**Name………………………………………………… Adm. №:…………… Class………**

**Candidate’s Signature……………. Date…………………….…..………**

**121/2**

**MATHEMATICS (ALT A)**

**END TERM 2 EXAMINATION**

**September 2022**

**SUNRISE 2 EVALUATION EXAMS - 2022**

**MATHEMATICS ALT A PAPER 2**

**FORM FOUR END OF TERM 2 - 2022**

**September 2022**

 **Time: **

**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 spaces 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. ***Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.***
6. *Marks may be given for correct working even if the answer is wrong.*
7. ***Non-programmable*** *silent electronic calculators* ***and*** *KNEC Mathematical tables may be used, except where stated otherwise.*
8. ***This paper consists of 13 printed pages.***
9. ***Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.***
10. ***Candidates should answer the questions in English.***

**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**

1. A rectangular block has a square base whose side is exactly 8cm. Its height measured to the nearest millimetre is 3.1cm. find in cubic centimetres the greatest possible error in

calculating its volume (3mks)

1. Simplify  (3mks)
2. Find the area bounded by the curve y= x3 + 5, the x axis and lines x=1 and x = 3 (3mks)
3. A bag contains 2 green balls, 3 red balls and one blue ball. Another bag contains 4 green balls, 5 red balls and 3 blue balls. A ball is chosen at random from a bag. Find the probability that the chosen ball is blue. (3mks)
4. P varies partly as the square of V and partly as the cube of V. When V= 2, P = -20 and when

V = -3, P = 135. Find the relationship between P and V. (3mks)

1. The second term of a G.P is 6, and the fifth term is 48, find the common ratio and the 3rd term of the G.P. (3mks)
2. Nancy pays for a car on hire purchase in 15 monthly instalments. The cash price of the car is Ksh. 300,000 and the interest rate is 15% p.a. A deposit of Ksh 75,000 is made. Calculate her monthly repayments. (4mks)
3. Solve for θ in the equation 2 sin (2θ + 10) = -1 for 0 < θ < 3600. (3mks)
4. The diagram below shows a garden XYZ

 X

 Y Z

1. Draw the locus of points equidistant from sides XY and XZ. (1mk)
2. Draw the locus of points equidistant from points X and Z. (1mk)
3. A bead is lost in the garden within a region which is nearer to point X than to point Z

 and closer to side XZ than to side XY. Show by shading the region where the bead can

 be located. (1mk)

1. Expand the given binomial up to the term with x4: (1+3x)6. Use your expansion to evaluate (1.3)6 correct to 4 decimal places. (4mks)
2. Line PQ is the diameter of a circle. Find the equation of the circle in the form

ax2+bx+cy2+dy-e =0, given the coordinates P(0,2) and Q(6,2). (3mks)

1. Determine the amplitude, the period and phase angle for the graph y=3sin(1/4x-900). (3mks)
2. Make x the subject of the formular. (3mks)

P = bx2 – ax

 x

1. Under a transformation represented by a matrix 5x 2x , a triangle of area 10cm2 is

 -3 x

mapped onto atriangle of area 110cm2. Find x. (3mks)

1. Evaluate without using Mathematical tables or a calculator. (3mks)

 

1. A body starts from rest and after t seconds its velocity in ms-1 was recorded as shown below;

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| T in (sec) | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Velocity | 0 | 0.29 | 5.4 | 7.7 | 9.7 | 11.4 | 12.7 |

Use the trapezoidal rule to estimate the distance covered by the body between 1 and 6 seconds (3mks)

 **SECTION II**

1. (a) Complete the table below to 2 decimal places. (2mks)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  X | 00 | 300 | 600 | 900 | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 | 3000 | 3300 | 3600 |
| – Cos x | – 1 |  | – 0.5 |  | 0.5 | 0.87 |  | 0.87 |  |  | -0.5 | 0.87 |  |
| Sin ( x – 300) |  | 0.0 | 0.5 |  |  | 0.87 | 0.5 |  | – 0.5 |  |  | – 0.87 | – 0.5 |

