

NAME..... INDEX NO.....

CANDIDATE'S SIGNATURE.....

DATE.....

121/2  
MATHEMATICS  
PAPER 2  
JULY/AUGUST 2011  
TIME: 2½ HRS.

**NANDI SOUTH, NANDI EAST AND TINDIRET  
DISTRICTS JOINT EXAMINATION 2011**

*Kenya Certificate of Secondary Education  
MATHEMATICS PAPER 2*

**INSTRUCTIONS TO CANDIDATES:**

1. Write your **Name** and **Index Number** in the spaces provided at the top of this page.
2. Sign and Write the date of examination in the spaces provided above.
3. This paper consists of two Sections; Section **I** and Section **II**.
4. Answer all the questions in Section **I** and any **FIVE** questions from Section **II**.
5. All answers and working must be written on the question paper in the spaces provided below each question.
6. Show all the steps in your calculation, giving your answer at each stage in the spaces provided **below** each question.
7. Marks may be given for correct working even if the answer is wrong.
8. Non-programmable silent electronic calculators and KNEC Mathematical tables **may be** used except where stated otherwise.

**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 questions in this section:**

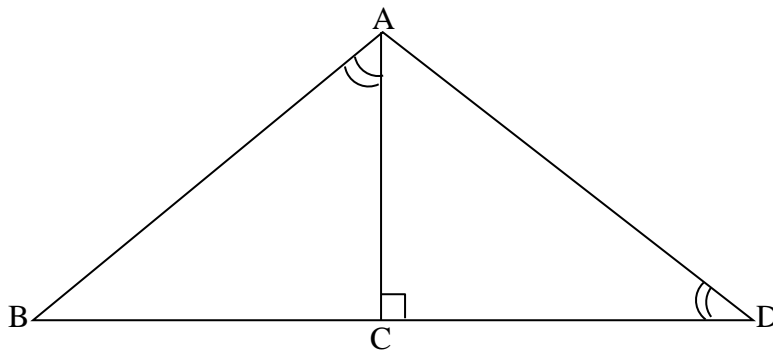
1. Given that  $\tan \theta = \frac{1}{\sqrt{3}}$ , where  $\theta$  is an acute angle, determine without using tables the value of
- (i)  $\cos (270^\circ - \theta)$ . (2mks)
- (ii)  $\sin (270^\circ - \theta)$ . (2mks)
2. Expand and simplify  $(1 + \sqrt{2})^3 - (1 - \sqrt{2})^3$  (2mks)
3. A quantity Q varies jointly as the square root of  $\chi$  and inversely as y. Given that when y is reduced by 20% and  $\chi$  increased by A%, Q increases by 37.55%, find the value of A. (3mks)
4. If  $\chi : y = 4 : 1$  and  $y : t = 3 : 1$ , find the ratio  $\chi : y : t$  and hence or otherwise evaluate and simplify  $\frac{\chi - y}{3t + y}$  (2mks)

5. Find the equation of the circle which passes through the points A(0, 2) and B(0, 8) and which touches the positive  $x$ -axis in the form  $x^2 + y^2 + gx + fy + c = 0$ . (4mks)
6. A rectangular sheet of metal measures 8cm by 5cm. Equal squares of side  $x$ cm are removed from each corner and the edges are then turned up to make an open box of volume  $V$ cm<sup>3</sup>, show that  $V = 40x - 26x^2 + 4x^3$ . Hence, find the maximum possible volume. (3mks)
7. Paul and Dominic working together can complete a piece of work in 15 days. They start working together but after 6 days, Paul falls ill and Dominic takes 30 more days to complete the work by himself. How long would each of them take to complete the work when working alone. (3mks)
8. The first term of an arithmetic series is  $(3P + 5)$  where  $P$  is a positive integer. The last term is  $(17P + 17)$  and the common difference is 2. Find, in terms of  $P$ .
- (I) the number of terms. (1mk)
- (II) the sum of the series. (2mks)
9. Given that  $\log_2(x - 5y + 4) = 0$  and  $\log_2(x + 1) - 1 = 2 \log_2 y$ . Find the values of  $x$  and  $y$ . (4mks)

10. Calculate the quartile deviation for the following set of data:  
17, 18, 23, 29, 33, 45, 52 and 60. (3mks)
11. A square paper has squares of side 4cm drawn on it. A coin of diameter 3cm is dropped at random onto the paper. What is the probability that it will not lie across a square. (Express your answer to 2 decimal places). (3mks)
12. A washing machine is offered for a cash price of Ksh:40,000. It can also be bought on hire purchase for a deposit of Ksh:3,500 and 30 monthly installments of Ksh.1400 each.  
Calculate:
- (i) the amount of interest paid. (2mks)
- (ii) the rate of interest per annum to 1s.f. (2mks)
13. A rectangular model prepared by a student had an area of  $6.2\text{m}^2$ . If its length is 2.5m, calculate the percentage error in its breadth. (3mks)

14. The equation of a tangent to a circle is  $3y - x = -8$ . If the centre of the circle is  $(3, 5)$ , determine the coordinates of the point of contact of the tangent and the circle. (3mks)

15. In the figure below, angles  $BAC$  and  $ADE$  are equal. Angle  $ACD$  is right angle. The ratio of the sides  $AC : BC = 4 : 3$ .



