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PAPER 1
SECTION 1 (50 MARKS)
Answer all the questions

1. Show that 8260439 is exactly divisible by 11, using test of divisibility. (2mks) ***BND****

2. Use logarithms tables to evaluate

$$\sqrt[3]{(4.562 \times 0.038)\,(0.3 + 0.52)^{-1}}$$

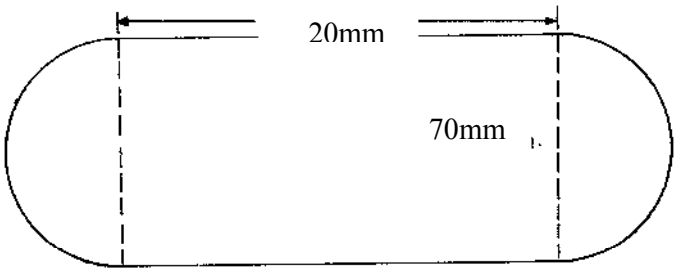
Giving your answer to 3 significant figures. (4mks) ***BND****

3. Without using a calculator, evaluate

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

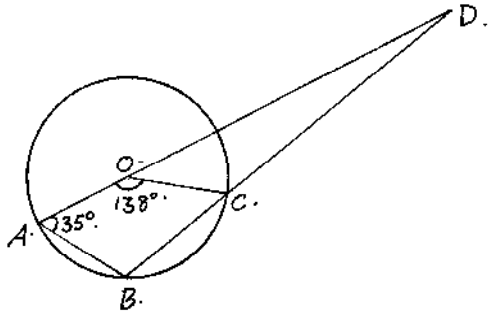
(3mks) ***BND****

4.



The above figure (not drawn to scale) shows the cross-section of a metal bar of length 3 meters. The ends are equal semi-circles. Determine the mass of the metal bar in kilograms if the density of the metal is 8.87 g/cm^3 . (3mks) ***BND****

5. In the figure below, O is the center of the circle. AOD and BCD are straight lines. Angle AOC = 138^0 and angle OAB=35^0. Determine the size of angle ADB. (2mks) ***BND****



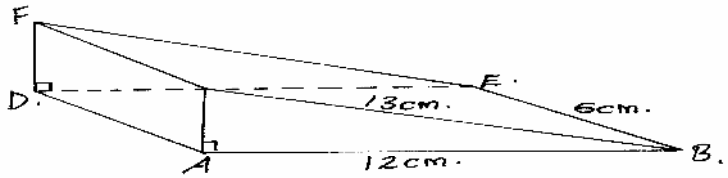
6. At 10.30am, a boy starts out from town A and cycles at an average speed of 15km/h towards B which is 65km away. Some 20 minutes later a motorist leaves town B and travels towards A at an average speed of 75km/h. At what time did the two meet. (4mks) ***BND****

7. Find the integral values of X which satisfy the following inequality.

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

(3mks) ***BND****

8. a) Sketch the net of a wedge in the following figure.



b) Calculate the surface area of the net drawn above. (3mks) ***BND****

9. The G.C.D of two numbers is 12 and their L.C.M is 240. If one of the numbers is 60, find the other number. (2mks) ***BND****

10. 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 = mc + c. (3mks) *BND*

11. A surveyor recorded the information about a tea farm in his field book as in the table below.

	Q	
	600	90 to C
To A 180	420	
	300	90 to D
To B 50	50	
	P	

a) Given that PQ = 650m, make a sketch of the field. (2mks) *BND*

b) Hence find the area of the field in hectares. (2mks) *BND*

12. Factorise completely the expression,

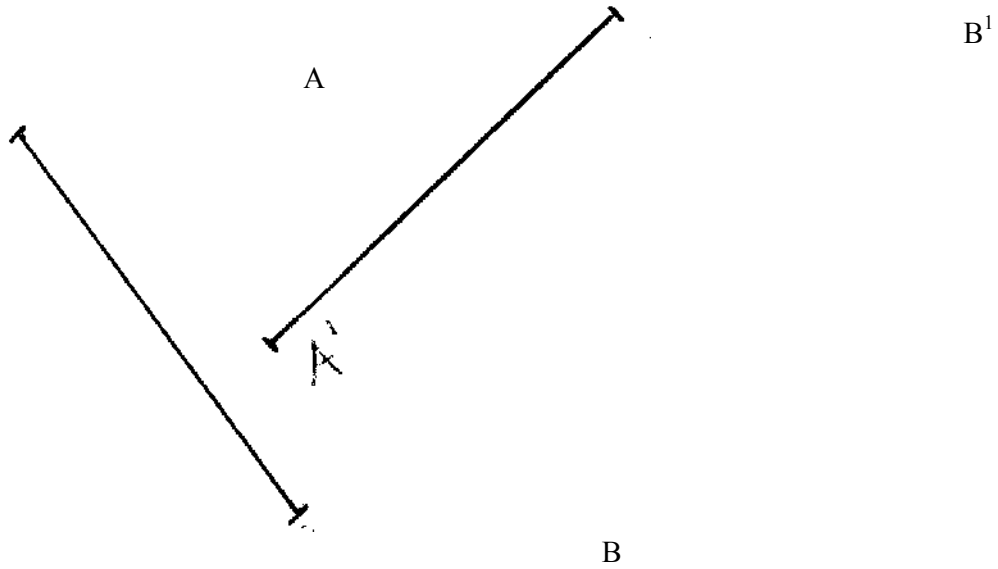
$3x^2y^2 - 8xy - 51$ (3mks) *BND*

. On the grid below, draw a histogram to represent the following distribution. (3mks) *BND*

