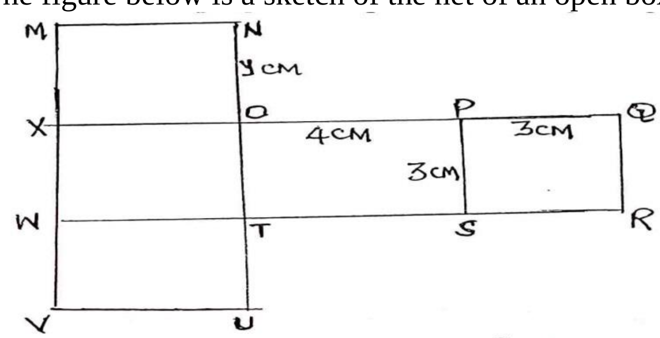
NAME:……………………………………………CLASS:………….ADM NO:…………….
121/1MATHEMATICSPAPER 1
FORM THREE
END TERM 2 EXAM - 2021
TIME: 2 ½ HOURS
<u>Instructions.</u>
Answer all questions in this section in the spaces provided.

1. Without using mathematical tables or calculators, evaluate: (3mks)

$$\frac{0.38 \times 0.23 \times 2.7}{0.114 \times 0.0575}$$

2. Determine the equation of the line through the point A (5,3) and parallel to the line y = 2x + 3. (3mks)

3. The figure below is a sketch of the net of an open box. The dimensions are in centimeters.



a. State the value of y. (1mk)

b. Calculate the surface area of the box (2mks)

4. Given that $\left(\frac{3}{m} - 4m = 2\frac{-9}{m}\right)$, find the value of m. (2mks)

5. The table below shows speeds of vehicles measured to the nearest 10Kph as they passed a certain point.

Speed (Kph)	30	40	50	60	70	80	90	100	110
Frequency	1	4	9	14	38	47	51	32	4

i. Calculate the mean speed of the vehicles. (3mks)

ii. State the modal speed. (1mk)

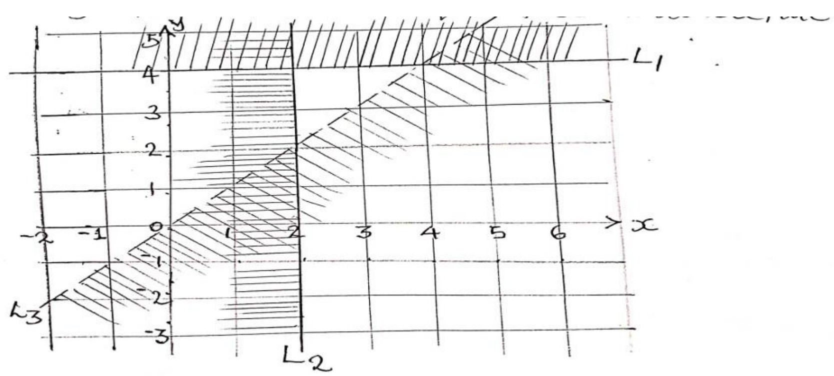
(3mks)

6. Given that $A = \begin{pmatrix} 4 & 3 \\ -1 & 2 \end{pmatrix}$ and $C = \begin{pmatrix} 14 & 7 \\ -4 & 2 \end{pmatrix}$, find B if

$2A + B = C$

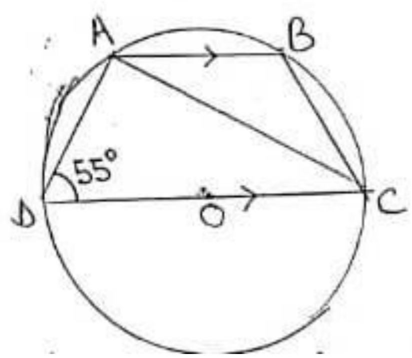
7. A container is in the form of a frustrum of a right pyramid 4m square at the bottom, 2.5m square at the top and 3M deep. Calculate the capacity of the container. (4mks)

8. The unshaded region in the figure below is bounded by lines L_1, L_2 and L_3. State the three inequalities that define the region.
(3mks)



9. Simplify: $\dfrac{\sqrt{54} + 3\sqrt{3}}{\sqrt{3}}$ (3 mks)

10. In the figure below, O is the centre of the circle. A, B, C and D are points on the circumference of the circle. Line AB is parallel to line DC and angle ADC= 55^{O}.



