

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 %

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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)

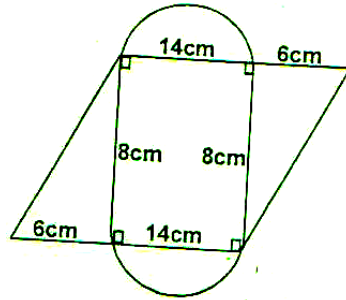
6. Using tables evaluate.
 $\frac{1}{34.52} + \sqrt[3]{0.787} + (0.934)^3$ (3 marks)

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

8. The exterior angle of a regular polygon is 24° . 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.

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

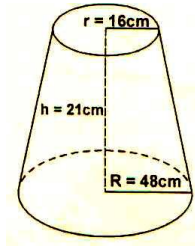
(3 marks)

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 $BC = 5\text{cm}$, angle $ABC = 75^\circ$ and $ACB = 60^\circ$. 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

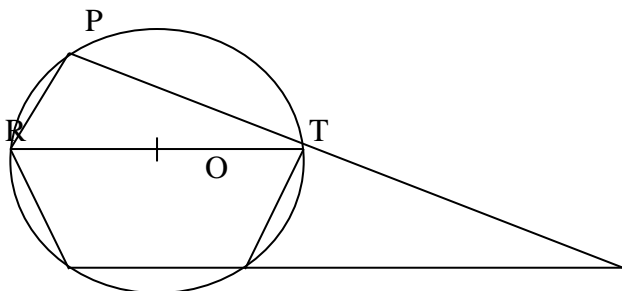
17. The figure below is a frustum of a solid cone of base radius 48cm and top radius 16cm. The height of the frustum is 21cm.



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. $\angle QTP = 46^\circ$, $\angle TQR = 75^\circ$ and $\angle SRT = 38^\circ$, PTU and RSU are straight lines.



R

S

U

Calculate the following angles giving a reason in each case.

(a) $\angle RST$ (2marks)

(b) $\angle SUT$ (2marks)

(c) $\angle PST$ (2marks)

(d) Obtuse $\angle ROT$ (2marks)

(e) $\angle SQT$ (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 field.

(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 $N65^{\circ}W$ from A at a distance of 60km. D is on a bearing of $N20^{\circ}W$ 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)**

(a) Find;
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)**

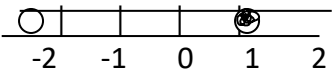
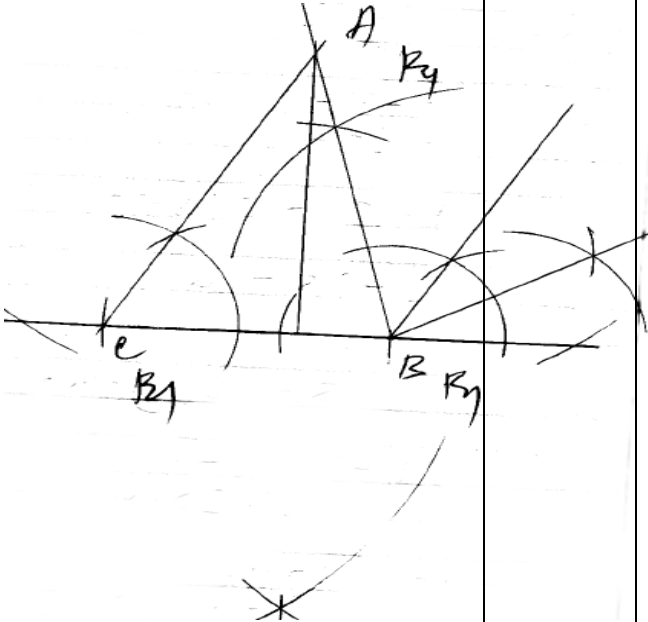
c) If a lorry carries 7 tonnes of sand, calculate the number of lorries of sand to be purchased. **(3 marks)**

SET 1

MATHS PAPER 1 (MS) MARKING SCHEME.

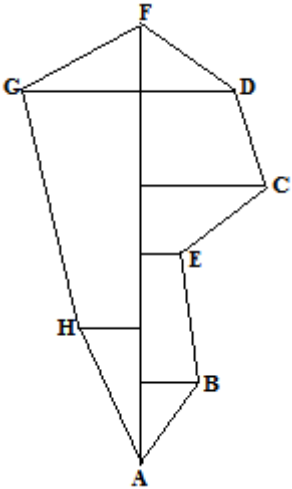
1.	(a) 15 (b) $\frac{15 + 15}{2} = 15$	A1 A1	
2.	$m_{PQ} = \frac{-2 - 6}{4 - -2} = \frac{-4}{3}$ $\therefore \text{Gradient of } \perp = \frac{3}{4}$ $\text{Mid-point} \left(\frac{-2 + 4}{2}, \frac{6 - 2}{2} \right) = (1, 2)$ $\frac{y - 2}{x - 1} = \frac{3}{4}$ $y = \frac{3}{4}x + \frac{5}{4}$	M1 M1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

