**Name………………………………………………………………............Index No ………………………………………**

**School …………………………………………………………..Candidate’s Signature …………………………………..**

 **Date……………………………………..…………**

**121/2**

**MATHEMATICS**

 **PAPER 2**

**TIME: 21/2 HOURS**

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

**121/2**

**Mathematics**

**Paper 2**

 **21/2 hours**

**INSTRUCTIONS TO THE CANDIDATES**

* *Write* ***your name*** *and* ***index number*** *in the spaces provided above*
* *This paper contains two sections;* ***Section*** *1 and* ***Section 11****.*
* *Answer all the questions in* ***section 1*** *and only* ***five*** *questions from* ***Section 11***
* *All workings and answers must be written on the question paper in the spaces provided 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* ***EXCEP****T where stated otherwise.*
* *Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.*
* ***This paper consists of 15 printed pages.***
* ***Candidates should check carefully to ascertain that all the pages are printed as indicated and no questions are missing.***

**FOR EXAMINER’S USE ONLY**

**Section 1**

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

**Section 1I** **GRAND TOTAL**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Question | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | **Total** |
| Marks |  |  |  |  |  |  |  |  |  |

**SECTION I (50MARKS)**

***Answer all questions in this section.***

1. Use logarithms to evaluate: (3marks)

 $\frac{4.497 ×\sqrt{0.3673}}{1-CoS 81.53^{0} }$

1. The sum of the fifth and the sixth term of an AP is 30. If the third term is 5, find the first term. (3marks)
2. Make K the subject of the formula and simplify (3marks)

 $t=\frac{2y+1}{\sqrt{2ky+k}}$

1. Solve the value of x : (3marks)

 2 + (log *x*)2 =3 log x

1. The curve *x y* =12 cuts the line y = 7*- x* at two points. Find the coordinates of the two points. ( 3marks)
2. The sides of a triangle were measured and recorded as 4cm, 6.2cm and 9.50cm. Calculate the % error in its perimeter, correct to 2 decimal places. (3marks)
3. The figure below shows a triangle **PQR** in which **PQ**=8cm, angle **QPR**=100o and angle PRQ=35o, Calculate to 2 decimal places the length of **QR** hence the area of triangle **PQR** to 2decimal places.

 (3marks)

P

100o

 8cm

Q

350

R

1. ( a ) Expand (1-2*x*)6 up to the term in *x*3 (1mark)

( b ) Use the expansion above to evaluate (1.02)6  to 4 decimal places. (2marks)

1. OA=3i +4j - 6k and OB =2 i + 3j + k. P divides the line AB in the ratio 3:-2. Find the co-ordinates of OP in term of i, j and k. (3marks)

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1. Given the matrix 5-x 2 has no inverse, find the value of x. (2marks)

 3x 4

1. Ann, Betty and Caro agreed to share some amount of money in the ratio 3:4:2. If Betty got twice as much as Caro and Ann got Sh 6000 more than Caro, then how much money was being shared?

(3marks)

1. Given that C varies partly as A and partly as the square of A and that C=20 when A= 2 and C=21 when A= 3, determine the value of C when A = 4. (3marks)
2. Kiprono buys tea costing sh112 per kilogram and sh 132 per kilogram and mixes them, then sells the mixture at sh 150 per kilogram. If he is making a profit of 25% in each kilogram of the mixture , determine the ratio in which he mixes the tea. (3marks)
3. Without using a calculator, solve $\frac{\sqrt{252}+\sqrt{72}}{\sqrt{32 }+\sqrt{28}}$ , leaving your answer in the form $a\sqrt{b }+c $where a, b, and c are integers. (4marks)
4. Find the radius and the centre of a circle whose equation is: (3marks)

 3x2 + 3y2 +18y- 12x – 9=0

1. A new laptop depreciates at 8% per annum in the first year and 12% per year in the second year. If its value at the end of the second year was sh121, 440. calculate its original value. (3marks)

**SECTION II (50MARKS)**

***Answer ONLY five questions in this section***

1. Mrs. Langat, a primary school head teacher, earns a basic salary of sh.38,300, house allowance of sh 12000 and medical allowance of sh 3600 every month. She claims a family relief of sh.1172 and insurance relief of 3% of the premium paid. Using tax rates table below:

|  |
| --- |
| Tax table |
|  Taxable income (£/ p.a) | Tax ( Ksh/£) |
| 1-8800 | 2 |
| 8801-16800 | 3 |
| 16801-24800 | 5 |
| 24801-36800 | 7 |
| 3680148800 | 9 |
| Over 48800 | 10 |

