Name …… File Number……..…… Class …….

121/1
MATHEMATICS
Paper 1
2½ Hours

SET 1

FORM 3

Kenya Certificate of Secondary Education (K.C.S.E)

Instructions to candidates

1. Write your name, admission number and class in the spaces provided above.
2. The paper contains two sections: **Section I** and **Section II**.
3. Answer **ALL** the questions in **Section I** and **ANY FIVE** questions from **Section II**.
4. All working and answers must be written on the question paper in the spaces provided below each question.
5. Marks may be awarded for correct working even if the answer is wrong.
6. Negligent and slovenly work will be penalized.
7. Non-programmable silent electronic calculators and mathematical tables are allowed for use.

For Examiner's use only

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

17	18	19	20	21	22	23	24	Total

Grand Total %

This booklet contains 12 printed pages. Please confirm that all the pages exist and are properly printed before starting the exam.

Section I(50 marks)

Answer all the questions in this section

1. A basketball team play 10 matches in a tournament. The following are scores in each match.
9, 15, 17, 16, 7, 20, 21, 15, 10, 1
Determine:

(a) the mode. **(1 mark)**

(b) the median. **(1 marks)**

2. The coordinates of P and Q are (-2, 6) and (4, -2) respectively. Find the equation of a perpendicular bisector of line PQ, in the form $y = mx + C$. **(4 marks)**

3. The marked price of a car in a dealer's shop was Ksh. 450,000/=. Magari bought the car at 7% discount. The dealer still made a profit of 13%. Calculate the amount of money the dealer had paid for the car. **(3marks)**

4. Simplify $\frac{12x^2 + ax - 6a^2}{9x^2 - 4a^2}$. **(3marks)**

5. Solve for m in the equation:
$3^{4(m+1)} + 3^{4m} = 246$ **(3marks)**

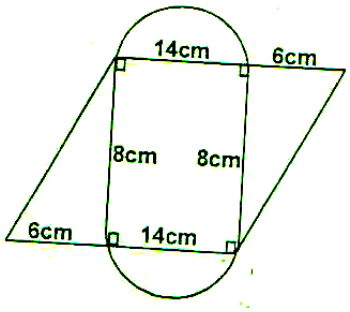
6. Using tables evaluate.
$\frac{1}{34.52} + \sqrt[3]{0.787} + (0.934)^3$ **(3 marks)**

7. Evaluate without using a calculator $\frac{\frac{2}{3}\left(1\frac{3}{7} - \frac{5}{8}\right)}{\frac{3}{4} + 1\frac{5}{7} \div \frac{4}{7} of\ 2\frac{1}{3}}$. **(3marks)**

8. The exterior angle of a regular polygon is 24^0. Determine the sum of the interior angles. **(3marks)**

9. The figure below represents an opened collar cloth, find the distance round it. (Take $\pi = 3\frac{1}{7}$)

(3marks)



10. An American tourist arrives in Kenya with 1000 US$ and converted the whole amount into Kenyan shilling. He spent sh. 40000 and changed the balance to Sterling pounds before leaving for United Kingdom. A Kenyan bank buys and sells foreign currencies as shown.

	Buying (in Kshs)	Selling (in ksh)
1 US dollar	84.2083	84.3806
1 Sterling pound	134.7941	135.1294

Calculate the amount he received to the nearest sterling pound. **(3 marks)**

11. Katu is now four times as old as her daughter and six times as old as her son. Twelve years from now, the sum of the ages of her daughter and son will differ from her age by 9 years. What is Katu's present age? **(3 marks)**

12. Solve the following inequality and show your solution on a number line. **(3 marks)**

$4x - 3 \leq \frac{1}{2}(x + 8) < x + 5$

13. A farmer has a piece of land measuring 840m by 396m. He divides it into square plots of equal size. Find the maximum area of one plot. **(3marks)**

14. Using a ruler and a pair of compasses only, construct a triangle ABC in which BC = 5cm, angle ABC = 75^0 and ACB = 60^0. From A drop a perpendicular to BC and measure its length to the nearest mm. **(4 marks)**

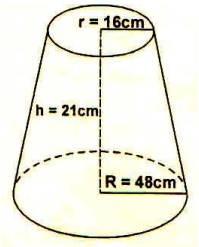
15. A two digit number is such that the sum of the digits is 11. When the digits are reversed, the new number exceeds the original number by 9. Calculate the original number. **(4marks)**

16. Two similar containers have masses 256kgs and 128kgs respectively. The surface area of the smaller container is 810 cm^2. What is the area of the corresponding surface of the large container? **(3marks)**

SECTION II(50 MARKS)

Answer any FIVE questions in this section

17. The figure below is a frustum of a solid cone of base radius 48cm and top radius 16cm. The height of the frustum is 21cm.



