Name………………………………………………..Index Number……………………..

121/2
MATHEMATICS ALT A
Paper 2
Oct./Nov. 2012
2 ½ hours

Candidate's signature……………..

Date………………………………..

THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education
MATHEMATICS ALT A
Paper 2
2 ½ 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 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 questions.
(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

SECTION I (50 marks)

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

1. Evaluate $\dfrac{\log 4^5 - \log 5^4}{\log 4^{1/5} + \log 5^{1/4}}$, 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 house 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)

4. Give 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 $(2t + 10^0) = 0.5$ for $0^0 \leq t \leq 180^0$ (2 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 96kg, calculate the mean mass, per bag, of the maize. (3 marks)

9. Solve the equations

$x + y = 17$

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

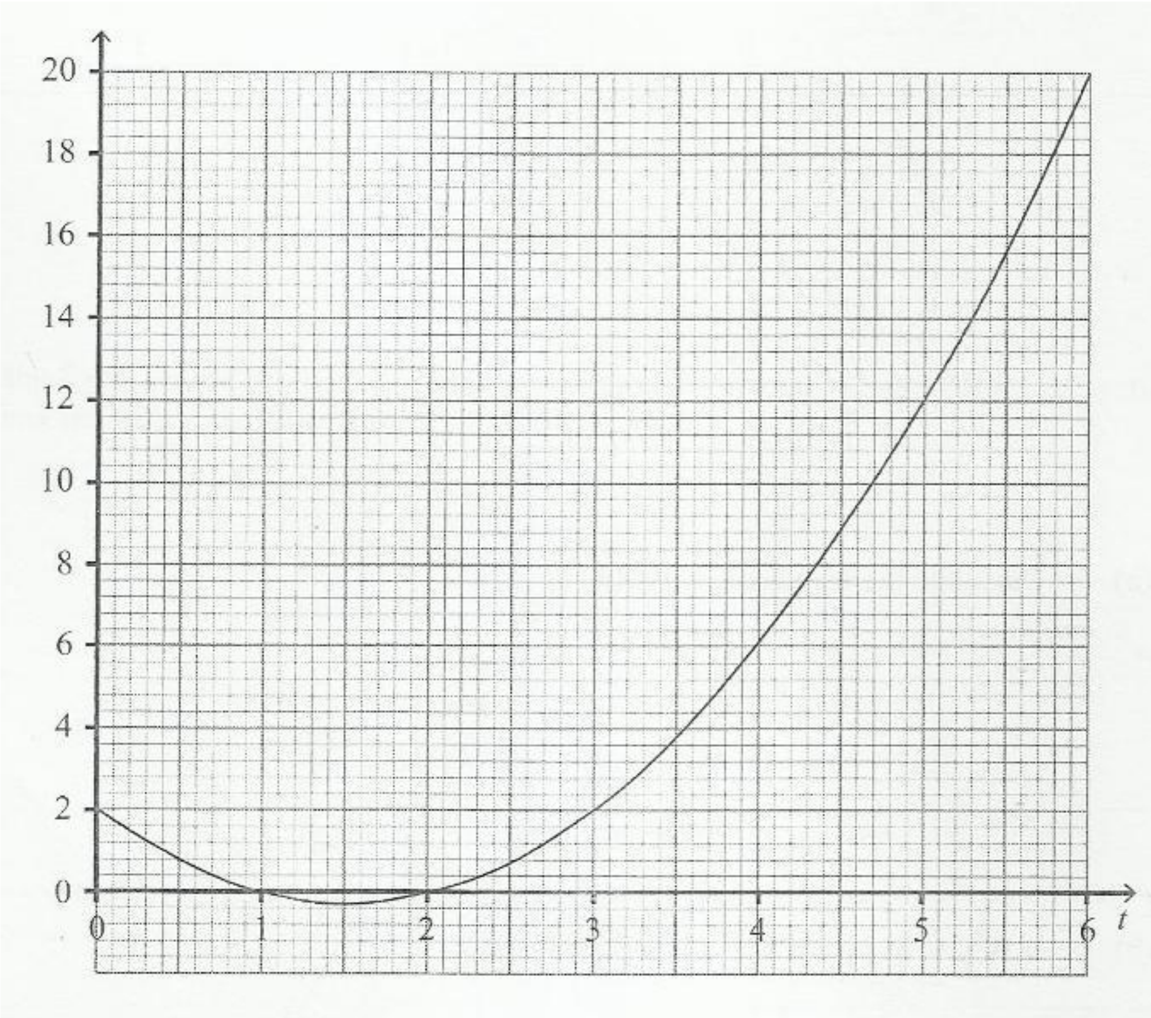
10. Simplify $\frac{\sqrt{5}}{\sqrt{5}-2}$, leaving the answer in the form a + $b\sqrt{c}$,
where, b and c are integers. (2 marks)

