**NAME \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ INDEX NO. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**SCHOOL \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ SIGNATURE \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ DATE \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**121/2**

**MATHEMATICS ALT A**

**PAPER 2**

**TIME: 2½ HOURS**

JULY/AUGUST, 2015

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

**121/2**

**MATHEMATICS ALT A**

**PAPER 2**

**TIME: 2½ HOURS**

**INSTRUCTIONS TO CANDIDATES**

1. Write your name and index number in the spaces provided above.
2. Sign and write the date of examination in the space provided above.
3. This paper consists of **TWO** sections. **Section I** and **Section II**.
4. Answer **ALL** the questions in **section I** and only **FIVE** questions from **Section II.**
5. All answers and working must be written on the question paper in the space provided below each question.
6. Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
7. Marks may be given for correct working even if the answer is wrong.
8. Non-programmable silent calculators and KNEC mathematical tables may be used except where stated otherwise.
9. This paper consists of **16** printed papers.
10. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

**FOR EXAMINER’S USE ONLY**

**SECTION 1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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 A (50 MARKS)**

***Answer ALL questions in this section in the spaces provided***

1. Use logarithm tables to evaluate the following to four significant figures. (4 marks)

1. The fifth term of an arithmetic progression is 11 and twenty fifth terms is 51. Find the first term and common difference. (2 marks)
2. Find the quartile deviation of the following data. 8,10,2,7,5,9,6,12,4,6,3,7 (3 marks)
3. A man deposits Sh. 500,000 in an investment which pays 12% per annum interest compounded quarterly. Find how many years it takes for the money to double. (3 marks)
4. A triangle ABC whose area is 4cm2 is mapped onto triangle A1B1C1 whose area is 64cm2 under a transformation matrix
5. Calculate the possible values of n (2 marks)
6. Find the image of A(3,4) under the above matrix transformation where n<0 (2 marks)
7. a) Expand and simplify (2 - x)5 in ascending powers of x upto and including the term in x3 (2 marks)

b) Hence approximate the values of (1.98)5 to four significant figures. (2 marks)

1. The velocity (V) of a roller-scatter on a straight road is given by V= 3t2 + 5t – 8 m/s where t is time in seconds. Find his acceleration at time t=2 second. (2 marks)
2. Chord QX and YZ intersect externally at Q. The secant WQ =11cm and QX =6cm while ZQ=4cm



**5cm**

1. Calculate the length of chord YZ (2 marks)
2. Use the answer in i) above to find the length of the tangent SQ (2 marks)
3. Solve for θ in the domain 0° θ 360° (3 marks)

2cos2θ = -0.7071

1. Simplify + , leaving the answer in the form. a, b where a, b, and c are constants. State their values. (3 marks)
2. Three athletes, James David and Geoffrey are in a race. James is twice as likely to win as David while David is thrice as likely to win as Geoffrey. Find the probability that.
3. Geoffrey wins the race (1 mark)
4. James does not win the race. (2 marks)
5. Given the equation. M =

Express t in terms of m

1. Identify the stationery points of the curve y = x3 – 6x2 + 9x – 4 and state their nature (4 marks)
2. Find the radius and centre of a circle whose equation is

2x2 + 2y2 - 16x + 8y +8 =0 (3 marks)

1. Solve for x in the equation.

Log 5+ 2 + log (2x + 10) = log (x-4) (3 marks)

1. The major arc of a circle subtends on an angle of 240° at the centre of circle. Given that the, length of the arc is 88cm calculate the diameter of the circle, (Take π =) (2 marks)

**SECTION B (50 MARKS)**

***Answer only five questions from in this section in the spaces provided***

1. The table below shows the ages in years of 60 candidates who vied on a political party for parliamentary elections in a certain country as recorded in a computer program.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Age in years | 20 – 29 | 30 – 39 | 40 – 49 | 50 – 59 | 60 – 69 |
| No. of candidates | 8 | 13 | 19 | 17 | 3 |

Calculate;