Determine the size of angle ACB. (2mks)

11. The results of a survey activity are shown in the field book below.

	Y	
	250	
	240	70D
C 80	170	
	70	60B
A 60	50	
	X	

If all the measurements are in metres, calculate the area of the field in :

(i) m^2 (3mks)

(ii) Ha (1mk)

12. Construct a circle centre x and radius 2.5cm. Construct a tangent from point p, 6cm from x to touch the circle at R. measure the length of PR. (3mks)

13. Given that $a=\begin{pmatrix} 2 \\ -3 \end{pmatrix}$, $b=\begin{pmatrix} -5 \\ 4 \end{pmatrix}$ and $c=\begin{pmatrix} 0 \\ -2 \end{pmatrix}$, find

$\left| a+b+c \right|$ to four significant figures. (3mks)

14. Two matrices A and B are such that $A=\begin{pmatrix} K & 4 \\ 3 & 2 \end{pmatrix}$ and $B=\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, given that the determinant of AB = 4, find the value of K. (3mks)

15. A solid metal cone has a diameter of 14cm and a height of 24cm. calculate the surface area of the cone. (2mks)

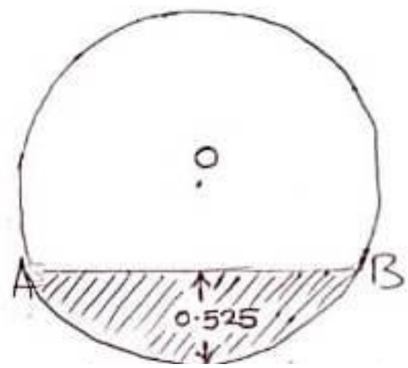
16. Without using a calculator, evaluate : (3mks)

$$\frac{2\tfrac{1}{2} - 1\tfrac{1}{5} \text{ of } 2}{\tfrac{1}{4} - (-\tfrac{1}{2})^3}$$

SECTION II (50 MARKS)

Answer any five questions from this section.

17. The figure below shows the cross section of a cylinder of a petrol tanker. Its length is 7M and internal diameter 2.1M. The depth of the petrol it contains is 0.525M, AB being the horizontal level of the petrol.



Calculate:

a. <AOB where O is the centre of the circular section. (3mks)

b. The area of sector AOB. (2mks)

c. The shaded area. (3mks)

d. The mass of the petrol in the tanker, given that one cubic metre of petrol has a mass of 700kg. (2mks)

18. On the grid provided draw the graph of $y = 2x^2 + 3x + 1$ for $-4 \leq x \leq 3$. (6mks)

b. Use your graph to solve the equation.

i. $2x^2 + 4x - 3 = 0$ (2mks)

ii. $x^2 - x - 45 = 0$ (2mks)

19. Atieno and Muthoni invested in a matatu business. They bought a min bus whose carrying capacity was 26 passengers. 25 of whom would be paying. They put the mini bus on a route connecting two towns A and B, where the fare was sh. 120 one way. Every day the matatu made 3 round trips between the two towns. On each day, fuel used was shs. 2500. The driver and conductor were paid shs. 450 and sh. 250 respectively. A further shs. 3500 was set aside daily for mainatainance, insuarance and loan repayment.

a) How much was:

i. The amount of the day's collections. (2mks)

ii. The net profit. (2mks)

b) The agreement between Atieno and Muthoni was that they would be sharing each day's profit in the ratio 3:4. Calculate how much each got on a day when the mini bus was 75% full per round trip. (6mks)

20. The length of 40 athletes in a country athletics competition were as shown in the table below:

Height (cm)	**Frequency (f)**
150-159	2
160-169	8
170-179	10
180-189	Y
190-199	6
200-209	2

a. Find the value of y. (2mks)

b. State the modal class (1mk)

c. Calculate the mean height of the athletes. (4mks)

d. On the grid provided below, draw a histogram to represent the information shown above. (3mks)

