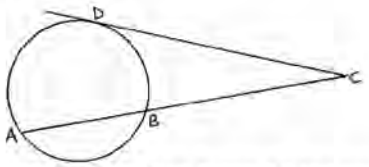
KAHURO/MURANG'A EAST JOINT EXAMINATION – 2016

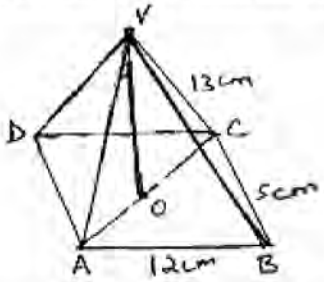
Kenya Certificate of Secondary Education
121/2
MATHEMATICS ALT A
PAPER 2
JULY/AUGUST, 2016
TIME: 2½ HOURS

SECTION I: (50 MARKS)

1. Use logarithms to evaluate, correct to 4 decimal places.
$$\sqrt{\frac{7.24 + 3.072}{23.2\ Cos 70^o}}$$ (4 marks)
2. Make R the subject of the formula
$A = \prod (R + r)(R - r)$ (3 marks)
3. The seventh term of an arithmetic sequence is 17, three times the third term is 3. Calculate the first term and the common difference of the sequence. (3 marks)
4. Find the value of χ given that
$\begin{pmatrix} \chi & 6 \\ 4 & \chi - 2 \end{pmatrix}$ is a singular matrix. (2 marks)
5. In the figure below DC is a tangent to the circle at point D. Given that ABC is straight line where AB 9.45cm and BC = 5cm. Find the length of DC. (3 marks)



6. Tap A can fill a bath in 4min. Tap B can fill the same bath in 6min and tap C can empty the bath in 8min.
(a) Calculate how long it would take to fill the bath if all the taps were left running. (2 marks)
(b) Calculate how long it would take to fill the bath if all taps were left running for 3min after which tap C is closed. (2 marks)
7. Rose cocoa beans cost Sh.60 per kg while Wairimu beans cost Sh.90 per kg. In what ratio should they be mixed such that by selling the mixture at Sh.84 per kg, a profit of 20% is made. (3 marks)
8. A point Q divides a line PR internally in the ratio 2: 1 and a point T divides the line internally in the ratio 3: 1. In what ratio does T divide PQ? (3 marks)
9. Given that $y = \frac{\chi(\chi^2 - 1)}{\chi + 1}$ is the equation of a curve, find the gradient of the tangent to the curve at the point (2, 4). (3 marks)
10. Find the quartile deviation of the data below 2, 4, 6, 8, 10, 5, 6, 9, 4, 6. (3 marks)
11. Under a shear with χ-axis invariant a square with vertices A (1, 0), B (3, 0), C (3, 2) and D (1, 2) is mapped onto a parallelogram with vertices A^1 (1, 0), B^1 (3, 0), C^1 (7, 2) and D^1 (5, 2). Find the shear matrix. (3 marks)
12. Find the value of χ given that $\log (15 - 5\chi) - 1 = \log (3\chi - 4)$. (3 marks)
13. Simplify, without using tables or calculators
$\frac{1 - Cos\ 60^o\ Sin\ 60^o}{1 + Cos\ 30^o\ Sin\ 30^o}$ leaving your answer in the form $a + b\sqrt{c}$. (4 marks)
14. A triangle ABC is such that AB = 9cm, BC = 7cm and AC = 11cm. Find the radius of a circle which passes through A, B and C correct to 2d.p. (3 marks)
15. Find the percentage error in using 0.67 as an estimate of $^2/_3$. (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 = 12cm, BC = 5cm and CV = 13cm.



Calculate the angle between the edge CV and the base ABCD. (3 marks)

SECTION B: (50 MARKS)

Answer any FIVE questions from this section.