- Given that the area of the triangle  $ABC = 24\text{cm}^2$ , calculate the area of triangle  $ACD$ , giving your answer to 3s.f. (3mks)

16. A particle moves in a straight line from a fixed point. Its velocity  $V\text{m/s}$  after  $t$  seconds is given by  $V = 9t^2 - 4t + 1$ . Calculate the distance traveled by the particle during the third second. (3mks)

**SECTION II: (50 MARKS)**

**Answer only five questions in this section:**

17. Rates of tax in operational in 2009 are as given in the table below.

<u>K£p.a</u>	<u>Rate of tax %</u>
1 – 5208	10
5209 – 9744	15
9745 – 14292	20
14293 – 18840	25
Over 18840	30

(a) Mrs. Koech pays Ksh.5400 P.A.Y.E monthly. She was entitled to house allowance of Ksh.9000p.m and getting a monthly tax relief of Ksh.1093. calculate her monthly basic salary. (8mks)

(b) Mrs. Koech's other deduction per month were:  
Cooperative society contribution Ksh.2000  
Loan repayment. Ksh.2500  
Calculate her net salary per month. (2mks)

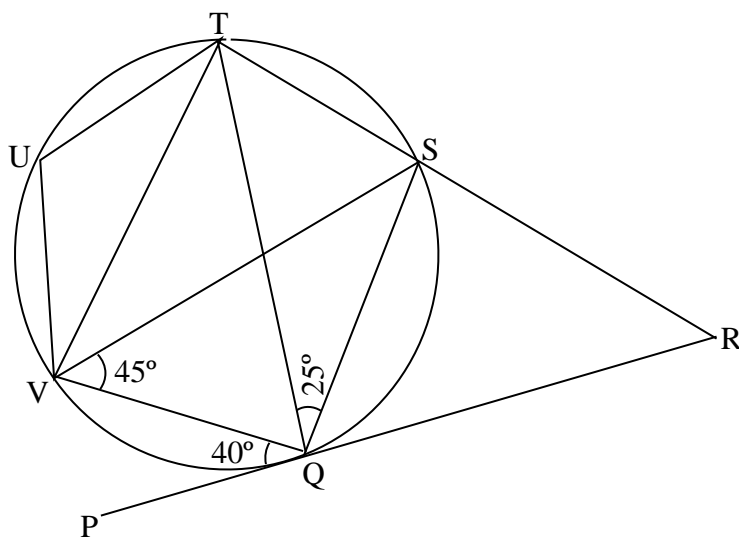
18. The vertices of a triangle ABC are A(1, 1), B(4, 1) and C(5, 4). A transformation represented by a Matrix  $= \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$  maps  $\Delta ABC$  onto  $\Delta A^1B^1C^1$ . A second transformation represented by  $Q = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$  maps  $\Delta A^1B^1C^1$  onto  $\Delta A^{11}B^{11}C^{11}$ .

- (a) On the same axes, draw the three triangles ABC,  $A^1B^1C^1$  and  $A^{11}B^{11}C^{11}$ . (6mks)
- (b) Describe a single transformation which maps  $\Delta ABC$  onto  $\Delta A^{11}B^{11}C^{11}$  and find its matrix. (4mks)

GRAPH



19. In the figure below, PQR is a tangent to the circle at Q.



Find the following angles, giving reasons for each answer.

(a) SVT: (2mks)

(b) SQR: (3mks)

(c) VUT: (3mks)

(d) QRS: (2mks)

