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Name .... Index Number ..../.............

121/2
MATHEMATICS ALT A
Paper 2
Oct./Nov. 2012
2½ hours

Candidate's Signature ....

Date ....

THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education

MATHEMATICS ALT A
Paper 2
2½ hours

121/2 – Mathematics Alt A	
Thursday	8.00 am–10.30 am
08/11/2012	(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 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 20 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 I (50 marks)

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

1   Evaluate $\dfrac{\log 4^5 - \log 5^4}{\log 4^{\frac{1}{5}} + \log 5^{\frac{1}{4}}}$, giving the answer to 4 significant figures.   (2 marks)

2   Make n the subject of the equation.   (3 marks)

$$\frac{r}{p} = \frac{m}{\sqrt{n-1}}$$

3   An inlet tap can fill an empty tank in 6 hours. It takes 10 hours to fill the tank when the inlet tap and an outlet tap are both opened at the same time. Calculate the time the outlet tap takes to empty the full tank when the inlet tap is closed.   (3 marks)

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4   Given that $P = 2i - 3j + k$, $Q = 3i - 4j - 3k$ and $R = 3P + 2Q$, find the magnitude of R to 2 significant figures.   (3 marks)

5   Solve the equation $\sin(2t + 10)° = 0.5$ for $0° \leq t \leq 180°$ (2 marks)

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6   Construct a circle centre x and radius 2.5 cm. Construct a tangent from a point P, 6 cm from x to touch the circle at R. Measure the length PR.   (4 marks)

7   Kago deposited Ksh 30 000 in a financial institution that paid simple interest at the rate of 12% per annum. Nekesa deposited the same amount of money as Kago in another financial institution that paid compound interest. After 5 years, they had equal amounts of money in the financial institutions.

Determine the compound interest rate per annum, to 1 decimal place, for Nekesa's deposit.   (4 marks)

8   The masses in kilograms of 20 bags of maize were; 90, 94, 96, 98, 99, 102, 105, 91, 102, 99, 105, 94, 99, 90, 94, 99, 98, 96, 102 and 105.
Using an assumed mean of 96 kg, calculate the mean mass, per bag, of the maize.   (3 marks)

9   Solve the equations

$x + y = 17$

$xy - 5x = 32$ (4 marks)

10   Simplify $\dfrac{\sqrt{5}}{\sqrt{5}-2}$, leaving the answer in the form $a + b\sqrt{c}$, where a, b and c are integers.   (2 marks)

11 The base and height of a right angled triangle were measured as 6.4 cm and 3.5 cm respectively. Calculate the maximum absolute error in the area of the triangle. (3 marks)

12 (a) Expand $(1 + x)^7$ up to the 4th term. (1 mark)

(b) Use the expansion in part (a) above to find the approximate value of $(0.94)^7$. (2 marks)