(b) Draw the graphs of y = sin (x – 300) and y = – Cos x on the same axes, for 00 < x < 3600. (5mks)



c) Use your graph to solve the equation sin (x - 300) + Cos x = 0. (3mks)

1. Figure below is a pyramid on a rectangular base. PQ=16cm, QR = 12cm and VP = 13cm.



12cm

16cm

13cm

 Find

 (a) The length of **QS**. (2mks)

 (b) The height of the pyramid to 1 decimal place. (2mks)

 (c) The angle between **VQ** and the base. (2mks)

 (d) The angle between plane **VQR** and the base. **(**2mks)

 (e) The angle between planes **VQR** and **VPS** **(**2mks)

1. The following table shows the distribution of marks obtained by 50 students in a test.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |

By using an assumed mean of 62, calculate

(a) The mean (5mks)

(b) The variance (3mks)

(c) The standard deviation (2mks)

1. (a Hellen’s earnings are as follows:

 Basic salary sh. 38000 per month

 House allowance sh. 14000 per months

 Travelling allowance sh.8500 per month and

 Medical allowance Ksh.3300 per month.

She is given a personal relief of Ksh. 12672 per annum

 The table for payable tax is shown below

 Income in K£ p.a Payable tax rate in Kshs per K£

 0-6000 2

 6001-12000 3

 12001-18000 4

 18001 -24000 5

 24001-30000 6

 30001-36000 7

 36001-42000 8

 42001-48000 9

 Over 48000 10

**Calculate**

 (i) Hellen’s taxable income in K£ p.a (2mks)

 (ii) Her P.A.Y.E (5mks)

 (iii) Hellen is deducted the following items per month

NHIF Ksh.320

 Cooperative shares Ksh.2000

 Loan repayment Ksh5000

 Determine her net salary per month (3mks)

1. In the figure below, O is the centre of the circle. A, B, C and D are points on the circumference of the circle. A, O, X and C are points on a straight line. DE is a tangent to the circle at D.

Angle BOC= 480 and angle CAD = 360.

**E**

**D**

**C**

**B**

**O**

**A**

**36o**

**48o**

**X**

1. Giving reasons or otherwise, find the value of the following angles:-
2. Angle CBA (1mk)
3. Angle BDE (2mks)
4. Angle CED (3mks)
5. It is also given that AX = 12 cm, XC = 4 cm, DB = 14 cm and DE = 20 cm.

Calculate:

1. DX (2mks)
2. AE (2mks)
3. The position of two towns A and B on the earths surface are (360N, 490E) and (360N, 131W) respectively.

 a) Find the difference in longitude between town A and town B. (2mks)

 b) Given that the radius of the earth is 6370, calculate the distance between town A and B.

 (i) In nm. (2mks)

 (ii) In kilometers. (2mks)

 c) Another town C is 840km East of town B on the same latitude as town A and B. Find

 the longitude of town C. (4mks)

1. a) Using a ruler and compasses only, construct triangle ABC such that AB=4cm, BC=5cm

and ∠ABC = 1200. Measure AC. (4mks)

 b) On the diagram, construct a circle which passes through the vertices of the triangle ABC.

 Measure the radius of the table. (4mks)

 c) Construct a perpendicular from the centre of the circle to the line BC. Measure the length

 of the perpendicular. (2mks)

1. A metal sphere has a radius 5cm and a density of 2.4g/cm³.
2. Calculate the mass of the ball in kg (4mks)
3. The ball is dropped into a cylindrical container which is partially filled with water.

The ball is fully sub-merged. If the cylinder has a base radius of 8cm, calculate the

change in the water level. (3mks)

1. The sphere is melted down to form a metal cylinder of same radius. Calculate the height

of the cylinder formed. (3mks)