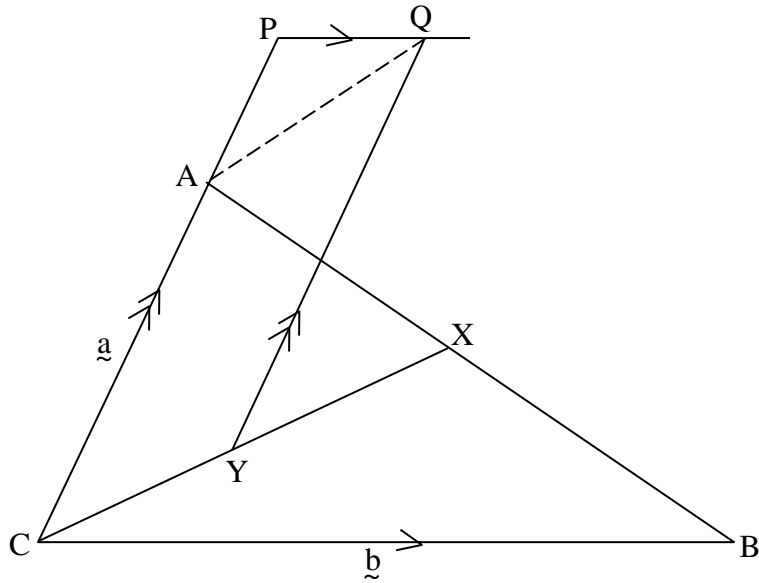
20. On the same axes, draw the graph of  $y = 2 \sin \chi$  and  $y = 3 \sin (\chi + 30^\circ)$  for the domain  $-360^\circ \leq x \leq 360^\circ$ . (4mks)

From your graph determine

- (a) the period of each of the functions. (1mk)
- (b) the amplitude of each of the functions. (1mk)
- (c) the solution to  $2 \sin \chi = 3 \sin (\chi + 30^\circ)$ . (2mks)
- (d) the transformation that maps the graph of  $y = 2 \sin \chi$  onto the graph of  $y = 3 \sin (\chi + 30^\circ)$ . (2mks)

GRAPH

21. In the figure below X divides AB in the ratio 1 : 2. Y is the midpoint of CX and  $AP = \frac{1}{3} CA$ . Lines YQ and PQ are parallel to CA and CB respectively.



Given that  $\vec{CA} = \vec{a}$  and  $\vec{CB} = \vec{b}$ , express in terms of  $\vec{a}$  and  $\vec{b}$ :

- (a)  $\vec{AB}$ : (1mk)
- (b)  $\vec{AX}$ : (1mk)
- (c)  $\vec{CP}$ : (1mk)
- (d)  $\vec{CY}$ : (2mks)
- (e) Given that  $\vec{YQ} = m\vec{a}$  and  $\vec{PQ} = n\vec{b}$ , express  $\vec{PY}$  in two different ways and hence find the values of m and n. (2mks)
- (f) Hence show that CAQY is a parallelogram (3mks)

22. The table below shows marks scored by 100 form three students in a Mathematics examination.

Marks	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
No. of students	2	10	13	17	18	14	10	6	6	4

- (a) Draw an ogive to represent the above information. (4mks)
- (b) Using your graph, estimate:
- (i) the median. (1mk)
- (ii) the quartile deviation. (4mks)
- (c) If the pass mark is 35%, how many students passed? (1mk)

GRAPH

23. A form two class at Siwo Secondary School has 15 girls and 25 boys. The probability of a girl completing the secondary school course is  $\frac{3}{5}$  and that of a boy is  $\frac{4}{5}$ .

(a) A student is picked at random from the class. Find the probability that,

(i) the student picked is a girl and will complete the course. (2mks)

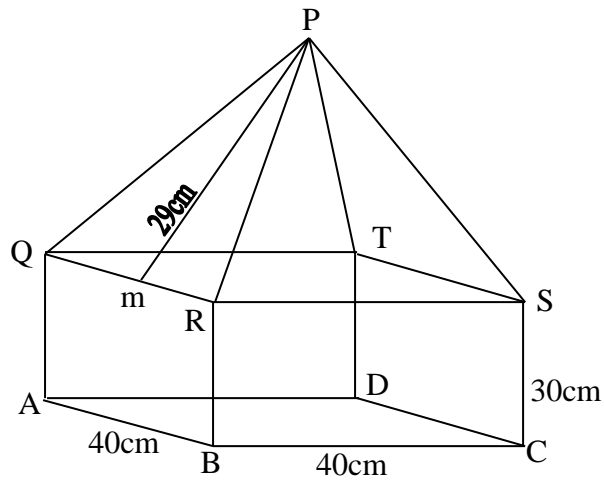
(ii) the students will not complete the course. (3mks)

(b) If two students are picked at random from the class. Find the probability that;

(i) both are girls. (2mks)

(ii) both are of the same gender and will complete the course. (3mks)

24. The figure below shows a right pyramid with a square block at its base. The sides of the base are 40cm and the height of the base is 30cm.  $m$  is the midpoint of  $QR$  such that  $Pm = 29\text{cm}$ .



Calculate

- (a) the vertical height of vertex  $P$  from plane  $ABCD$ . (3mks)
- (b) the angle between planes  $PQR$  AND  $PST$ . (2mks)
- (c) the projection of line  $RP$  on the plane  $QRST$ . (3mks)
- (d) the angle between planes  $QRCD$  and  $ABCD$ . (2mks)