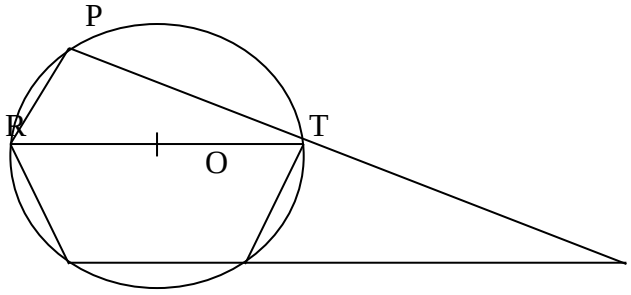
Taking by as $\frac{22}{7}$, calculate:

a) The height of the solid cone. **(2marks)**

b) The volume of the solid frustum. **(3marks)**

c) The total surface area of the frustum. **(5marks)**

18. The figure below shows a circle centre O in which QOT is a diameter. <QTP = 46^0, TQR = 75^0 and SRT = 38^0, PTU and RSU are straight lines.



R S U

Calculate the following angles giving a reason in each case.

(a) <RST **(2marks)**

(b) <SUT **(2marks)**

c) <PST **(2marks)**

d) Obtuse <ROT **(2marks)**

e) <SQT **(2marks)**

19.(a) A rectangular tank of base 2.4m by 2.8m and a height of 3m contains 3600 litres of water initially. Water flows into the tank at the rate of 0.5 litres per second.

Calculate:

(i) The amount needed to fill the tank. **(2marks)**

(ii) The time in hours and minutes required to fill. **(3marks)**

b) Pipe A can fill an empty tank in 3 hours while pipe B can fill the same tank in 6 hours. When the tank is full, it can be emptied by pipe C in 8 hours. Pipes A and B are opened at the same time when the tank is empty. If one hour later pipe C is also opened, find the total time taken to fill the tank. **(5marks)**

20. A salesman is paid a commission of 2% on goods worth over Ksh.100000. He is also paid a monthly salary of Ksh.12000. In a certain month, he sold 360 pairs of shoes at Ksh.500 each pair.

(a) Calculate the salesman's earning that month. **(3 marks)**

b) The following month, his monthly salary was increased by 10%. His total earnings that month were Ksh.17600.
Calculate

(i) The total amount of money received from the sales of the shoes that month. **(5 marks)**

(ii) The number of pairs of shoes sold that month. **(2 marks)**

21. The distance between towns M and N is 280km. A car and a lorry travel from M to N. The average speed of the lorry is 20km/h less than that of the car. The lorry takes 1h 10min more than the car to travel from M to N.

(a) If the speed of the lorry is x km/h, find x **(6marks)**

(b) The lorry left town M at 8.15am. The car left town M later and overtook the lorry at 12.15pm. Calculate the time the car left town M. **(4marks)**

22. The table below shows measurements, in metres made by surveyor in his field book.

	F	
	420	
G 100	380	D70
	300	C100
	220	E40
H60	140	
	80	B60
	A	

a) Using an appropriate scale draw the region. **(5 marks)**

b) Find the area in hectares of the filed. **(5 marks)**

23 A, B, C and D are four schools where B is 84km north of A and C is on a bearing of $N65^0W$ from A at a distance of 60km. D is on a bearing of $N20^0W$ from C and at a distance of 30km.
Use a scale drawing to show relative positions of A,B,C and D using a scale of 1cm to represent 10km. **(5marks)**

Find;

(a) the distance and bearing of B from C. **(2marks)**

(b) the bearing and distance of D from B. **(2marks)**

(c) the bearing of A and D. **(1mark)**

24. A company is to construct a parking bay whose area is $135m^2$. It is to be covered with a concrete slab of uniform thickness of 150mm. To make the slab, cement, ballast and sand are to be mixed so that their masses are in the ratio 1: 4: 4. The mass of $1m^3$ of dry slab is 2500kg. Calculate

a)i) the volume of the slab. **(2marks)**

ii) the mass of the dry slab. **(1 mark)**

iii) the mass of cement to be used. **(2 marks)**

b) If one bag of cement is 50kg, find the number of bags to be purchased. **(2 marks)**

