

**KCSE TRIAL 2021**  
**MATHEMATICS PAPER 1**

SECTION A (50 Marks)

**Attempt all questions in the spaces provided**

1. Show that 8260439 is exactly divisible by 11, using test of divisibility.

(2 marks)

2. Use logarithms tables to evaluate

$$\sqrt[3]{(4.562 \times 0.0380)(0.3 + 0.52)^{-1}}$$

Give your answer to 3 significant figures.

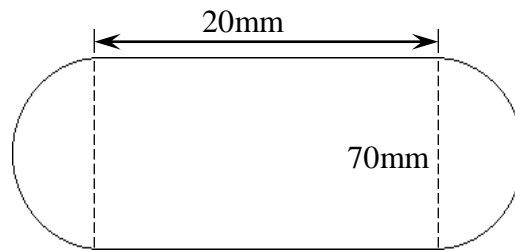
(4 marks)

3. Without using a calculator, evaluate

$$\frac{36 - 8x - 4 - 15 \div -3}{3x - 3 + -8(6 - (-2))}$$

(3 marks)

4. The figure below (not drawn to scale) shows the cross-section of a metal bar of length 3 metres.



The ends are equal semicircles. Determine the mass of the metal bar in kilograms if the density of the metal is  $8.87 \text{ g/cm}^3$  (3 marks)

5. A solid metal cone has a diameter of 14cm and a height of 24cm. If the cone is melted and recast into a cylinder of the same diameter, what is the height of the cylinder? (3 marks)

6. Find the integral values of  $x$  which satisfy the following inequality.

$$2x+3 > 5x-3 > -8$$

(3 marks)

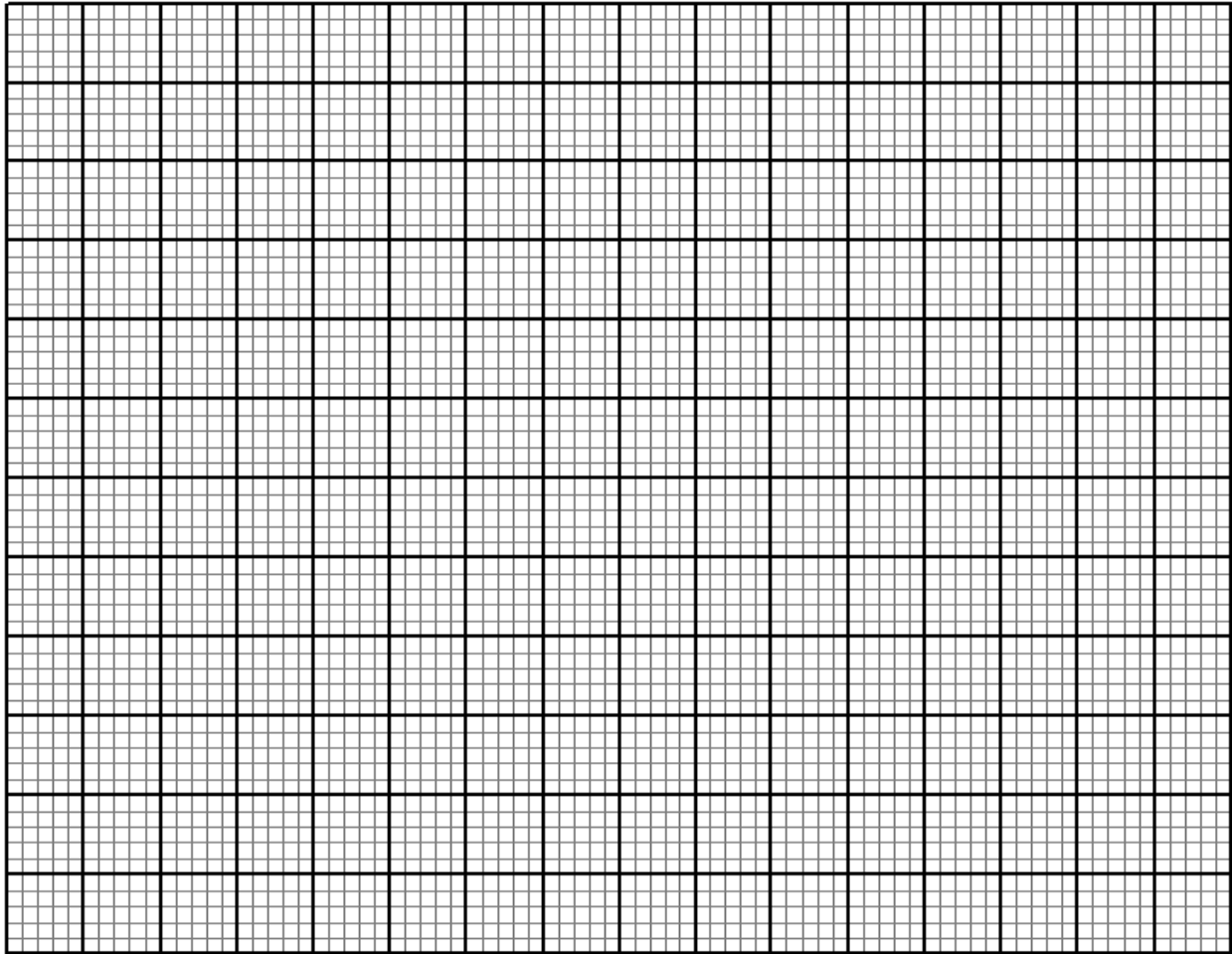
7. ABCD is a Rhombus with three of its vertices A (2, 5), B (1,-2), C (-5, 1). Determine the equation of line BD in the form of  $y = mx+c$  (3 marks)