1. The mean (2 marks)
2. The interquartile range of the data (3 marks)
3. The percentage of candidates whose ages were 54.5 years and below (2 marks)
4. The variance and standard deviation of the distribution using 44.5 as the working mean. (4 marks)
5. An aircraft leaves town P(30°S,14°W) and moves directly east to town Q at a speed of 270 knots for 12 hours. Determine;
6. The distance moved in nautical miles
7. The distance moved in km (take 1nm = 1.853km)
8. The position of town Q
9. The local time at Q if the local time at P is 9.13pm. Give the answer to the nearest minute.
10. a) Complete the table below for the curves y =3cos2x and y = 2sin(2x + 30)° (2 marks)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| x | 0 | 15 | 30 | 45 | 60 | 75 | 90 | 105 | 120 | 135 | 150 | 165 | 180 |
| 3cos2x | 3 | 2.598 | 1.5 | 0 | -1.5 |  | -3 | -2.598 | -1.5 | 0 |  | 2.598 | 3 |
| 2sin(2x+30)° | 1 |  | 2 |  |  |  |  |  | -2 | -1.732 | -1 |  | 1 |

b) On a graph paper, draw on the same axes the graph of y=3cos2x and y=2sin(2x+30)° for 0° x 180° (4 marks)

*(Take the scale 1cm for 15° on the x axis and two cm for 1 unit on the y - axis)*



1. State the amplitude period and phase angle of each curve (2 marks)
2. Use your graph to:-
3. Estimate the value of x for which 3cos2x – 2sin(2x+30)° =0 (1 mark)
4. Estimate the range of values of x for which 3cos2x<2sin(2x+30)° (1 mark)
5. a) Two blends of tea costing Ksh. 140 and Ksh.160 per kg respectively are mixed in the ratio 2:3 by mass. The mixture is sold at sh.240 per kg.
6. Find the percentage profit (2 marks)
7. In what ratio should the two blends be mixed to get a mixture that costs sh.148 per kg (2 marks)

b) A quantity P is partly constant and partly varies as the cube of Q. when Q = 2, P = 50 and

when Q =4, P =330. Find the value of Q when P= 16885 (6 marks)

1. The table below shows the income tax rates for a certain year.

|  |  |
| --- | --- |
| Taxable pay per month Ksh | Tax rate |
| 1 -9680 | 10% |
| 9681 – 18800 | 15% |
| 18801 – 27920 | 20% |
| 27921 – 37040 | 25% |
| 37040 – and above | 30% |

That year Mary paid net tax of Ksh.5,512 p.m. Her total monthly taxable allowances amounted to Ksh.15220 and he was entitled to a monthly relief of Ksh. 162. Every month the following deductions were made.

* NHIF – Ksh.320
* Union dues – Ksh.200
* Co-operative shares – Ksh.7500

1. Calculate Mary’s monthly basic salary in Ksh. (7 marks)
2. Calculate her monthly net salary. (3 marks)
3. Three quantities P, Q and R are such that P varies directly as the square of Q and inversely as the square root of R.
4. Given that P = 20 when Q = 5 and R = 9. Find P when Q = 7 and R = 25 (4 marks)
5. If Q increased by 20% and R decreased by 36%, find the percentage change in P (6 marks)
6. In the figure below OAB is a triangle in which OS =3/4 OA and AR:RB = 2:1 Lines OR and SB meet at T.



1. Given that OA =a and OB =b, express in terms of a and b
2. AB (1mark)
3. OR (2 marks)
4. SB (1 mark)
5. Given that ST=mSB and OT=nOR, determine the values of the scalars m and n (6marks)
6. A particle moves a long a straight line such that its displacement S meters from a given point is

S= t3 – 5t2 +3t +4, where t is time in seconds.

Find,

1. The displacement of the particle at t = 5 (2 marks)
2. The velocity of the particle when t=5 (2 marks)
3. The values of t when the particle is momentarily at rest. (3 marks)
4. The acceleration of the particle when t =2 (3 marks)