121/2
MATHEMATICS
Paper 2
2 ½ hours
Dec 2015

Name .....

Kenya Certificate of Secondary Education (K.C.S.E)

INSTRUCTIONS TO CANDIDATES:

- Write your name and index number in the spaces provided at the top of this page.
- The paper contains two sections: **Section I and Section II.**
- Answer **all** questions in **section I** and **any FIVE** in **Section II**
- Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
- Marks may be given for correct working even if the answer is wrong.
- **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

This paper consists of 15 printed pages
Candidates should check the question paper to ensure that all the printed pages are printed as indicated and no questions are missing

SECTION I (50 Marks)

Answer all the questions in this section.

1. Solve for x in the equation. 3mks

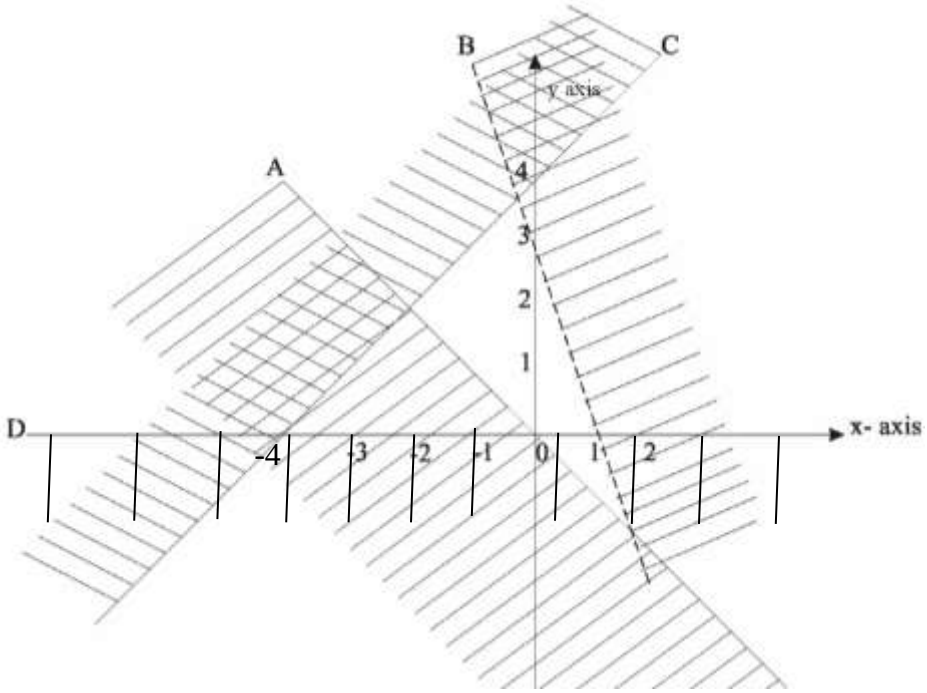
   $\text{Log}_8 (x + 5) - \text{Log}_8 (x - 3) = {}^2/_3$

2. If the quadratic equation $x^2 + 2(a + 2)x + 9a = 0$ has equals roots, what are possible values of a? (3mks)

3. A curve passes through the point (3,-3). If its gradient is $5x^2 + 1$, **find** its equation.(3 marks)

4. Factorize completely $6(x-4)^2-54$ (3mks)

5. Form the three inequalities that satisfy the given region **R**. Given lines **A**, **B** and **C** (4 marks)



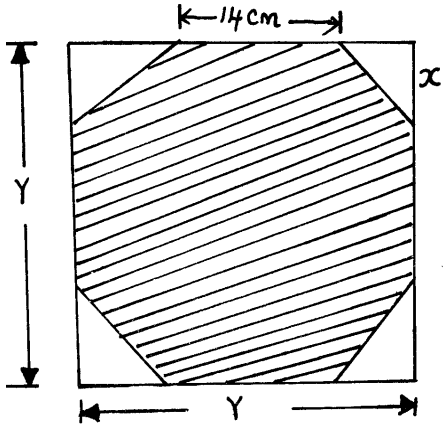
6. A fraction $^2/_7$ truncated to 3 decimal places. Find the percentage error in doing this.