8. If  $\sin \alpha = 5t$  and  $\cos \alpha = 6t$ , find t. (3 marks)

9. Factorise completely the expression,  
 $3x^2y^2-8xy-51$  (3 marks)

10. On the grid below, draw a histogram to represent the following distribution. (4 marks)

Length (cm)	1 – 5	6 – 9	16 – 30	31 – 40
Frequency	2	4.5	3.33	4



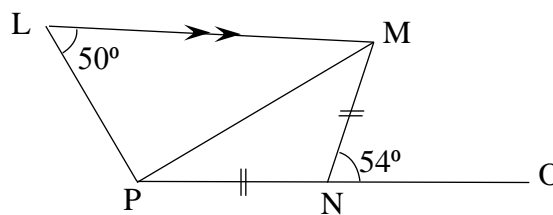
11. An observer stationed 20m away from a tall building finds that the angle of elevation of the top of the building is  $68^\circ$  and the angle of depression of its foot is  $50^\circ$ . Calculate the height of the building. (3 marks)

12. Solve without using tables.

$$9^{x+1} + 3^{2x+1} = 108$$

(3 marks)

13. In the figure below  $\angle MNO = 54^\circ$ , and  $\angle PLM = 50^\circ$ ,  $PN = NM$  and  $PO$  is parallel to  $LM$ . Find the value of  $\angle LPM$ . (3 marks)



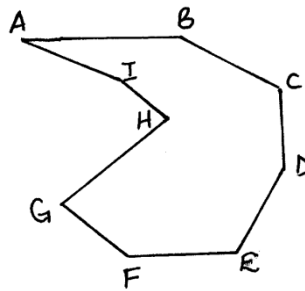
14. A container of height 90cm has a capacity of 4.5litres. What is the height of a similar container of volume  $9m^3$ . (3 marks)

15. Express  $0.\dot{4}5$  as fraction in its simplest form

(3 marks)

16. a) Find by calculation the sum of all the interior angles in the figure ABCDEFGHI below

(2 marks)



b) Find the number of sides of a regular polygon whose interior angle is  $162^\circ$

(2 marks)