13 The graph below shows the relationship between distance s metres and time t seconds in the interval $0 \le t \le 6$.
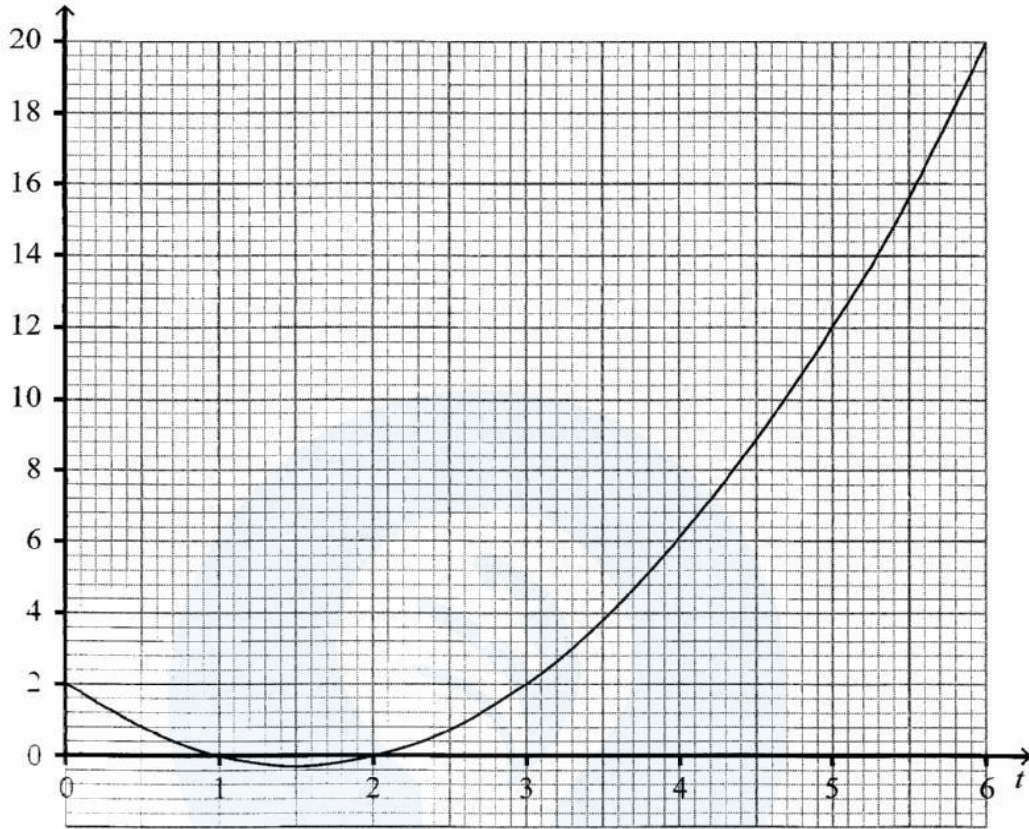
Use the graph to determine:

(a) the average rate of change of distance between $t = 3$ seconds and $t = 6$ seconds;

(2 marks)

(b) the gradient at $t = 3$ seconds.

(2 marks)

14 In the figure below, the tangent ST meets chord VU produced at T. Chord SW passes through the centre, O, of the circle and intersects chord VU at X. Line ST = 12 cm and UT = 8 cm.
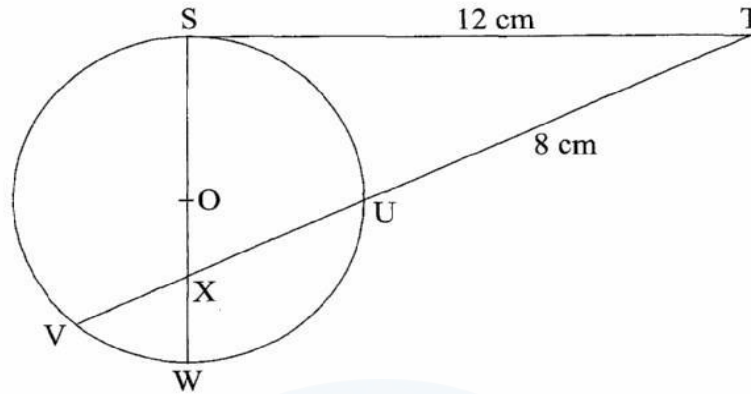

(a) Calculate the length of chord VU. (2 marks)

(b) If WX = 3 cm and VX:XU = 2:3, find SX. (2 marks)

15   Three quantities P, Q and R are such that P varies directly as Q and inversely as the square root of R. When P = 8, Q = 10 and R = 16. Determine the equation connecting P, Q and R.

                 (3 marks)

16   In the figure below, VABCD is a right pyramid on a rectangular base. Point O is vertically below the vertex V. AB = 24 cm, BC = 10 cm and CV = 26 cm.
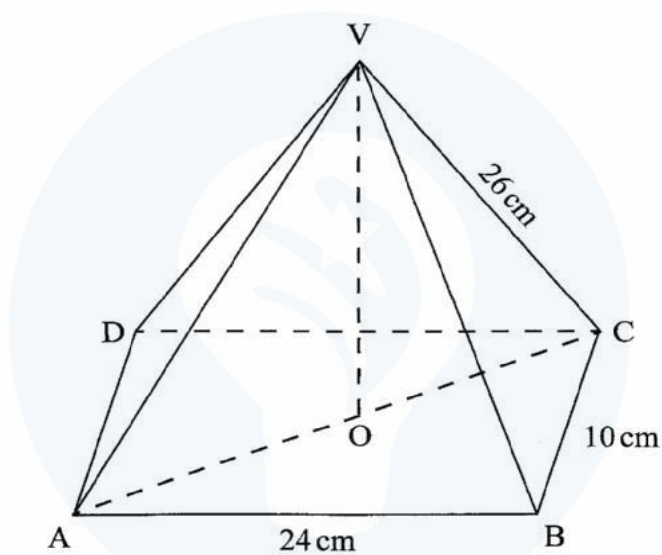
Calculate the angle between the edge CV and the base ABCD.   (3 marks)

