

KCSE MATHS PREDICTIONS FROM VARIOUS COUNTIES

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

121/1/2 - MATHEMATICS - Paper 1/2

COUNTY AND SUBCOUNTY PREDICTIONS

KIRINYAGA
121/1
MATHEMATICS
MOCKS KCSE PREDICTIONS
Paper 1
2½ hours

SECTION I (50 MARKS)

Answer ALL questions in this section

1. Without using a calculator or mathematical table, evaluate

$$\frac{0.27 \times 9}{\sqrt{29.16}}$$

(3 marks)

2. Find the possible values of x in the equation.

$$9^{x^2} = 27^{(2x+12)}$$

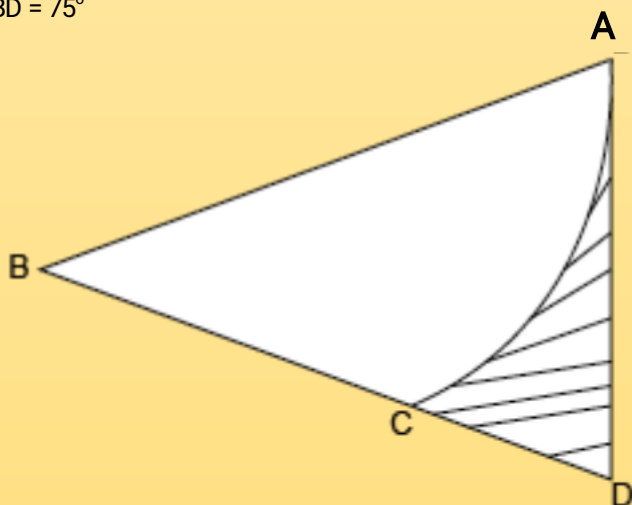
(3 marks)

3. Paint x cost Ksh 50 per litre while paint y cost Ksh 70 per litre. In what proportion must x be mixed with y to produce a mixture costing Ksh 58 per litre?

(3 marks)

4. Calculate the area of the shaded region given that AC is an arc of a circle centre B. Given that angle ABD = 75°

AB = BC = 14cm, CD = 8cm and
(3 marks)



5. A half the interior angles of an n sided irregular polygon measures 135° each. The remaining half measures 165° each. Find
6. Use square roots, reciprocal and square tables to evaluate to 4 significant figure.

$$(0.06458)^{\frac{1}{2}} + \left(\frac{2}{0.4327} \right)^2$$

(4 marks)

7. A straight line whose equation is $4y + 3x = 12$ cuts the x and y axis at P and Q. Calculate the co-ordinates of P and Q.

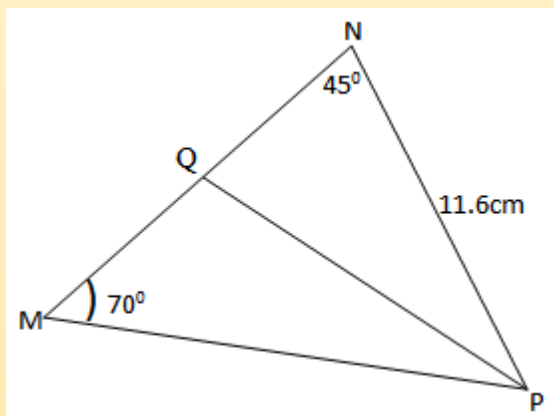
(3 marks)

8. Convert 154.50° into radian and write your answer in terms of π^c .

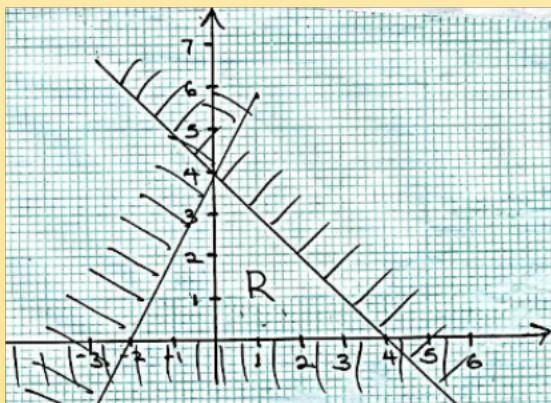
(2 marks)

9. In the figure below $NP = 11.6\text{cm}$, $\angle PMN = 70^\circ$ and $\angle PNQ = 45^\circ$.

(3 marks)



10. Write down the inequalities that define the unshaded region marked R in the figure below. (3 marks)



11. The length of a room is 4m longer than it's width. Find the length of the room if it's area is 32m^2 . (4 marks)
12. A Kenyan tourist left Germany for Kenya through Switzerland. While in Switzerland, he bought a watch worth 52 Deutsche marks. The exchange rate was as follows:
 1 Swiss Franc = 1.28 Deutsche Mark
 1 Swiss Franc = 45.21 Kenya Shillings
 Find the value of the watch in Kenya Shillings. (3 marks)
13. Two similar solid have surface area of 48cm^2 and 108cm^2 respectively. Find the volume of the smaller solid if the bigger one has a volume of 162cm^3 . (3 marks)
14. Give that $a = 2i + 3j - 5k$ and $b = i - 5j + 7k$. Evaluate $|2a + b|$ (3 marks)
15. A triangle with vertices A(1, 1) and B (1, 5) and C (4,5) is rotated half turn about the origin. Determine the co-ordinates of its image. (4 marks)
16. Mutune bought three pens and four exercise books for a total of Ksh 155 while Bingo bought two similar pens and five similar exercise books for a total of Ksh 150. Determine the cost of a pen and that of an exercise book. (3 marks)

SECTION II (50 MARKS)

Answer only five questions from this section in the spaces provided.

17. a) Find the equation of a straight line passing through the points (3, 2) and (-3, 6) giving your answer in the form $\frac{x}{a} + \frac{y}{b} = 1$ when a and b are constants. (4 marks)
- b) State the co-ordinates of A and B at which the line in (a) above cross the x – axis and y – axis respectively. (2 marks)
- c) Using the information in (a) and (b) above find the area of triangle AOB, where O is the origin. (2 marks)
- d) Find the acute angle the line in (a) above makes with the X axis. (2 marks)
18. The table below shows marks obtained by 100 candidates at East side high school in biology examination.

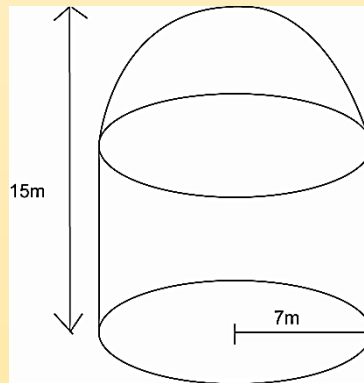
Marks	15-24	25-34	35-44	45-54	55-64	65-74	75-84	85-94
Frequency	6	14	24	14	x	10	6	4

- a) Determine the value of x.

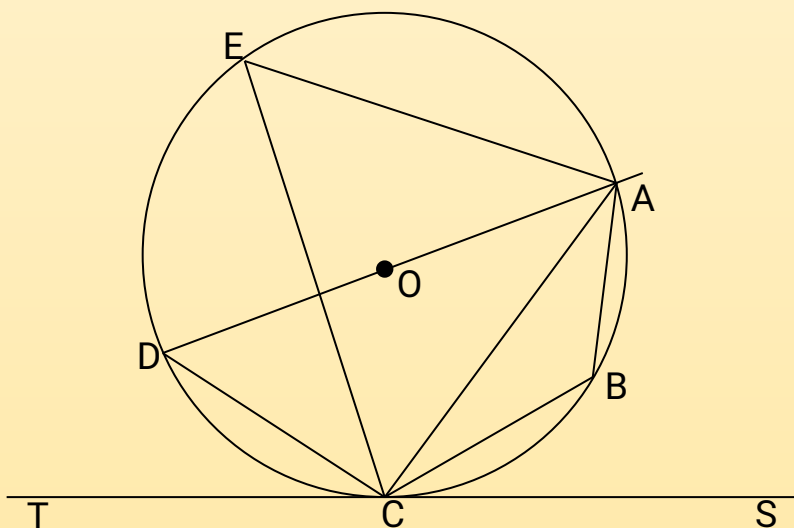
(2 marks)

- b) State the modal class (1 mark)
 c) Calculate the median mark (3 marks)
 d) Calculate the mean mark (4 marks)

19. A water tank is represented by the solid shown below which is a hemisphere on a cylinder. The base radius of the cylinder is 7m and the height of the tank is 15m (use $\pi = \frac{22}{7}$)



- a) Calculate the volume of the hemispherical part. (2 marks)
 b) Calculate the volume of the cylindrical part. (2 marks)
 c) Calculate the capacity of the tank. (4 marks)
 d) Calculate the total surface area excluding the base. (2 marks)
20. a) Given the matrix $A = \begin{pmatrix} 3 & 4 \\ 2 & 3 \end{pmatrix}$ find the inverse of A. (2 marks)
- b) Two universities, TECK and KCT purchased beans and rice. TECK bought 90 bags of beans and 120 bags of rice for a total of sh 360,000. KCT bought 200 bags of beans and 300 bags of rice for a total of sh 850,000. Use the matrix method to find the price of one bag of each item (5 marks)
- c) The price of beans later decreased in the ratio 4 : 5 while the price of rice increased by 20%.
 A businessman bought 20 bags of beans and 30 bags of rice. How much did he pay? (3 marks)
21. The boundaries PQ, QR, RS and SP of a ranch are straight such that: Q is 16km on bearing of 040° from P, R is directly south of Q and east of P and S is 12 km on a bearing 120° from R.
- a) Using a scale 1 cm represent 2km, show the above information in a scale drawing. (3 marks)
 b) From the scale drawing determine
 (i) the distance in kilometres of P from S. (2 marks)
 (ii) The bearing of P from S. (2 marks)
 c) Calculate the area of the ranch PQRS in square kilometres. (3 marks)
22. A number of nurses working at Kibera health centre decided to raise Sh. 144,000 to buy a plot of land. Each nurse was to contribute the same amount. Before the contribution were collected five of the nurses retired. This meant that the remaining nurses had to pay more to meet the target.
- a) If there were n nurses originally, find the expression of the increase in contribution per nurse. (3 marks)
 b) If the increase in the contribution per nurse was Sh. 2,400, find the number of nurses originally at the health centre. (3 marks)
 c) How much would each nurse have contributed if the 5 nurses had not retired? (2 marks)
 d) Find the percentage increase per nurse because of the retirement. (2 marks)
23. a) Use the trapezium rule to estimate the area under the curve $y = x^2 + x - 6$ over the interval $0 \leq x \leq 8$ using 8 trapezia. (4 marks)
 b) Find the exact area under the curve in (a) above. (4 marks)
 c) Find the percentage error in the estimated area in (a) above. (2 marks)
24. In the figure below, DA is a diameter of the circle ABCDE centre O. TCS is a tangent to the circle at C, $AB = BC$ and angle $DAC = 38^\circ$.



Giving reasons, determine the following angles.

- | | |
|-----------------|-----------|
| a) $\angle DCT$ | (2 marks) |
| b) $\angle DEA$ | (2 marks) |
| c) $\angle ACB$ | (2 marks) |
| d) $\angle BDC$ | (2 marks) |
| e) $\angle BOA$ | (2 marks) |

KIRINYAGA SCHOOL BASED FORM 4 EXAMINATION.

121/2

MATHEMATICS

MOCKS KCSE PREDICTIONS/.

Paper 2

2½ hours

SECTION I (50 MARKS)

Answer ALL questions in this section in the spaces provided.

1. Use logarithms to 4 decimal places to evaluate. (4 marks)

$$\left(\frac{0.7841 \times \sqrt{0.1356}}{\log 84.92} \right)^{\frac{1}{3}}$$

2. A train moving at 20m/s take 15 seconds to completely cross a bridge which is 30m long.

What is the length of train in m. (3 marks)

3. The width of a room is 8m less than length. Find the measurement of the room if the area is 48m². (3 marks)

4. Find the percentage error in the total length of four rods measuring 12.5cm, 24.5cm, 12.9cm and 10.1cm all the nearest 0.1cm. (3 marks)

5. Simplify the following surds leaving your answer in the form $a + b\sqrt{c}$

$$\frac{\sqrt{5}}{2\sqrt{2}-\sqrt{5}} + \frac{\sqrt{2}}{2\sqrt{2}+\sqrt{5}} \quad (3 \text{ marks})$$

6. Find the value of x given that

$$\log_2(x^2 - 2) - \log_2\left(\frac{1}{2}x + 5\right) - 1 = 0 \quad (3 \text{ marks})$$

7. The quantities P, Q and R are such that P varies directly as the square of Q inversely as the square root of R. When P = 24, Q = 2 and R = 9.

Determine

- i) the line connecting P, Q and R
 ii) the value of P when Q = 5 and R = 36.

(3 marks)

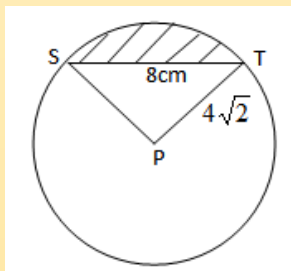
(1mk)

8. Make y the subject of the formula.

(3 marks)

$$V = \left(\frac{ax^2y}{w-y} \right)^{\frac{1}{2}}$$

9. The figure below shows a circle with centre P and radius $4\sqrt{2}$ cm. If the length of the chord ST is 8cm, show that the shaded area is $(8\pi - 16)\text{cm}^2$ (3 marks)



10. Expand $(1 + \frac{1}{4}x)^5$ upto the term in x^4 . Hence evaluate $(0.95)^5$ giving your answer correct to 4 S.F. (3 marks)

11. Mary and Jane working together can cultivate a piece of land in 6 days. Mary alone can complete the work in 15 days. After the two had worked for 4 days Mary withdrew the services. Find the time taken by Jane to complete the remaining work. (3 marks)

12. Determine the equation of the tangent to the curve $y = \frac{4x^3 + 4}{x^2}$ at the point $x = 2$. (3 marks)

13. The fifth term of an arithmetic progression is 11 and the twenty fifth term is 51.

Calculate the first term and the common difference of the progression.

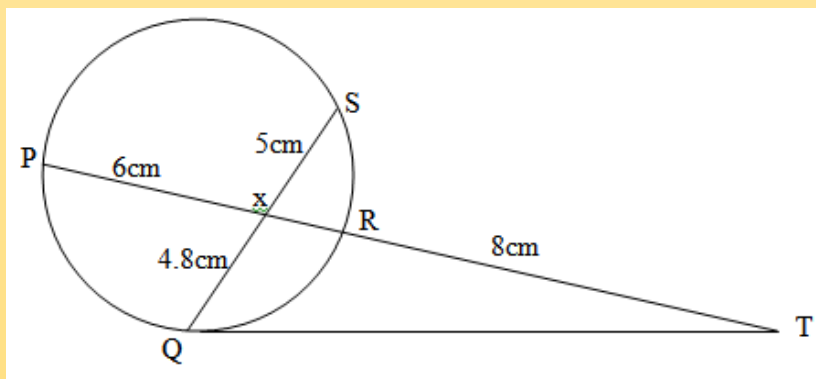
(3 marks)

14. The coordinates of the end points of the diameter of a circle are A(3, -2) and B(5, 1).

Find the equation of a circle in the form $ax^2 + by^2 + cx + dy + e = 0$

(3 marks)

15. In the figure below QT is a tangent to the circle at Q. PXRT and QXS are straight lines. PX = 6cm, RT = 8cm, QX = 4.8cm and XS = 5cm. (4 marks)



Find the length of QT

(3 marks)

16. Find in radians in the values of x in the interval $0^\circ \leq x \leq 2\pi^\circ$ for which $2\cos^2x - \sin x = 1$ (leaving your answer in terms of π) (4 marks)

SECTION II (50 MARKS)Answer only five questions from this section in the space provided.

17. Ken, Tom and Peter compete to hit the bull's eye in a game of dart. The probabilities of each hitting the bull's eye are Ken $\frac{2}{5}$, Tom $\frac{1}{4}$ and Peter $\frac{3}{7}$ respectively.

- a) Use the tree diagram to show the possible outcomes. (2 marks)

- b) Calculate the probability that:-

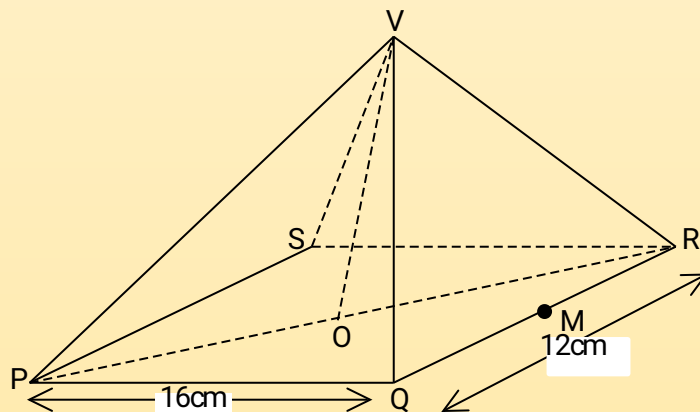
- i) All three hit the target. (2 marks)

- ii) Only one hits the target. (3 marks)

- iii) Two hit the target. (3 marks)

18. The figure below represents a right pyramid with vertex V and a rectangular base PQRS.

$VS = VP = VQ = VR = 18\text{ cm}$, $PQ = 16\text{ cm}$ and $QR = 12\text{ cm}$. M and O are the mid points of QR and PR respectively.