21. A line L passes through points (-2,3) and (-1, 6) It is perpendicular to a line at (-1, 6)

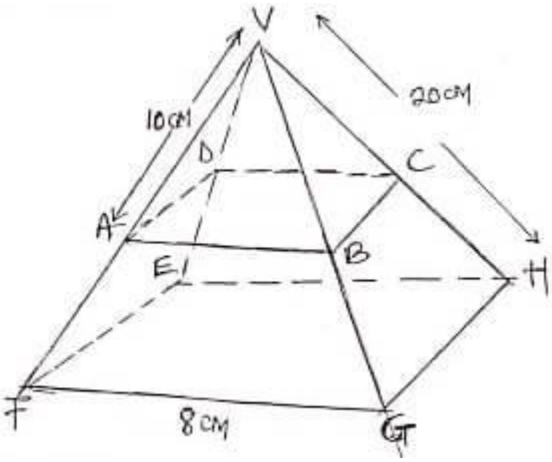
a. Find the equation of L. (2mks)

b. Find the equation of P in the form y = mx+ c. (2mks)

c. Another line Q is parallel to L and passes through point (1,2). Find the equation of Q. (3mks)

d. Find the point of intersection of lines P and Q. (3mks)

22. The figure below is a right pyramid VEFGH with a square base of 8cm and a slant edge of 20cm. points A,B,C and D lie and plane ABCD is parallel to the base EFGH.



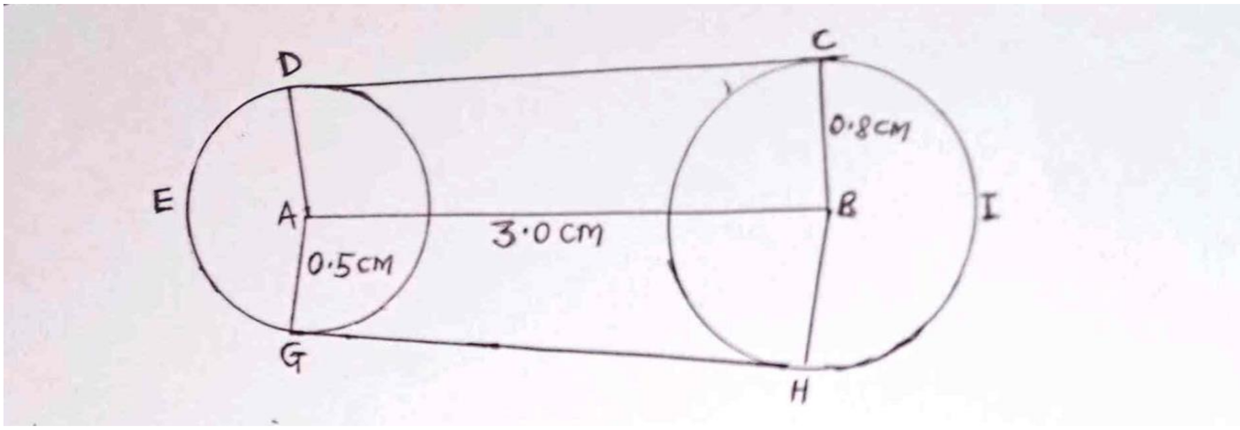
a. Find the length of AB. (2mks)

b. Calculate to 2 decimal places.
   i. The length of AC. (2mks)

   ii. The perpendicular height of the pyramid VABCD. (2mks)

c. The pyramid VABCD was cut off. Find the volume of the frustrum ABCDEFGH correct to 2 decimal places. (4mks)

23. The diagram below shows a design model of a race course drawn to scale of 1cm represents 50km. it consists of two circles centre A and B radii 0.5cm and 0.8cm respectively. The distance between their centres is 3.0cm,