SECTION II (50 marks)

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

17   Amaya was paid an initial salary of Ksh 180 000 per annum with a fixed annual increment. Bundi was paid an initial salary of Ksh 150 000 per annum with a 10% increment compounded annually.

    (a)   Given that Amaya's annual salary in the 11th year was Ksh 288 000, determine:

        (i)   his annual increment;   (2 marks)

        (ii)   the total amount of money Amaya earned during the 11 years.   (2 marks)

    (b)   Determine Bundi's monthly earnings, correct to the nearest shilling, during the eleventh year.   (2 marks)

(c)   Determine, correct to the nearest shilling:

    (i)   the total amount of money Bundi earned during the 11 years.   (2 marks)

    (ii)   The difference between Bundi's and Amaya's average monthly earnings during the 11 years.   (2 marks)
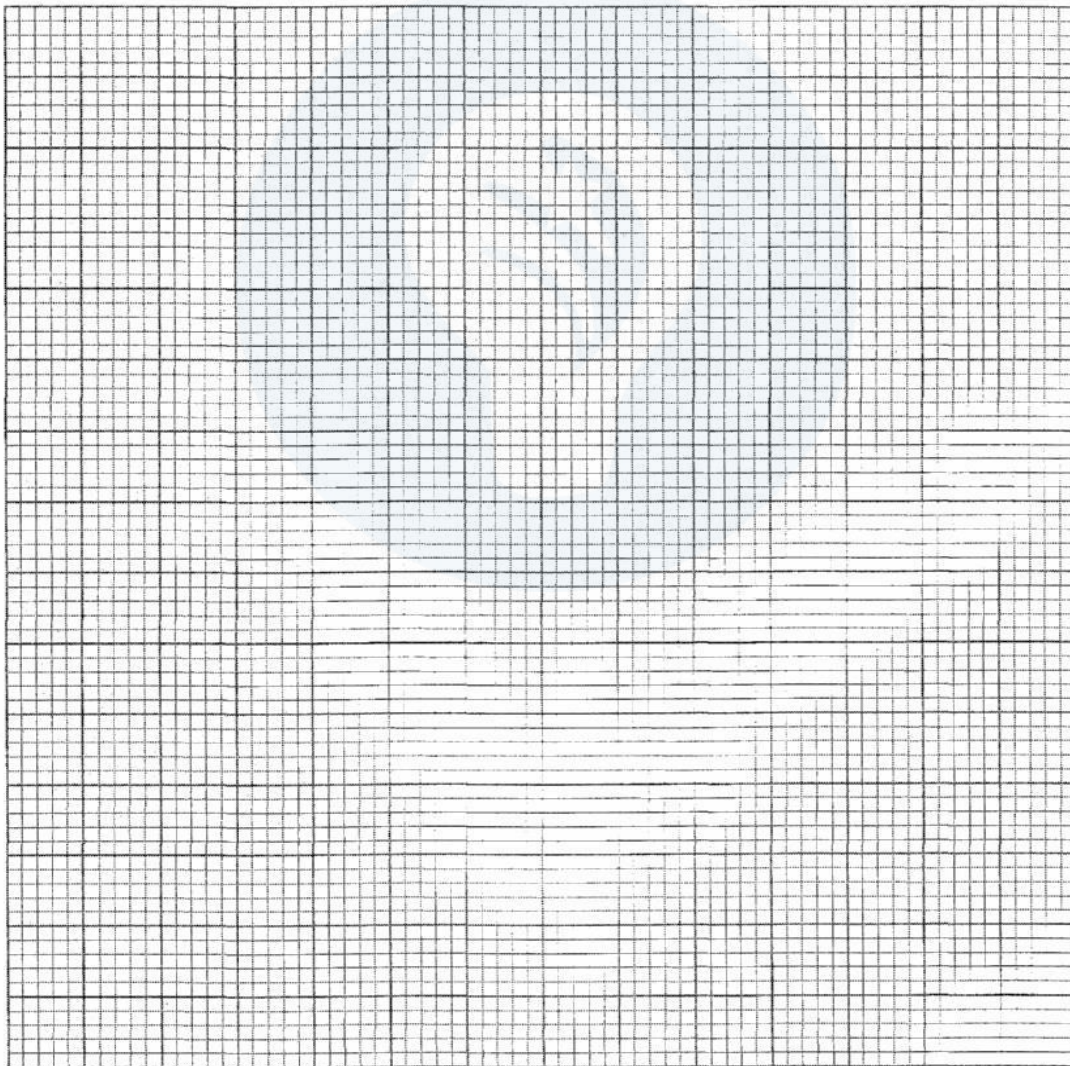
18   OABC is a parallelogram with vertices O(0,0), A(2,0), B(3,2) and C(1,2).