Determine:

- The length of the projection of line VP on the plane PQRS. (3 marks)
 - The size of the angle between line VP and the plane PQRS to 2 d.p. (3 marks)
 - The size of the angle between the planes VQR and PQRS (4 marks)
19. At the beginning of the year 2004, Kamau bought two houses, one in Thika and the other in Nairobi, each at Kshs 3,750,000. The value of the house in Thika appreciated at the rate of 12% p.a.
- Calculate the value of the house in Thika after 9 years to the nearest shillings. (2 marks)
 - After n years, the value of the house in Thika was Ksh 8,290,055 while the value of the house in Nairobi was Ksh 8,822,271.
 - Find n (4 marks)
 - Find the annual rate of appreciation of the house in Nairobi. (4 marks)
20. a) Complete the table below for the function $y = 2 \sin x$ and $y = 3 \sin(x + 30^\circ)$ for the $-180^\circ \leq x \leq 180^\circ$ to 2 d.p. (2mks)

x	-180°		-150	-120	-90	-60	-30	0	30	60	90	120	150	180
$y = 2 \sin x$	0.00			-1.73				0.00			2.00			0.00
$y = 3 \sin(x + 30^\circ)$			-2.60				0.00					1.50		

- on the same axis draw the graphs of $y = 2 \sin x$ and $y = 3 \sin(x + 30^\circ)$ for $-180^\circ < x \leq 180^\circ$. (4 marks)
 - From the graph determine the period and amplitude of the graph $y = 3 \sin(x + 30^\circ)$. (2 marks)
 - Use your graph to solve the equation $2 \sin x = 3 \sin(x + 30^\circ)$. (2 marks)
21. A plane S flies from a point P (40°N , 45°W) to a point Q (35°N , 45°W) and then onto a point T (35°N , 135°E).
- Given that the radius of the earth is 6370km find the distance from P to Q in Km. (2 marks)
 - Find in nm
 - the shortest distance between Q and T. (2 marks)
 - the longest distance between Q and T (to the nearest tens) (2 marks)
 - Find the difference in time taken when S flies along the shortest and longest routes if its speed is 420 knots (4 marks)
22. The table below shows the distribution of marks scored by 60 students in a test.

Marks	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90
Frequency	2	5	6	10	14	11	9	3

- On the grid provided draw a cumulative frequency curve of the data. (3 marks)
(Take 1 cm to represent 5 students on the vertical scale and 1 cm to represent 10 marks on the horizontal scale).
 - From the curve in (a) above
 - estimate the median mark (1 mark)
 - Determine the quartile deviation. (2 marks)
 - Determine the 10th and 90th percentile range. (2 marks)
 - It is given that students who score over 45 marks pass the test. Use your graph in (a) above to estimate the percentage of students that pass. (2 marks)
23. The diagram shows a triangle OPQ in which M and N are points on OQ and PQ respectively such that $OM = \frac{2}{3} OQ$ and $PN = \frac{1}{4} PQ$.

Lines PM and ON meet at X.

P

a) Given that $\vec{OP} = p$ and $\vec{OQ} = q$. Express in terms of p and q the vectors.

i) $\vec{PQ}$ (1 mark)

ii) $\vec{PM}$ (1 mark)

iii) $\vec{ON}$ (2 marks)

b) You are further given that $\vec{OX} = k\vec{ON}$ and $\vec{PX} = h\vec{PM}$

i) Express $\vec{OX}$ in two different ways. (2 marks)

ii) Find the value of h and k . (3 marks)

iii) Find the ratio $PX : XM$ (1 mark)

24. A particle moves along a straight line such that its displacement S metres from a given point is $S = t^3 - 6t^2 + 9t + 3$ where t is the time in seconds. Find:-

a) The displacement of the particle at $t = 3$ s. (2 marks)

b) The velocity of the particle where $t = 4$ s (3 marks)

c) The value of t where the particle is momentarily at rest. (3 marks)

d) The acceleration of the particle when $t = 4$ s. (2 marks)

CEKENAS

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FORM FOUR

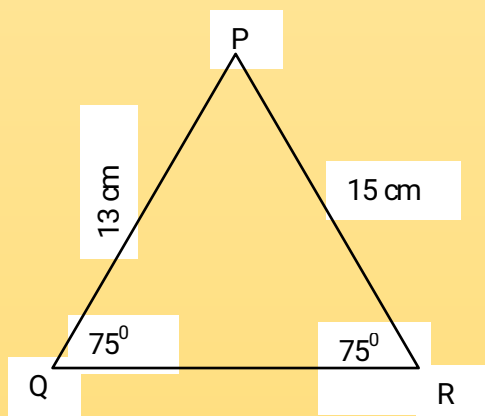
MATHEMATICS PAPER 1

. MOCKS KCSE PREDICTIONS/ . .

TIME: 2½ HOURS

SECTION 1

- Evaluate
$$\frac{(\frac{1}{4} - \frac{3}{8}) \div 3^{\frac{1}{2}} + 1^{\frac{5}{6}}}{\frac{3}{7} \text{ of } 3^{\frac{2}{3}} - 3^{\frac{4}{7}} - (\frac{5}{4})}$$
 (3 mks)
- Three angles of a polygon are 125, 140 and 160. The remaining angles are 145° each. Calculate the sum of the interior angles of the polygon (3 mks)
- A dealer has two types of grades of tea A and B. Grade A costs Ksh. 140 per kg. grade B costs Ksh. 160 per kg. If the mixture is sold at Ksh. 180 per kg and the dealer makes a profit of 20%. Find the ratio in which the two grades should be mixed (3 mks)
- Evaluate
$$\frac{(\frac{1}{125})^{\frac{2}{3}} \times (\frac{16}{25})^{-\frac{1}{2}}}{32^{-\frac{3}{5}}}$$
 (4 mks)
- List all the integral values of X which satisfy the inequality
$$\frac{4+x}{-3} > 3x+2 > -13$$
 (3 mks)
- The equation of line L₁, is 10y = 4x – 20. Line L₁ intersects another line L₂ perpendicularly at the point P (10, 2). Find the coordinates of point M where L₂ intersects with line x = 12 (3 mks)
- Use tables of square roots and reciprocals to evaluate
$$\sqrt{\frac{10}{0.625}} + \frac{4}{\sqrt{164}}$$
 (3 mks)
- In the triangle PQR below PQ = 13cm, PR = 15cm and ∠PQR = 75°



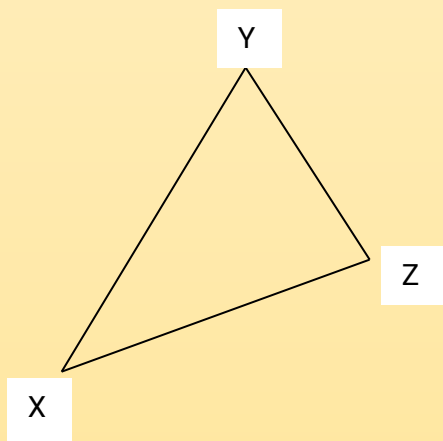
- Calculate correct to 3 significant figures the area of the triangle PQR (3 mks)
- A sector of a circle of radius 42cm subtends an angle of 120° at the centre of the circle. The sector is folded into an inverted right cone. Calculate:-
 - The base radius of the cone (3 mks)
 - To one decimal place the vertical height of the cone (1 mk)
- Simplify the expression:
$$\frac{x-3}{x+3} - \frac{x^2-3x}{x^2-9}$$
 (3 mks)
- Murimi bought 50 physics text books and 60 mathematics text books for a total of Ksh. 85,500. Had Murimi bought half number of physics text books and one and a half times the number of mathematics text books he would have paid Ksh. 5250 more.
 - Form 2 equations to represent the above information (1 mk)
 - Use matrix method to find the price of a physics book and a mathematics text books (3 mks)

12. A commercial bank buys and sells foreign currencies at the rate shown below.

	Buying	Selling
100 Japanese yen	84.0	84.2
1 Us dollar	88.6	88.7

A tourist went to Kenya with 500,000 yen. He changed the money to Ksh. In a bank which charged a commission of 5%. He spent $\frac{3}{4}$ of the money and converted the rest to Us dollars when leaving the country. How much money to the nearest dollars did he go back with? (3 mks)

13. XYZ is a triangle. Draw the locus of a point M such that $\angle XYZ$ is equal to angle $\angle XMZ$ and Y must lie on the locus of M (3 mks)



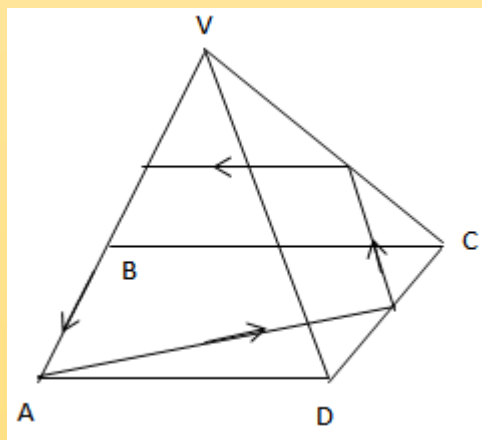
14. A point P has the coordinates (1, 2, 3) if $PQ = 5i + j + 2k$, find:-

- (a) The coordinates of point Q
(b) The modulus of PQ

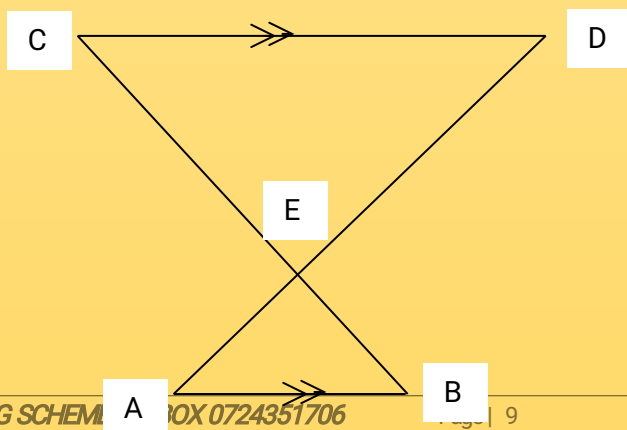
(2 mks)

(1 mk)

15. The figure below represents a right pyramid. A string is fixed at A, then passes through mid points of edges DC, VC, VB and finally at A. Given that the dimension of the base is a square of side 5cm and $VA = VB = VC = VD = 6$ cm Draw the net representing the right pyramid (3 mks)



16. In the figure below AB is parallel to CD, BC and AD intersect at E. Given $DE:EA = 5:1$ and $BC = 12$ cm. Calculate the length of EC (3 mks)



SECTION II**(Answer only five questions in this section)**

17. Three partners Mutua, Muthoka and Mwikai contributed Sh. 600,000, Sh. 400,000 and Sh. 800,000 respectively to start a business of a matatu plying Mbumbuni – Machakos route. The matatu carries 14 passengers with each paying Ksh. 250. The matatu makes two rounds trips each day, Sh. 6000 is used to cover running costs and wages.

- (a) Calculate their net profit per day (2 mks)
- (b) The matatu works for 25 days per month and service every month at a cost of Ksh. 10,000. Calculate their monthly profit in June (1 mk)
- (c) The three partners agreed to save 40% of the 24% to be shared in the ratio of their contribution. Calculate Muthoka's share in month of . MOCKS KCSE PREDICTIONS (4 mks)
- (d) The matatu developed a mechanical problem and they decided to sell through agent who charged a commission of 5% on selling price. Each partner received 475,000, from the agent after he had taken commission. Determine the price at which the agent sold the matatu (3 mks)

18. (a) Complete the table below for the equation $y = x^2 - 6x + 5$

X	0	1	2	3	4	5	6
X^2	0		4	9		25	
$-6x$	0						-36
5	5	-6			-24		
Y	5					0	

(2 mks)

- (b) Draw the graph of $y = x^2 - 6x + 5$ using values in the table (3 mks)

- (c) Use the graph to solve the equation

(i) $x^2 - 6x + 5 = 0$

(1 mk)

(ii) $x^2 = 6x - 7$

(2 mks)

(iii) $x^2 - 6.5x + 5 = 0$

(2 mks)

19. Four towns A, B, C and D are situated such that town A is 40km from B on a bearing of 310° . C is 60km from B on a bearing of 570° E. Another town D is 50km from A on a bearing of $N70^\circ$ E.

- (a) Using a scale of 1cm to represent 10km, show the relative position of the towns (4 mks)

- (b) From your scale drawing determine:

- (i) Bearing and distance of D from C (2 mks)

- (ii) Bearing and distance of B from D (2 mks)

- (iii) Bearing and distance of A from C (2 mks)

20. A matatu left town K at 7.00a.m and travelled towards town M at an average speed of 60km/hr. A car left town M at 9.00a.m and travelled towards K at an average speed of 50km/hr. The distance between the two towns is 324km. Find:-

- (a) The time each vehicle arrived at their destination

- (i) Matatu (2 mks)

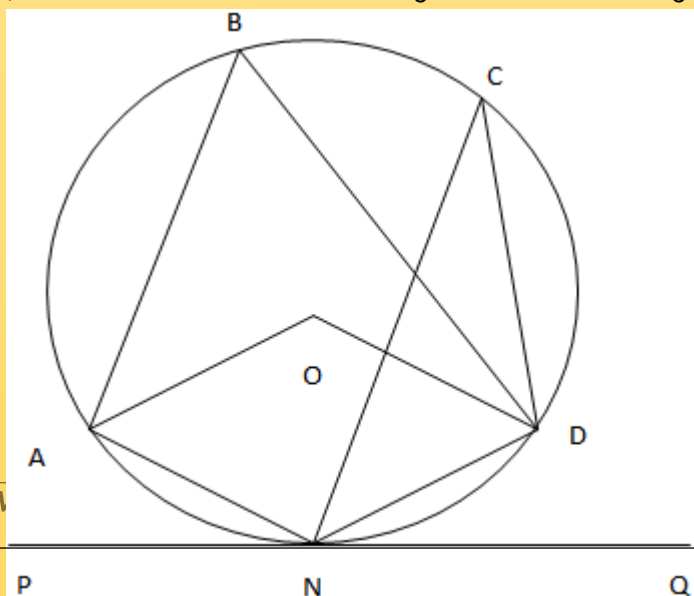
- (ii) Car (2 mks)

- (b) (i) The distance the matatu covered before the car started to move from town M to town K (1 mk)

- (ii) The time the two vehicles met on the way (3 mks)

- (iii) How far the car was from town K when they met (2 mks)

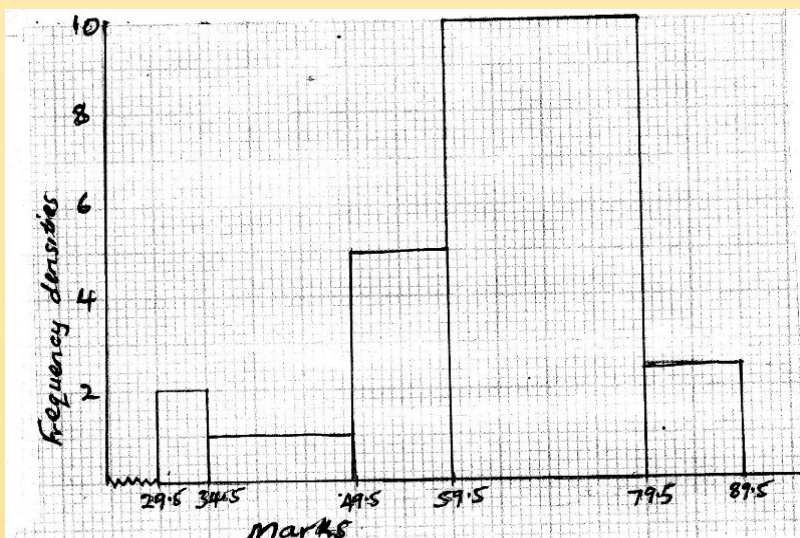
21. In the figure below, O is the centre of the circle. PQ is a tangent to the circle at N. Angle NCD is 10° and angle ANP is 30°



Giving reasons find

- (a) Angle DON (2 mks)
- (b) Angle DNQ (2 mks)
- (c) Angle DBA (2 mks)
- (d) Angle ONA (2 mks)
- (e) Angle ODN (2 mks)

22. The histogram below represents the distribution of marks obtained in a test. The frequency of the second class is 3.



- (a) Complete the table below (3 mks)

Marks		35 – 49			
Frequency		3			

- (b) Use the table in (a) above to find

- (i) The mean mark (4 mks)
- (ii) Median mark (3 mks)

23. A metal sphere has a radius of 5cm and density of 2.4g/cm^3

- (a) Calculate the mass of the ball in kg (3 mks)
- (b) The ball is dropped into cylindrical container which is partly filled with water. The ball is fully submerged and the cylinder has a radius base of 8cm. Calculate the change in water level (3 mks)
- (c) The sphere is melted down to form a metal cylinder of base radius of 5cm. Calculate the height of the cylinder formed (3 mks)

24. The displacement S metres of a moving particle after t seconds is given by

$$S = 2t^3 - 5t^2 + 4t + 2$$

Determine:-

- (a) The velocity of the particle when $t = 2$ (3 mks)
- (b) The value(s) of t when the particle is momentarily at rest (3 mks)
- (c) The displacement when the particle is momentarily at rest (2 mks)
- (d) The acceleration of the particle when $t = 5$ (2 mks)

CEKENAS

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FORM FOUR

MATHEMATICS PAPER 2

MOCKS KCSE PREDICTIONS/ . .

