Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Index No.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Candidate’s Signature\_\_\_\_\_\_\_\_\_\_\_\_

**121/2**

**MATHEMATICS**

**PAPER 2**

**JULY/AUGUST 2017**

**TIME: 2 ½ HOURS**

**SUKEMO JOINT EVALUATION TEST- 2017**

**Kenya Certificate of Secondary Education**

**Mathematics**

**Paper 2**

**2 ½ hours**

**INSTRUCTIONS**

1. Write your name and index number in the spaces provided at the top of this page.
2. The paper consists two sections: Section I and II
3. Answer all the questions in section I and ONLY 5 in section II
4. Show all the steps in your calculations giving your answers at each stage in the spaces below each question
5. Marks may be given for correct working even if the answer is wrong.
6. Non-programmable silent electronic calculator and KNEC mathematical tables may be used except where stated otherwise.

**FOR EXAMINAER’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

**SECTION I**

**Answer all the questions in the spaces provided (50mks)**

1. The expression x2 + 10x + c + 2 = 0, where c, is a constant is a perfect square. Find the value of c. (2mks)
2. Ken was asked to truncate 7/9 to 3 significant figures. He rounded it off instead to 3 decimal places. Calculate the percentage error resulting from his rounding off. (3mks)
3. The co-ordinates of a point A is (2, 8, 3) and B is (-4, -8, -5). A point P divides AB externally in the ratio 7: -3.

Find the co-ordinates of P (3mks)

1. In a triangle XYZ, XY = 2cm, YƵ (2√3-1) cm, and angle YXƵ = 600. Determine Sin (XƵY) giving your answer in the form m + √3 , where M and N are integers (4mks)

n

1. Find the term independent of X in the expansion of (X3 – 2/X3) 6  (3mks)
2. Solve for X: (Log3X)2 – ½ log3 X= 3/2  (3mks)
3. The cash price of a T.V set is Ksh.13,800. A customer opts to buy the set on hire purchase terms by paying deposit of Ksh.2,280. If simple interest of 20% p.a is charged on the balance and the customer is required to pay by 24 monthly instalments, calculate the amount of each instalment. (3mks)
4. Make x the subject of the formula ax = 3r - x2 (3mks)

2 2

1. Calculate the area under the curve

y = 3x2 + 8, x-axis, x = 1 and x = 5, using the mid-ordinate rule with 4 ordinates. (3mks)

1. A circle is tangent to the y – axis and intersects the x- axis at (2,0) and (8,0). Obtain the equation of the circle, (4mks)
2. A variable y varies as the square of x and inversely as the square root of Ƶ. Find the percentage change in y when x is changed in the ratio 5:4 and Ƶ reduced by 19%
3. Solve for X in the equation:

2 Sin2x – 1 = Cos2x + Sin x, for 00 ≤ x ≤ 3600 (3mks)

1. A die is biased so that when tossed, the probability of a narrator of a number n showing up, is given by p(n) = kn where is a constant and n = 1, 2, 3, 4, 5, 6 (the numbers of the faces of the die)
2. Find the value of k (1mk)
3. If the die is tossed twice, calculate the probability that the total score is 11 (2mks)
4. In the figure below, the tangent ST meets chord VU produced at T. Chord SW passes through the Centre, O of the circle and intersects chord VU at X. Line ST = 12cm and UT = 8cm.

S

T

U

O

X

V

W

1. Calculate the length of chord VU (1mk)
2. If WX = 3cm and VX : XU = 2 : 3, Find SX (2mks)
3. The heights in centimeters of 100 trees seedlings are shown in the table below

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Height | 10 - 19 | 20 - 29 | 30 - 39 | 40 - 49 | 50 - 59 | 60 - 69 |
| No. of Seedlings | 9 | 16 | 19 | 26 | 20 | 10 |

Calculate the quartile deviation (4mks)

1. Given that the ratio x:y = 2:3, find the ratio (5x – 2y) : (x +y) (2mks)

**SECTION II**

**Answer any five questions (50mks)**

1. A curve is represented by the function

y = 

1. Find dy/dx (1mk)
2. Determine the values of y at the turning points of the curve (4mks)

In the spaces provided below, sketch the curve y =. 5mks

1. Complete the table below for the functions y = 3 cos θ and y = Sin 2θ correct to 2 decimal places. (2mks)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 00 | -1800 | -1500 | -1200 | -900 | -600 | -300 | 00 | 300 | 600 | 900 | 1200 | 1500 | 1800 |
| 3 Cos θ | -3 |  | -1.50 | 0 |  | 2.60 | 3 | 2.60 |  | 0 | -1.50 |  | -3 |
| Sin 2 θ | 0 | 0.87 | 0.87 | 0 |  | -0.87 | 0 | 0.87 | 0.87 | 0 |  |  | 0 |