Calculate in km:

i. The length of CD. (2mks)

ii. The length of DEG (take $\pi = 3.142$) (2mks)

iii. The length of HIC (take $\pi = 3.142$) (2mks)

iv. During a race, the course is managed by race officials placed 500M apart and each is paid Ksh. 2300 per day. How much is needed to pay race officials for one day's event. (4mks)

24. A bus left Nairobi at 6.00a.m and travelled towards Kapsabet Boys at an average speed of 100km/hr. At 6.30 am, a van left kapsabet Boys and travelled towards Nairobi to receive the bus with a number of students moving at an average speed of 125km/h given that the distance between Nairobi and Kapsabetis 500km Calculate:

a. The time the two vehicles met. (4mks)

b. On meeting the bus proceeded with its journey but the van had a break of 30 minutes before proceeding for Kapsabet Boys. Calculate:

i. The time the bus arrived at Kapsabet Boys. (3mks)

ii. The time the van arrived at Kapsabet. (3mks)

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END TERM 2 EXAM - 2021
FORM 3
MATHEMATICS PAPER 2.
TIME:2HRS 30MIN
<u>Instructions.</u>
Answer all questions in this section in the spaces provided.
SECTION A : 50MKS.

1. Use mathematical tables to evaluate: (4mks)

$$\sqrt[3]{\frac{0.8423 \times 72.5}{930.5}}$$

2. After how many y years would kshs. 15000 amount to ksh 24015.50 at a rate of 16% p.a. (3mks)

3. Three years ago, Juma was three time as old as Ali. In two years time, the sum of their ages will be 62. Determine their present ages. (3mks)

4. Evaluate:

$$\tfrac{1}{3} \text{ of } (2\tfrac{3}{4} - 5\tfrac{1}{2}) \times 3\tfrac{6}{7} \div \tfrac{9}{4}$$ (3mks)

5. Find the height of an isosceles triangle if the equal sides are each 26cm and the base is 48cm long. (2mks)

6. A straight line L1 has a gradient of – ½ and passes through the point P(-1, -3). Another straight line L2 passes through the points Q(1,-3) and R (4,5), find:
   a. The equation of L1. (2mks)

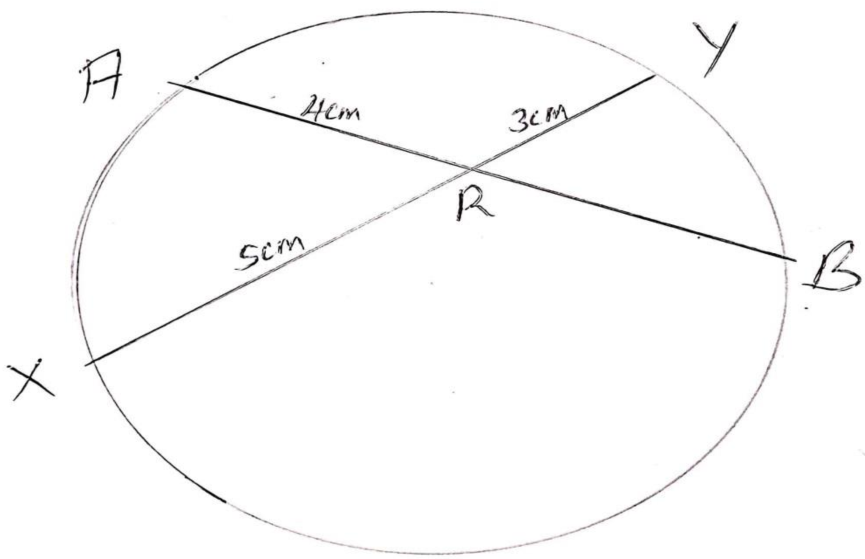
   b. The equation of L2. (2mks)

7. Solve the following quadratic equation by completing the square. (3mks)
   $2x^2 - 5x + 3 = 0$

8. Make A the subject of the formula. (3mks)

$$T = \frac{2m}{n}\sqrt{\frac{L - A}{3K}}$$

9. In the figure below, chords AB and XY interest in a circl at R. Given that AR = 4cm, XR = 5cm and RY=3cm. find AB. (2mks)