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

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

(b) Use the expansion in part (a) above to find the approximate value of $(0.94)^7$. (1 mark)

13. The graph below shows the relationship between distance *s* meters and time *t* seconds in the interval $0 \leq 6$.

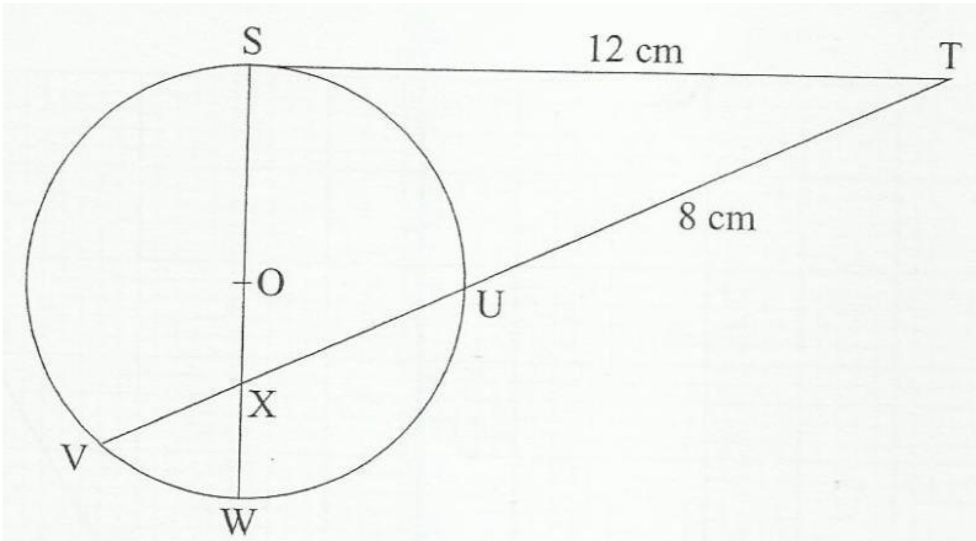


Use the graph to determine:

(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. Lien ST = 12cm and UT = 8cm.

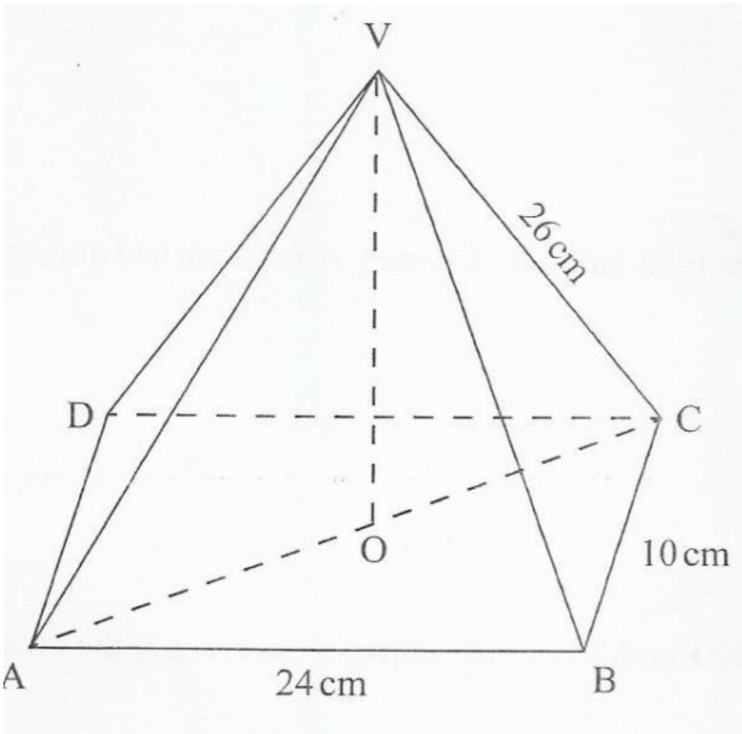


(a) Calculate the length of chord VU. (2 marks)

