

Kenya Certificate of Secondary Education  
MIRROR JET

**121/1**

**MATHEMATICS**

**Paper 1**

□Alt. A□

**Term 2. 2024 – 2½ hours**

Name ..... Index Number.....

Class ..... Admission Number ..... Date.....

**Instructions to candidates**

- a) Write your name and index number in the spaces provided above.
- b) Write your class, admission number and the date of examination in the spaces provided above.
- c) This paper consists of **two** sections; **Section I** and **Section II**.
- d) Answer all the questions in **Section I** and only **five** questions from **Section II**.
- e) **Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.**
- f) Marks may be given for correct working even if the answer is wrong.
- g) **Non – programmable** silent electronic calculators **and** KNEC Mathematical tables may be used, except where stated otherwise.
- h) **This paper consists of 14 printed pages.**
- i) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- j) **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**

--

--	--	--	--	--	--	--	--	--

--

# MIRROR JET - 2024

## SECTION I (50 Marks)

Answer *all* the questions in this section in the spaces provided.

- Express  $2.81\overline{12}$  as a fraction hence evaluate  $\frac{1}{112}$  of  $26\frac{52}{112}$   $\times$   $4\frac{14}{112}$   $\div$   $11\frac{281}{112}$  (3 marks)

- A parallelogram ABCD is such that side  $BC = 8.8$  cm,  $DC = 12.5$  cm and  $\angle BAD = 60^\circ$ . Find the exact area of the parallelogram. (3 marks)

$$\frac{\sqrt{6561}}{3^x}$$

3. Solve for x in the equation  $81^{x+3} \div 27^{x+4} = \frac{\sqrt{6561}}{3^x}$  (3 marks)

4. Simplify  $\frac{3mn^2m^2n^6}{m^2n^6}$  (3 marks)

5. A cone is formed from sector of circle diameter 21 cm that subtends an angle of 75° at the centre. Find the volume of the cone correct to 1 decimal place. (3 marks)

6. A building is 8.2 m tall. A man standing on the top of the building elevates the top of a tree at  $44^\circ$  and depresses the bottom of the tree at  $58^\circ$ . Find the height of the tree giving your answer to 2 decimal places. (3 marks)
7. Two similar buckets A and B have capacities 12 litres and 40.5 litres respectively. If the vertical height of B is 24 cm more than the vertical height of A, determine the vertical height of B. (2 marks)
8. Tree seedlings are planted on each side of a street such that the first pair of tree seedlings are opposite each other. The seedlings are planted at intervals of 9 m on one side and 12.6 m on the other side. Calculate the number of tree seedlings planted by the time another pair of seedlings are opposite each other. (3 marks)

9. Three of the interior angles of an irregular polygon measure  $63^\circ$  each. The remaining interior angles measure  $73.5^\circ$  each. Find the number of sides of the polygon hence name the polygon. (3 marks)
10. By selling 40 exercise books at sh. 640, a sales man realizes a loss of 20%. How many books should be sold at sh. 182 to realize a profit of 30%. (3 marks)
11. Use mid ordinate rule with 4 strips to estimate the area enclosed by the line  $y = x$  and the curve  $y = 9x - x^2$ . (4 marks)

**12.** A translation  $T$  maps a point  $P(2,1)$  onto  $P'(1,2)$ . Given that  $Q(5,1)$  is the image of  $Q$  under the same translation, calculate the distance between  $P$  and  $Q$ . (3 marks)

**13.** Daniel bought 3 pens, 5 exercise books and 2 sets. A pen costs sh. 15, an exercise books cost sh. 100 and a set cost sh. 250

(a) Write a  $1 \times 3$  matrix to represent items bought by Daniel. (1 mark)

(b) Write a  $3 \times 1$  matrix to represent the price of the items bought by Daniel (1 mark)