O′A′B′C′ is the image of OABC under transformation matrix $\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$

(a)   (i)   Find the coordinates of O′A′B′C′.   (2 marks)

(ii)   On the grid provided draw OABC and O′A′B′C′.   (2 marks)

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(b) (i) Find O″A″ B″ C″, the image of O′ A′ B′ C′ under the transformation matrix

$$\begin{pmatrix} 1 & 0 \\ 0 & -2 \end{pmatrix}.$$ (2 marks)

(ii) On the same grid draw O″ A″ B″ C″. (1 mark)

(c) Find the single matrix that maps O″ A″ B″ C″ onto OABC. (3 marks)

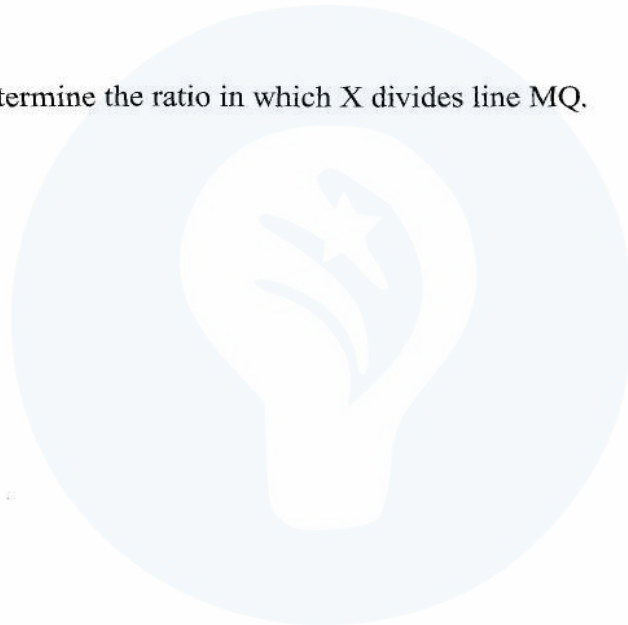Visit smartsolve.org for more maths resources

19 In triangle OPQ below, **OP** = **p**, **OQ** = **q**. Point M lies on **OP** such that **OM** : **MP** = 2 : 3 and point N lies on **OQ** such that **ON** : **NQ** = 5 : 1. Line PN intersects line MQ at X.
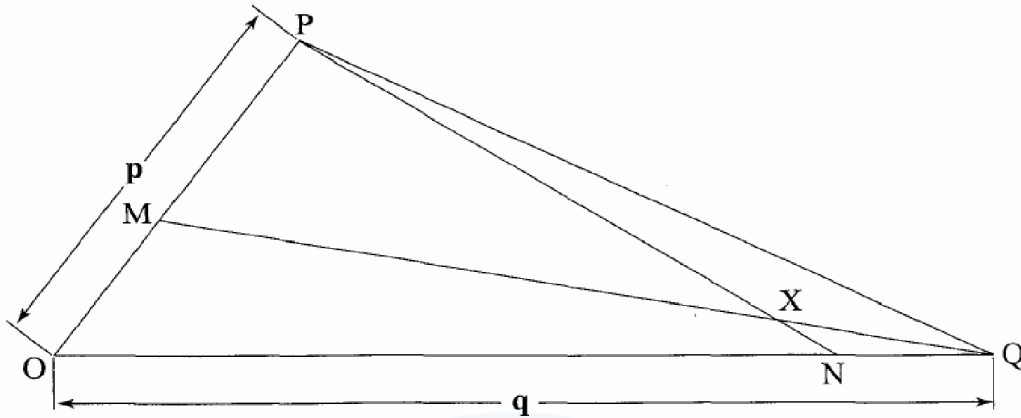
(a)   Express in terms of **p** and **q**:

