NAME…………………………………………………………………………………………………..ADM.NO……………..CLASS…………….

121/2

MATHEMATICS

PAPER 2

MARCH/APRIL 2017

TIME: 2 ½ HOURS

3KNT JOINT EXAM 2017

INSTRUCTIONS TO CANDIDATES

1. Write your name and admission number in the spaces provided above.
2. The paper contains TWO sections: Section 1 and section ll
3. Answer all the questions in section 1 and only five questions from section 11 Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
4. All answers and working must be written on the question paper in the spaces provided below each question
5. Non programmable silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.

For examiners use only

Section 1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | TOTAL |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Section 1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | TOTAL |
|  |  |  |  |  |  |  |  |  |

|  |
| --- |
| **GRAND TOTAL** |

SECTION 1 ( 5O MKS)

1. Use Mathematical tables to evaluate (4mks)

 $∛\left(\frac{4.283×0.9748}{log4.189}\right)$

1. A student got 27 as a result of multiplying 8.8 x 2.6 by rounding off the answer to the nearest whole numbers. Calculate the percentage error that arose. (3mks)
2. Make r the subject in the formula (3mks)

S = $\frac{rt}{√( r^{2} - t)}$

1. Machine A can do a piece of work in 6 hours . While machine B can do the same work in 9 hours. Machine A was set to do the work but after 3 ½ hours it broke down and machine B did the rest of the work. Find how long machine B took to do the rest of the work.
2. In the figure below QT is a tangent to a circle at Q. PXRT and QXX are straight lines PX=6cm, RT=8cm, QX=4.8cm and XS=5CM.

 S

P

 R T

X

 Q

1. Find the length of
2. XR (2mks)
3. QP (2mks)
4. Express the following in surd form and simplify by rationalizing the denominator

 1

 1 – sin 450 (3mks)

1. Given that Q =5m – 2n where M= $\left(\genfrac{}{}{0pt}{}{3}{2}\right)$ and n = $\left(\genfrac{}{}{0pt}{}{4}{1}\right)$

Find

1. Column vector Q (2mks)
2. Q’ the image of Q under translation vector $\left(\genfrac{}{}{0pt}{}{-4}{-6}\right)$

 (1mk)

8)a) Lines NA and NB represent tangents to a circle at points A and B. use a pair of compasses and ruler only to construct the circle. Given NA=NB=6cm and <ANB = 45o (2mks)

B )Measure the radius of the circle (1mk)

9 a) Expand (1 + 2x)5 up to the 4th term. (2mks)

b) Hence use the expansion to evaluate (1.02)5 correct to 3 decimal places (2mks)

10. A man invested ksh 24,000 in an account which pays 10% interest P.A . The interest is compounded quarterly. Find the amount in the account after 1 ½ years. (3mks)

11. Given that A = 3i + 2j – k , B=6i – 8j +3k and C=4A+3B find the magnitude of C. Correct to (2 sf) (3mks)

12. An equilateral triangle of sides 9cm is completely enclosed in a circle of radius rcm. Find the least value of r. (3mks)

13. Fin d the centre and radius of the circle whose equation is X2 +y2 – 4y -21 = 0 (3mks)

14. The table below shows values of x and y for the function y=2 sin 3xo in the range 0o ≤ X≤ 150o.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Xo | 0 | 15 | 30 | 45 | 60 | 75 | 990 | 105 | 120 | 135 | 150 |
| Y | 0 | 1.4 | 2 | 1.4 | 0 | -1.4 | -2 | -1.4 | 0 | 1.4 | 2 |

1. On the grid provided, draw the graph of y=2 sin 3x (2mks)



1. From the graph determine the period.

15. If 4x2 + 8x + (k-3) is a perfect square. Find the value of K. (2mks)

16. Find the value of X that satisfy the equation log(x+5) = log4 – log (x + 2) (3mks)

SECTION 11 ( 50MKS )

17. Income tax for all income earned was charged at the rate shown below.

Total Income K£ p.a Rate in Ksh per K£

1 – 1980 2

1981 – 3960 3

3961 – 6440 5

6441 – 7920 7

7921 – 9900 9

Above 9900 10

Michael earned a salary of sh 12500 P.M In addition he was given a house allowance of sh 6550. He also gets family relief of sh 300p.m. Find

1. i) His taxable income p.a in K£ (2mks)

ii) Income tax he pays per month (6mks)

1. Apart from income tax, the following deductions are made per month

NHIF of ksh 320.

