Name.....Index No.....

Adm No.....Class.....Candidates signature.....

MATHEMATICS

5TH JULY 2017

TIME: $2\frac{1}{2}$ HOURS

**ALLIANCE HIGH SCHOOL**

**TRIAL EXAMINATIONS 2017**

***Kenya Certificate of secondary Examinations***

**INSTRUCTIONS TO THE CANDIDATES**

1. Write your name and index number in the spaces provided at the top of the page
2. The paper contains **Two** sections; section I and section II
3. Answer all questions in section I and only **five** questions in section II
4. Show all the steps in your calculations giving your answer in the spaces provided below each question.
5. This paper consists of printed pages

Non programmable silent electronic calculators and KNEC mathematical tables may be used.

For Examiners 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 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

1. Without using mathematical tables or a calculator, evaluate. (4marks)

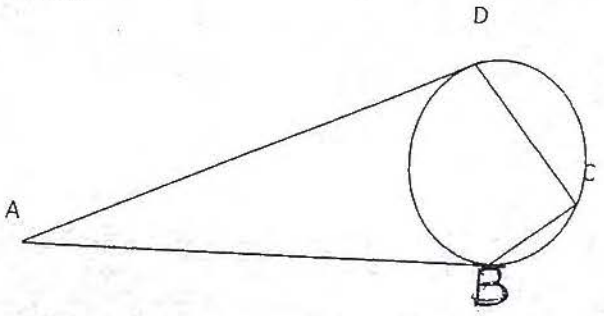
$$\frac{\log 27^{1/2} + \log 8^{1/2} - \log 125^{1/2}}{log6 - log5}$$

2. If $\left(\frac{16}{9}\right)^{-3x+2} = \left(\frac{3}{4}\right)^{\frac{2}{3}}$, find the value of $x$. (3marks)

3. P and Q are two points such that $\overrightarrow{OP} = i - 2j - k$ and $\overrightarrow{OQ} = 3i - 6k$. M is a point such that it divides QP -3:5. Find the coordinates of M. (3marks)

4. A balloon in the form of a sphere of radius 2cm is blown up so that the volume increases by 237.5%. Determine the new volume of the balloon in terms of π. (3marks)

5. A plank AD is lying against a log of circular cross-section area as shown below. AB is the ground level




Given that D is 3m above the ground and BCD= 77°, calculate the length of plank AB.

(4marks)

6.Make A the subject of the formula $\{log_{10}(A-B)-log_{10}(4+k)\} \div log_b b^2 = 1$

(3marks)

7. Two interior angles of a polygon are 74° and 106°. Each of the other interior angles are 150°. Find the number of sides of the polygon

(3marks)

8. Factorise completely $\frac{a^3+a^2b-ab^2-b^3}{2ab-a^2-b^2}$ (3marks)

9. Find the equation of locus of points 2cm from point Q (2,1) (3marks

10. The gradient of a circle is given by $\frac{dy}{dx} = kx^{-2}$ where k is a constant. If the circle passes through the points (4,7) and (6,8) find the value of k. (3mrks)

11.Given that $\tan 75° = \sqrt{3} + 2$ determine $\tan 15°$ without using mathematical tables or calculator. (3marks)

12. A lorry travelling at an average speed of 64km/ hr left station at 7:05am. A car left the same station at 8:50am and caught up with the lorry at 10:20am. Find the average speed of the car. (3mark)

13. Find the value of acute angle x in the following equation. $2\sin(2x-30) = \sqrt{3}$ (3marks)

14. Find the obtuse angle between $y\sqrt{3} = x+4$ and the y-axis. (3marks)

15. Given that $log_a 2 = 0.74193$ and $\log_a 3 = 1.1759$ evaluate $log_a 112.5$ (3marks)

16. The equation of a curve is given as $2y = 2x^3 + 7x^2 - 12x$. Find the value of y at turning point. (4marks)

**Section II: Answer only FIVE Questions**

17. a)The length of an arc is $\frac{1}{5}$ of the circumference of the circle. The area of the sector formed by the arc is $27.72cm^2$. Calculate the radius of the circle. (3mrks)

b)If the sector was cut off and folded to form a cone, calculate the radius of the cone formed. (4mrks)

c)The base of the cone formed was chopped from a square touching the vertices of the square, calculate the area of the material left. (3mrks)

18. O and P are points on a line. A particle along the line in such a way that t seconds after leaving O, its velocity is vm/s where $v = kt - t^2$ where k is a constant. At the time when t = 6seconds the particle is momentarily at rest at P. find;

a) The value of k (2mrks)