    (i)   **PN**;   (1 mark)

    (ii)   **QM**.   (1 mark)

(b)   Given that **PX** = k**PN** and **QX** = r**QM**, where k and r are scalars:

    (i)   write two different expressions for **OX** in terms of **p**, **q**, k and r;   (2 marks)

(iii) find the values of k and r;   (4 marks)

(iii) determine the ratio in which X divides line MQ.   (2 marks)

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Turn over

20 In June of a certain year, an employee's basic salary was Ksh 17 000. The employee was also paid a house allowance of Ksh 6 000, a commuter allowance of Ksh 2 500 and a medical allowance of Ksh 1 800. In July of that year, the employee's basic salary was raised by 2%.

(a) Calculate the employees:

    (i) basic salary for July; (2 marks)

    (ii) total taxable income in July of that year. (2 marks)

(b) In that year, the Income Tax Rates were as shown in the table below:

Monthly taxable income (Kshs)	Percentage rate of tax per shilling
Up to 9 680	10
From 9 681 to 18 800	15
From 18 801 to 27 920	20
From 27 921 to 37 040	25
From 37 041 and above	30

Given that the Monthly Personal Relief was Ksh 1 056, calculate the net tax paid by the employee. (6 marks)

21   (a)   On the same diagram construct:

   (i)   triangle ABC such that AB = 9 cm, AC = 7 cm and angle CAB = 60°;   (2 marks)

   (ii)   the locus of a point P such that P is equidistant from A and B;   (1 mark)

   (iii) the locus of a point Q such that CQ ≤ 3.5 cm.   (1 mark)

   (b)   On the diagram in part (a):

   (i)   shade the region R, containing all the points enclosed by the locus of P and the locus of Q, such that AP ≥ BP;   (2 marks)

   (ii)   find the area of the region shaded in part (b)(i) above.   (4 marks)

22 A tourist took 1 h 20 minutes to travel by an aircraft from town T(3°S, 35°E) to town U(9°N, 35°E).

(Take the radius of the earth to be 6 370 km and $\pi = \frac{22}{7}$),

(a) Find the average speed of the aircraft. (3 marks)

(b) After staying at town U for 30 minutes, the tourist took a second aircraft to town V(9°N, 5°E). The average speed of the second aircraft was 90% that of the first aircraft. Determine the time, to the nearest minute, the aircraft took to travel from U to V. (3 marks)

(c) When the journey started at town T, the local time was 0700h. Find the local time at V when the tourist arrived. (4 marks)

23   A box contains 3 brown, 9 pink and 15 white clothes pegs. The pegs are identical except for the colour.

(a)   Find the probability of picking:

(i)   a brown peg;   (1 mark)

(ii)   a pink or a white peg.   (2 marks)

(b)   Two pegs are picked at random, one at a time, without replacement. Find the probability that:

(i)   a white peg and a brown peg are picked;   (3 marks)

(ii)   both pegs are of the same colour.   (4 marks)

24 The acceleration of a body moving along a straight line is $(4 - t)$ m/s^2 and its velocity is v m/s after t seconds.

    (a)   (i)   If the initial velocity of the body is 3m/s, express the velocity v in terms of t.

                                                                                                      (3 marks)

                (ii)   Find the velocity of the body after 2 seconds.   (2 marks)

    (b)   Calculate:

                (i)   the time taken to attain maximum velocity;   (2 marks)

                (ii)   the distance covered by the body to attain the maximum velocity.   (3 marks)