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

 Class: \_\_\_\_\_ Adm:\_\_\_\_\_\_\_\_\_\_\_\_\_

121/1

MATHEMATICS

PAPER 1

TIME: 2 ½ HRS

**M O K A S A II E X A M I N A T I O N**

**AUGUST/ SEPTEMBER 2022**

**Kenya Certificate to Secondary Education**

**MATHEMATICS (PAPER 1)**

**TIME: 2 ½ HOURS**

**Instructions**

* *Write your name, class and admission number in spaces provided above.*
* *The paper contains* ***two*** *sections* ***A*** *and* ***B.***
* *Answer* ***all*** *questions in section* ***A*** *and* ***any five*** *questions**from section* ***B*** *in the spaces provided below each question.*
* *Show all the steps in your calculations giving your answers at each stage in the spaces below each question.*
* *Non-programmable silent electronic calculator and mathematical tables may be used except where stated otherwise.*

**For Examiner’s Use Only**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | **TOTAL** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**SECTION A**

**SECTION B**

 **PERCENTAGE**

 **SCORE**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | **TOTAL** |
|  |  |  |  |  |  |  |  |  |

**SECTION A (50 marks)**

**Answer all questions in this section**

1. Evaluate the following (3 marks)

2. The diagram below is a frequency of marks scored by 80 form four students in a given school.

50

40

30

20

10

No. of students

 10 30 50 70 90 100

Marks

Draw a frequency distribution table from the above polygon. (4 marks)

3. Given that vector **OA=**6**i +**3**j and OB =-i**+3**j.** A point M divides vector AB internally in the ratio 2:5. Find vector OM leaving your answer in unit vectors. (3 marks)

4. During the 2022 general election 14,301,400 valid votes were cast. If a candidate named Simiyu got 0.01% of the valid votes. Calculate;

(i) Simiyu’s number of votes correct to 4 s.f. (1 mark)

(ii) Proof that the answer above is divisible by 11 (1 mark)

5. Use tables to find the reciprocals and square root of the following (3 marks)

6.  Solve the simultaneous equations. (3 marks)

 ,

7. Find the prime factors of;

(a) 244036 and 103823. (1 mark)

(b) Hence, evaluate (2 marks)

8. Simplify the following expression (3 marks)

9. On the surface of a cube ABCDEFGH a continuous path BFDHB is drawn as shown by the arrows below.

 E H H

3cm

F G

D C

3cm

3cm

A B

(a) Draw and label a net of the cube (2 marks)

(b) On the net show the path (1mark)

10. Solve the following inequalities and represent the solutions on a single number line. (3marks)

11. Given that A = , B =

Find the inverse of AB. (3 marks)

12. Two bells’ rings at intervals of *30 minutes* and *36 minutes*. The bells rings together for the third time at 7:52 am on Monday. Determine the time and the day they rang together for the first time. (3 marks)

13. 1.5 litres of water (density 1g/cm3) is added to 5 litres of alcohol (density 0.8g/cm3). Calculate the density of the mixture. (3 marks)

14. A business woman bought two bags of maize at the same price per bag. She discovered that one bag was of high quality and the other of low quality. On the high quality bag she made a profit by selling at Kshs 1,040, whereas on the low quality bag she made a loss by selling at Kshs. 880.If the profit was three times the loss, calculate the buying price per bag. (3 marks)

15. Two trucks A and B travelling at 28km/hr. and 26km/hr. respectively approach one another on a straight road. Truck A is 10m long, while truck B is 15m long. Determine the time in seconds that elapse before the trucks completely pass each other. (3 marks)

 16. Find the value of m in the following equation (3 marks)

**SECTION B (50 marks)**

Answer **any five** questionsfrom this section

17. Three business partners Jane, Kamau and Paul contributed 140000,120000 and

160000 respectively to start a business. They agree to share the profit as follows; 40% to be shared equally,30% to be shared in the ratio of their contributions and

30% to be retained for the running of the business. If their total profit for their first

year was 210000.

Calculate;

(a) amount received by each partner (6 marks)

(b) amount retained for running the business (2 marks)

(c) If their second year of the business, profit decrease in the ratio of 10:11.

Find the profit for their second year of business. (2marks)

18. Four points A, B, C and D are such that A is 21m on a bearing of S60⁰W from B, D is 15m on a bearing of S300E from A.C is due east of D and S400Wfrom B.

(a) Using a scale of 1cm to represent 3metres, draw a diagram to show the relative positions of the four points A,B,C and D (4 marks)

Find :

(i) distance CD and BC (2 marks)

(ii) distance and compass bearing of A from C (2 marks)

 (iii) distance and bearing of B from D (2 marks)

19. The figure below shows a circumcircle of a triangle ABC. Given that AB = 5.8cm,

C

 BC =3.4cm and AC = 4.1cm

3.4cm

4.1cm

5.8cm

A

B

(a) Calculate the angle BAC (5 marks)

(b) The radius of the circle (3 marks)

(c) Find the area of the triangle (2 marks)



20. Triangle ABC has co-ordinates A(2, 0), B (2, 2) and C(0, 2). Using the grid provided below draw;

(a) Triangle A,B and C (1 mark)

(b) Triangle A1B1C1, the image of triangle ABC under reflection in line x = 0.

 (2 marks)

(c) Triangle A11B11C11 and D11, the image of triangle ABC under rotation of

centre. (2 marks)

 (d) The co-ordinates of triangle A111B111C111, the image of triangle ABC under enlargement centre (0, 0) scale factor -1. (3 mark)

 (e) The single transformation which maps triangle A111B111C111 to triangle A1B1C1.

 (2 marks)

21. Given a solid frustum of right pyramid on a rectangular base PQRS of sides by . The top is a rectangle ABCD of sides by. The slant edges are long.

(a) Draw a sketch of the frustum. (1 mark)

(b) Calculate:

(i) The height of the frustum. (2 marks)

(ii) The capacity of the frustum giving your answer to 4 significant figures. (4 marks)

(iii) Surface area of the frustum. (3 marks)

22. (a) Find the equation of the mirror line in the form of ax + by – c = 0 given that

A’ (3, -3) is the image of A (-1, -5) under a reflection. (3 marks)

(b) A straight line passing through point (-3, 4) is perpendicular to the line

whose equation is 2y-5x=11 and intersects the x-axis and y-axis at the points P and Q respectively. Find the co-ordinates of P and Q. (3 marks)

(c) A triangle ABC is formed by the points A (3, 4), B (-7, 2) and C (1, -2)

If points M and P are mid-points of AB and AC respectively, find the equation of the perpendicular bisector of the MP in the form (4 marks)



(c) Use the graph (b) above to solve;

(i) (2 mark)

(ii) (3 marks)

23. (a) Complete the table below for for the domain -5

 (2 marks)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **X** | **-5** | **-4** | **-3** | **-2** | **-1** | **0** | **1** | **2** | **3** |
|  | -11 |  |  |  | 17 | 14 | 7 |  |  |

(b) Draw the graph of  for the domain -5 (3 marks)

24. (a) Using trapezoidal rule with six strips, estimate the area under the curve

 between and and x-axis. (4 marks)

 (b) (i) Use integration to evaluate the exact area under the curve. (3 marks)

 (ii) Find the percentage error in calculating the area using trapezoidal rule (3 marks)