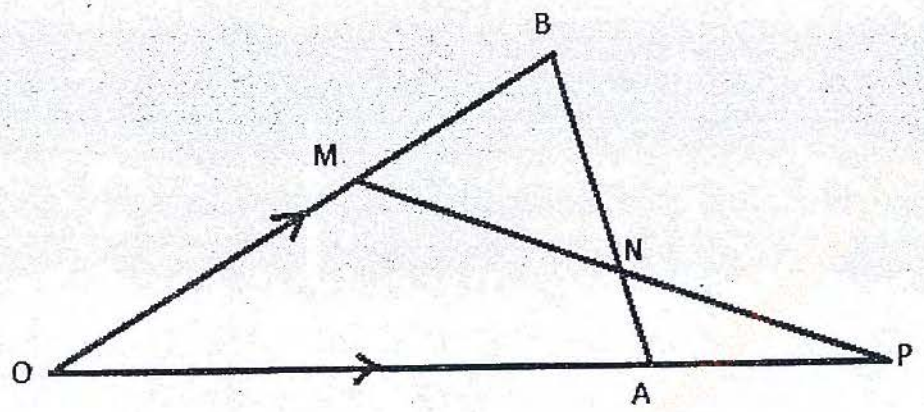
b)The distance OP (3mrks)

c)The average speed of the particle between O and P (2mrks)

d) The acceleration of the particle when it is at P (3mrks)

20.a) The points A(-2,-1), B(3,9) and C(k-1,k+3) are collinear. Find k. (2mrks)

b) In the figure below, OA = a, OB = b, OM = $\frac{1}{3}$b and BN = $\frac{4}{9}$BA

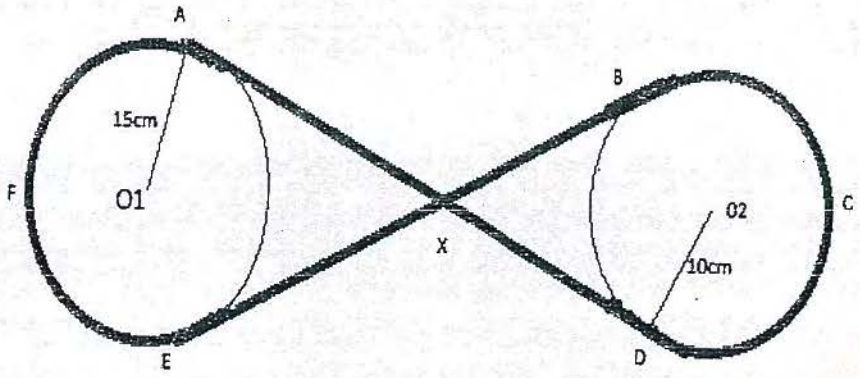



i) express MN and ON in terms of a and b (2mrks)

ii) Given that MP = hMN, express OP in terms of a, b and h (2mrks)

iii) Given also that OP = kOA, form an equation and hence find h and k. (4mrks)

19. The following is an axle made up of two circular gears of radius 15 cm and 10 cm. The distance between their centers is 40 cm.




a)i)Calculate angle $AO_1E$ (2mrks)

ii)Angle $BO_2X$ (1mrks)

iii)The length of the belt (4mrks)

b) The total surface area of two mettalic spheres is $116\pi$ cm$^2$ and their radii differ by 3 cm. find the radius of each sphere. (3mrks)

21. Three points P,Q and R are on a level ground. Q is 240 m from P on a bearing Of $230^0$. R is 120 m to the east of P.

a) Using scale of 1cm to represent 40 m, draw a diagram to show the positions of P,Q and R in the space provided below. (3marks)

b) Determine: i) the distance of R from Q (1mrks)

ii) the bearing of R from Q (1mrks)

c) A vertical post stands at P and another one at Q. a bird takes 18 seconds to fly directly from the top of the post at Q to the top of the post at P. given that the angle of depression of the top of the post at P from the top of the post at Q is $9^0$, calculate :

i)the distance to the nearest metre the bird covers; (3mrks)

ii)the speed of the bird in km/h (2mrks)

22.A cylindrical water tank is of diameter 7 metres and height 2.8 metres.
a)Find the capacity of the water tank in litres. (3mrks)

b)If 15litres are used per day for irrigation by each family member, 80litres are also used per day for cooking and washing and a further 60litres are wasted per day. Find the number of complete days a full tank would last the family of six. (2mrks)

c)Two members of the family were absent for 90 days. During the 90 days wastage was reduced by 20% but cooking and washing remained the same. Calculate the number of days a full tank would now last the family. (5mrks)

23.a)i)Plot a triangle ABC whose vertices are A(0,4), B(3,0), and C(4,7) (2marks)