7.	$\frac{\frac{2}{3}\left(\frac{10}{7} - \frac{5}{8}\right)}{\frac{3}{4} + \frac{12}{7} \div \left(\frac{4}{7} \times \frac{7}{3}\right)}$ $= \frac{\frac{2}{3}\left(\frac{80-35}{56}\right)}{\frac{3}{4} + \frac{12}{7} \div \frac{4}{3}}$ $= \frac{\frac{2}{3} \times \frac{45}{56} = \frac{15}{28}}{\frac{3}{4} + \frac{12}{7} \times \frac{3}{4} = \frac{3}{4} + \frac{9}{7}}$ $= \frac{15}{28} \times \frac{28}{57} = \frac{5}{19}$	M1 M1 A1													
		3mks													
8.	<p><i>No of sides</i> = $\frac{360}{24} = 15$</p> <p><i>No of triangles</i> = $15 - 2 = 13$</p> <p><i>Sum of angle</i> = $13 \times 180 = 2,340^\circ$</p>	M1 M1 A1													
		3mks													
9.	<p>$C = \frac{22}{7} \times 14$ or $C = \frac{1}{2} \times \frac{22}{7} \times 14 \times 2$</p> <p>= 44cm</p> <p>$P = 44 + 12 + 2(8^2 + 6^2)^{\frac{1}{2}}$</p> <p>= 76cm</p>	M1 M1 A1													
		3mks													
10	<p>1000 x 84.2084</p> <p>= 84208.3</p> <p>84208.3 - 40000</p> <p>= 44208.30</p> <p>$\frac{44,208}{135.1293}$</p> <p>= 327</p>	M1 M1 A1													
		3mks													
11	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;">Now</th> <th style="text-align: center;">1n 12yrs</th> </tr> </thead> <tbody> <tr> <td style="padding-left: 20px;">Katu</td> <td style="text-align: center;">x yrs</td> <td style="text-align: center;">x + 12</td> </tr> <tr> <td style="padding-left: 20px;">Son</td> <td style="text-align: center;">x/6yrs</td> <td style="text-align: center;">x/6 + 12</td> </tr> <tr> <td style="padding-left: 20px;">Daughter</td> <td style="text-align: center;">x/4 yrs</td> <td style="text-align: center;">x/4 + 12</td> </tr> </tbody> </table> <p>$(x/6 + 12) + (x/4 + 12) = (x + 12) - 9$</p> <p>$21 = x - x/6 - x/4$</p> <p>$21 = 7x$</p> <p style="padding-left: 20px;">12</p> <p>$7x = 252$</p> <p style="padding-left: 20px;">$x = 36$yrs</p> <p>Katu is 36yrs old now</p>		Now	1n 12yrs	Katu	x yrs	x + 12	Son	x/6yrs	x/6 + 12	Daughter	x/4 yrs	x/4 + 12	M1 M1 A1	
	Now	1n 12yrs													
Katu	x yrs	x + 12													
Son	x/6yrs	x/6 + 12													
Daughter	x/4 yrs	x/4 + 12													

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																			
13	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr> <td colspan="3" style="text-align: center;"><i>G.C.D for 840 and 396</i></td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px;">2</td> <td style="padding: 2px;">840</td> <td style="padding: 2px;">396</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px;">2</td> <td style="padding: 2px;">420</td> <td style="padding: 2px;">148</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px;">2</td> <td style="padding: 2px;">210</td> <td style="padding: 2px;">74</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px;"></td> <td style="padding: 2px;">105</td> <td style="padding: 2px;">37</td> </tr> <tr> <td colspan="3" style="padding: 2px;">$2 \times 2 \times 2 = 8m^2$</td> </tr> </table>	<i>G.C.D for 840 and 396</i>			2	840	396	2	420	148	2	210	74		105	37	$2 \times 2 \times 2 = 8m^2$			M1 M1 A1	
<i>G.C.D for 840 and 396</i>																					
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		3mks																			
14.	<p>Length of the perpendicular from A 6.0cm B1</p> 																				
15	<p>Let the number be xy $x + y = 11$ (i) $(10y + x) - (10x + y) = 9$ $9y - 9x = 9 \quad y - x = 1$ $x + (x + 1) = 11$ $2x = 10$ $x = 5 \quad y = 5 + 1 = 6$ The original no. 56</p>	M1 M1 M1																			
		A1																			
		4mks																			

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

		10mks	
19	<p>(a) (i) Capacity of the tank $= 2.4 \times 2.8 \times 3 \times 1000$ $= 20160L$ Amount = 20160 – 3600 $= 16560$ Litres</p> <p>(ii) Time taken to fill = $\frac{16560}{0.5}$ $\frac{16560}{0.58 \times 60 \times 60}$ $= 9\text{hr } 12\text{ min}$</p> <p>(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 $\frac{1/2}{3/8} = \frac{3}{2}$ $= 2 \times \frac{3}{3} = \frac{4}{3}$ hrs Total time = $1 + \frac{4}{3}$ $= 2\text{hrs } 20\text{ mins}$</p>	M1 A1 M1 A1 M1 M1 M1 A1	
		10mks	
20	<p>(a) Commission $\frac{2}{100} \times (500 \times 360)$ $= 3600$ Total pay 12000 + 3600 M1 Shs.15600</p> <p>(b) (i) $\frac{110}{100} \times 12000 = 13200$ $17600 - 13200$ $= 4400$ $\frac{2}{100} x = 4400$ $x = 4400 \times \frac{100}{2}$ $= 222000$</p> <p>(ii) $\frac{222000}{500}$ $= 440$ pairs</p>	M1 A1 M1 M1 M1 A1 M1 A1	
		10mks	
	<p>(a) Speed of car = $(x+20)$ km/h Speed of lorry = x km/h $\frac{280}{x} - \frac{280}{x+20} = \frac{11}{6}$ $280(x+20) = 280(x) = \frac{7}{6}(x+20x)$ $1680x + 33600 - 1680x = 7x^2 + 140x$ $7x^2 + 140x - 33600 = 0$</p>	M2 M1 M1	

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