TIME: 2½ HOURS

SECTION I (50 MARKS)**Answer all questions in this section**

1. Use logarithms to 4 decimal place to evaluate

$$\left(\frac{0.7841 \times \sqrt{0.1356}}{\log 84.92} \right)^{1/3}$$

(4 mks)

2. The top of a table is a regular pentagon. Each side of the pentagon measures 40.0cm. Find the maximum percentage error in calculating the perimeter of the top of the table (3 mks)
3. Without using a calculator or mathematical tables, Simply completely leaving your answer in form, $a + b\sqrt{c}$

$$\frac{1 - \cos 60^\circ}{1 + \tan 30^\circ}$$

(3 mks)

4. Use the trapezium rule with seven ordinates to find the area bounded by the curve

$$Y = x^2 + 1, \quad \text{lines } x = -2, x = 4 \text{ and } x - \text{axis}$$

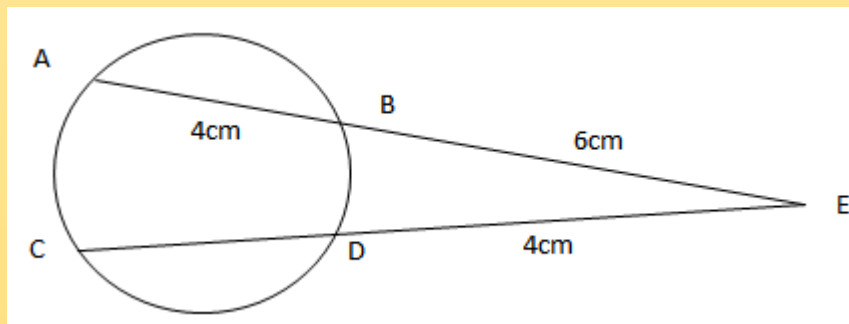
(3 mks)

5. Given that $x = \sqrt[3]{\frac{p}{2u+p}}$ make P the subject of the formula

$$x = \sqrt[3]{\frac{p}{2u+p}}$$

(3 mks)

6. The figure below shows a circle with secants ABE and CDE, it AB = 4cm and BE = 6cm and DE = 4cm, Find the length of CD (2 mks)



7. A curve passes through the point (1, -2). Given that $\frac{dy}{dx} = 3x^2 - 4x + 1$, Find the equation of the curve (3 mks)
8. Water flows from a pipe at the speed of 250litres per minute. If the pipe is used to drain a tank full of water measuring 3.2m by 2.5m by 2m. How many minutes would it take to drain the tank completely (3 mks)
9. The data below shows the age of 10 students picked at random in a secondary school, 6, 11, 13, 14, 8, 7, 12, 20, P and 9. If $\sum f x^2 = 1360$. Determine the value of P hence find the standard deviation to 3 d.p (3 mks)
10. Solve for x in the equation $2 \sin^2 x - 1 = \cos^2 x + \sin x$ for $0^\circ \leq x \leq 360$ (4 mks)
11. Solve for x in $3 \log_3 x + 4 = \log_3 24$ (3 mks)
12. The resistance to the motion of a car is partly varies as the square of the speed. At 40km/h the resistance is 530N and at 60km/h it is 730N. What will be the resistance at 70km/h (4 mks)
13. In a transformation, an object with area 4cm^2 is mapped onto an image whose area is 48cm^2 by a transformation matrix $\begin{pmatrix} y+1 & y \\ 4 & 2 \end{pmatrix}$ (3 mks)

Find the value of y

14. Margaret and Otieno had a hall each. The capacity of each hall was 1920 people. When filled completely Margaret would have equal

number of people in x rows of seats while Otieno would have equal number of people in $x + 4$ rows of seats. The number of people in each row in Margaret hall is 2 more than the number of people in each row in Otieno hall. Calculate the number of people per row in Otieno's hall. (4 mks)

15. Write an equation of a circle that has a diameter whose end points are (2, 7) and (-6, 15) in the form $x^2 + y^2 + ax + by + c = 0$ where a , b and c are integers (3 mks)

16. (a) Expand $(1 + \frac{1}{4}x)^7$ upto the terms in x^4 (1 mk)

- (c) Use the expansion above to estimate the value $(0.975)^7$ correct to 4 significant figures (2 mks)

SECTION 2 (50 MKS)

Attempt only five questions in this section

17. The Hire purchase (H.P) price of a public address system was Ksh. 276,000. A deposit of Ksh. 60,000 was paid followed by 18 equal monthly installments. The cash price of the public system was 10% less than the H.P price.

- (a) Calculate

- (i) The monthly installments (2 mks)

- (ii) The cash price (2 mks)

- (b) A customer decided to buy the system in cash and was allowed a 5% discount on the cash price. He took a bank loan to buy the system in cash. The bank charged compound interest on the loan at the rate of 20% p.a. The loan was repaid in 2 years. Calculate the amount repaid to the bank by the end of the second year. (3 mks)

- (c) Express as a percentage of the hire purchase price, the difference between the amounts repaid to the bank and the hire purchase price. (3 mks)

18. (a) Complete the table below for graphs of $Y = \sin x$ and $Y = 2 \sin(x + 30)$

x	0	30	60	90	120	150	180	210	240	270	300	330	360
Sin x	0		0.87			0.5			-0.87			-0.5	
$2\sin(x+30)$	1	0.5		1.74		0	-1				-1		

- (b) On the grid provided draw the graphs of $Y = \sin x$ and $Y = 2 \sin(x+30)$ for $0 \leq x \leq 360^\circ$ (4 mks)

- (c) State the transformation that maps $Y = \sin x$ onto $Y = 2 \sin(x + 30)$ (2 mks)

- (d) Find the values of x which satisfy the equation $\sin x - 2 \sin(x + 30) = 0$ (2 mks)

19. (a) An arithmetic progression is such that the first term is -5, the last is 135 and the sum of the progression is 975.

Calculate

- (i) The number of terms in the series (4 mks)

- (ii) The common difference of the progression (2 mks)

- (b) The sum of the first three terms of a geometric progression is 27 and first term is 36. Determine the common ratio and the value of the fourth term (4 mks)

20. A boat P leaves port A(45°N , 50°W) and sails at an average speed of 10 knots. It sails due east along a parallel of Latitude to B(45°N , 42°W) and then sails due north to C(48°N , 42°W). Another boat Q leaves D(55°N , 10°W) at the same time as P leaves A. it sails due west and then due South to meet boat P and C.

- (a) How long does it take boat P to reach point C? (4 mks)

- (b) If boat Q sails at the same speed as boat P. How long does the former take to reach point C (4 mks)

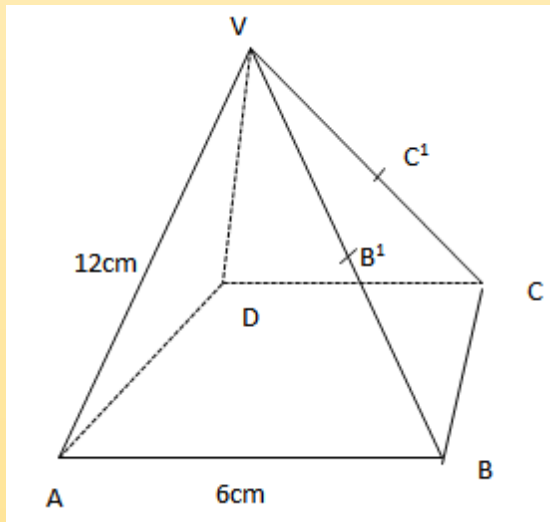
- (c) At what speed would boat Q have sailed to reach point C at the same time as boat P (2 mks)

21. The probability that our school will host soccer and rugby tournament this year is 0.8. If we host, the probability of winning soccer is 0.7. If we don't host the probability of winning soccer is 0.4. If we win soccer the probability of winning rugby is 0.8, otherwise if we lose the probability of winning rugby is 0.3.

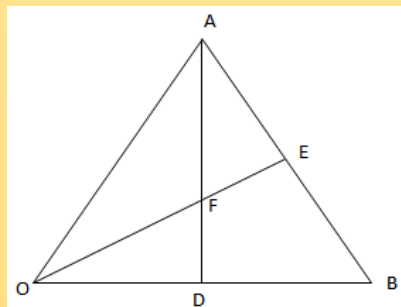
- (a) Draw a tree diagram to represent this information. (2 mks)
- (b) Use the tree diagram to find:-
- (i) The probability that we lose both games (2 mks)
- (ii) The probability that we will win only one game (3 mks)
- (iii) The probability that we will host and lose both games (2 mks)
- (iv) The probability that we win at least one game, if we host (1 mks)

22. The figure below shows a right pyramid VABCD with a square base of side 6cm

$$VA = VB = VC = VD = 12\text{cm}$$



- (a) Calculate:-
- (i) The height of the pyramid correct to 2 d.p. (3 mks)
- (ii) The angle between the planes VAD and VBC correct to 2 significant figures (3 mks)
- (b) B' and C' are points on VB and VC respectively such that $VB':VB = VC':VC = 1:3$
Calculate the angle between plane ABCD and $AB'C'D$ (4 mks)
23. In the figure below, E is the mid-point of AB. $OD:DB = 2:3$ and F is the point of intersection of OE and AD



- (a) Given that $OA = a$ and $OB = b$ express in terms of a and b
- (i) OE (1 mark)
- (ii) AD (1 mark)
- (b) Given further that $AF = t AD$ and $OF = s OE$ where s and t are scalars,
Find the values of s and t (5 mks)
- (c) Show that O, F and E are collinear (3 mks)
24. A relief organization has to transport at least 80 people and at least 18 tonnes of supplies to site. There are two types of vehicle available, type A and type B. Type A can carry 900kg of supplies and 6 people while type B can carry 1350kg of supplies and 5 people. There at most 12 vehicles of each type available. By taking x to represent the number of vehicles of type A and y to represent the number of vehicles of type B.
- (a) Write down all the inequalities to represent the above information (4 mks)
- (b) On the grid provided draw all inequalities in (a) above (4 mks)
- (c) Use the graph in (b) above to determine the least number of vehicle required at the site (2 mks)

IGEMBE

Paper 1

. MOCKS KCSE PREDICTIONS .

Time: 2½ Hours

ICSSE FORM FOUR TRIAL EXAM . MOCKS KCSE PREDICTIONS .

SECTION A:

1. Evaluate:

$$\frac{\sqrt{\frac{1}{4} \text{ of } \frac{7}{2} + \frac{3}{2} \left(\frac{5}{2} - \frac{2}{3} \right)}}{\frac{3}{4} \text{ of } 2 \frac{1}{2} \div \frac{1}{4}}$$

(3 marks)

2. Solve the equation:

$$\frac{x+1}{2} - \frac{3}{x} = \frac{x-2}{5}$$

(4 marks)

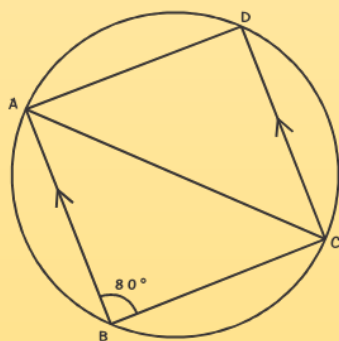
3. 40 women can do a piece of work in 60 days working 9 hours a day. How many more women should be added in order to do the same work in 48 days working 10 hours a day. (2 marks)

4. If $\tan x = \frac{1}{\sqrt{3}}$ Find without using tables or calculators, $\sin(90^\circ - x) + \cos(90^\circ - x)$. Leave your

answer in surd and simplest form. (3 marks)

5. A regular polygon has the sum of all its interior angles as 1260° . Find the size of each exterior angle of the polygon. (3 marks)

6. In the figure below ABCD is a cyclic quadrilateral in which AD = DC and AB is parallel to CD.



Given that angle ABC = 80° , find the size of :

a) $\angle DAC$

(1 mark)

b) $\angle BAC$

(1 mark)

c) $\angle BCD$

(1 mark)

7. A line is drawn through point (2, 1) perpendicular to line $x + 2y = 4$. Find the equation of the line. (3 marks)

8. Find the value of x if:

$$3^{2x+3} + 1 = 28$$

(3 marks)

9. Given that $a = 2i - 3j + 2k$, $b = 3i - 4j - k$ and $c = i + 3k$ and $R = 3a - b + c$. Find the magnitude of R correct to 3 significant figures. (4 marks)

10. The area of a rectangle is 24cm^2 , if its length is 5cm longer than its width, find its length of the rectangle. (4 marks)

11. Find the greatest number which when divided by 247, 367 and 607 leaves a remainder of 7 in each case. (3 marks)

12. Find the integral values that satisfy the inequalities.

$$4x - 9 < 6 + x \text{ and } 8 - 3x < x$$

(3 marks)

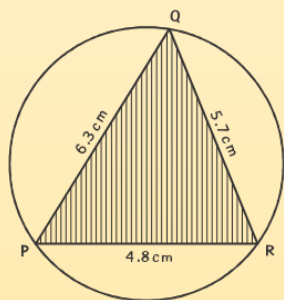
13. The cost of 3 pairs of trousers and 3 shirts is sh.2400. The cost of two pairs of trousers and 3 shirts is 1975. Find the cost of one pair of trousers and 4 shirts. (3 marks)

14. The currency exchange rates at a given bank in Kenya are as follows.

Currency	Buying	Selling
1 Sterling pound	135.50	135.97
1 US dollar	72.23	72.65

A tourist arrived in Kenya with 5000 US dollars which he converted to Kenya shillings upon arrival. He spent Ksh.214, 500 and converted the remaining to Sterling pounds. How many pounds did he receive? (2marks)

15. The circle below whose area is 18.05cm^2 circumscribes a triangle PQR, where $PQ = 6.3\text{cm}$, $QR = 5.7\text{cm}$ and $PR = 4.8\text{cm}$



Find the area of the unshaded part.

(4 marks)

16. A point T divides line AB internally in the ratio 5: 2. Given that A (-4, 10) and B is (10, 3) find the coordinate of T.

(3 marks)

SECTION B :

17. A group of people planned to contribute sh.2000,000 to start a business. However before the contributions were made 40 members pulled out. As a result each of the remaining members were to contribute sh.2500 more.

- Find the original number of members in the group. (3 marks)
- After each member contributing half the expected amount of money the members opted to get a bank loan that would offset $\frac{1}{4}$ of the remaining amount. How much would each member contribute after the bank loan. (4 marks)
- Twenty new members joined the group just before the business started. As a result the old members were to be refunded some money. How much was the refund. (3 marks)

18. The table below shows grouped marks obtained by 100 candidates and frequencies for all groups.

- a) Use the information to draw an ogive curve. (6 marks)

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	13	20	25	10	8	4	2

- b) Use your graph to estimate the :

- median of the data (1 mark)
- upper quartile (1 mark)
- lower quartile (1 mark)
- 80th percentile (1 mark)

19. A straight line passes through the points (8, -2) and (4, -4)

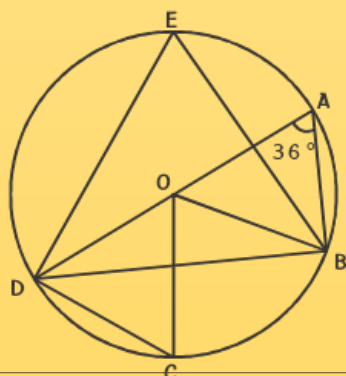
- Write its equation in the form $ax + by + c = 0$ where a, b and c are integers. (3 marks)
- If the line in (a) above cuts the x-axis at point P, determine the coordinates of P. (2 marks)
- Another line which is perpendicular to the line in (a) above passes through point P and cuts the y-axis at the point Q. Determine the coordinates of point Q. (3 marks)
- Find the length of QP. (2 marks)

20. a) Complete the table below for $y = \sin 2x$ and $y = \sin (2x + 30)$ giving your answer to 2d.p. (2 marks)

	0	15	30	45	60	75	90	105	120	135	150	165	180
$\sin 2x$	0				0.87				-0.87				0
$\sin (2x + 30)$	0.5				0.5				-1				0.5

- Draw the graphs of $y = \sin 2x$ and $y = \sin (2x + 30)$ on the axis. (4 marks)
- Use your graph to solve $\sin (2x + 30) - \sin 2x = 0$. (1 mark)
- Determine the transformation which maps $\sin 2x$ onto $\sin (2x + 30)$ (1 mark)
- State the period and the amplitude of $y = \sin (2x + 30)$ (2 marks)

21. In the figure below DA is the diameter of a circle. ABCDE centre O. $AB = BC$ and angle DAB = 36° .

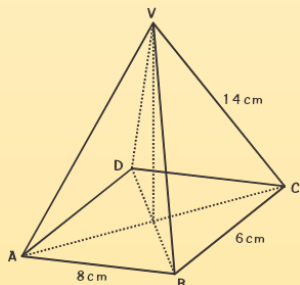


a) Giving reasons find the size of angle :

- i) CDB
- ii) DBC
- iii) DOC
- iv) OCA
- v) DEB

(2 marks)
(2 marks)
(2 marks)
(2 marks)
(2 marks)

22. The figure below is right pyramid whose slanting edge is 14cm, AB is 8cm and BC = 6cm.

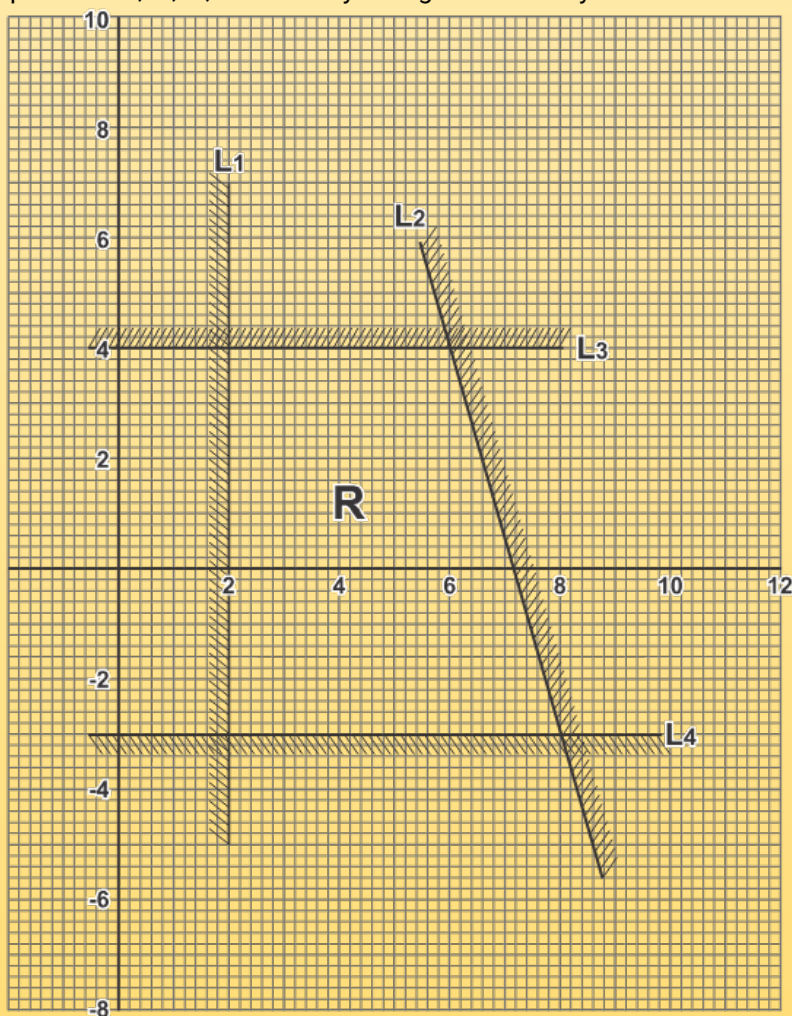


- a) Find the surface area of the pyramid.
- b) Find the volume of the pyramid.