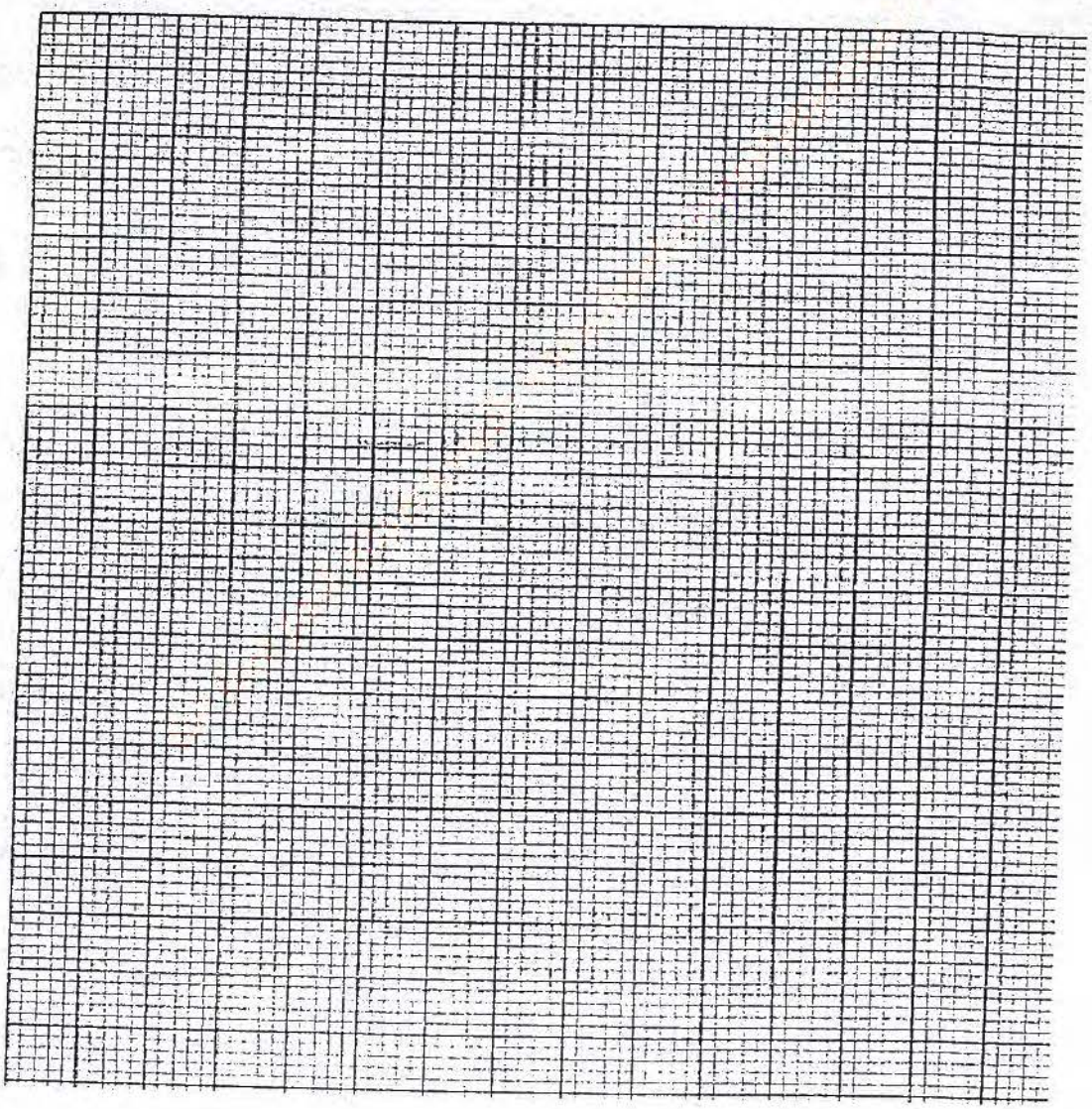
ii)Draw the line of symmetry for triangle ABC and write down its equation. (1mrks)

b)i)Draw triangle A'B'C' the image of triangle ABC under reflection in the line Y=X (2mrks)

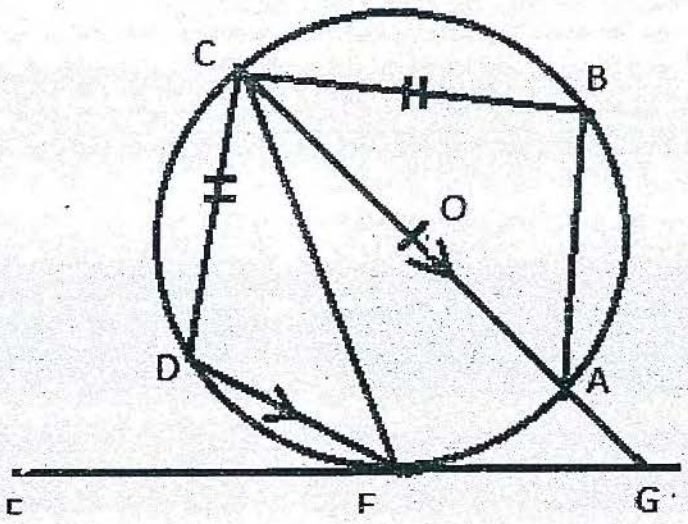
ii)State the coordinates of the invariant points under this transformation. (1mrk)

c)i)Determine a single matrix that maps triangle ABC to triangle A''(-4,0), B''(0,3) and C''(-7,4) (2mrks)

ii)Describe fully the transformation in c)i) above. (2mrk)



24. The following diagram shows a circle ABCDE. The line FEG is a tangent to the circle at point E. line DE is parallel to CG and line CB = line AE, <DEC = $30^0$ and <AGE = $30^0$




Determine giving reasons the size of angles

a)ACE (2mrks)

b)AEG (2mrks)

c)DCE (2mrks)

d)DOE (2mrks)

e)Obtuse angle BAG (2mrks)