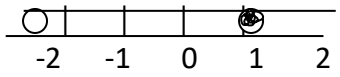
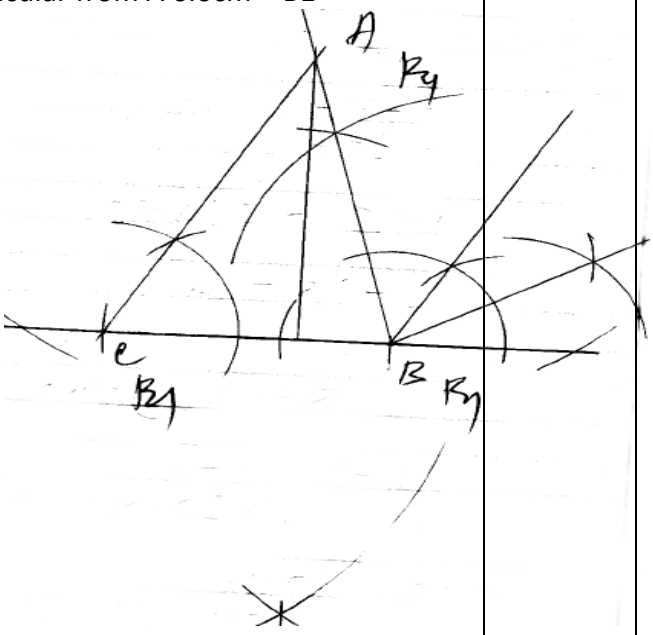
c) If a lorry carries 7 tonnes of sand, calculate the number of lorries of sand to be purchased. **(3 marks)**

SET 1

MATHS PAPER 1 (MS) MARKING SCHEME.

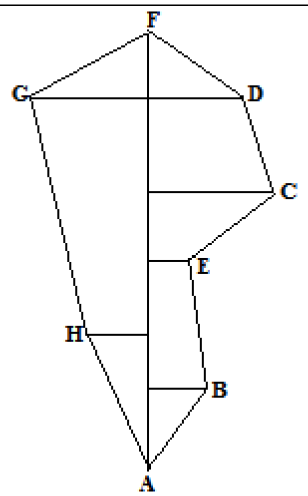
1.	(a) 15 $(b)\quad \frac{15+15}{2}=15$	A1 A1	
2.	$m_{PQ}=\frac{-2-6}{4--2}=\frac{-4}{3}$ $\therefore Gradient\ of\ \perp=\frac{3}{4}$ $Mid-point\left(\frac{-2+4}{2},\frac{6-2}{2}\right)=(1,\ 2)$ $\frac{y-2}{x-1}=\frac{3}{4}$ $y=\frac{3}{4}x+\frac{5}{4}$	 M1 M1 M1 A1	
		4mks	
3	100% = 450,000 93% ? 93 x 450000 100 = 418,500 113% = 418500 100% ? 100 x 18500 113 = 370353.9823	 M1 M1 A1	
		3mks	
4.	$\frac{(3x-2a)(4x+39)}{(3x+2a)(3x-2a)}$ $=\frac{4x+3a}{3x+2a}$	M2 A1	
		3mks	
5.	34m 34 + 34m = 246 Let 34m = y 81y + y = 246 82y = 246 y = 3 34m = 31, m = ¼	M1 M1 A1	
		3mks	
6	$\frac{1}{34.52}+\sqrt[3]{0.787}+(0.934)^3$ $\frac{1}{3.452\ x\ 10}+\sqrt[3]{\frac{787}{1000}}+\left(\frac{9.34}{10}\right)^2$ 0.2901 x 0.1 + 9.233 x 0.1 + 814.8 x 0.001 0.02901 + 0.9233 + 0.8148 = 1.76711	 M1 M1 A1	
		3mks	