(6 marks)
(4 marks)

23. a) Write down the inequalities of L_1 , L_2 , L_3 , L_4 that satisfy the region indicated by letter R.

(8 marks)



- b) Find the area of the unshaded region labelled letter R. (2 marks)

24. A particle moves along a straight line such that its displacement s metres from a given point is $s = t^3 - 5t^2 + 3t + 4$ where t is time in seconds.

Find :

- a) the displacement of the particle at $t = 5$
- b) the velocity of the particle when $t = 5$
- c) the value of t when the particle is momentarily at rest
- d) the acceleration of the particle when $t = 2$

(2 marks)
(3 marks)
(3 marks)
(2 marks)

IGEMBE

Paper 2

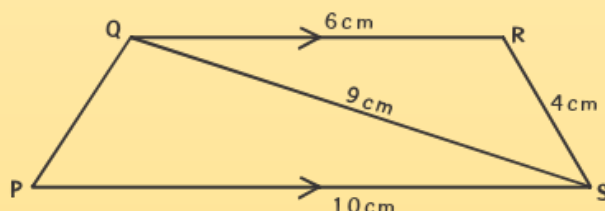
. MOCKS KCSE PREDICTIONS .

Time: 2½ Hours

ICSSE FORM FOUR TRIAL EXAM . MOCKS KCSE PREDICTIONS .

SECTION I : (50 MARKS)

- Solve the equation:
 $\log 3(x+3) = 3 \log 3 + 2$ (3 marks)
- Make n the subject of the formula $E = \left(\frac{n(n-x)}{n-1} \right)^{1/2}$ (3 marks)
- A translation maps point $A(6, 4)$ onto $A'(10, 8)$
 - Determine the translation vector. (1 mark)
 - A point B' is the image of $B(4, 10)$ under the same translation. Find the length $A'B'$ leaving your answer in surd form. (2 marks)
- The points $(5, 5)$ and $(-3, -1)$ are ends of a diameter of a circle centre A . Determine :
 - the coordinates of A . (1 mark)
 - The equation of a circle expressing it in form $x^2 + y^2 + ax + by + c = 0$ (2 marks)
- Without using a set square or a protractor construct :
 - Triangle ABC such that $AB = 8\text{cm}$, $BC = 6\text{cm}$ and $\angle ABC = 30^\circ$ (2 marks)
 - Measure the length AC . (1 mark)
 - Draw a circle that touches sides AB , BC and AC . (1 mark)
- In the figure below PQRS is a trapezium with QR parallel to PS. $QR = 6\text{cm}$, $RS = 4\text{cm}$, $QS = 9\text{cm}$ and $PS = 10\text{cm}$



Calculate :

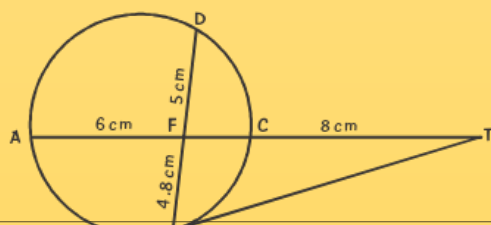
- the size of angle SQR (2 marks)
 - the area of triangle PQS (1 mark)
- The grades A, B and C of rice were mixed in the ratio 3: 4: 5. The cost per kg of each of the grades A, B and C were Ksh.120, Ksh.90 and Ksh.60 respectively. Calculate:
 - the cost of one kg of the mixture. (2 marks)
 - the selling price of 5kg of the mixture was sold at 8% profit. (2 marks)
 - Expand $(1 + 2x)^8$ in ascending power of x up to including the term x^3 . (1 mark)
 - Hence evaluate $(1.02)^8$ to 3 decimal places. (2 marks)
 - Express in surd form and simplify by rationalizing the denominator. (3 marks)

$$\frac{1 + \cos 30^\circ}{1 - \sin 60^\circ}$$

- P and Q are two matrices. If $P = \begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix}$ find Q given that $P^2 = (P + Q)$ (3 marks)

- Factorize $a^2 - b^2$.
 Hence find the exact value of $2557^2 - 2547^2$ (2 marks)

- In the figure below BT is a tangent to the circle at B . $AFCT$ and BFD are straight lines. $AF = 6\text{cm}$, $CT = 8\text{cm}$, $BF = 4.8\text{cm}$ and $FD = 5\text{cm}$



Find the length of :

- a) FC (2 marks)
b) BT (1 mark)

13. A bank charges compound interest on money borrowed. A business man borrowed Ksh.16000 from the bank. He paid back Ksh.25000 after 2 years. Find the interest rate per annum. (3 marks)
14. Solve for x in the equation
 $\log(5x + 75) - 2 \log 3 = \log(2x - 9)$ (3 marks)
15. Use the mid-ordinate rule with six strips to find the area bounded by curve $y = x^2 + 1$, the lines $x = -4$, $x = 8$ and the x-axis. (3 marks)
16. A train moving at an average speed of 72km/h takes 15 seconds to completely cross a bridge that is 80 metres long.
a) Express 72km/h in metres per second. (1 mark)
b) Find the length of the train in metres. (2 marks)

SECTION II:

17. The following table shows the rate at which income tax was charged during a certain year.

Monthly taxable income in Ksh.	Tax rate %
0 - 9860	10
9861 - 19720	15
19721 - 29580	20
29581 - 39440	25
39441 - 49300	30
49301 - 59160	35
over 59160	40

A civil servant earns a basic salary of Ksh.35750 and a monthly house allowance of sh.12500. The civil servant is entitled to a personal relief of sh.1062 per month. Calculate:

- a) taxable income (2 marks)
b) calculate his net monthly tax (5 marks)
c) Apart from the salary the following deduction are also made from his monthly income.

WCPS at 2% of the basic salary
Loan repayment Ksh.1325
NHIF sh.480

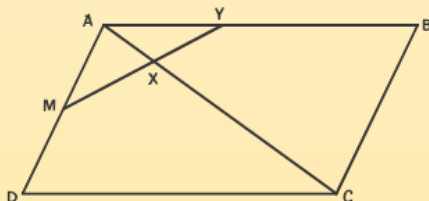
Calculate his net monthly earning. (3 marks)

18. The product of the first three terms of a geometric progression is 64. If the first term is a and the common ratio is r.
a) Express r in terms of a. (3 marks)
b) Given that the sum of the three terms is 14. Find the values of a and r and hence write down two possible sequences each up to the 4th term. (7 marks)
19. A quadrilateral ABCD has vertices A (4, -4), B(2, -4), C(6, -6) and D(4, -2).
a) On the grid provided, draw the quadrilateral ABCD. (2 marks)
b) $A^1B^1C^1D^1$ is the image of ABCD under positive quarter turn about the origin on the same grid, draw the image $A^1B^1C^1D^1$. (2 marks)
c) $A^{11}B^{11}C^{11}D^{11}$ is the image of $A^1B^1C^1D^1$ under the transformation given by the matrix
i) Determine the coordinates of $A^{11}B^{11}C^{11}D^{11}$ (2 marks)
ii) On the same grid, draw the quadrilateral $A^{11}B^{11}C^{11}D^{11}$ (2 marks)
iii) Determine a single matrix that maps ABCD onto $A^{11}B^{11}C^{11}D^{11}$ (2 marks)
20. The probability that a pupil goes to school by a bodaboda is $\frac{2}{3}$ and by a matatu is $\frac{1}{4}$. If he uses a bodaboda the probability that he is late is $\frac{2}{5}$ and if he uses a matatu the probability of being late is $\frac{3}{10}$. If he uses other means of transport the probability of being late is $\frac{3}{20}$.
a) Draw a tree diagram to represent this information. (3 marks)
b) Find the probability that he will be late for school. (3 marks)
c) Find the probability that he will be late for school if he does not use matatu. (2 marks)
d) What is the probability that he will not be late for school? (2 marks)
21. Two towns P and Q are located at P(60°N, 29°W) and Q(60°N, 31°E) taking $\pi = \frac{22}{7}$ and R = 6370km

Calculate the distance between P and Q.

- i) along the parallel of latitude in km (2 marks)
- ii) along the longitude in nm (2 marks)
- iii) If the local time at P is 1200 hours determine the local time at Q. (2 marks)
- b) An aeroplane flew due South from A(60°N, 45°E) to B a distance of 8008km from A. Find the position of B. (4 marks)

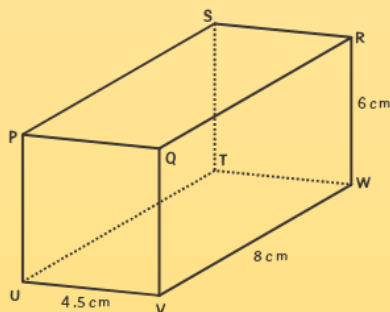
22. OABC is a parallelogram M is the midpoint of OA and $AX = \frac{2}{7}AC$, OA = a and OC = c



- a) i) Express the following in terms of vectors a and c (1 mark)
- i) AC (1 mark)
- ii) AX (2 marks)
- iii) MX (4 marks)
- b) If $AY = hAB$ and $MY = kMX$. Express MY in two different ways hence find the scalars h and k. (4 marks)
- c) Find the ratio of AY and YB. AY: YB. (2 marks)
- 23. a) Complete the table for $y = 3x^2 - 2x - 8$ for $-3 \leq x \leq 3$ (2 marks)

x	-3	-2	-1	0	1	2	3
x^2	9	4	1	0		4	9
$3x^2$	27			0			27
$-2x$	6			0			-6
-8	-8	-8	-8	-8	-8	-8	-8
y	25			-8			

- b) Draw the graph of $y = 3x^2 - 2x - 8$ for $-3 \leq x \leq 3$ (4 marks)
- c) Use the graph to solve the following equations:
 - i) $3x^2 - 2x - 8 = 0$ (1 mark)
 - ii) $3x^2 + x - 5 = 0$ (3 marks)
- 24. The diagram below represents a cuboid PQRSTUWV in which UV = 4.5cm, VW = 8cm and WR = 6cm



Calculate:

- a) the length of UR (2 marks)
- b) i) the size of the angle between the lines UR and UW (2 marks)
- ii) the size of angle between the lines PQ and PV (2 marks)
- c) The size of the angle between the planes PQWT and UVWT (2 marks)
- d) Length of side VR (2 marks)

KANGEMA FORM 4 END OF TERM 2 EXAM

121/1

MATHEMATICS

Paper 1

. MOCKS KCSE PREDICTIONS .

Time: 2½ Hours

SECTION I : (50 MARKS)**Answer all questions in the spaces provided.**

1. Without using a calculator or mathematical tables simplify. (3 marks)

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

2. Simplify completely: (3 marks)

$$\frac{3x^2 - 5xy - 2y^2}{y^2 - 9x^2}$$

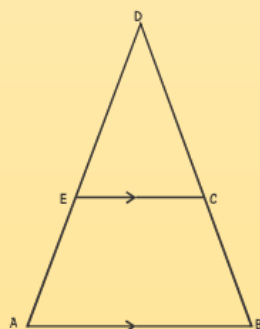
3. Find the value of x in the following equation: (4 marks)

$$64^{x+1} + 8^{2x} = 1040$$

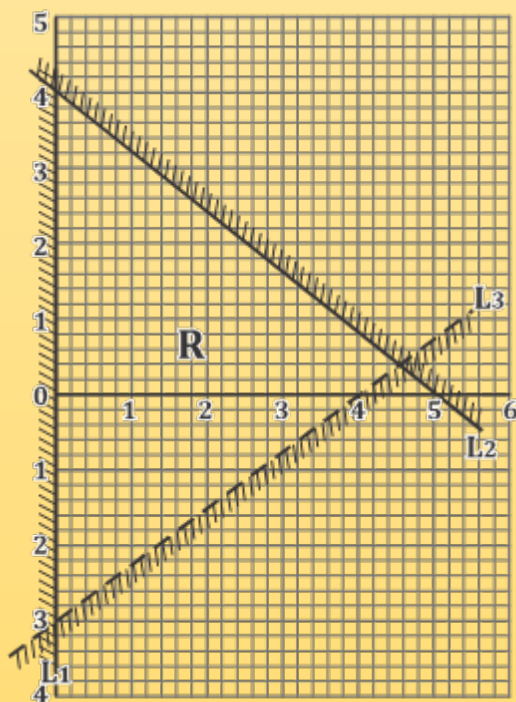
4. The image of A (5, 5) under an enlargement scale factor -2 is A¹(8, 7). Find the coordinates of the centre of enlargement. (3 marks)

5. Thirty two men working at the rate of 9 hours a day can complete a piece of work in 7 days. How many more men working at the rate of 8 hours a day would complete the same work in 6 days. (3 marks)

6. In the figure below triangle DEC is similar to triangle DAB and EC is parallel to AB. Given that DE: DA is 3: 5, find the ratio of the area of triangle DEC to that of trapezium ABCE. (4 marks)



7. Find the inequalities that define the region R shown in the figure below. (3 marks)



8. Four interior angles of a hexagon are 100° , 140° , 125° and 105° . The fifth interior angle is four times the sixth angle. Find the fifth angle. (3 marks)

9. Given that $\sin \theta = \frac{2}{3}$ and θ is an acute angle, find without using tables or calculator.

a) $\tan \theta$ (1 mark)

b) $\cos (90 - \theta)$ (2 marks)

10. The currency exchange rates of a given bank are as follows.

Currency	Buying (Ksh.)	Selling (Ksh)
1 Sterling pound	145.80	146.20
1 US dollar	100.80	101.00

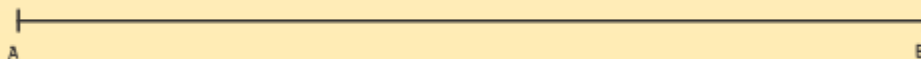
A tourist arrived in Kenya with 7000 US dollars which he converted to Kenya shillings upon arrival. He spent Ksh.332790 and converted the remaining pounds. How many pounds did he receive? (3 marks)

11. Two lines L_1 and L_2 are such that both pass through the point A (x, x). Given that L_1 has a gradient of 3 and also passes through B(6, 8), find :

a) the value of x (2 marks)

b) the equation of L_2 if it also passes through point C(2x, 3x) in the form $y = mx + c$. (2 marks)

12. Divide the line below into three equal parts. (2 marks)



13. Given that $\vec{OP} = 3\vec{i} - 2\vec{j}$ and $\vec{OQ} = 8\vec{i} - 5\vec{j}$, find $|\vec{PQ}|$ to 3 significant figures. (3 marks)

14. Use the tables of reciprocals and square roots to evaluate:

$$\frac{0.1}{0.0351} + \sqrt{0.498} \quad (3 \text{ marks})$$

15. Use logarithms to evaluate: (4 marks)

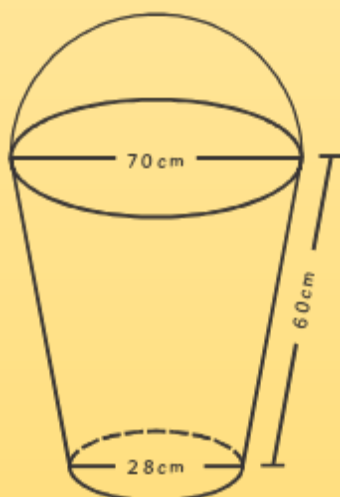
$$\sqrt{\frac{(0.08294)^2 \times (39.24)^3}{8458}}$$

16. A tailor bought a pair of trousers at sh.1600. He marked the price such that after allowing his discount of 20% he would still make a profit of 30% on the cost price. Determine the price at which the pair of trousers was marked. (2 marks)

SECTION II : (50 MARKS)

Attempt five questions only from this section.

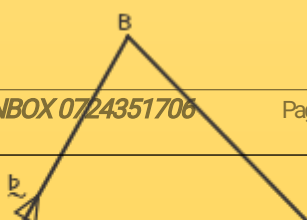
17. The figure below represents a model of a solid structure in the shape of a frustum of a cone with hemispherical top. The diameter of the hemispherical part is 70cm and is equal to the diameter of the top of the frustum. The frustum has a base diameter of 28cm and a slant height of 60cm.