 (a)Calculate Mrs. Langat’s annual taxable income in Kenya pound per annum (2marks)

 ( b )Tax due every month from Mrs. Langat (4marks)

 ( c ) If further deductions are made every month from her salary:

* WCPS of 2% of basic salary
* Life insuarance premium of sh4600
* Sacco loan repayment of sh 14,200

 Calculate: (i) the total deductions (2marks)

 ( ii ) her net pay for every month (2marks)

1. A bag contains:5 red balls, 3 blue balls and 4 yellow balls. Kurgat mixed the balls carefully, selected one ball and put it aside, then picked another and noted their colors.

( a )Draw a tree diagram to illustrate his pickings. (2marks)

( b )calculate the probability that :

1. Both balls picked were red (2marks)
2. Both balls picked were of the same color. (3marks)
3. There was no red ball from the two balls picked. (3marks)
4. In the triangle **OPQ** given below OP= p and OQ= q. R is a point on PQ such that PR: RQ= 1:3 and that

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 5 OS = 2 OQ and further that PS intersect with OR at T.

O

Q

S

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p

~

q

P

R

 ( a ) Express in term of P and q

1. OS (1mark)
2. PQ (1mark)
3. OR (1mark)

 ( b )Given that OT= h OR and PT = k PS. Determine the values of h and k. (5marks)

1. The vertices of a rectangle A (-1, -1) B (-4, -1) C (-4, -3) and D (-1, -3).

( a )on the grid provided , draw the rectangle and its image A,B,C,D under a transformation whose matrix is

 -2 0 (4marks)

 0 -2

 ( b )A2 B2 C2 D2  is the image of A1 B1 C1 D1 under a transformation matrix P= ½ 1

1. ½
2. Determine the co-ordinates of A2 B2 C2 D2  (2marks)

1. On the same grid draw the quadrilateral A2 B2 C2 D2  (2marks)

 ( c )Find the area of quadrilateral A2 B2 C2 D2  (3marks)

1. A and B are two points on the latitude 400N. The two points lie on the longitude 800W and 1000E respectively. (take R=6370km and $π=\frac{22}{7}$ )

( a ) Calculate:

1. The distance from A to B along the parallel of latitude (3marks)
2. The shortest distance from A to B (4marks)

 ( b )Two planes P and Q left A for B at 400 knots and 600 knots respectively. If P flew along the great circle and q along the parallel of latitude, which one arrived earlier and by how long? Give your answer to the nearest minute (3marks)

1. The table below shows marks obtained by a class of 80 students in mathematics test.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mark  | 1-10 | 11-20 | 21-30 | 31-40 | 41-50 | 51-60 | 61-70 | 71-80 | 81-90 | 91-100 |
| No. of students | 3 | 8 | 21 | 20 | 17 | 5 | X | 3 | X | x |

 ( a) determine the value of x (2marks)

( b ) state the modal class (1mark)

( c )calculate the mean mark (4marks)

 ( d )calculate the variance of the data (3marks)

1. ( a ) Complete the table below for the equation y=x3 -2x2 – 4x+ 7

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X | -3 | -2 | -1 |  | 1 | 2 | 3 | 4 |
| Y | -26 |  | 8 | 7 | 2 |  | 8 |  |

( b )using the scale 1cm to represent 1 unit on x- axis and 1cm to represent 5units on the y –axis, draw the graph of y=x3 -2x2 -4x +7 (3marks)

 ( c ) use your graph to estimate the roots of the equation x3 – 2x2-4x +2=0 (1mark)

( d ) by drawing straight lines, use your graph to solve the equation

1. x3 – 2x2-4x +2=0 (2marks)
2. x3 – 2x2-3x+3=0 (2marks)
3. The initial velocity of a particle was 1 m/s and its acceleration is given by 2-t m/s2 every second after the start.

( a ) (i) determine the equation representing its velocity. (3marks)

 (ii) Find the velocity of the particle during the third second (3marks)

( b ) (i)find the equation representing its distance t seconds after the start (3marks)

 (ii) What was the distance covered by the particle during the first three seconds