10. Given the matrix M = $\begin{pmatrix} 3 & -5 \\ 5 & 2 \end{pmatrix}$ Find the inverse of M and hence or otherwise, solve the simultaneous equations. (3mks)

$3x - 5y = -9$

$5x - 2y = 16$

11. Solve the equation $\frac{2}{x-1} - \frac{1}{x+2} = \frac{1}{x}$ (3mks)

12. Solve for x in the equation: (3mks)

$\text{Log}\,(x-1) = \log 12 - \log (x-2)$

13. Using binomial expression, expand and simplify $(1 – 2x)^3$ up to the term x^3. (1mk)

b. Use the simplified expansion in (a) above to calculate to 4 decimal places the approximate value of $(0.98)^3$ (3mks)

14. A trader bought two brands of sugar labeled Grade A and Grade B. Grade A sugar costs sh 60 per kg and grade B sugar costs sh 50 per kg. he mixed them in a ratio such that after selling the mixture at sh 81 per kg, he made a profit of 50%. Determine the ratio in which he mixed grade A sugar to grade B. (3mks)

15. A quantity P is partly constant and partly varies as the square of Q when Q=2, P= 40 and when Q=3 P=65. Determine the value of P when Q=4. (3mks)

16. A cold water tap can fill a bath in 6 minutes while a hot water tap can fill it in 12 minutes. The drainage pipe can empty the bath in 8 minutes. All the three are opened fully for 3 minutes and then the hot water tap is closed. How many more minutes will it take to fill the bath? (4mks)

SECTION B (50 MKS)
Answer any five questions in this section.

17. Personal tax relief p.a is sh 12672 p.a

Income (K£per annum)	Rate (Sh per pound)
1-5808	2
5809-11280	3
11281-16752	4
16753-22224	5
Excess over 22224	6

a. Mr. Omondi earns a basic salary of sh 15000 per month. In addition, he gets a medical allowance of sh 2400 and a house allowance of sh 12000. Use the tax brackets above to calculate the tax he pays in a year. (10mks)

18. A student at Anestar school tossed a coin three times and recorded the results on every successive toss.

a) By use of a tree diagram, show all the possible outcomes. (3mks)

b) Find the probability of getting:

i. One head (1mk)

ii. Two heads and a tail, in the order. (1mk)

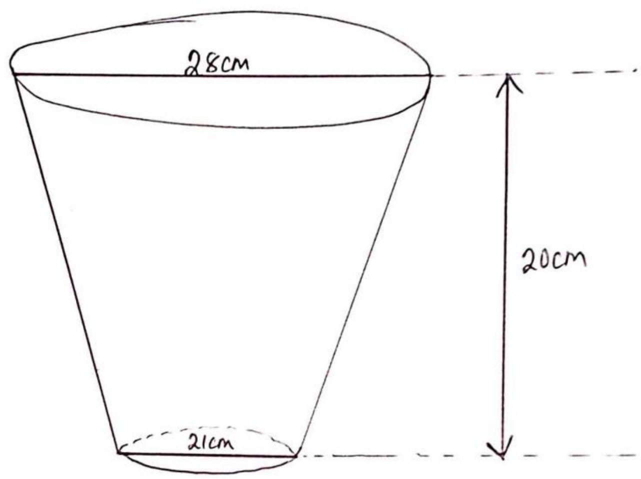
iii. Two heads and a tail, in any order. (1mk)

iv. Three heads. (1mk)

v. At least one head. (1mk)

vi. No head. (2mks)

19. The diagram below shows a frustrum made by cutting off a small cone on a plane parallel to the base of the original cone. The frustum represents a bucket with the open – end diameter of 28cm and the bottom diameter of 21cm. The bucket is 20cm deep as shown. Calculate to one decimal place, the capacity of the bucket in litres. (10mks)