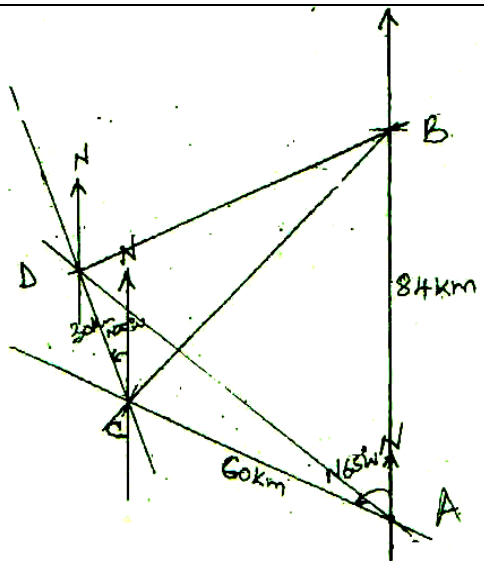
7.	$\dfrac{\frac{2}{3}\left(\frac{10}{7}-\frac{5}{8}\right)}{\frac{3}{4}+\frac{12}{7}\div\left(\frac{4}{7}\times\frac{7}{3}\right)}$ $=\dfrac{\frac{2}{3}\left(\frac{80-35}{56}\right)}{\frac{3}{4}+\frac{12}{7}\div\frac{4}{3}}$ $=\dfrac{\frac{2}{3}\times\frac{45}{56}}{\frac{3}{4}+\frac{12}{7}\times\frac{3}{4}}=\dfrac{\frac{15}{28}}{\frac{3}{4}+\frac{9}{7}}$ $=\dfrac{15}{28}\times\dfrac{28}{57}=\dfrac{5}{19}$	M1 M1 A1	
		3mks	
8.	$No\ of\ sides=\dfrac{360}{24}=15$ $No\ of\ tiangles=15-2=13$ $Sum\ of\ angle=13\times180=2{,}340^0$	M1 M1 A1	
		3mks	
9.	C = $\frac{22}{7}$ x 14 or C = $\frac{1}{2}$ x $\frac{22}{7}$ x 14 x 2 = 44cm P = 44 + 12 + $2(8^2+6^2)^{\frac{1}{2}}$ = 76cm	M1 M1 A1	
		3mks	
10	1000 x 84.2084 = 84208.3 84208.3 - 40000 = 44208.30 $\dfrac{44{,}208}{135.1293}$ $=327$	M1 M1 A1	
		3mks	
11	Now 1n 12yrs Katu x yrs x + 12 Son x/6yrs x/6 + 12 Daughter x/4 yrs x/4 + 12 (x/6 + 12) + (x/4 + 12) = (x + 12) - 9 21 = x - x/6 - x/4 21 = 7x 12 7x = 252 x = 36yrs Katu is 36yrs old now	M1 M1 A1	

12	$4x - 3 < \frac{1}{2}(x + 8)$ $4x - \frac{1}{2}x < 4 + 3$ $3\frac{1}{2}x < 7$ $x < 2$ $\frac{1}{2}x + 4 < x + 5$ $-1 < \frac{1}{2}x$ $-2 < x$ $-2 < x < 2$  	M1 M1 B1	
		3mks	
13	*G.C.D for 840 and 396* 2 | 840 | 396 2 | 420 | 148 2 | 210 | 74 | 105 | 37 $2x2x2 = 8m^2$	M1 M1 A1	
		3mks	
14.	Length of the perpendicular from A 6.0cm B1  		
15	Let the number be xy $x + y = 11$ ..... (i) $(10y + x) - (10x + y) = 9$ $9y - 9x = 9$ $y - x = 1$ $x + (x + 1) = 11$ $2x = 10$ $x = 5$ $y = 5+1=6$ The original no. 56	M1 M1 M1 A1	
		4mks	

16	$vsf = \frac{256}{108} = \frac{64}{27}$ $lsf = \sqrt[3]{\frac{64}{27}} = \frac{4}{3}$ $asf = \frac{16}{9}$ $SA\ of\ l\arg er\ container = \frac{16}{9} \times 810cm^2$ $= 1{,}440cm^2$	M1 M1 A1	
		3mks	
17.	(a) $\frac{H}{h} = \frac{R}{r} \Rightarrow \frac{48}{16} = \frac{h+21}{h}$ 48h = 16h + 336 32h = 336 h = 10.5cm H = 10.5 + 21 = 31.5cm (b) Volume of solid frustum $\frac{1}{3}\pi R^2 H - \frac{1}{3}\pi r^2 h$ $\frac{1}{3}x\frac{22}{7}$ x 482 x 31.5 - $\frac{22}{7}$ x $\frac{1}{3}$x162 x 10.5 = 76,032 – 2816 (c) L = $\sqrt{48^2 - 31.5^2}$ = 36.22cm l = $\sqrt{16^2 - 10.5^2}$ = 12.07cm curved surface area $\frac{22}{7}$ x 48 x 36.22 - $\frac{22}{7}$ x 16 x 12.07 $= 4857.1cm^2$ Area of top and bottom $\frac{22}{7}$ x 482 + $\frac{22}{7}$ x 162 = 8045.71 Total surface area = 4857.1 + 8045.71 = 12902.cm2	M1 A1 M1 M1 A1 M1 M1 M1 M1 A1	
		10mks	
18.	a) <RST = 180 – 75 = 1050 Cyclic angles add up to 1800. b) <SUT = 180 – (82 + 75) = 230 Angles of a triangle add up to 1800 c) <PST = 440 Angles subtended by the same chord i.e. chord PT are equal. The angle PQT = 440 d) Obtuse of <ROT 750 x 2 = 1500 Chord RT subtended <RQT = 750 Same chord RT subtends <ROT at the centre Hence 75 x 2 = 1500 e) 180 – (44 + 46 + 15 + 37) = 380 Cyclic angles add up to 1800. SQOT <SQP + <PTS = 1800	B1 B1 B1 B1 B1 B1 B1 B1 B1	