Calculate, taking $\pi = \frac{22}{7}$

- a) the area of the hemispherical surface. (4 marks)
- b) the surface area of the curved surface (4 marks)
- c) the total surface area of the model. (2 marks)

18. The diagram below shows triangle OAB in which OM: MB = 1: 3 and AN: NB = 1: 2. The lines ON and AM meet at X. OA = a and OB = b.



a) Express the following vectors in terms of $\vec{a}$ and $\vec{b}$.

i) $\vec{AB}$

(1 mark)

ii) $\vec{AM}$

(1 mark)

iii) $\vec{ON}$

(1 mark)

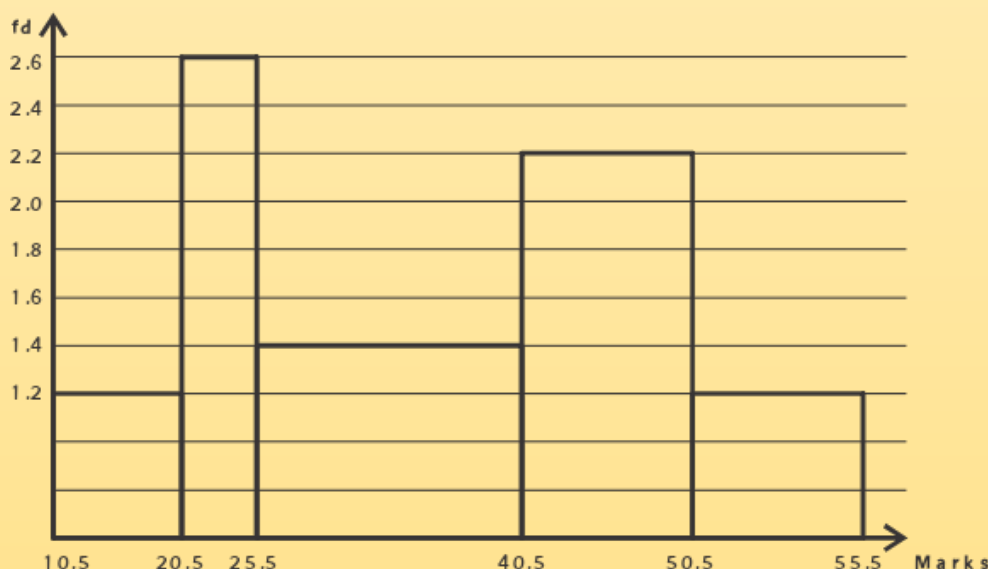
b) You have also been given that $\vec{OX} = h\vec{ON}$ and $\vec{AX} = k\vec{AM}$. Express $\vec{OX}$ in two ways and hence find the values of h and k .

(5 marks)

c) Show that A , X and M are collinear.

(2 marks)

19. The diagram below shows a histogram representing marks obtained in a Maths test by a Form one class of Kangema high school.



a) Develop a frequency distribution table for the data.

(4 marks)

b) State the modal frequency.

(1 mark)

c) Estimate the mean using an assumed mean of 33.

(5 marks)

20. John bought 3 brands of tea A, B and C. The cost price of the brands were sh.25, sh.30 and sh.45 per kilogram respectively. He mixed the brands in the ratio of 5 : 2 : 1 respectively. After selling the mixture he made a profit of 20%.

a) How much profit did he make per kilogram of the mixture.

(4 marks)

b) After one year, the cost price of each brand was increased by 12%.

i) For how much did he sell one kilogram of the mixture to make 20% profit.

(3 marks)

ii) What would have been his percentage profit if he sold one kilogram of the mixture at sh.40.25.

(3 marks)

21. Three boats, X, Y and Z are such that Y is 500km on a bearing of 030° from X. Boat Z is 750km from Y and on a bearing of 140° from Y.

a) Draw a sketch of the positions of the three boats.

b) Using your sketch or otherwise, calculate :

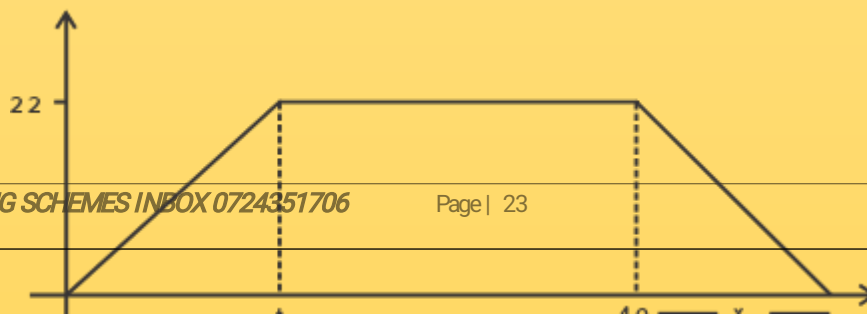
i) the distance of Z from X

ii) the bearing of X from Z

iii) the shortest distance from X to the direct route between Y and Z.

c) Boat S is sighted 900km due East of Y. Calculate the distance of S from Z.

22. The figure below shows a velocity-time graph of journey of a car. The car starts from rest and accelerates at $2^3/4\text{m/s}^2$ for t seconds until its is 22m/s.



Brakes are applied bringing it uniformly to rest. The total journey is 847m long.

- a) the value of t , the acceleration time (2 marks)
- b) the distance travelled during the first t seconds. (2 marks)
- c) the value of x , the deceleration time (4 marks)
- d) the rate of deceleration (2 marks)

23. The transformation T and S are defined as follows :

T = reflection on the line $y = x$

S = positive quarter turn about the origin

The points $A(3, 7)$, $B(3, 4)$ and $C(-1, 4)$ are the vertices of triangle ABC whose image under T is triangle $A^1B^1C^1$

- a) On the grid provided, draw triangle ABC and its image $A^1B^1C^1$ under transformation T . (3 marks)
- b) State the coordinates of $A^1B^1C^1$ (1 mark)
- c) Draw triangle $A^{11}B^{11}C^{11}$ the image of $A^1B^1C^1$ under transformation S . (2 marks)
- d) State the coordinates of $A^{11}B^{11}C^{11}$ (1 mark)
- e) Find a single matrix transformation that maps ABC onto $A^{11}B^{11}C^{11}$ (3 marks)

24. A straight line L_1 which passes through $A(-1, 2)$ has a gradient of $-\frac{1}{2}$. Another straight line L_2 passes through the points $B(2, -3)$ and $C(4, 6)$. Determine :

- a) the equation of L_1 in the form $y = mx + c$ (2 marks)
- b) the equation of L_2 in the form $y = mx + c$ (2 marks)
- c) the coordinates of the point of intersection of lines L_1 and L_2 (2 marks)
- d) the equation of a line through c and parallel to L_1 in the form $y = mx + c$ (2 marks)
- e) the equation of the line passing through $D(-2, -2)$ and perpendicular to L_2 in the form $y = mx + c$ (2 marks)

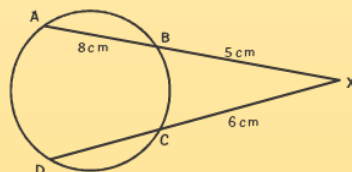
KANGEMA FORM 4 END OF TERM 2 EXAM**121/2****MATHEMATICS**

Paper 2

. MOCKS KCSE PREDICTIONS .

Time: 2½ Hours**SECTION I : (50 MARKS)**

- Given that $y = \frac{2p-r}{p+3r}$, express p in terms of y and r (3 marks)
- A quantity v is partly constant and partly varies as u . If $u = 1$ when $v = 12$ and $u = 12$ when $v = 23$. Find the value of v when $u = 5$. (3 marks)
- Solve for x in the equation $\log_{10}(3x+2) - 1 = \log_{10}(x-4)$ (3 marks)
- Solve the following inequality and state the integral values $2x - 1 < 7 + x \leq 3x + 2$ (3 marks)
- The circle whose length is 2.2m subtends an angle of 60° at the centre. Calculate the area of the minor segment of the circle. Take $\pi = \frac{22}{7}$ (4 marks)
- The base and perpendicular height of a triangle are measured as 8.2cm and 6.3cm respectively. Calculate the percentage error in calculating the area correct to 3d.p. (3 marks)
- Two taps A and B can fill a water bath in 8 minutes and 10 minutes respectively. Tap A is opened for 2 minutes then closed. Tap B is later opened for one minute then closed. How long will the two taps take running together to fill the remaining part of the water bath? (3 marks)
- Chords AB and CD of a circle meet at X as shown in the figure below. If $AB = 8\text{cm}$, $BX = 5\text{cm}$ and $CX = 6\text{cm}$, calculate the length of chord CD correct to 1d.p. (2 marks)



- Express the following in surd form and simplify by rationalizing the denominator giving your answer in the form of $a + b\sqrt{c}$ (3 marks)

$$\frac{1}{\cos 60^\circ - \sin 45^\circ}$$
- Expand and simplify $(1-3x)^5$ upto the term in x^3 (2 marks)
 - Hence use your expansion to estimate $(0.97)^5$ correct to 4d.p. (2 marks)
- In a transformation, an object with an area of 10cm^2 is mapped onto an image whose area is 60cm^2 . Given that the matrix of transformation is $\begin{pmatrix} y & y-1 \\ 2 & 4 \end{pmatrix}$ find the value of y . (3 marks)
- Given that $\vec{OA} = 3\vec{i} + 2\vec{j} - 4\vec{k}$ and $\vec{OB} = 4\vec{i} + 5\vec{j} - 2\vec{k}$. P divides AB in the ratio 1: 2. Determine the position vector of p in terms of $\vec{i}$, $\vec{j}$ and $\vec{k}$. (3 marks)
- Solve the equation: $2 \cos 4x = -1$ for $0 \leq x \leq 180^\circ$ (3 marks)
- The numbers 8, x and 2 are the first three terms of a G.P.
 - Find two possible values of x (2 marks)
 - Find the sum of the first five terms of the G.P if the common ratio is negative. (2 marks)
- Wanjiku pays for a car on hire purchase in 15 monthly instalments. The cash price of the car is Ksh.300, 000 and the interest rate is 15%p.a. A deposit of Ksh.75, 000 is made. Calculate her monthly repayments. (3 marks)
- Points A and B have coordinates as (1, 5) and (-3, 7) respectively. If AB is the diameter of the circle, find the equation of this circle. (3 marks)

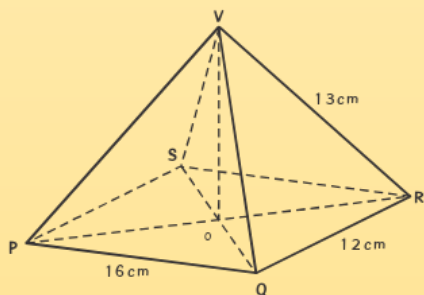
SECTION II : (50 MARKS)**Answer any five questions in this section.**

- Joshua has two children whose age difference is 5 years. Twice the sum of their ages is equal to the age of the parent.
 - Taking Y to be the age of the elder child, write an expression for
 - the age of the younger child (1 mark)
 - age of the parent (1 mark)
 - In 20 years time, the product of the children's ages will be 15 times the age of their parent.
 - Form an equation in y and hence determine the present possible ages of the elder child. (4 marks)
 - Find the present possible ages of the parent. (2 marks)
 - Determine the possible ages of the young child in 20 years time. (2 marks)
- The following table shows the distribution of marks obtained by 50 students in a test.

Marks	45 - 49	50 - 54	55 - 59	60 - 64	65 - 69	70 - 74	75 - 79
No. of students	3	9	13	15	5	4	1

By using an assumed mean of 62, calculate:

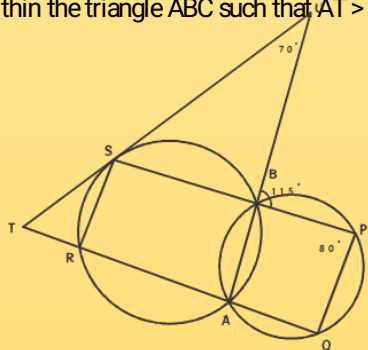
- a) the mean (5 marks)
 b) the variance (3 marks)
 c) the standard deviation (2 marks)
19. In a Mathematics test, the probability of 3 students Kamau, Otieno and Mwala passing are $\frac{2}{3}$, $\frac{3}{4}$ and $\frac{5}{6}$ respectively.
 a) Draw a tree diagram to represent this information. (3 marks)
 b) Use the tree diagram to find the probability that:
 i) all the three students will fail (2 marks)
 ii) at least two students will pass (3 marks)
 iii) only one student will pass (2 marks)
20. A particle moves in a straight line such that its displacement s metres from a given point is $s = t^3 - 6t^2 + 2t + 3$ where t is time in seconds. Find:
 a) The displacement of the particle at $t = 3$ (2 marks)
 b) The velocity of the particle where $t = 4$ (2 marks)
 c) The value of t when the particle is momentarily at rest (3 marks)
 d) The acceleration of the particle when $t = 4$ (3 marks)
21. a) A plane leaves airport A (40°S , 36°W) at 1400hrs on Monday and flies due North to airport B (50°N , 36°W). Calculate the distance the plane covers in kilometres. (Take $\pi = \frac{22}{7}$ and $R = 6370\text{km}$) (3 marks)
 b) After 45 minutes stoppage at B, the plane flies due East to airport C, distance of 2550 nautical miles from B. Find:
 i) the position of C (4 marks)
 ii) the local time the plane lands at C if its average speed for the whole journey is 1200km/hr . (3 marks)
 (Take 1 nautical mile = 1.854km)
22. Figure below is a pyramid on a rectangular base. $PQ = 16\text{cm}$, $QR = 12\text{cm}$ and $VP = 13\text{cm}$.



Find:

- a) the length of QS (2 marks)
 b) the height of the pyramid (2 marks)
 c) the angle between VQ and the base (2 marks)
 d) the angle between plane VQR and the base (4 marks)
23. a) Using a ruler and a pair of compasses only, construct triangle ABC in which $AB = 9\text{cm}$, $AC = 8\text{cm}$ and angle $BAC = 60^\circ$ (2 marks)
 b) On the same side of AB as C, draw the locus of a point P such that angle $APB = 60^\circ$ (3 marks)
 c) A region is within the triangle ABC such that $AT > 4\text{cm}$ and angle $ACT >$ angle BCT . Show the region T by shading it. (5 marks)

24.



The figure above shows two circles ABPQ and ABSR intersecting at A and B. QART, PBS and ABU are straight lines. The line TSU is a tangent to the circle ABSR at S. Given that $\angle BPQ = 80^\circ$, $\angle PBU = 115^\circ$ and $\angle BUS = 70^\circ$. Find state reasons the following angles

- a) $\angle BRS$ (2 marks)
 b) $\angle BSU$ (2 marks)
 c) $\angle STR$ (2 marks)
 d) $\angle BAR$ (2 marks)
 e) $\angle ARB$ (2 marks)

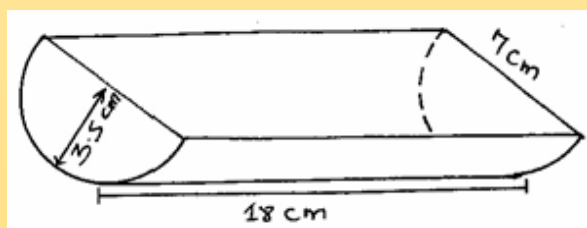
MURANGA SOUTH
END OF TERM II EXAMINATION
Kenya Certificate of Secondary Education
121/1
MATHEMATICS
FORM 4
. MOCKS KCSE PREDICTIONS .

TIME: $2\frac{1}{2}$ HOURS

SECTION I (50 MARKS)

Answer all questions in this section

- During a football match, sh. 1,462,800 was realized from stadium entrance fees. If the entrance fee was sh. 80 per person, calculate how many fans paid to watch match. (2 marks)
- Three women Kezia, Mary and Alice contributed money to buy a vehicle. Kezia contributed $\frac{1}{3}$ of the total amount, Mary contributed $\frac{3}{8}$ of the remaining amount and Alice contributed the rest of the money. The difference in the contribution between Mary and Alice was sh. 60,000. Calculate the cost price of the vehicle. (3 marks)
- Simply without using mathematical tables or calculators. (3 marks)
- Use logarithm to solve tables to evaluate; (4 marks)
- A chord AB of length 13cm subtends an angle of 67° at the circumference of a circle centre O. Find the radius of the circle to the nearest whole number. (3 marks)
- A metal weighs 83.16 grams when totally immersed in a cylinder of radius 3cm, the height of water level in the cylinder rises by 0.49 cm. Calculate density of the metal. (3 marks)
- The figure below is a semi cylinder of length 18 cm and radius 3.5 as shown.



- Draw a labeled net of the solid. (2 marks)
- A salesman is paid a salary of sh. 25,000. He gets a commission of 3.5% on sales above sh. 100,000 and an additional 1.5% if the sales exceed sh. 500,000. In the month of December the salesman received earnings totaling sh. 61,500. Calculate the total sales he made that month. (3 marks)
- The sum of interior angle of a regular polygon is twelve times its exterior angle. Find the number of sides of the polygon and name the polygon. (4 marks)

- In a botanical experiment the length of 60 leaves of a certain type of a tree were measured correct to the nearest 0.1cm.