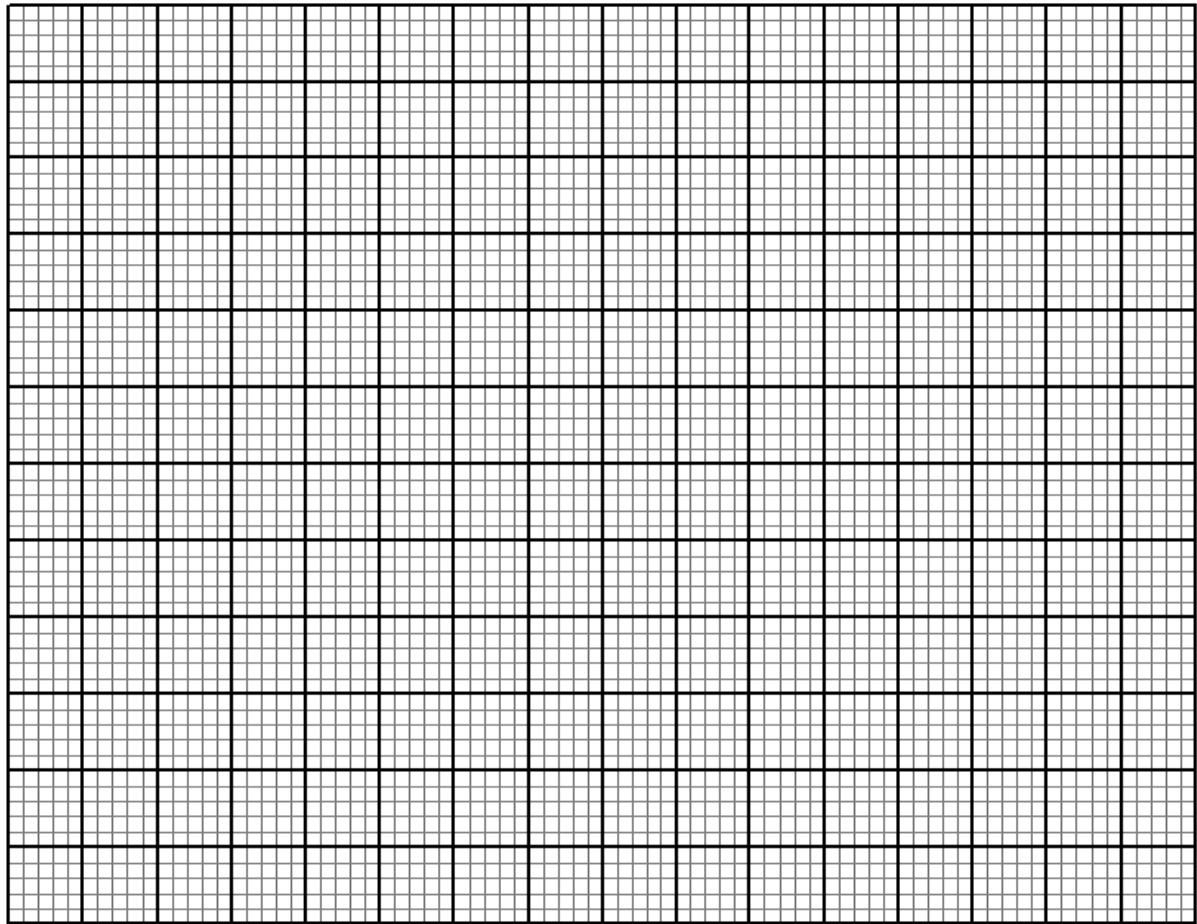
SECTION B (50 Marks)

**Attempt five questions only from this section**

17. The table below shows marks scored by 120 candidates in an examination.

Marks	1 – 10	11-20	21-30	31-40	41-50	51- 60	61-70	71-80	81-90	91-100
Frequency	2	6	10	a	24	21	19	12	8	1

- a) Determine the value of  $a$ . (1 mark)



- b) Taking 1cm to represent 10 marks on the horizontal axis and 1cm to represent 10 pupils on the vertical axis draw an ogive. (3 marks)

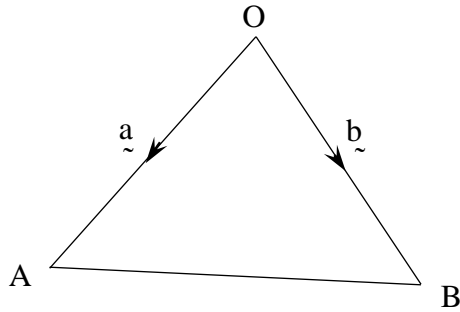
From your graph

- i. Determine the median. (2 marks)
- ii. Determine the range of marks of the middle 60% of the students. (2 marks)
- iii. If 63% is the pass mark for grade B+, how many students will get B+ and above? (1 mark)

- a) State the median class (1 mark)

