and T is 450 m directly south of R.
- (a) Using a scale of 1 cm to represent 60 m, draw a diagram to show the positions of the pegs. (3 marks)
- (b) Use the scale drawing to determine:
- (i) the distance between T and S in metres; (2 marks)
- (ii) the bearing of T from S. (1 mark)
- (c) Find the area of the field, in hectares, correct to one decimal place. (4 marks)

- 24 In the figure below, PQ is parallel to RS. The lines PS and RQ intersect at T. $RQ = 10$ cm, $RT:TQ = 3:2$, angle $PQT = 40^\circ$ and angle $RTS = 80^\circ$.



- (a) Find the length of RT. (2 marks)
- (b) Determine, correct to 2 significant figures:
- (i) the perpendicular distance between PQ and RS; (2 marks)

- (ii) the length of TS. (2 marks)



- (c) Using the cosine rule, find the length of RS correct to 2 significant figures. (2 marks)

- (d) Calculate, correct to one decimal place, the area of triangle RST. (2 marks)

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