Length (cm)	1 – 5	6 – 15	16 – 30	31 – 40
Frequency	2	9	10	8

14. An observer stationed 20m away from a tall building finds that the angle of elevation of the top of the building is 68^0 and the angle of depression of its foot is 50^0. Calculate the height of the building. (3mks) *BND*

15. Find by construction, the center and the angle of rotation if A^1B^1 is the image of AB. (3mks) *BND*



16. Solve without using tables.

$9^{x+1} + 3^{2x+1} = 108$ (3mks) *BND*

SECTION II (50 MARKS)

Answer any 5 questions in 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

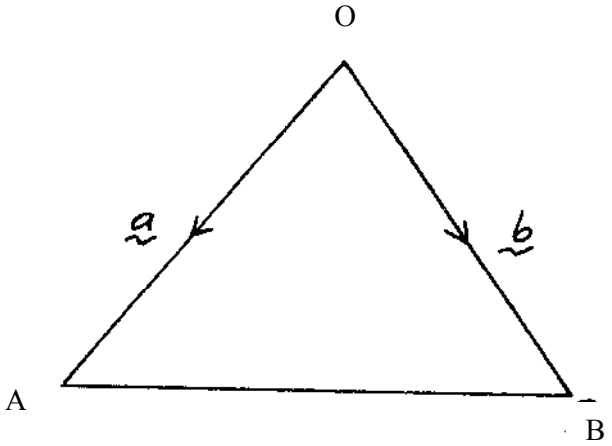
a) Determine the value of a. 1mk*BND*

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

From your graph

(i) deterine the median. (2mks) *BND*
(ii) determine the range of marks of the middle 60% of the students. (2mks) *BND*
(iii) If 63% is the pass mark for grade B+, how many students will get B+ and above? (1mk) *BND*
c) State the median class (1mk) *BND*

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



a) Express the vectors AB, AP, OQ and PQ in terms of a and b. (3mks) *BND*
b) Express AN in two different ways. (5mks) *BND*
c) (i) In which ratio does N divide AB (1mk) *BND*
(ii) Express PN in terms of PQ. (1 mk) *BND*

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. (2mks) *BND*
(b) Time taken between C and D. (2mks) *BND*
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. (4mks) *BND*
(d) If the return journey was at 54km/h, how long did he take for the journey. (2mks) *BND*

20. a) Construct a triangle PQR, such that PQ = 7.5cm, the ratio of <QPR = <PQR = 5:3, and <QRP is 60^0. (4mks) *BND*
b) Construct the locus of a point S, on the same side as R which moves such that < PSQ = 75^0. (3mks) *BND*
c) Construct the locus of a point T which moves such that it is always equidistant from lines PQ and PR and produce it to intersect the locus of S at M. (1mk) *BND*
d) By dropping a perpendicular from point M on to PQ at N, measure MN hence calculate the area of triangle PMQ. (2mks) *BND*

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.
(a) Calculate the cash price (2mks) *BND*
(b) How much will the employee have paid for the pick-up after 3 years? (2mks) *BND*
(c) What percentage profit did the financial company get from the employee on the pick up? (2mks) *BND*

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

(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? (2mks) *BND*

22. Three planes P,Q and R left Jomo Kenyatta International Airport at 8.10a.m, 8:40a.m and 9.20a.m respectively. Plane P traveled at 300km/h along $N70^0W$, plane Q traveled at 240km/h along ENE and R traveled at 400km/h along 210^0.

a) Using a scale of 1cm to represent 100km, locate the position of the planes at 10.50a.m. (6mks) *BND*

b) Find the distance of plane Q and R at 10.50a.m. (2mks) *BND*

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

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

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

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 $y= x^3 - 2x^2 + 5$ (3mks) *BND*

c) Using your graph estimate the roots of $x^3 - 2x^2 - 7x - 4 = 0$.

d) Use integration to find the area bounded by the curve $y = x^3 - 2x^2 + 5$, the y-axis and line $y = 7x + 9$.

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. (2mks) *BND*

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 jericans of 20 litres each per day. (2mks) *BND*

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. (2mks) *BND*

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

e) Calculate the monthly bill of the village if the cost of water is Kshs.1.50 per jelican (take a month of 30 days) (2mks) *BND*