Name ………………………………………………………….ADM Number……………

Candidate’s signature……………………Index Number……………………Class…………

121/1

MATHEMATICS

Paper 1

June/July, 2021

Time 2½ Hours

**MOKASA ONE EXAMINATION**

***Kenya Certificate of Secondary Education***

121/1

MATHEMATICS

Paper 1

June/July, 2021

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 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 calculator and KNEC mathematical tables may be used, except where stated otherwise.*
8. *Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.*
9. *Candidates should answer the questions in English.*

**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 |
|  |  |  |  |  |  |  |  |  |

**SECTION I (50 marks)**

***Answer all the questions in section I***

1. Evaluate 3/4 + 15/7 ÷ 4/7 of 21/3 (3 marks)

 (13/7 – 5/8) x 2/3

2. Simplify 8x2 + 6x – 9 (3 marks)

 16x2 – 9

3. Two similar solid cones made of the same material have masses of 8000g and 1000g respectively. If the base area of the smaller cone is 77cm2, calculate;

1. The base area of the larger cone (3 marks)
2. The radius of the larger cone (2 marks)

4. Given that cos(2x)° - sin(4x+30)° = 0. Calculate the value of x (3 marks)

5. A line L passes through point (3,1) and is perpendicular to the line 2y=4x+5. Determine the equation of the line L. (3 marks)

6. A Kenyan tourist left Germany for Kenya through Switzerland. While in Switzerland, he bought a watch worth 52 Deutsche marks. Using the exchange rates below.

 1 Swiss Franc = 1.28 Deutsche Marks

 1 Swiss Franc = 45.21 Kenya shillings

 Find the value of the watch to the nearest (2 marks)

1. Swiss Franc
2. Kenya shillings (2 marks)

7. State all integral values of x which satisfy the following pair of inequalities. (3 marks)

 

 

8. A man is now three times as old as his daughter. In twelve years time he will be twice as old as his daughter. Find their present ages. (3 marks)

9. The point A(3, 2) is mapped onto A1(7, 1) under a translation T. Find the co-ordinates of the image of B(4, 6) under the same translation. (3 marks)

10. Calculate the area of the trapezium below. (3 marks)

 7cm

 4√3 h

 60°

 11cm

11. Two machines A and B working together can do some work in 6 days. After 2 days machine A breaks down and it takes machine B 10 days to finish the remaining work. How long will it take machine A alone to finish the whole work if it does not break down. (3 marks)

12. Solve for K in the equation. (3 marks)

 

13. A square brass plate is 2mm thick and has a mass of 1.05kg. The density of the brass plate is 8.4g/cm3. Calculate the length of the plate in cm. (3 marks)

14. The sum of interior angles of two regular polygons of side n-1 and n are in the ratio 4:5. Calculate;

 (i) the value of interior angle of the polygon with side (n-1) (2 marks)

 (ii) exterior angle (1 mark)

15. Four athletes Onyango, Korir, Njuguna and Mutua can complete a 2km lap in a field in 12 minutes, 15 minutes, 18 minutes and 20 minutes respectively. If they start the race together, find the number of times the slowest athlete will be overlapped by the fastest athlete by the time they next cross the finish line simultaneously. (3 marks)

16. The figure below shows a triangular prism. Draw its net. (3 marks)

A

C

B

E

F

D

17. Four towns P, Q, R and S are such that Q is 160km from town P on a bearing of 065°. R is 280km on a bearing of 152° from Q. S is due west of R on a bearing of 155° from P. Using a scale of 1cm to represent 40km.

 a) Show the relative positions of P, Q, R and S. (6 marks)

 b) Find the bearing of;

 (i) S from Q (1 mark)

 (ii) P from R (1 mark)

 c) Find the distance

 (i) PS (1 mark)

 (ii) RS (1 mark)

18. a) Complete the table below for  (2 marks)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| x | -1 | -0.5 | 0 | 0.5 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 |
| y=4x2-x3 | 5 | 1.1 | 0 |  |  |  |  |  |  | 6.1 |  |

 b) On the grid provided, draw the graph of y = 4x2 – x3 for -1˂x˂4 (3 marks)



 c)i) use the graph to find the roots of x3 – 4x2 + 4 = 0 (2 marks)

ii) On the same axis, draw the graph of 2y = x + 6 and state the values of x for which the two graphs intersect. (3 marks)

19. A particle moves from rest and attains a velocity of 10m/s after two seconds it then moves with 10m/s velocity for 4 seconds. It finally decelerates uniformly and comes to rest after 6 seconds.

 a) Draw a velocity time graph for the motion of this particle (3 marks)

 b) From the graph find;

 (i) the acceleration during the first two seconds. (2 marks)

1. the uniform deceleration during the last six seconds. (2 marks)
2. the total distance covered by the particle (3 marks)

20. a) Find the gradient of a line L1 perpendicular to the line whose equation is y=4x+4

 (2 marks)

 b) Calculate the angle in which line L1 is making with

 (i) x-axis (2 marks)

 (ii) y-axis (1 mark)

1. Line L2 is passing through the x-axis at 2 and point T(-2, k) and it is parallel to line L1. Calculate the value of K. (2 marks)
2. Another line L3 is perpendicular to line L2 and passes through point T. Calculate the equation of line L3 leaving your answer in the form ax + by + c = 0 (3 marks)

21. In the figure below P, Q, R and S are points on the circle centre O. PRT and USTV are straight lines. Line UV is a tangent to the circle at S. Angle RST is 500 and angle RTV is 1500.



1. Calculate the size of:
	* 1. angle ORS (2 marks)
		2. angle USP (1 mark)
		3. angle PQR (2 marks)
2. Given that RT=7cm and ST=9cm, calculate to three significant figures:
	* 1. the length of line PR (2 marks)
		2. the radius of the circle. (3 marks)

22. In the triangle below **OA** = **a** and **OB** = b. M is the midpoint of AB and N is a point on OB such that ON =  OB. AN and OM intersect at P.

 A

 a

 O P M

 N

 b

B

1. Express the following vectors in terms of **a** and **b**
2. AB (1 mark)
3. OM (1 mark)
4. AN (2 marks)
5. If OP = tOM and AP = sAN, express OP in two different ways hence find the value of t and s. (5 marks)
6. State the ratio AN:NP (1 mark)

23. Two circles with centres O1 and O2 have radii 10cm and 8cm respectively and intersect at points A and B. Angle AO1B = 90° and angle AO2B = 124.23°. Calculate to two decimal places;



 a) The length AB (2 marks)

 b) The length O1O2 (2 marks)

 c) Area of minor segment centre O1 (3 marks)

1. Area of quadrilateral O1AO2B (3 marks)

24. A quadrilateral ABCD with vertices A(2, 6), B(4, 8), C(5, 6) and D(3, 4) is mapped onto quadrilateral AIBICIDI by a reflection in the line y = -x+5.

 a) On the grid provided draw the quadrilateral ABCD and its image A1B1C1D1 under reflection in the line y= -x+5 (5 marks)



b) Quadrilateral AIIBIICIIDII is the image of quadrilateral AIBICIDI under a negative quarter turn about (1, -1). On the same grid, draw quadrilateral AIIBIICIIDII and state the coordinates of the image (3 marks)

c) Quadrilateral AIIIBIIICIIIDIII is the image of quadrilateral AIIBIICIIDII under an enlargement with scale factor -1 about (1,-1). On the same grid, draw AIIIBIIICIIIDIII and state the co-ordinates of the image. (2 marks)