Length (cm)	3.0-3.4	3.5-3.9	4.0-4.4	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4
No. of leaves	1	4	9	14	12	10	6	3	1

- State the modal class. (1 mark)
- Calculate the median height. (3 marks)

- Given that $\underline{a} = 5i + 4j$, $\underline{b} = 3i - 2j$ and $\underline{c} = 7i + 10j$. Find the scalars $\underline{m}$ and $\underline{n}$ such that $\underline{m}\underline{a} + \underline{n}\underline{b} = \underline{c}$ (3 marks)

- Simplify the expression

$$\frac{x^2 - 9}{6 - 11x + 3x^2}$$

(3 marks)

- A circle O has the equation $x^2 + y^2 = 4$. The area of the circle in first quadrant is divided into 5 vertical strips each of width 0.4 cm. The table below shows the values of x and y for the first quadrant of the circle.

x	0	0.4	0.8	1.2	1.6	2.0
y	2.0	1.96	1.83	1.6	1.2	0

Use the trapezoidal rule to estimate area of the circle.

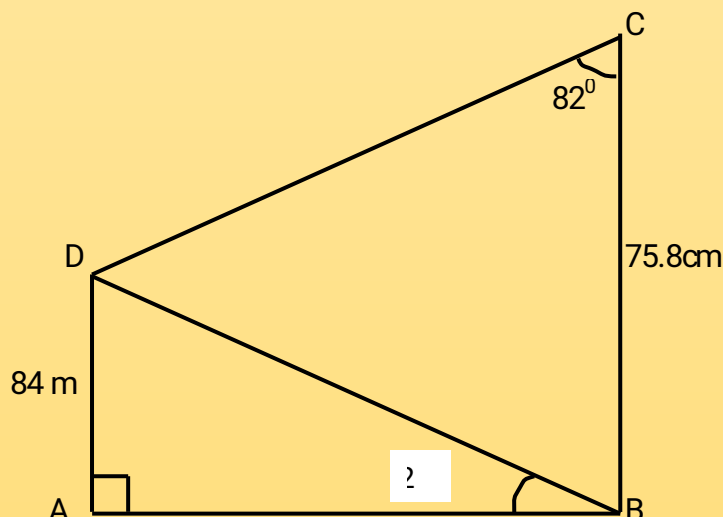
(3 marks)

14. A businessman bought 100 textbooks and 80 pens for sh. 25,600. If she had bought twice as many textbooks and half as many pens she would have paid sh. 7,400 less. Find the cost of one textbook and one pen. (3 marks)
15. The area occupied by a lake on a map is 28 cm^2 . If the scale of the map is 5cm to 1 km Calculate the actual area of the lake on the ground in hectares. (3 marks)
16. Waweru had walked two thirds away across a bridge when he saw an approaching train 60 m away. He ran back only to reach the bridge at the same time as the train was moving at 25 m/s and Waweru ran at 10 m/s, find the length of the bridge. (3 marks)

SECTION B (50 Marks)

Answer any five questions in this section.

17. Meshack and Kelvin contributed shs. 60,000 and sh. 90,000 respectively in order to start business. They employed a manager and agreed to pay him sh. 4,500 per month from the profit made each year. They also agreed that 20% of the profit made each year would be put back into the business while the rest would be shared between them in the ratio of their initial contribution. During the first year they made a profit of sh. 365,000. Calculate:-
- The manager's annual salary for that year. (1 mark)
 - The money put back into business that year. (2marks)
 - The business net profit for that year. (2marks)
 - How much each partner received that year. (3marks)
 - The capital for the following year. (2marks)
18. a) Given that $A = \begin{pmatrix} 2 & 3 \\ 4 & 4 \end{pmatrix}$, $B = \begin{pmatrix} x & 1 \\ 2 & 3 \end{pmatrix}$ and that AB is a singular matrix, solve for x. (4 marks)
- b) A clothes dealer sold 3 shirts and 2 trousers for sh. 840 and 4 shirts and 5 trousers for sh. 1,680. Form a matrix equation to represent the above information. Hence find the cost of 1 shirt and the cost of 1 trouser. (6 marks)
19. Using ruler and compass only:-
- Construct triangle ABC such that $AB = 5 \text{ cm}$, $AC = 6 \text{ cm}$ and angle $BAC = 67.5^\circ$. Measure BC. (4 marks)
 - On the same diagram, construct a circle which passes through the vertices of the triangle ABC. Measure the radius. (3 marks)
 - Calculate the area of the part that is outside the triangle but within the circle. (3 marks)
20. The figure below is a plot of land ABCD where $AD = 84 \text{ cm}$, $BC = 75.8 \text{ cm}$, $\angle ABD = 27^\circ$, DAB is a right angled triangle and $\angle DCB = 82^\circ$.

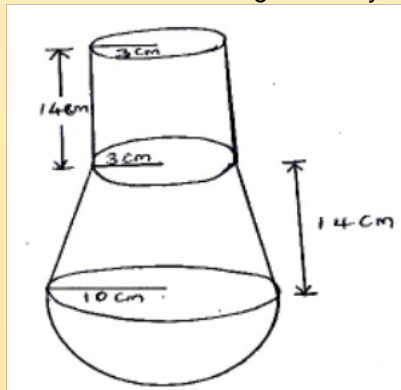


Leaving your answer to 1 decimal place determine;

- The length AB. (2 marks)
 - The length of DB. (2 marks)
 - The length of DC. (4marks)
 - The area of the plot in hectares. (2marks)
21. The L1 and L2 lines whose equations are $ax + by + c = 0$ and $qx + y = k$ intersect at P (8, 8).
- If the lines make angles of 135° and 45° respectively with x axis. State their gradient. (2 marks)
 - Find the equation of the lines above (4marks)
 - Find the equation of another line L3 passing through the (1, 2) and parallel to line L1 (4marks)
22. (a) $P'Q'R'$ is the image of PQR with vertices P (4,2) Q (1,1) and R (5,1) under a rotation. If P' is (-6, -4), Q' (-3, -3) and R' (-7, -3), draw triangles PQR and $P'Q'R'$. (2 marks)
- (b) $P''Q''R''$ is the image of PQR under a translation $T = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$. Write down the coordinates of $P''Q''R''$ and draw it. (3 marks)

- (c) $P''Q''R''$ with vertices $(-6, 2)$, $(-3, 1)$ and $(-7, 1)$ respectively is the image of PQR under transformation T. Draw $P''Q''R''$ and describe it fully. (3 marks)
- (d) $P^4Q^4R^4$ is the image of PQR under a $+90^\circ$ rotation about the origin. State the coordinates of $P^4Q^4R^4$. (2 mks)

23. The figure below is a solid which is partly a cylinder, frustum and hemisphere. The top radius is 3cm while the radius of the hemisphere part is 10cm. The length of the frustum is 14 cm while the height of the cylinder is 14 cm.



Determine:-

- The curved surface area of the cylindrical part of the solid. (2marks)
 - Curved surface of the hemispherical part. (2marks)
 - The curved surface area of the frustum part of the solid. (4marks)
 - The total surface area of the solid. (2 marks)
24. The equation of a normal to a curve at $(0, 3)$ is $2y + x = 6$.
- Find the equation of its tangent in the form $y = mx + c$. (2 marks)
 - The gradient function of the curve at $(0, 3)$ is $2 - 2x$
 - Find the equation of the curve (3 marks)
 - Find the turning point of the curve (3marks)
 - Sketch the curve. (2 marks)

MURANGA SOUTH

121/2

MATHEMATICS

PAPER 2

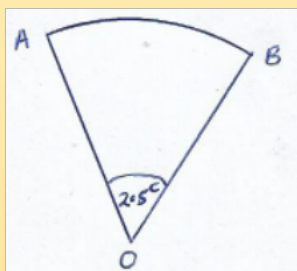
FORM 4

. MOCKS KCSE PREDICTIONS .

SECTION I (50 Marks)

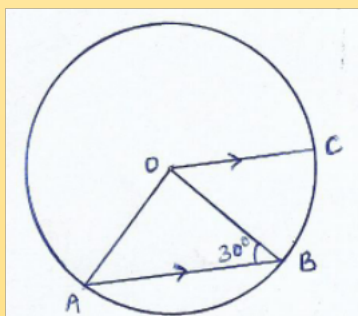
Answer all questions in this section.

1. The surface of spherical ball is increased by 21% after pressure was pumped in.
 - a) Find the circumference of the original ball if one with increased pressure has a circumference of 55cm. (2marks)
 - b) Calculate the percentage in volume of the ball. (2marks)
2. Simplify $\frac{4\sqrt{3}}{3-2\sqrt{3}}$ leaving your answer in the form $a\sqrt{b} + c$ (2marks)
3. In the figure below, AOB is a sector whose area is 7.2 cm^2 subtending an angle 2.5 radians at the centre O.



Calculate:

- a) Calculate the radius of the sector. (2marks)
- b) The length of the arc AB. (2marks)
4. O is the center of the circle. Given AB is parallel to OC and angle ABO = 30° , find angle ACO. (3marks)



5. A man can till $\frac{1}{2}$ of a piece of land in 4 days while his wife can till $\frac{5}{8}$ of the same piece of land in 3 days. How many days will the two take to till the whole piece of the land when working together? (3marks)
6. A mother's age is the square root of her daughters, After five years, the mother will be $4\frac{1}{2}$ times as old as the daughter. Find the daughter's present age. (4marks)
7. Solve y for the equation;
 $\log_{10} (3y+2) - 1 = \log_{10} (y-4)$ (3marks)
8. a) Expand $\left(1 - \frac{3}{2}x\right)^6$ upto the term in x^4 . (1 mark)
- b) Hence evaluate the first four terms of the expansion to evaluate $(1.03)^6$ to four significant figures (2marks)
9. Write down the equation of a circle centre (0,2) and radius 3 units, leaving your answer in the form $ax^2 + by^2 + cx + dy + e = 0$. (3 marks)
10. PQR is a triangle of area 9 cm^2 . If PQ is the fixed base of the triangle and 6cm long draw it and describe the locus of point R. (3marks)
11. A class has 18 boys and 12 girls. Three pupils are chosen at random from the class. What is the probability of choosing all the girls. (2marks)
12. A farmer wishes to purchase some goats and cows. He can buy at most 3 either animals. On average a cow and a goat cost sh. 12,000 and shs. 4,000 respectively. He has shs. 240 000 to spend and the number of cows should be at most twice the number of goats. He must buy more than five cows. List all the inequalities to represent the above information. (4 marks)
13. Given that $\frac{dy}{dx} = 2x^2 + 3$ and that $y = 3$ when $x = 0$, find the value of y when $x = \frac{1}{3}$. (3 marks)

14. The position of two towns X and Y are given to the degree as X(45° N, 10° E) and Y (45° N, 70° E)

Find:-

- The difference in longitude. (1mark)
- The distance between the two towns in nautical miles to the nearest whole number. (2marks)

15. Solve the equation $\sin (5x-20)^\circ = -0.8660$ for values of x between 0° and 90° (2marks)

16. Vector $\mathbf{AO} = 6\mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$ and $\mathbf{OB} = -2\mathbf{i} + 3\mathbf{j} - \mathbf{k}$. A point C divides AB in the ratio of 3:1. Find AC in terms of $\mathbf{i}$, $\mathbf{j}$ and $\mathbf{k}$ (3marks)

SECTION II (50 MARKS)

Answer only FIVE questions in this section.

17. Halima deposited sh. 500,000 in a financial institution which paid simple interest at a rate of 6% per annum. At the end of 2 years, She withdrew then invested the money in shares. The value of the shares depreciated at the rate of 4% during the first year of the investment. In the next 3 years, the value of the shares appreciated at the rate of 6% every four months. (3marks)
- Calculate the amount that Halima invested in shares. (2marks)
 - Calculate the value of Halima's shares. (3marks)
 - At the end of the year. (2marks)
 - At the end of the fourth year to the nearest shillings. (3marks)
 - Calculate Halima's gain from the shares as a percentage. (2marks)
18. An arithmetic progression of 41 terms is such that the sum of the first five terms is 560 and the sum of the five last terms is -250. Find:-

- The first term and the common difference (5marks)
- The last term (2marks)
- The sum of progression. (3marks)

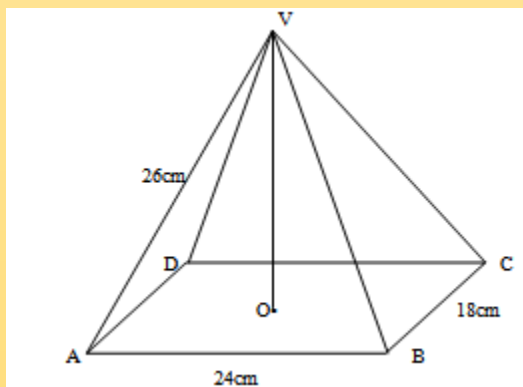
19. a) Complete the table below, giving values correct to decimal places. (2marks)

x°	0	30	60	90	120	150	180
$2\sin x^\circ$	0	1		2			
$1 - \cos x^\circ$			0.5	1			2

- b) On the grid provided using the same scale and axes draw the graphs of $y = 2\sin x^\circ$ and $y + \cos x^\circ = 1$. (5 marks)

Take the scale: 2 cm for 30° on the x -axis
2 cm for 1 unit on the y -axis

- c) Use the graph in (b) above to:-
- Solve the equation $2\sin x^\circ = 1 - \cos x^\circ$ (1mark)
 - Determine the range of values for which $2\sin x^\circ \geq 1 - \cos x^\circ$ (1mark)
 - State the amplitude of $2\sin x^\circ$ (1mark)
20. The diagram below represents a pyramid standing on rectangular base ABCD. V is the vertex of the pyramid and $VA = VB = VC = VD = 26$ cm. M and N are the midpoints of BC and AC respectively. $AB = 24$ cm and $BC = 18$ cm



Calculate:-

- The line of the length AC (2marks)
 - The length of projection of the VA on the plane ABCD. (1mark)
 - The angle between line VA and the plane ABCD. (2marks)
 - The vertical height of the pyramid. (2marks)
 - The size of the angle between the planes VBC and ABCD. (3marks)
21. Three quantities R, S and T are such that R varies directly as S and inversely as the square of T.
- Given that $R = 480$ when $S = 150$ and $T = 5$, write an equation connecting R, S and T. (4marks)
 - Find the value of R when $S = 360$ and $T = 1.5$. (2marks)
 - Find the percentage change in R if S increases and T decreases by 20%. (4marks)
22. (a) The acceleration of a particle t seconds after passing a fixed point is given by $a = 3t - 3$. Given that the velocity of the particle when $t = 2$ seconds is 5 m/s , find:-
- Its velocity when $t = 4$ seconds (3marks)
 - Its displacement at this time. (3marks)
- (b) Find the area bounded by the graph $x = 9y - y^3$ and the y -axis. (4marks)

23. The table below shows the marks scored by forty form 4 students in a mathematical test.

Marks	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
Frequency	2	4	5	7	10	6	3	2	1

- a) Using an assumed mean score of 55, calculate the mean of the data. (3marks)
- b) Calculate the lower quartile. (2marks)
- c) On the grid provided, draw the cumulative frequency curve to represent the above distribution. (3marks)
- d) From the graph, estimate:-
- i. The 5th decile. (1 mark)
- Range of marks of the middle 80% of the students. (1 mark)
24. ABCD is quadrilateral with vertices A (-7, 2) B (-2, 1) C (2, 8) D (-7, 7). A' B' C' D' is the image of ABCD under a transformation matrix $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$
- (i) Find the coordinates of A' B' C' D'. (2marks)
- (ii) On the grid provided draw ABCD and A' B' C' D'. (2marks)
- a) (i) Find A'' B'' C'' D'' the image of the of A' B' C' D' under the transformation matrix $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ (2mks)
- (ii) On the same grid draw A'' B'' C'' D'' (1mark)
- b) (i) Find the single matrix that maps A'' B'' C'' D'' onto ABCD. (2marks)
- (ii) Describe the transformation fully. (1mark)

KANDARA FORM FOUR END OF TERM TWO . EXAMINATION

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MATHEMATICS

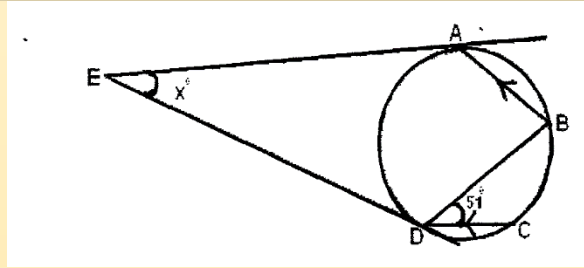
PAPER 1

TIME: 2 ½ HOURS

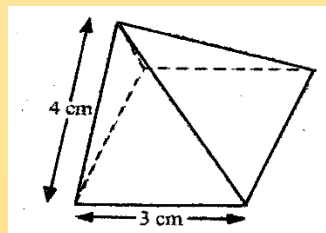
SECTION I (50 MARKS)

Answer all the questions in this section.