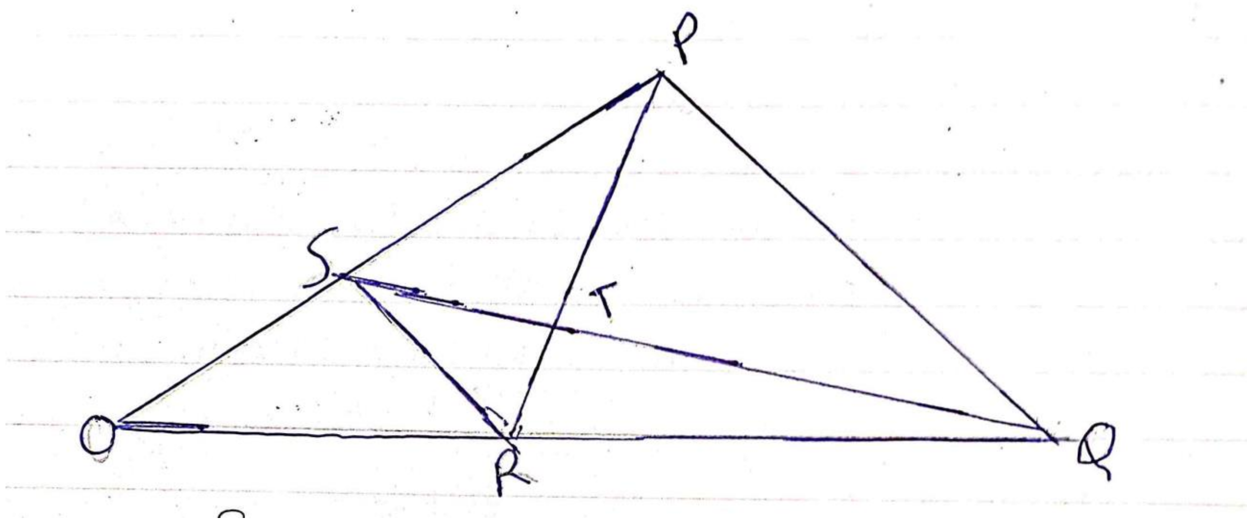
20. Town B is 180km on a bearing of 050^{O} from town A. another town C is on a bearing of 110^{O} from town A and on a bearing of 150^{O} from town B. A fourth town D is 240km on a bearing of 320^{O} from town A. using a scale drawing 1cm to represent 30km, calculate to the nearest kilometer:

a) The distance AC (2mks)

b) The distance CD (2mks)

c) The distance BC. (2mks)

21. In the figure below OPQ is a triangle in which OS= $^1/_3$ OP and OR = $^1/_3$OQ. T is a point on QS such that QT = ¾ QS.



a) Given that OP = p and OQ=q, express the following vectors in terms of p and q.

i. SR (2mks)

ii. QS (2mks)

iii. PT (2mks)

iv. TR (2mks)

b) Hence or otherwise show that the points P,T and R are collinear. (2mks)

22. The first term of an arithmetic progression is 2, the sum of the first 8 terms of the AP is 240.

i. Find the common difference of the AP. (2mks)

ii. Given that the sum of the first n terms of the AP is 1560, find n. (2mks)

b. The 3rd, 5th and 8th term of another AP form the first three terms of a G.P if the common difference of the AP is 3. Find

i. The first term of G.P (4mks)

ii. The sum of the first 9 terms of the GP to 4 s.f (2mks)

23. James is a sale executive earning a salary of ksh. 20,000 and commission of 8% for the sales in excess of kshs. 100,000. If in January 2010 she earned a total of ksh. 48,000 in salaries and commissions.

a. Determine the amount of sales he made in the month. (4mks)

b. If the total sales in the month of February and March increased by 18% and they dropped by 25% respectively. Calculate:

i. James's commission in the month of February. (3mks)

ii. His total earning in the month of March. (3mks)

24. At the beginning of the year 2000, Gachago bought two houses, one in Thika and another one in Nakuru each at sh. 1,240,000. The value of the house in Thika appreciated at a rate of 12% p.a.

a. Calculate the value of the house in Thika after 9 years to the nearest shillings. (2mks)

b. After n years, the value of the house in Thika was 2,741,245 while the value of the house in Nakuru was 2917231.

i. Find n (4mks)

ii. Find the annual rate of appreciation of the house in Nakuru. (4mks)