18. The position vectors of points A and B with respect to the origin are  $\mathbf{a}$  and  $\mathbf{b}$  respectively. P is a point on  $\mathbf{OA}$  such that  $\mathbf{OA}=3\mathbf{OP}$ . Q divides  $\mathbf{OB}$  externally in the ratio 5:2.  $\mathbf{PQ}$  intersects  $\mathbf{AB}$  at N.

a) Express the vectors  $\mathbf{AB}$ ,  $\mathbf{AP}$ ,  $\mathbf{OQ}$  and  $\mathbf{PQ}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ . (3 marks)



b) Express  $\mathbf{AN}$  in two different ways. (5 marks)

c) In which ratio does N divide  $\mathbf{AB}$  (1 mark)

d) Express  $\mathbf{PN}$  in terms of  $\mathbf{PQ}$ . (1 mark)



19. A commuter train moves from station **A** to station **D** via **B** and **C** in that order, the distance from **A** to **C** via **B** is 70km and that from **B** to **D** via **C** is 88km. Between the stations **A** and **B**, the train travels at an average speed of 48km/h, and takes 15 minutes between **C** and **D**. The average speed of the train is 45km/h. Find:-

a) The distance from **B** to **C**. (2 marks)

b) Time taken between **C** and **D**. (2 marks)

c) If the train halts at **B** for 3 minutes and at **C** for 4 minutes and the average speed for the whole journey is 50km/h. Find its average speed between **B** and **C**. (4 marks)

d) If the return journey was at 54km/h, how long did he take for the journey? (2 marks)

20. On the upper part of a line RQ construct locus of points

(10 marks)

- a)  $T_1$  such that angle  $RTQ = 45^\circ$
- b) M on RQ which is equidistant from R and Q.
- c) S which is equidistant from R and Q and lies on T.
- d) Calculate area bounded by loci  $T_1$  and line RQ.

21. The marked price of a pick-up is Kshs.1, 087,500/= . A financial company bought this car at a discount of 20%, for a company employee, who was then to give a down payment of Kshs. 180, 000/= and 36 monthly instalments of Ksh.35, 600/= each.

a) Calculate the cash price. (2 marks)

b) How much will the employee have paid for the pick-up after 3 years? (2 marks)

c) What percentage profit did the financial company get from the employee on the pick up? (2 marks)

d) If the car was depreciating at the rate of 12% p.a, calculate the value of the car after 3years. (2 marks)

e) If the employee is to buy a new car at the same initial cost, at what percentage profit, on the value of the car after the third year, must he sell it? (2 marks)

22. Three planes **P**, **Q** and **R** departed Jomo Kenyatta International Airport at 0810 Hrs, 0840 Hrs and 0920 Hrs respectively. Plane **P** traveled at 300km/h along  $N70^{\circ}W$ , plane **Q** traveled at 240 km/h along **ENE** and **R** traveled at 400 km/h along  $210^{\circ}$ .

a) Using a scale of 1cm to represent 100 km, locate the position of the planes at 1050 Hrs. (6 marks)