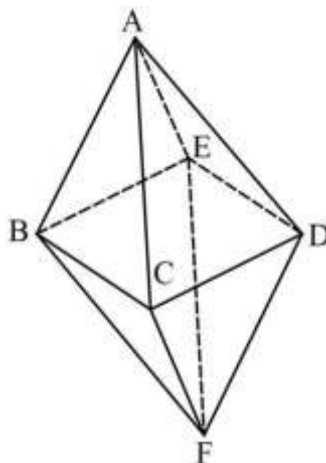
(c) Use the matrix above to find Daniel's total expenditure (2 marks)

**14.** Find the equation of the normal to the curve  $y = 2x^2 - 3x + 4$  at  $x = 2$  (3 marks)

15. Solve the inequalities  $2 \leq 7 - 12 \leq 5 - 18x$  and  $x \leq x$  and represent the solution on a number line.

(3 marks)

16. The figure below shows a regular octahedron of side 2 cm.



(a) Sketch a net of the solid.

(2 marks)

- (b) Hence or otherwise, show that the total surface area of the solid is  $8\sqrt{3}\text{cm}^2$ . (2 marks)
- SECTION II** (50 Marks)

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

- 17.** A car travelling at 10 m/s accelerate uniformly in 100 seconds to velocity of 25 m/s. It maintains this velocity for another 150 seconds before decelerating uniformly to rest after 100 seconds. Calculate
- (a) The total distance covered in kilometers (3 marks)

- (b) The average speed in the first 200 seconds. (3 marks)

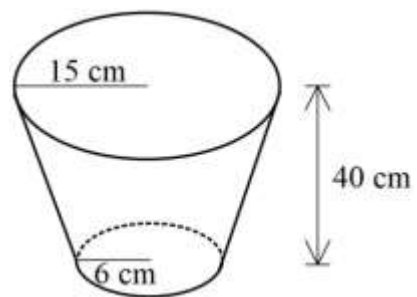
- (c) The initial acceleration (1 mark)



(d) Time taken to travel the last half of the journey.

(3 marks)

18. The figure below shows a bucket in the shape of a frustum whose top radius is 15 cm and base radius is 6 cm. The height of the bucket is 40 cm.



Taking  $\pi = 3.142$

- (a) Calculate correct to 4 significant figures the surface area of the bucket.

(4 marks)

- (b) If the bucket is filled to a height of 30 cm, calculate:

- i. The radius of the water surface

(3 marks)

- ii. The volume of water inside the bucket correct to 1 decimal place. (3 marks)

**19.** The data below shows the masses of 40 students in a class

45	65	66	67	72	79
	69	57	65	58	65
		66	67	49	50
51	70	79	69	84	52
85	90	87	69	81	68
74	70	49	82	58	52
				64	60

- (a) Starting with a class of 45-54 and using , a uniform class width prepare a frequency distribution table.

(2 marks)

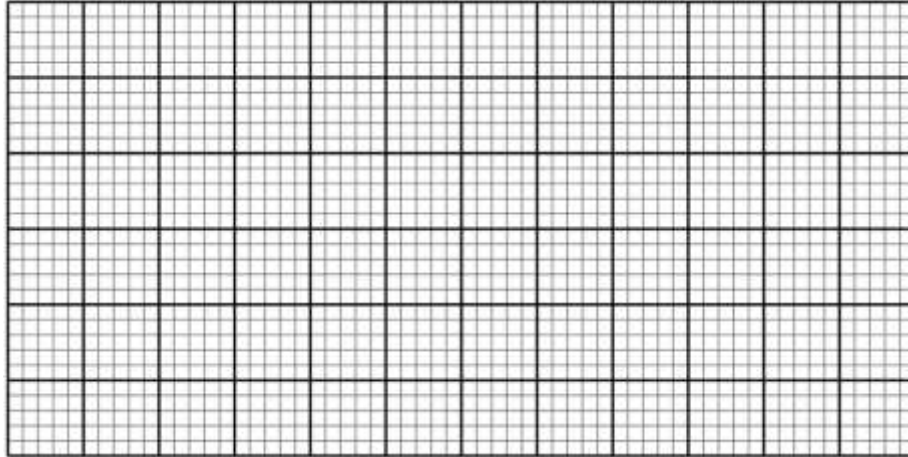
- (b) From the frequency distribution table above estimate.