1. Without using a calculator, evaluate $\frac{2\frac{1}{4} + \frac{3}{5} \div \frac{5}{6} \text{ of } 2\frac{2}{5}}{1\frac{7}{10}}$, leaving your answer as a fraction in its simplest form. (3mks)
2. Find the equation of a perpendicular bisector of a line AB if the coordinates of A and B are (-4, -2) and (6, 2) respectively. (3mks)
3. Use squares, squares roots and reciprocal tables only to evaluate the following giving your answer correct to 2 decimal places. (4mks)
- $$\frac{1}{\sqrt{31.47}} + \frac{3}{8.54^2}$$
4. Find the integral values of x for which: (3mks)
- $$\begin{aligned} -6 &\leq 3x + 3 \\ 14 - 3x &> 2 \end{aligned}$$
5. Pipe A empties a full tank in 8 hours, pipe B empties in 6 hours and pipe C empties in 3 hours. If all the three pipes are open for 30 minutes and then pipe A closed, How long will it take to empty a full tank. (3mks)
6. Without using a calculator or mathematical table, evaluate. (3mks)
- $$\frac{8^{\frac{3}{5}} + 4^{\frac{3}{5}}}{16^{-\frac{3}{4}}}$$
7. Simplify the expression: (3mks)
- $$\frac{3x^2 - 4xy + y^2}{9x^2 - y^2}$$
8. Two trains T₁ and T₂, traveling in opposite directions on parallel tracks are just beginning to pass one another. Train T₁ is 72 metres long and is traveling at 108 km/hr. T₂ is 78 metres long and traveling at 72 km/hr. Find the time in seconds the two take to completely pass one another. (4mks)
9. In the figure below and EA are tangents to the circle at D and A. DC is parallel to AB and $\angle BDC = 51^\circ$. Calculate the value of x. (3mks)



10. Two similar containers have base areas 25cm^2 and 324cm^2 respectively. Calculate the Capacity of the larger container correct to one decimal place if the capacity of the smaller one is 8cm^3 (3mks)
11. Solve for m ;
 $\text{Log}5 - 2 + (2m+10) = \log(m-4)$ (4mks)
12. Given that $1.\dot{0}\dot{5} = 1\frac{a}{b}$. Find the values of a and b . (3mks)
13. A Kenyan bank buys and sells foreign currencies using the rates shown below.
- | | | |
|------------------------|-------|------------------|
| Buying
(Ksh) | | Selling
(Ksh) |
| 1 Euro 86.25 | 86.97 | |
| 100 Japanese Yen 66.51 | 67.26 | |
- A Japanese traveling from France arrives in Kenya with 5000 Euros, which he converts to Kenya shillings at the bank. While in Kenya he spent a total of Ksh.289,850 and then converted the remaining Kenya shillings to Japanese Yen at the bank. Calculate the amount of Japanese Yen that he received. (3 mks)
14. All prime numbers between ten and twenty are arranged in descending order to form a number. (1mk)
- a) Write down the number (1 mark)
- b) State the total value of the third digit in the number formed in (a) above. (1 mark)
15. An aircraft flying at 800 knots leaves airport A(60°N , 12°E) at 9am local time for airport B (60°N , 88°W) along the parallel of latitude. Find the local time at B when the plane lands. (3mks)
16. The diagram below represents a right pyramid on a square base of side 3 cm. The slant Height of the pyramid is 4 cm



- a) Draw a net of the pyramid (2 marks)
- b) On the net drawn, measure the height of a triangular face from the top of the Pyramid (1 mark)

SECTION 11 (50 MARKS)

Answer only FIVE questions from this section.

17. The vertices of a triangle are A(2,5), B(4,3) and C(2,3). H represents a half turn rotation about the point (0,2). (4 mks)
- a) Draw triangles ABC and $A_1B_1C_1$ under H
- b) T represents a reflection in the line $x = 0$ and K represents a translation $\begin{pmatrix} 0 \\ -2 \end{pmatrix}$. Find the coordinates of A'' , B'' , C'' of A' , B' , C' under TK. Hence draw triangle $A''B''C''$. (4mks)
- c) Find the area of triangle $A''B''C''$ (2mks)
18. B is 102km on the bearing of 112° from A. C is 94km on the bearing of 062° from B D is 073° from A and 336° from C. (6mks)
- (a) Using a scale of 1cm to represent 20km, draw a diagram to show the positions of A, B, C and D.
- b) Using your diagram, determine;
- i) The bearing of B from D and A from C. (2mks)
- ii) The distance AC and BD (2mks)
19. A group of people planned to contribute equally towards a water project which needed kshs. 2,000,000 to complete. However, 40 members of the group withdrew from the project. As a result, each of the remaining members were to contribute ksh 2500 more. (5mks)
- (a) Find the original number of members in the group.
- (b) Forty five percent of the value of the project was funded by Constituency Development Fund (CDF). Calculate the amount that would be made by each of the remaining members of the group. (3mks)
- (c) Members contribution were in terms of labour provided and money contributed. The ratio of the value of labour to the

money contributed was 6:19, calculate the total amount of money contributed by the members (2mks)

20. A bus left Kisumu at 9:30 a.m towards Nairobi at an average speed of 81 km/hr. A matatu left Nairobi at 10.10 a.m at an average speed of 72km/hr. The distance between Kisumu and Nairobi is 360km.

(a) Determine

(i) The time taken before the two vehicles met. (3mks)

(ii) The distance between the two vehicles 40 minutes after meeting. (2mks)

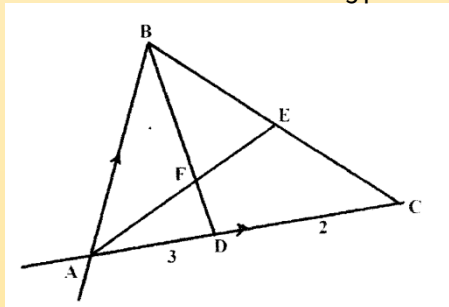
b) A car left Kisumu towards Nairobi at 9.50 a.m at an average speed of 90 km/hr.

Determine

i) The time when the car caught up with the bus. (3mks)

ii) The distance of Nairobi from the place where the car caught up with the bus. (2mks)

21. In the figure below E is the mid point of BC. AD: DC 3:2 and F is the meeting point of BD and AE.



If $AB = b$ and $AC = c$, find

i) BD (2mk)

ii) AE (2mks)

b) If $BF = t BD$ and $AF = n AE$. Find the value of t and n . (5mks)

c) State the ratio of BD to BF. (1mk)

22. A surveyor recorded the measurements of a field in a field book using lines AB 260m as shown below.

	B	
	130	R 40
	70	Q10
	50	P20
S50	10	
	A	

a) Sketch the map of the field. (4mks)

b) Find the area of the field in hectares. (6mks)

23. A trader sold an article at sh.4800 after allowing his customer a 12% discount on the marked price of the article. In so doing he made a profit of 45%.

a) Calculate

(i) The marked price of the article. (3 marks)

(ii) the price at which the trader had bought the article (2marks)

b) If the trader had sold the same article without giving a discount. Calculate the percentage profit he would have made. (3 marks)

c) To clear his stock, the trader decided to sell the remaining articles at a loss of 12.5% calculate the price at which he sold each article. (2mks)

24. The distances S metres from a fixed point, covered by a particle after t seconds is given by the equation, $S = t^3 - 6t^2 + 9t + 5$

a) Calculate the gradient to the curve at $t = 0.5$ seconds. (3mks)

b) Determine the values of S at the maximum and minimum turning points of the curve. (4mks)

c) On the space provided, Sketch the curves of $S = t^3 - 6t^2 + 9t + 5$ (3mks)

KANDARA FORM FOUR END OF TERM TWO . EXAMINATION

121/2

MATHEMATICS

PAPER 2

TIME: 2 ½ HOURS

SECTION 50 MARKS*Answer all questions in this section in the spaces provided.*

1. Use logarithm to evaluate (4mks)

$$\sqrt[3]{\frac{58.32 \times 0.9823^2}{693.5}}$$

2. Make **t** the subject of the formula (3mks)

$$x = \sqrt[3]{\frac{3h(t-h)}{t}}$$

3. Simplify and rationalize the expression giving your answer the form of **a + b√c**, where **a**, **b** and **c** are constants (3mks)

$$\frac{11}{7-\sqrt{3}} - \frac{5}{7+\sqrt{3}}$$

4. The measurements of the radius and height of a cylinder are given as 8cm and 9.5cm respectively. Calculate the percentage error in the volume of the cylinder. (3mks)

5. (a) Expand $(1 - 2x)^6$ in ascending powers of x upto x^3 . (2mks)

- (b) Hence evaluate $(1.02)^6$ to 4 d.p. (2mks)

6. (a) Construct $\triangle ABC$ such that **AB** = 6cm, **BC** = 5cm and **AC** = 4cm. (1mk)

- (b) Construct the locus of point **Q** inside the triangle **ABC** above such that the area of $\triangle ABQ$ is 6cm^2 . (2mks)

7. A pilot leaves point **T**(60°S, 10°W) and flies due East for a distance of 960 nm to point **U**. Determine the position of **U**. (3mks)

8. Find the radius and centre of the circle whose equation is $3x^2 + 3y^2 - 12x + 18y - 9 = 0$. (3mks)

9. Quantity **Q** partly varies as quantity **R** and partly varies inversely as the square of **R**. Given that **Q** = 3 when **R** = 1 and **Q** = 5 when **R** = $\frac{1}{2}$

- (i) Find an equation connecting **Q** and **R**. (3mks)

- (ii) Find the value of **Q** when **R** = $\frac{3}{2}$ (1mk)

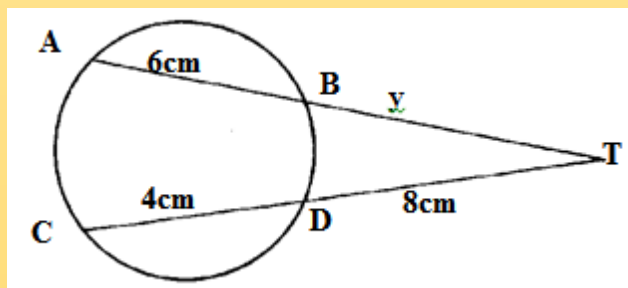
10. Determine the integral values of **x** that satisfy the following inequalities. (3mks)

$$-18 - 3x \leq 2x - \frac{1}{2} \leq 20 - \frac{3x}{2}$$

11. The longest side of a right angled triangle is 25cm and the two sides containing the right angle are **x** cm and **y** cm. If one of the shorter sides exceeds the other by 17cm, obtain two equations in **x** and **y** and solve them. (4mks)

12. If $\vec{OA} = 2\vec{i} - 4\vec{k}$ and $\vec{OB} = -2\vec{i} + \vec{j} - \vec{k}$. Find the magnitude of **AB**. (2mks)

13. In the fig. below line **CD** = 4cm, line **DT** = 8cm and **AB** = 6cm. **AT** and **CT** are straight lines meeting at point **T**.



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

14. In what ratio should grade **P** of tea costing sh. 450 per kg be mixed with grade **Q** of tea costing sh. 350 per kg so that a profit of 10% is made by selling the mixture at sh. 451 per kg? (3mks)

15. Find the values of θ between 0° and 180° such that $2\cos 3\theta = 3\sin 3\theta$ (3mks)

16. Solve $8^x = 4^{2x+1}$ and $27^{2x} = 9^{x-3}$ giving your answers as an exact fraction. (3mks)

SECTION B (50 MARKS)**Answer any five questions in this section in the spaces provided.**

17. Income tax is charged on annual income at the rates shown below.

Taxable annual income	Rate sh per k £
1 - 2300	2
2301 - 4600	3
4601 - 6900	5
6901 - 9200	7
9201 - 11,500	9
11501 and above	10

personal relief ksh. 1056 per month.

Insurance relief ksh. 480 per month.

Mr. Onyango earns a basic salary sh. 13800 per month. In addition to his salary he get a house allowance of ksh.8000 per month and medical allowance of sh. 5000 per month.

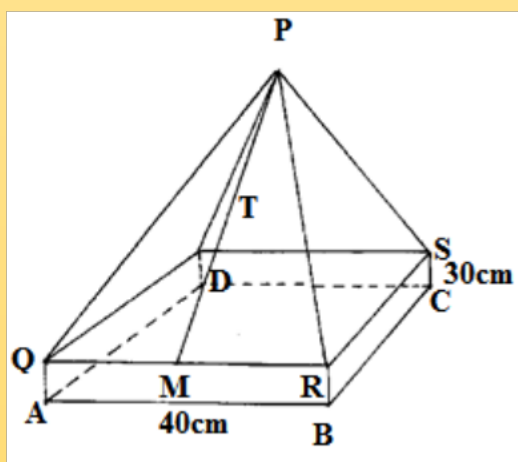
Calculate;

- (b) Mr. Onyango's taxable income (2mks)
- (ii) Mr. Onyango's net tax per month in Kenya shillings. (5mks)
- (iii) Calculate Mr. Onyango's net monthly salary in Kenya shillings. (3mks)

18. The table below shows the mark scored by students in a maths exam

Class	30 - 39	40 - 49	50 - 59	60 - 69	70 - 79	80 - 89
No. of students	3	17	27	23	8	2

- a) Draw a cumulative frequency curve (3mks)
- b) Use your graph to determine
- i) The median (1mk)
- ii) The quartile deviation (1mk)
- iii) The number of students who scored above 67. (1mk)
- (c) Use an assumed mean of 64.5 to calculate the standard deviation of the above data. (4mks)
19. An arithmetic progression has the first term as x and the common difference as d .
- (a) Write down in terms of x and d , the 3rd, 9th and 25th terms of the progression. (1mk)
- (b) The progression is increasing and the 3rd, 9th and 25th terms forms the first three Consecutive terms of a geometric series. If the sum of the 7th and twice the 6th term of the arithmetic progression is 78, calculate:
- (i) The first term and the common difference of the A.P (6mks)
- (ii) The sum of the first nine terms of the A.P (3mks)
20. The figure below shows a right pyramid with a square block at its base. The sides of the base are 40cm and the height of the base is 30cm. M is the mid-point of QR such that $PM = 29$ cm.



Calculate:

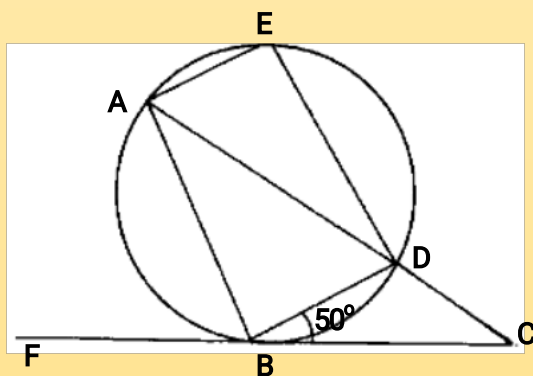
- (a) The vertical height of vertex P from plane $ABCD$. (3mks)
- (b) The angle between planes PQR and PST . (2mks)
- (c) The length of the projection of the line RP on the plane $QRST$ (3mks)
- (d) The angle between planes $QRCD$ and $ABCD$ (2mks)
21. The manager of a hotel has enough money to buy a total of 120 crates of soft drinks of two brands novida and alvaro. The number of novida crates has to be less than twice the number of alvaro crates. There must be at most 90 crates of novida but at least 15 crates

but not more than 60 crates of alvaro.

- (a) Let x be the number of novida crates and y be the number of alvaro crates
- (i) Represent the information using inequalities. (3mks)
- (ii) Plot the graph of the above inequalities. (3mks)
- (b) The profit from a crate of novida is 75 and that of alvaro is 50. Find the number of crates of each type that he should buy to make maximum profit. (2mks)
- (c) Due to inflation the profit on a crate of novida reduced by 20% and that on a crate of Alvaro increased by 80%. Find the difference in the maximum profit that can be made by the hotel as result of these changes. (2mks)
22. Given that $y = 2\sin 2x$ and $y = 3\cos(x + 45^\circ)$
- (a) Complete the table below. (2mks)

X	0°	20°	40°	60°	80°	100°	120°	140°	160°	180°
$2\sin x$	0		1.97		0.68	-0.68	-1.73		-1.28	0.00
$3\cos(x + 45^\circ)$	2.12	1.27		-0.78		-2.46			-2.72	-2.12

- (b) Use the data to draw the graphs of $y = 2\sin 2x$ and $y = 3\cos(x + 45^\circ)$ for $0^\circ \leq x \leq 180^\circ$.
On the same axes. (4mks)
- (c) State the amplitude and period of each curve. (2mks)
- (d) Use the graph to solve the equation $2\sin 2x - 3\cos(x + 45^\circ) = 0$ for $0^\circ \leq x \leq 180^\circ$ (2mks)
23. (a) Given that BC is a tangent to the circle and that angle $ABC = 110^\circ$ and angle $CBD = 50^\circ$. Calculate giving reasons



- (i) Angle AED (2mks)
- (ii) Angle BAD (2mks)
- (iii) Angle DCB (2mks)
- (b) Given that $BD = 3\text{cm}$ and $DC = 5\text{cm}$. Find the area of triangle BDC . (4mks)
24. The water supply in a town depends entirely on two water pumps. A and B. The probability of pump A failing is 0.1 and the probability of pump B failing is 0.2.
- [a] Draw a tree diagram to represent this information (2mks)
- (b) Calculate the probability that;
- (i) Both pumps are working (2mks)
- (ii) There is no water in the town (2mks)
- (iii) Only one pump is working (2mks)
- (iv) There is some water in the town (2mks)

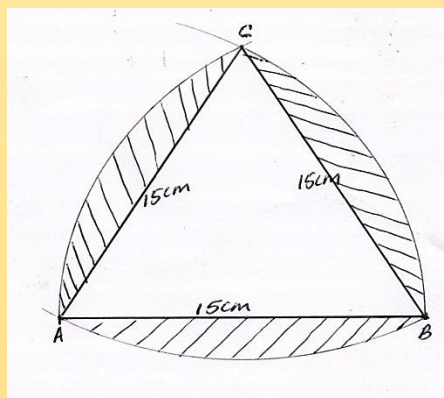
NYERI CENTRAL SUB COUNTY
MATHEMATICS ALTA
PAPER 1
. MOCKS KCSE PREDICTIONS/., .
TIME: 2½ HOURS

1. Without using mathematical tables or a calculator evaluate, leaving your answer in power form.

$$\left(\frac{16}{81}\right)^{-3/4} \times 512^{2/3}$$

(3marks)