Window penson scheme 2% of gross salary.

Calculate Michael’s net monthly salary (2mks)

18. The first term of an A.P is 2. The sum of the first 10 terms of the A.P is 155

i) Find the common difference of the A.P (2mks)

ii) Given that the sum of the first n terms of the A.P is 392. Find n (3mks)

b) The 3rd, 5th and 8th terms of another A.P form the first three terms of a G.P. If the common difference is 3 find

i)The first term of the G.P (3mks)

ii)The sum of the first II terms of the G.P to 4. Significant figures. (2mks)

19. A’B’C’D’ is the image of ABCD under a shear parallel X-axis. D(2,4) is mapped onto D’(1,4) while A(-1,1) is mapped onto A’(1,1) if the co-ordinates of A, B, C and D are (-1, 1) (0,1) (3,4) and (2,4) respectively.

a) Draw ABCD and A’B’C’D’ under shear on the grid provided and state the co-ordinates of B’ and C’(3mks

b)State the invariant line (1mk)

c)A’B’C’D’ undergoes a stretch parallel to y-axis with scale factor -2 and invariant line y=3. On the same grid, draw A’’B’’C’’D’’ . (4mks)

20. A parent has two children whose age difference is 5 years twice the sum of the ages of the two children is equal to the age of the parent.

a) Taking X to be the age of the elder child, write an expression for:

i) the age of the young child (1mk)

ii) The age of the parent (1mk)

b)In twenty years time, the product of the children’s ages will be 15 times the age of their parent.

1. Form an equation in X and hence determine the present possible ages of the elder child. (4mks)
2. Find the present possible ages of the parent. (2mks)
3. Determine the possible ages of the younger child in 20 years time. (2mks)

21. Two variables A and B are believed to be related by a law of the form A=MnB+1.1 where M and n are constants. The table below shows corresponding values of A and B

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| A | 1.79 | 2.27 | 2.48 | 2.96 | 3.21 | 3.79 |
| B | 1.0 | 3.8 | 5.4 | 7.0 | 8.6 | 9.5 |

By drawing a suitable straight line graph estimate the values of M and n (10mks)



22. In a class there are 22 girls and 35 boys. The probability of a girl completing the secondary education is 3/5 where as that of a boy is 2/3.

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

i) the student picked is a boy and will complete course (3mks)

ii) Student picked will complete the course (3mks)

b)Two students are picked at random. Find the probability that the student picked is a boy and a girl that both will not complete the course. (4mks)

23. The table below shows the distribution of marks scored by a group of 250 students in an exam.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Marks | 1-10 | 11-20 | 21-30 | 31-40 | 41-50 | 51-60 | 61-70 | 71-80 | 81-90 | 91 -100 |
| Frequency | 5 | 12 | 20 | 44 | 68 | 42 | 24 | 15 | 12 | 8 |

1. Estimate the median mark (4mks)

b(i) Using an assumed mean of 555. Calculate

1. The mean (3mks)
2. The standard deviation (3mks)

24. a) Construct a triangle PQR such that PQ=7.5cm the ratio /\_QPR: /PQR= 5:3 and /\_ QRP=600 (3mks)

1. Construct the locus of a point S on the same side as R which moves such that its always equidistant from lines PQ and PR and produce it to intersect the locus of S at M (2mks)
2. By dropping a perpendicular from point M onto PQ at N, measure MN hence calculate the area of triangle PMQ (2mks)