3mks

7. A plane figure of area $50cm^2$ is transformed by the matrix $\begin{pmatrix} 1 & 3 \\ 2 & -7 \end{pmatrix}$ and then followed by the matrix $\begin{pmatrix} 3 & -1 \\ 0 & 4 \end{pmatrix}$. Find the area of the final image. (2mks)

8. Two variables P and Q are such that P varies partly as Q and partly as the square root of Q. Determine the equation connecting P and Q. When Q=16, P=500 and when Q = 25, P = 800 (3mks)

9. A girl wanted to make a regular octagon of side 14cm. She made it from a square piece of a card of size ycm by cutting four isosceles triangle whose equal sides were x cm each as shown in the figure below.



a) Write down an expression for the area of the octagon in terms of x and y. (1mk)

b) Find value of x. (1mk)

c) Find the area of the octagon. (2mks)

10. Make x the subject of the formula

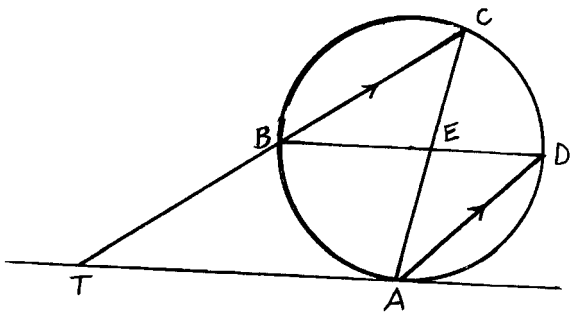
$$W = Y - \left(R + X^{2}\right)^{\frac{1}{2}}.$$ (3mks)

11. Find cos x – Sin x, if tan x= ¾ and $90^o \leq x \leq 360^o$ (3mks)

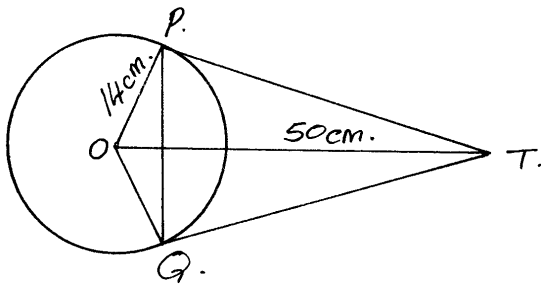
12. Expand ; $\left(1-\frac{1}{2}x\right)^6$ up to the fourth term. Hence use your expansion to evaluate $(1.02)^6$ to four decimal places. (4mks)

13. The first term of an increasing A.P is 3. The third term, the sixth term and the tenth term of the A.P form the consecutive terms of the G.P. find the common difference of the AP. (3mks)

14.In the figure below if angle ACB=40^0 angle ATB = 45^0 and TC is parallel to AD. Calculate angle ABT and AEB. (3mks)



15.The figure below shows a circle center O of radius 14cm. TP and TQ are tangents to the circle at points P and Q respectively OT = 50cm.



Calculate the length of the chord PQ to 4s.f. 3mks

16.A coffee blender mixes 6 parts of type A with 4 parts of type B. If type A costs sh 72 and type B costs him sh 66 per Kg respectively, at what price should he sell the mixture in order to make 5% profit? Give your answer to the nearest ten cents. (3 marks)

17.The following table shows the distribution of marks obtained by 50 students.

Marks	45 – 49	50 – 54	55 – 59	60 – 64	65 – 69	70 – 74	75 – 79
No. of students	3	9	13	15	5	4	1

a) By using a suitable assumed mean, calculate

(i) the mean (5mks)

(b) the variance (3mks)

(c) the standard deviation (2mks)

18. A man goes to work by either matatu or by bus. If he goes by matatu, the probability that he will be late is $^1/_5$ while if he goes by bus, the probability that he will be late is $^1/_8$.

a) Suppose he tosses a coin to decide whether to go by matatu or by bus, what is the probability that he will be late.

b) If he travels by matatu for four successive days what is the probability that he will be late

(i) every day

ii) on any three days.

19. The cash price of a radio cassette is Ksh.27,000 it can also be bought using either of the two plans below
PLAN A: A deposit of shillings 6,000 and 15 equal monthly installments
PLAN B: 20 equal monthly instalments of shillings 1680 each.