(b) If WX = 3cm 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 = 24cm, B



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 Kshs.180,000 per annum with a fixed annual increment. Bundi was paid an initial salary of Kshs150,000 per annum with a 10% increment compounded annually.

(a) Given that Amaya's annual salary in the 11^{th} year was Kshs.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)

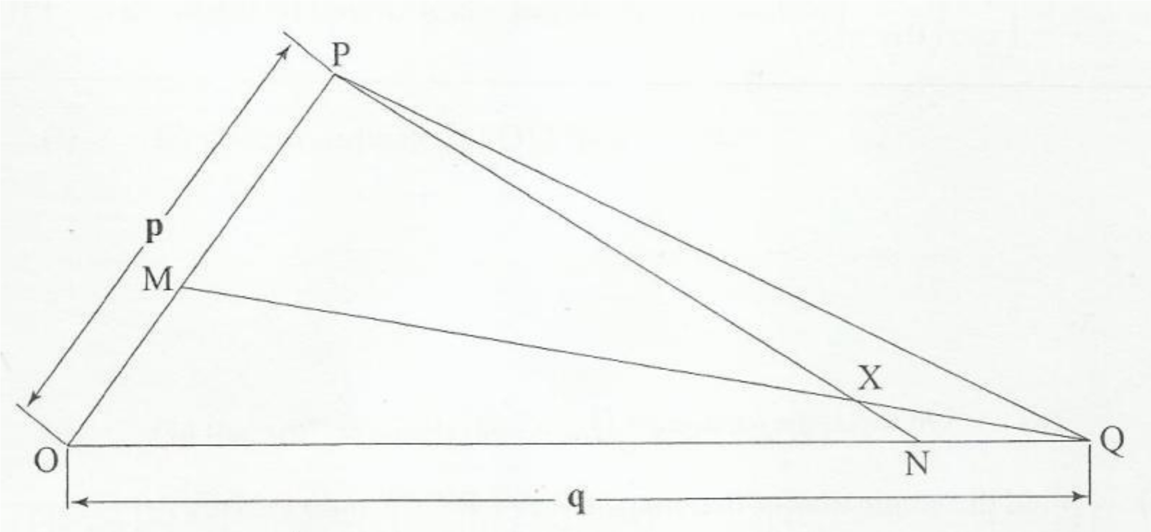
(b) (i) Find O" A"B"C", the image of O'A'B'C' under the transformation matrix

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

19. In triangle OPQ below, OP = 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 lien MQ at X.



(a) Express in terms of p and q: (1 mark)

(i) PN;

(2 marks)

(iii) QM (1 mark)

(b) Given that PX – kPN and OX = rQM, where k and r are scalars:

(i) write two different expression for OX in terms of p, q k and r;

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

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

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 Kshs6,000, a commuter allowance of ksh2,500 and a medical allowance of kshs1,800. 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 tax per shilling
Up to 9680	10
From 9681 to 18800	15
From 18801 to 27920	20
From 27921 to 37040	25
From 37041 and above	30

Given that the Monthly Personal Relief was Kshs.1056, calculate the net tax paid by the employee.

21. (a) On the same diagram construct:

(i) triangle ABC such that AB = 9cm, AC = 7cm and angle CAB = 60^0; (2 marks)

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

(iii) the locus of a point Q such that CQ $\leq$ 3.5cm (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$\geq$ BP; (2 marks)

(ii) find the area of the region shaded in part (b) (i) above. (2 marks)

22. A tourist took 1 h 20 minutes to travel by an aircraft from town T (^{30}S, 35^0E) to town U (9^0N, 35^0E).
(Take the radius of the earth to be 6370km and ת = 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 (9^0N, 5^0E). 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 form 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)

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/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 attained the maximum velocity. (3 marks)

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