1. Plot the graph of y = 3 Cos θ and y = Sin 2 θ on the same axis for -1800 ≤θ≤1800 (5marks)
2. Use the graph in (a) to find
3. The value of θ which satisfy the equation 3 Cos θ – Sin 2θ = 0 (2mks)
4. The difference in values of y when θ = 450 (1mk)
5. A rectangle PQRS with vertices P(2,0), Q(4,0), R(4,4), and S(2,4) is given a stretch transformation with the line X = 2 invariant and point Q (4,0) is mapped onto QꞋ (6,0). The image P1 QI RISI of the rectangles is enlarged with scale factor of -2 Centre origin, followed by a reflection in the line y= 0
6. Plot the rectangle PQRS and the images of its successive transformation (5mks)
7. Describe the transformations which map the third image onto the first image (2mks)
8. Determine the single matrix that will map the third image onto the second image (1mk)
9. Give the matrix of transformation that will rotate PQRS through 900 about the origin (2mks)
10. Use ruler and a pair of compasses only in this question
11. i) Construct triangle ABC in which AB = 8cm, BC = 7.5cm and <ABC = 112 ½0 (3mks)

ii) Measure length of AC (1mk)

1. By shading the unwanted regions show the locus of P within the triangle ABC such that:
2. AP≤PB
3. AP>3cm

Mark the required region as P (3mks)

1. Construct a perpendicular from C to meet AB at D (1mk)
2. Locate the locus of R in the same diagram such that the area of triangle ARB is ¾ the area of triangle ABC
3. Income tax rate are as shown below

|  |  |
| --- | --- |
| Income (k£ p.a) | Rate (Ksh per £) |
| 1 - 4200 | 2 |
| 4201 – 8000 | 3 |
| 8001 – 12600 | 5 |
| 12601 – 16800 | 6 |
| 16801 and above | 7 |

Momanyi pays Sh.4000 as PAYE per month. He has a monthly house allowance of Ksh.10800 and is entitled to a personal relief of Ksh.1100 per month.

1. Determine;
2. His gross tax p.a in Ksh (2mks)
3. His taxable income in k£ p.a (4mks)
4. His basic salary in Ksh p.m (2mks)
5. Given that the following deductions are made from his pay every month; NHIF Sh320, WCPS Sh.560 and NSSF 6% of his basic pay. calculate his net salary per month (2mks)
6. The first term of an arithmetic progression (AP) is 2. The sum of the first 8 terms of the AP is 156.
7. Find the common difference of the AP (2mks)
8. Given that the sum of the first n terms of the AP is 416, find n (2mks)

b) The 3rd, 5th and 8th terms of another AP Correspond to the first three consecutive terms of a GP. If the common difference of the AP is 3, find;

i) The first term of the GP (4mks)

ii) The sum of the first 8 terms of the GP to 4 significant figures (2mks)

1. a) Two towns on latitude 300S are 3000km apart. Find the longitude difference of the two towns. (π = 22/7 and the radius of the earth to be 6370km) (3mks)

b) The position of the airport P and Q are P(600N, 450W) and Q(600N, k0E). It takes a plane 5 hours to travel due East from P to Q at an average speed of 600 knots.

i) Calculate the value of k (2mks)

ii) The local time at P is 10.45am. What is the local time at Q when the plane reaches there? (3mks)

1. Calculate the shortest distance between {(300S, 360E) and 300S, 1440W}in nautical miles (2mks)
2. PQRSV is a right pyramid on a horizontal square base of side 10cm. The slant edges are all 8cm long. Calculate;

V

8cmm

S

P

10cmm

R

Q

1. The height of the pyramid (2mks)
2. The angle between
3. Line VP and the base PQRS (2mks)
4. Line VP and line RS (2mks)
5. Planes VPQ and the base PQRS (2mks)
6. Volume of the pyramid (2mks)

**THE END**

**Wishing you all the best!**

**Maths Departments of SUKEMO**