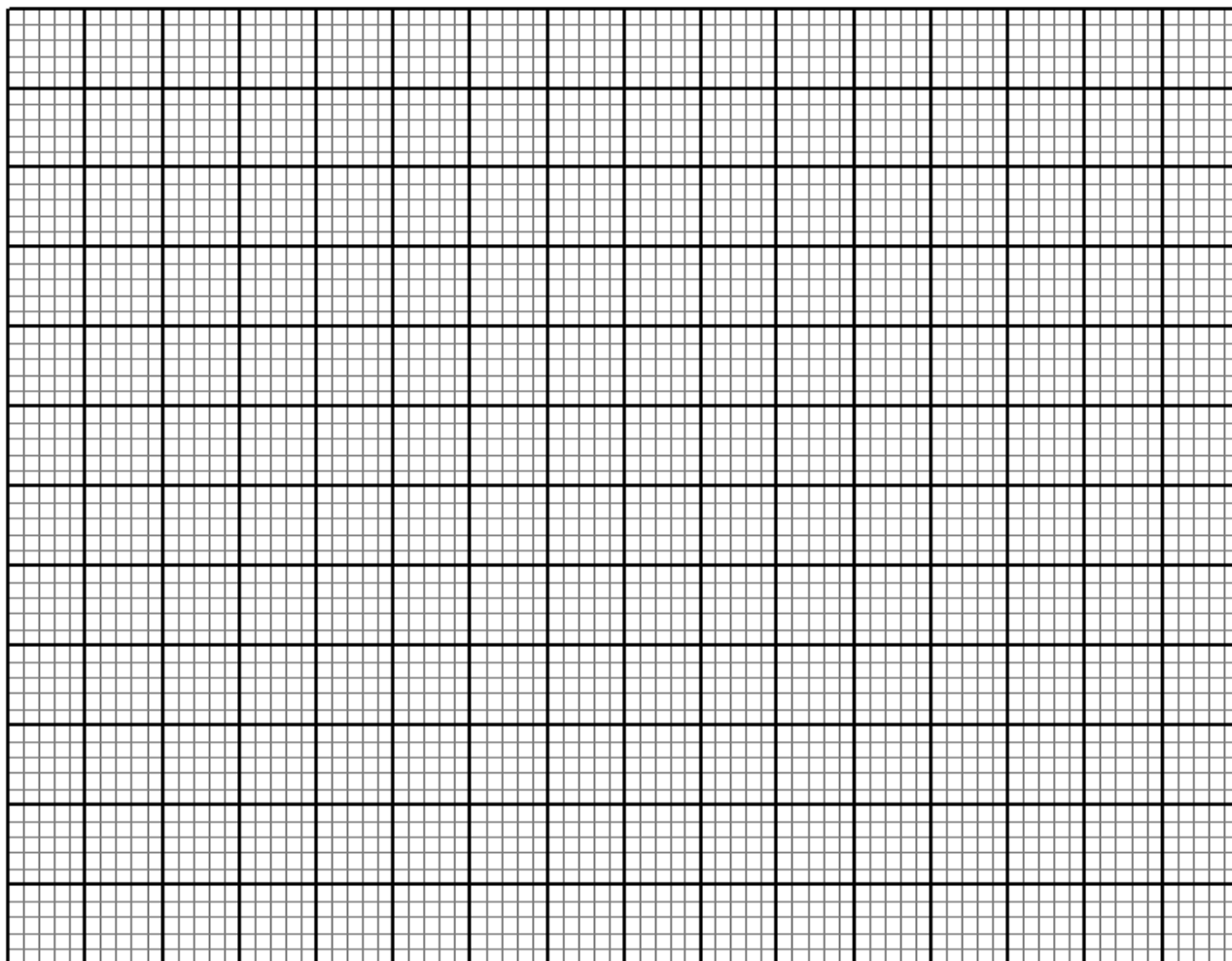
b) Find the distance of plane **Q** and **R** at 1050 Hrs. (2 marks)

c) Find the bearing of plane **Q** from plane **P** (1 mark)

d) Find the bearing of plane **R** from plane **Q**. (1 mark)

23. a) Complete the following table for the function:  $y = x^3 - 2x^2 + 5$ . (2 marks)

x	-3	-2	-1	0	1	2	3	4
$x^3$		-8	-1	0	1		27	64
$-2x^2$	-18		-2	0	-2	-8	-18	
5	5	5		5	5	5	5	5
y	-40		2	5	4	5	14	



- b) By using the scale of 2cm to represent one unit on the horizontal scale and 1cm to represent 5 units on the vertical scale, draw the graph of  $y = x^3 - 2x^2 + 5$ . (3 marks)
- c) Using your graph estimate the roots of  $x^3 - 2x^2 - 7x - 4 = 0$ . (2 marks)
- d) Use integration to find the area bounded by the curve  $y = x^3 - 2x^2 + 5$ , the y-axis and line  $y = 7x + 9$ . (3 marks)

24. Water flows through a pipe of internal radius of 3.5cm at 9 metres per second into a storage tank of rectangular base of 12m by 8m. Calculate

a) the volume of water delivered into the tank in one minute in litres. (2 marks)

b) the capacity of water in litres that is consumed by a village of 435 families that depend on this water, in one week, if each family consumes an average of six jerrycan of 20 litres each per day. (2 marks)

c) the minimum height of the water level in the storage tank that will ensure that the village doesn't suffer from water shortage within the week. (2 marks)

d) how long will it take the pipe to fill the tank to that level giving your answer in hours. (2 marks)

e) Calculate the monthly bill of the village if the cost of water is Kshs.1.50 per jerrycan (take a month of 30 days) (2 marks)