- i. Mean mass (3 marks)

- ii. The median mass (3 marks)

(c) On the grid provided draw a frequency polygon

(2 marks)



**20.** A parent has two children whose age difference is 5 years. Twice the sum of the ages of two children is equal to the age of the parent.

(a) Taking  $x$  to be the age of the elder child, write an expression for:

(i) The age of the younger child

(1 mark)

(ii) The age of the parent.

(1 mark)

(b) In twenty years' time, the product of the children's age will be 15 times the age of their parents

(i) Form an equation in  $x$  and hence determine the present possible ages of the elder child.

(4 marks)

(ii) Find the present possible ages of the parent

(2 marks)

(iii) Find the possible sum of ages of the children in 20 years' time

(2 marks)

**21.** The displacement  $S$  metres of a bouncing particle after  $t$  seconds is given by  $S = t^3 - 5t^2 + 7t - 3$ . Determine

(a) The displacement of particle during the 4<sup>th</sup> second.

(2 marks)

(b) The velocity of the after 4 seconds.

(3 marks)

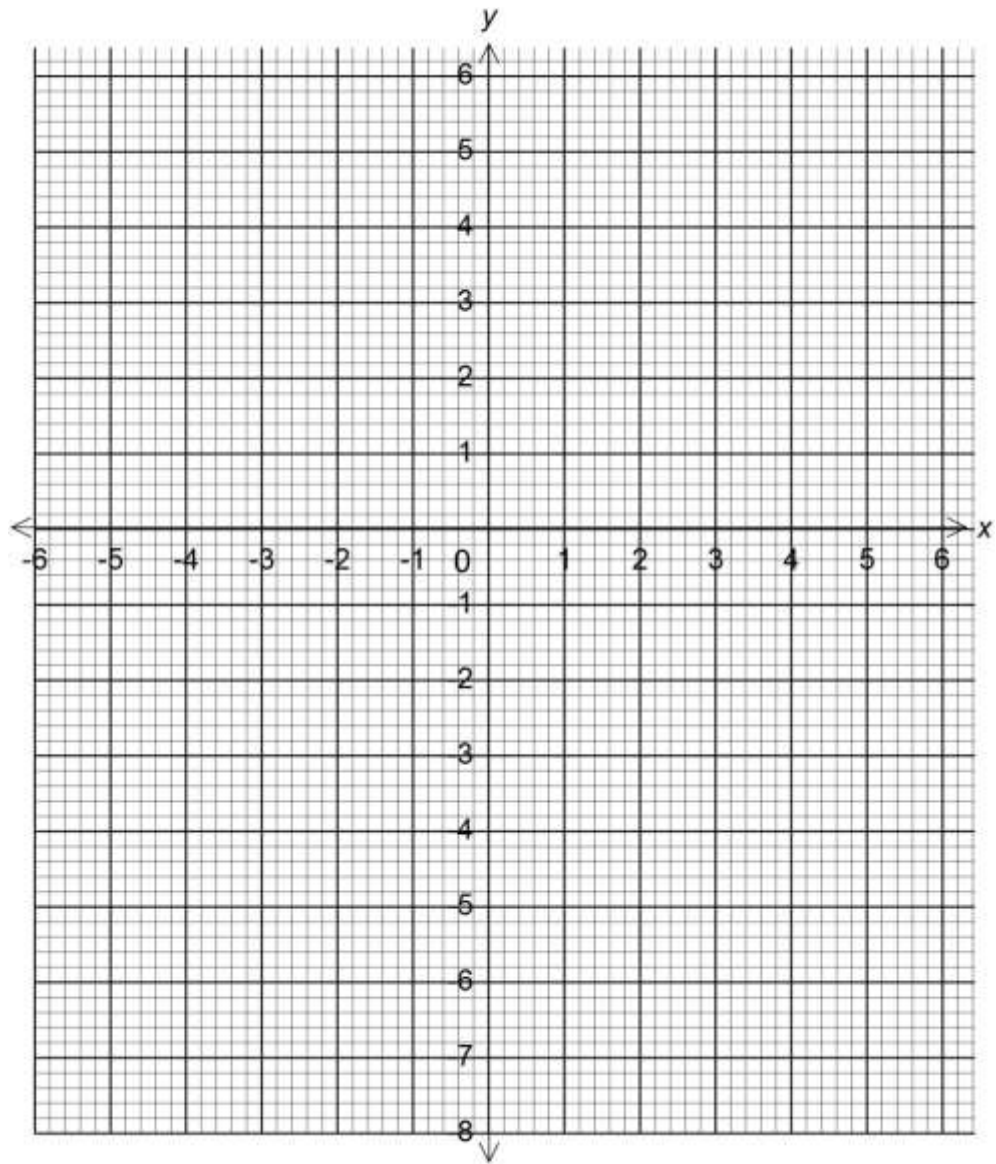
(c) The time when the particle is momentarily at rest  
(marks)