		10mks	
19	(a) (i) Capacity of the tank = 2.4 x 2.8 x 3 x 1000 = 20160L Amount = 20160 – 3600 = 16560 Litres (ii) Time taken to fill = $\frac{16560}{0.5}$ $=\frac{16560}{0.58x60x60}$ =9hr 12 min (b)In 1hr, pipe A and B fill $\frac{1}{3}+\frac{1}{6}=\frac{1}{2}$ in 1 hr pipe C empties $\frac{1}{8}$ of the tank the next hour all pipes open, amount in tank increases by $\frac{1}{2}-\frac{1}{8}$ $=\frac{3}{8}$ Time taken to fill the remaining half of the tank is $\frac{1}{2}\div\frac{3}{8}$ $=\frac{1}{2}$ x $\frac{8}{3}=\frac{4}{3}$ hrs Total time = $1+\frac{4}{3}$ = 2hrs 20 mins	M1 A1 M1 A1 M1 M1 M1 M1 A1	
		10mks	
20	$(a)\ Commission\ \frac{2}{100}\times(500\times360)$ = 3600 Total pay 12000 + 3600 M1 Shs.15600 $(b)\ (i)\ \frac{110}{100}\times12000=13200$ 17600 – 13200 = 4400 $\frac{2}{100}\chi=4400$ $\chi=4400\times\frac{100}{2}$ = 222000 $(ii)\ \frac{222000}{500}$ $=440\ pairs$	M1 A1 M1 M1 M1 M1 A1 M1 A1	
		10mks	
	(a)Speed of car= (x+20) km/h Speed of lorry = x kh/h $\frac{280}{x}-\frac{280}{x+20}=\frac{11}{6}$ 280 (x+20) = 280(x) = 7/6 (x2+20x) 1680 x + 33600 – 1680x = 7x2 + 140x 7x2 + 140x – 33600 = 0	M2 M1 M1	

	x2 + 20x – 4800 = 0 (x+80) (x-60) = 0 x= 60kh/h b)Time taken = 280 = 4hr, 40min 60 Arrival time 8.15am for the lorry 4.40 12.55pm During overtaking distance travelled 60 x 4 = 240km 280 – 240 = 40km For car 40 = 30mins 80 Time 12.15pm – 3 hours =9.15am	 M1 A1 M1 M1 M1 A1	
		10mks	
22	 b) 1/2 x 40 x 70 = 1400 1/2 x 80 x 170 = 6800 1/2 x 80 x 140 = 5600 1/2 x 140 x 100 = 7000 1/2 x 80 x 60 = 2400 1/2 x 140 x 60 = 4200 1/2 x 160 x 240 = 19200 1/2 x 100 x 40 = 2000 = 48,600m2 10,000 = 4.86 hectares	S1 B4 M1 M1 M1	Scale used Offset at 900 to AF

		A1	
		10mks	
23	 (a) BC = 8.0±0.1 x 10 = 80±1km Bearing of B from C ≅ N43±1E (b) DB = 7.1±0.1 x 10 = 71±1km Bearing of D from B S650±W c) bearing of A from D S50±10E	B1 B1 B1 B1 B1 B1 B1 B1 B1 B1	
		10mks	
24.	a)i) V = 135 x 0.15 = 20.25m3 ii) 1m3 = 2500kg 20.25m3 = x = 20.25 x 2500 = 50625kg ii) C : B : J 1 : 4 : 4 Cement = 1/9 x 50625 = 5625kg b) 5625/50 = 112.5 bags c) Sand = 4/9 x 50625 = 22500 7 tons => 7000kg = 22500/7000 = 3.2 lorries	M1 A1 A1 M1 A1 M1 A1 M1 M1 A1	
		10mks	