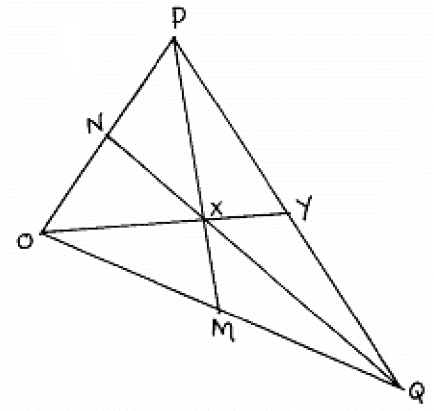
17. Mobile dealer sells phones of two types Nokia and Motorola. The price of one Nokia and one Motorola phone is Ksh.2000 and Ksh.1600 respectively. The dealer wishes to have at least fifty mobile phones. The number of Nokia phones should be at least the same as those of Motorola phone. He has Ksh.120000 to spend on phones.
If he purchases χ Nokia phones and y Motorola phones:
(a) Write down all the inequalities to represent the above information. (4 marks)
(b) Represent the inequalities in part (a) above on the grid provided. (4 marks)
(c) The profit on a Nokia phone is Ksh.200 and that on a Motorola phone is Ksh.300. Find the number of phones of each type he should stock. (3 marks)

18. Given that $-2\chi^2 - 3\chi + 11 = y$
(a) Complete the table below.

χ	-4	-3	-2	-1	0	1	2	3
y	-9		9		11		-3	

(2 marks)
(b) On the grid provided draw the graph of $y = -2\chi^2 - 3\chi + 11$ for values of χ from -4 to 3. (3 marks)
(c) Use the graph to solve.
$-2\chi^2 - 3\chi + 11 = 0$ (2 marks)
$-2\chi^2 - 5\chi + 10 = 0$ (3 marks)

19. The figure below triangle OPQ in which OP = p and OQ = q . M and N are points on OQ and OP respectively such that ON = NP = 1: 3 and OM: MQ = 2: 1.



(a) Express the following vectors in terms of p and q.
(i) PM.
(ii) QN.
(iii) PQ.
(b) Lines PN and QN intersect at X such that PX = hpm and QX = KQN. Express OX in two different ways and find the value of h and K. (6 marks)
(c) OX produced meets PQ at Y such that PY: YQ = 3: 2. Using the ratio theorem or otherwise, find OY in terms of p and q. (1 mark)

20. Income tax is charged on annual income at the rate shown below.

Taxable income K£ p.a.	Rate Ksh. Per £
1 – 2300	2
2301 – 6900	3
6901 – 9200	5
9201 - 11500	7
11501 and over	9

Mr. Njoroge earn a basic salary of Ksh.15000 per month and lives in a company house for which he pays a nominal-rent of Ksh.1250 per month. He enjoys personal relief of Ksh.1056 per month and insurance relief of Sh.270 per month. Calculate.
(a) Taxable pay is the employee's salary + 15% of salary less his taxable income nominal rent. Calculate Njoroge's taxable income in K£ p.a. (3 marks)
(b) The amount of tax he pays per month in Kenya shillings. (5 marks)
(c) His net monthly salary in shillings. (2 marks)

21. Use ruler and compasses only for all constructions in this question.
(a) Construct triangle ABC given that AC = 6cm, AB = 5.6cm and angle BAC = 75°. Measure BC. (3 marks)
(b) L_1 is the locus of points equidistant from BA and BC. Construct L_1. (2 marks)

(c) Construct L_2, the perpendicular from C to AB. (2 marks
(d) L_1 and L_2 meet at P. Locate P. (1 mark)
(e) Find the point inside the triangle which is furthest from point P.
What is the distance of that point from P? (2 marks)

22. The table below shows marks scored by 40 candidates in an examination.

Marks	Frequency
11 – 20	1
21 – 30	5
31 – 40	8
41 – 50	9
51 – 60	8
61 – 70	4
71 – 80	2
81 - 90	3

Using an assumed mean of 45.5 estimate:
(i) Mean. (3 marks)
(ii) Standard deviation. (3 marks)
(iii) Calculate the quartile deviation. (4 marks)

23. Two bags X and Y contains ten and eight balls respectively. Bag X has 6 green and 4 red balls while bag Y has 3 and 5 red balls. A bag is selected at random
and 2 balls selected without replacement.
(a) Draw a tree diagram to represent the above information. (4 marks)
(b) Find the probability of selecting a green ball the first time. (2 marks)
(c) What is the probability of selecting at most one red ball? (2 marks)
(d) Find the probability of selecting two green balls. (2 marks)

24. The length and the width of a rectangular are $(6\chi - 1)$ and $(\chi - 2)$ respectively. If the length and the width are increased by 4cm the new area is thrice that of the initial rectangle.
(a) Find the dimension of the initial rectangle. (6 marks)
(b) By what percentage does the area of the rectangle increase after the change? (2 marks)
(c) What is the difference in size between the length and the width of the initial length? (2 marks)