(3

(d) The acceleration of the particle when  $t = 3$  seconds

(2 marks)

**22.** (a) The points A (2,6), B (1,1), C (3,4) and D (5,3) are vertices of quadrilateral ABCD. Plot the quadrilateral ABCD. (1 mark)



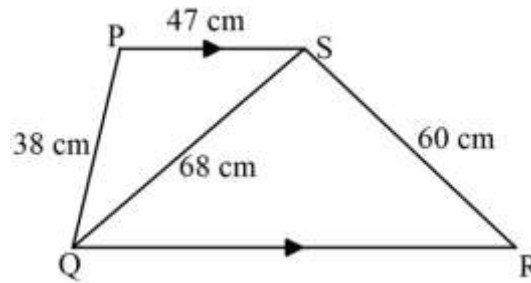
(b) Locate and write down the coordinates of the points  $A, B, C, D$ , the images of  $A, B, C, D$  under a rotation of positive  $90^\circ$  about the origin. Draw  $A, B, C, D$  (2 marks)

(c)  $A, B, C, D$  is the image of  $A, B, C, D$  under a reflection in the  $x$  – axis. Draw the quadrilateral  $A, B, C, D$  and write down its coordinates. (2 marks)

(d)  $A, B, C, D$  is the image of  $A, B, C, D$  under enlargement . Scale factor  $2$  centre  $(0,2)$  . On the grid draw  $A, B, C, D$  (3 marks)

(e) Describe a transformation that would map triangle  $ABC$  onto  $A, B, C, D$  (2 marks)

23. The figure PQRS is a trapezium in which PS is parallel to QR.  $PQ = 38$  cm,  $PS = 47$  cm,  $QS = 68$  cm and  $RS = 60$  cm



Calculate to 2 d.p

- i. The size of angle QPS

(3 marks)

- ii. The size of angle SQR

(2 marks)

- iii. Area of triangle QRS

(3 marks)

- iv. Perpendicular height of the trapezium

(2 marks)

24. PR represents the diagonal of a rhombus PQRS in which  $\angle PRS = 60^\circ$ . Complete the figure.

(2 marks)



- i. Measure QS (1 mark)
- ii. Construct a perpendicular from Q to meet SR produced at T. Measure QT. (2 marks)
- iii. Construct a circle to touch the sides of the rhombus (2 marks)
- iv. Find the area of rhombus that is outside the circle (3 marks)



**THIS IS THE LAST PRINTED PAGE.**

**BLANK PAGE.**