(a) If the total payment in plan A is 20% more than the cash price. Find
(i) The amount of each installment (2mks)

(ii) The annual rate of interest (3mks)

(b) Find the annual rate of interest in PLAN B (3mks)

(c) Which plan is cheaper and by how much (2mks)

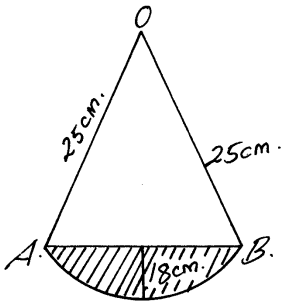
20.A and P are known to be connected by a law of the form $A=kp^n$ where k and n are constants the table bellow shows values of A and corresponding values of P.

P	0.5	1.2	2	4	6	9	15
A	0.25	3.46	16	128	432	1458	6750

(a) Express $A=kp^n$ in linear form (1mk)
(b) Draw the linear graph to represent the information given above (5mks)
(c) Use your graph to estimate the value of k and n (3mks)
(d) Find the law connecting A and P (1mk)

21. The figure below represents a cross-section of a horizontal cylindrical pipe of center O and radius of 25cm. The shaded region represents water in the pipe to a depth of 18cm. Calculate

(a) The length AB (2mks)



(b) The size of angle AOB (3mks)

(c) The area in cm^3 to 3 significant figures of the shaded region (3mks)

(d) If the pipe is 10m long, calculate the amount of water in liters in the pipe (2mks)

22.a) Given the transformation matrices

$$\mathbf{T}_1 = \begin{matrix} 2 & 1 \\ -1 & -2 \end{matrix} \text{ and } \mathbf{T}_2 = \begin{matrix} 3 & 1 \\ 1 & 3 \end{matrix}$$

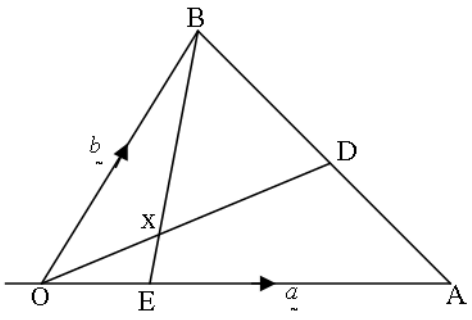
and that transformation $\mathbf{T}_1$ followed by $\mathbf{T}_2$ can be replaced by a single transformation $\mathbf{T}$, write down the matrix for $\mathbf{T}$. 2mks

b) Find the inverse of matrix $\mathbf{T}$. 2mks

c) The points $A^{11}(7, -11)$, $B^{11}(-7, -13)$, $c^{11}(-8, 16)$ and $D^{11}(8,8)$ are the images of Points A,B,C and D respectively under transformation $\mathbf{T}_1$ followed by $\mathbf{T}_2$. Write down the coordinates of A,B,C and D 4mks

d) Find the co-ordinates of A^1,B^1 , C^1 and D^1 of the image of A,B,C and D respectively under transformation $\mathbf{T}_2$. 2mks

23.The figure below shows triangle **OAB** in which **OA** is vector $\underset{\sim}{a}$ and **OB** is vector $\underset{\sim}{b}$. Points **D** and **E** are such that **AD** = $\frac{1}{3}$ **AB** and **OE** = $\frac{1}{3}$ **OA**.



(a) Express in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$

(i) $\overline{OD}$ (1 mark)

(ii) $\overline{BE}$ (1 mark)

(b) If $\overline{OX} = \mathbf{k}\overline{OD}$ and $\overline{BX} = \mathbf{h}\ \overline{BE}$, where **k** and **h** are constants, express OX in terms of;

(i) **k**, $\underset{\sim}{a}$ and $\underset{\sim}{b}$ (2 marks)

(ii) **h**, $\underset{\sim}{a}$ and $\underset{\sim}{b}$ (2 marks)

(c) Find the values of **h** and **k**. (4 marks)

24. (a) A shear parallel to the x-axis (the invariant line) maps point (1,2) on to point (7,2). T is the transformation equivalent to this shear followed by the reflection in the line. y = x. **find** the matrix which defines T. (5mks)

(b) A transformation P maps points (1,3) and (-2,-3) on to points (2,4) and (-3,-11) respectively. Find the matrix of the transformation. (5mks)