2. Water in a plastic rectangular tank is leaking at a rate of 2cm^3 per seconds. Find
 (a) The volume of water that leaks from the tank every hour. (1mark)
 (b) The time to the nearest minute it will take the leakage to fill a cylindrical container of radius 22cm and height 35cm (Take $\pi=3.142$) (3marks)
3. If $\tan x = \frac{5}{8}$ find $\sin (90 - x)$. giving your answer in 3 s.f.g (3marks)
4. Simplify $\frac{16x^2 - 9}{12x^2 + 7x - 12}$ (3marks)
5. The interior angles of a heptagon are $120^\circ, 100^\circ, 140^\circ, 2\frac{1}{2}x, 3x - 20^\circ, 1\frac{3}{4}x$ and $2x + 5^\circ$.
 Find the difference between its largest angle and its smallest angle. (3marks)
6. Line $y=3x + 10$ intersects line $5x + y + 6 = 0$ at a point P. Find the co-ordinates of P. (3marks)
7. Given the inequalities $x - 5 \leq 3x - 8 < 2x - 3$
 (a) Solve the inequalities (2marks)
 (b) Represent the solution on a number line. (1mark)
8. In the figure below ABC is an equilateral triangle of side 15cm. Arcs AB, BC and AC are those of circles with centres C, A and B respectively. Calculate the area of the shaded region. (3marks)

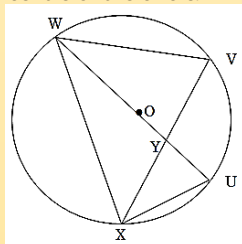


9. Three consecutive odd numbers x, y and z add up to 387. Find the three numbers (3marks)
10. If $\vec{OP} = 5\mathbf{i} - 3\mathbf{j}$ and $\vec{OQ} = 3\mathbf{i} + 5\mathbf{j}$, find the magnitude of PQ to two significant figures. (3marks)
11. A commercial bank buys and sells Japanese Yen in Kenya shillings at the shown below
- | | |
|-----------|-----------|
| Buying | Selling |
| Ksh0.8109 | Ksh0.8433 |
- Japanese tourist was left with Ksh70,000 at the end of her tour to Kenya. If she converted the money to Japanese Yen through the bank how many Japanese Yen did she get. (3marks)
12. Without using logarithms or calculators tables evaluate (3marks)
- $$\sqrt{\frac{331.24 \times 0.0576}{60.84}}$$
13. Given that $\log 4 = 0.6021$ and $\log 6 = 0.7782$, without using mathematical tables or calculator evaluate $\log 0.096$. (4marks)
14. A car took 135 minutes to cover a distance of $(3x - 6)$ km at an average speed of $(x + 24)$ km/h. Find the actual distance that was covered. (3marks)
15. $G'(1, -5)$ and $H'(-8, 8)$ are the images of G and H respectively under a translation. If the co-ordinates of H is $(-5, 6)$, find the co-ordinates of G. (3marks)
16. Use reciprocal and squares tables to evaluate, to 4 significant figures the expression. (3marks)

$$\frac{1}{17.62} + 5.318^2$$

Section II answer any five (50marks)

17. (a) Find the inverse of $\begin{pmatrix} 6 & 4 \\ 5 & 3 \end{pmatrix}$ (2marks)
- (b) In January of a certain year, a retailer sold 18 pans and 12 sufurias at a total of sh11 400. In February, he sold 15 pans and 9 sufurias at a total of sh9 150. Use matrix method to find the selling price of each item (4marks)
- (c) From the start of MOCKS KCSE PREDICTIONSto the end of December that year, the selling price of each pan was increased by 15% and that of a sufuria was reduced by 6%. In this latter period, he sold five times as many pans and six times as many sufurias as he had sold in January and February. Use the matrix method to calculate his total sales of pans and sufurias from the start of MOCKS KCSE PREDICTIONSto the end of December. (4marks)
18. In the figure below, O is the centre of the circle. WOU is a straight line $\angle WXV = 48^\circ$ and $VX = WX$



- (a) Giving a reason (s) in each case, find the sizes of
- (i) $\angle UXV$ (2marks)
- (ii) $\angle VOW$ (2marks)
- (iii) $\angle UOV$ (2marks)
- (b) If $UV = 8\text{cm}$ find the area of the circle. (4marks)
19. (a) Sketch the graph of $y = 2x^2 + 4x - 9$ for the values $-3 \leq x \leq 1$. (2marks)
- (b) Use mid-ordinates rule with 4 strips to estimate the area of the region bounded by $y = 2x^2 + 4x - 9$ the x-axis and the line $x = -3$ and $x = 1$. (3marks)
- (c) Calculate the area of the same region using the integration method. (3marks)
- (d) Calculate the percentage error when mid-ordinates rule is used to estimate the area. (2marks)
20. The displacement, s metres of a moving particle from point O after t seconds is given by $S = t^3 - 5t^2 + 3t + 10$.
- (a) Find s when $t = 2$ (2marks)
- (b) Determine
- (i) The velocity of the particle at $t = 5$ seconds (3marks)
- (ii) The value of t when the particle is momentarily at rest. (3marks)
- (c) Find the time when the velocity of the particle is maximum. (2marks)
21. (a) Solve $2x + 1 = 1$ (4marks)
- (b) The width of Kwamboka's office is 3.1m less than its length. The area of the floor is 33m^2 .
- (i) Find the perimeter of the office's floor. (4marks)
- (ii) Kwamboka lays a rectangular carpet in her office leaving a space of 15m^2 of floor space around it. Given that the width of the carpet is half length of the carpet find the length of the carpet. (2marks)
22. A(1,3) B(5,5) C(4,3) and D(4,1) are the vertices of quadrilateral ABCD.
- (a) On the grid draw quadrilateral ABCD (2marks)
- (b) Quadrilateral A'B'C'D' is the image of ABCD under a positive quarter turn about the origin. On the same grid draw A'B'C'D' and state its co-ordinates. (3marks)
- (c) A'B'C'D' is mapped onto quadrilateral A''B''C''D'' by a reflection on the x-axis. On the same grid draw A''B''C''D'' and state its co-ordinates. (3marks)
- (d) Under a reflection on line PQ quadrilateral A''B''C''D'' is mapped back onto ABCD. On your graph draw the minor line PQ and give its equation. (2marks)
23. The figure below represents a 16cm high solid frustum with a base radius of 8.4cm and a top radius of 14cm. The frustum is made of wax whose density is 0.82g/cm^3 .
- (a) Taking $\pi = \frac{22}{7}$ find
- (i) The volume of the frustum (5marks)
- (ii) The mass of the frustum in kilograms correct to 2d.p. (2marks)
- (b) Lucy melts down the frustum and recasts it into a solid cube of side h cm. If 15% of the wax was lost in melting process find h (3marks)

24. The following table shows the ages in months of some children that were taken to Afya clinic in a certain week.

Age(months)	$0 \leq x < 10$	$10 \leq x < 15$	$15 \leq x < 25$	$25 \leq x < 45$	$45 \leq x < 75$
frequency	24	32	48	66	30

- (a) Estimate (i) the mean age (4marks)
(ii) the median age (2marks)
- (b) State the modal class (1mark)
- (c) On the grid provided draw a histogram to represent the distribution. (4mks)

NYERI CENTRAL SUB COUNTY

121/2

MATHEMATICS ALT A

PAPER 2

. MOCKS KCSE PREDICTIONS/., .

TIME: 2½ HOURS

Section 1 Answer All The Questions (50 marks)

1. Solve for θ in the equation.

$$6 \cos^2 \theta - \sin \theta - 4 = 0 \text{ in the range } 0^\circ \leq \theta \leq 180^\circ \quad (3 \text{ Marks})$$

2. The equation of a circle is $x^2 - 8x + y^2 + 12y + 16 = 0$

Determine the coordinates of the centre of the circle and its radius. (3Marks)

3. 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 $Q = 4$. (4 Marks)

4. The gradient function of a curve is given by $\frac{dy}{dx} = 2x - 4$

Determine;

- (a) the equation of the curve given the curve passes through point (0,3) (2 Marks)

- (b) the coordinates of the turning point of the curve. (1 Mark)

5. Solve for x in the equation $\log(x - 1) = \log 12 - \log(x - 2)$ (3 Marks)

6. A triangle whose area is 6.5cm^2 is mapped onto a triangle whose area is 13cm^2 by a matrix

$$\begin{pmatrix} \chi + 4 & 6 \\ 5 & \chi \end{pmatrix}.$$

Find the possible values of χ .

(4 marks)

7. Given that $\frac{1}{1 + \sqrt{2}} - \frac{3}{1 - \sqrt{2}} = P + Q\sqrt{R}$ find the values of P, Q and R. (4 marks)

8. Make t the subject of the formula $V = \sqrt{\frac{tv^2 - w}{n}}$ (3 marks)

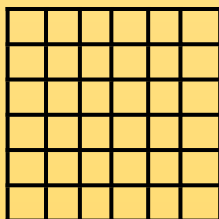
9. A point T divides a line AB internally in the ratio 5:2. Given that A is (4,10) and B is (11,3).

Find the coordinates of T. (3 marks)

10. A shopkeeper mixes coffee costing sh. 160 per kg with another type which costs sh. 240 per kg. Find the ratio in which the two types should be mixed so that if one of the mixtures is sold at Sh. 220, a profit of 10% is realized. (3marks)

11. A two digit number is made by combining any of the two digits 1,3,5,7 and 9 at random.

- a) Make an array of possible combinations (2 marks)



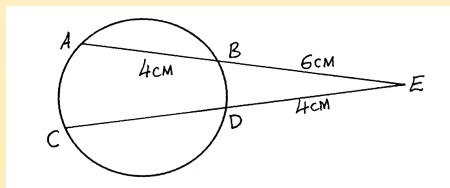
- b) Find the probability that the number formed is prime. (1 mark)

12. (a) Expand and simplify the binomial expression $(2 + 2y)^5$ in ascending powers of y (1mark)

- (b) Use the expansion up to the fourth term to evaluate $(2.02)^5$ correct to 4 decimal places. (2marks)

13. A man deposited Ksh. 48,000 in a bank that compounded at the rate of r% p.a semi-annually for two years and realized Ksh. 54,968. Find r giving your answer correct to 4 s.f. (3 marks)

14. A right circular cylinder is to be made so that the sum of its radius and its height is 6cm. Find the maximum possible volume of the cylinder. (3marks)
15. The figure below shows a circle with secants ABE and CDE, if $AB = 4\text{cm}$ and $BE = 6\text{cm}$ and $DE = 4\text{cm}$ find the length of CD. (2marks)



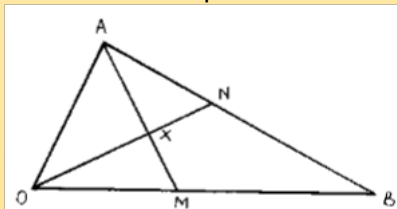
16. Taps A and B can fill a tank in 4 and 9 hours respectively. Both taps are turned on for 2 hours after which tap A is closed. Find how long tap B takes to fill the remaining part of the tank. (3marks)

Section II answer five questions only (50marks)

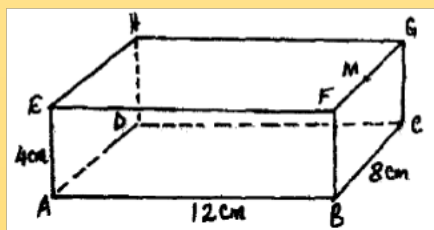
17. The position of two towns are A (30°S , 20°W) and B (30°S , 80°E) find

- (a) the difference in longitude between the two towns. (2 marks)
- (i) the distance between A and B along parallel of latitude in km (take radius of the earth as 6370km and $\pi = \frac{22}{7}$). (2 marks)
- (ii) in nm. (2 marks)
- (c) Find local time in town B when it is 1.45pm in town A. (4 marks)

18. In the figure below M and N are points on OB and BA respectively such that $OM:MB=2:3$ and $BN:NA=2:1$. ON and AM intersect at x.



- a) Given that $OA = \mathbf{a}$ and $OB = \mathbf{b}$ express the following in terms of $\mathbf{a}$ and $\mathbf{b}$. (4marks)
- $\vec{AB}$
- $\vec{AM}$
- $\vec{ON}$
- b) By taking $OX = h \vec{ON}$ and $AX = k \vec{AM}$, where h and k are scalars. Find two expressions for OX in terms of $\mathbf{a}$ and $\mathbf{b}$. Hence determine the constants h and k . (5marks)
- c) Find the ratio in which x divides AM . (1mark)
- 19 The figure below shows a cuboid ABCDEFGH. (Given that $AB = 12\text{cm}$, $BC = 8\text{cm}$ and $BE = 4\text{cm}$)



- (a) State the projection of AG on the plane EFGH. (1 mark)
- (b) Determine the angle between the line AG and the plane EFGH. (3marks)
- (c) Given that M is the mid-point of FG, determine the angle between the planes AMD and ABCD. (3marks)
- (d) Find the volume of the cuboid (1mark)
20. A manager wishes to hire two types of machine. He considers the following facts:
- | | Machine A | Machine B |
|--------------------------------|---------------|---------------|
| Floor space | 2m^2 | 3m^2 |
| No. of men required to operate | 4 | 3 |
- He has a maximum of 24m^2 of floor space and a maximum of 36 men available. In addition he is not allowed to hire more machines of type B than of type A.
- (a) If he hires x machines of type A and y machines of type B, write down all the inequalities that satisfy the above conditions. (4marks)
- (b) Represent the inequalities on the grid and shade the unwanted region. (4marks)

- (c) If the profit from machine A is sh. 4 per hour and that from using B is sh.8 per hour. What number of machine of each type should the manager choose to give the maximum profit? (2marks)

21. The frequency distribution of marks of 110 students is given in the table below.

Marks	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
f	2	5	9	12	25	37	11	6	2	1

- (a) On the grid provided, draw an Ogive to illustrate the data (4marks)
- (b) From your graph estimate
- (i) The median mark (1mark)
- (ii) The interquartile range (2marks)
- (iii) The pass mark, if 68% of the students are to pass (3marks)
22. (a) The first term of an Arithmetic Progression(AP) is 2. The sum of the first 8 terms of the AP is 156.
- (i) Find the common difference of the AP. (2marks)
- (ii) Given that the sum of the first n terms of the AP is 416, find n . (3marks)
- b) The third, fifth and eighth terms of another AP form the first three consecutive terms of a Geometric Progression (GP). If the common difference of the AP is 3, find
- (i) The first term of the GP, (3marks)
- (ii) The sum of the first 9 terms of the GP, to 4 significant figures. (2marks)

23. The taxation rate, for 2007 were as in the table below.

Income (Ksh. P.M)	Tax rate (%)
1 - 2000	5
2001 – 4000	10
4001 - 6500	15
Above 6500	20

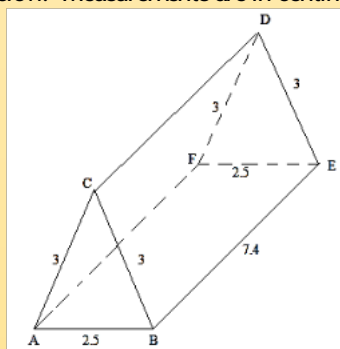
In certain month in 2007, Mutai paid a tax of Ksh. 3000 after having been given a personal relief Ksh. 1056 per month.

- (a) How much tax per month could he have paid if he did not get tax relief. (2marks)
- (b) Calculate the his total taxable income in Ksh. P.m (6marks)
- (c) Given that his total taxable allowance amount to Ksh. 4520 P.m. Calculate his monthly basic salary in Kenya shillings. (2marks)
24. (a) Using a ruler and pair of compasses only, construct triangle **ABC** in which **AB**=9cm, **BC**=8.5cm and $\angle \text{BAC}$ =60°. (3marks)
- (b) On the same side of **AB** as **C**:
- (i) Determine the locus of a point P such that $\angle \text{APB} = 60^\circ$. (3marks)
- (ii) Construct the locus of **R** such that **AR**>4cm (2marks)
- (iii) Determine by shading the region **T** inside the triangle such that $\angle \text{ACT} \geq \angle \text{BCT}$. (2marks)

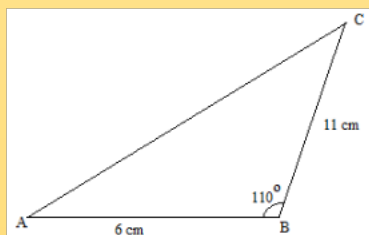
BUURI EAST STANDARDS**121/1****MATHEMATICS****. MOCKS KCSE PREDICTIONS, .****PAPER 1****TIME: 2½ HOURS****SECTION I (50 MARKS):****Answer all the questions in this section in the spaces provided.**

1. Without using a calculator evaluate. (3 marks)

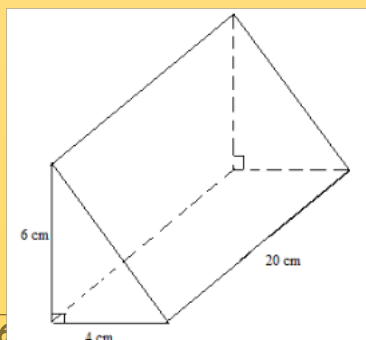
$$\frac{-4(3+1)-18 \div 6+5}{-3 \times -6+1 \times 11}$$
2. The distance between Jane's home and her school is $\frac{4}{5}$ of 8km. One day she run $\frac{1}{4}$ of the way and walked the rest of the journey. What distance did she walk? (3 marks)
3. Otiende works for a coffee processing company as a sales man. He is paid on Monthly basis as per agreement below.
 - a) A basic pay of sh. 20,000 per Month.
 - b) A commission of 2% for goods sold up to a maximum of sh. 200,000.
 - c) A commission of 4% for goods sold over sh. 200,000 in that Month.
 In a certain Month he sold goods worthy sh. 600,000. Calculate his total pay for that Month. (3 marks)
4. Draw the net of the solid shown in the figure below. Measurements are in centimeters. (3 marks)



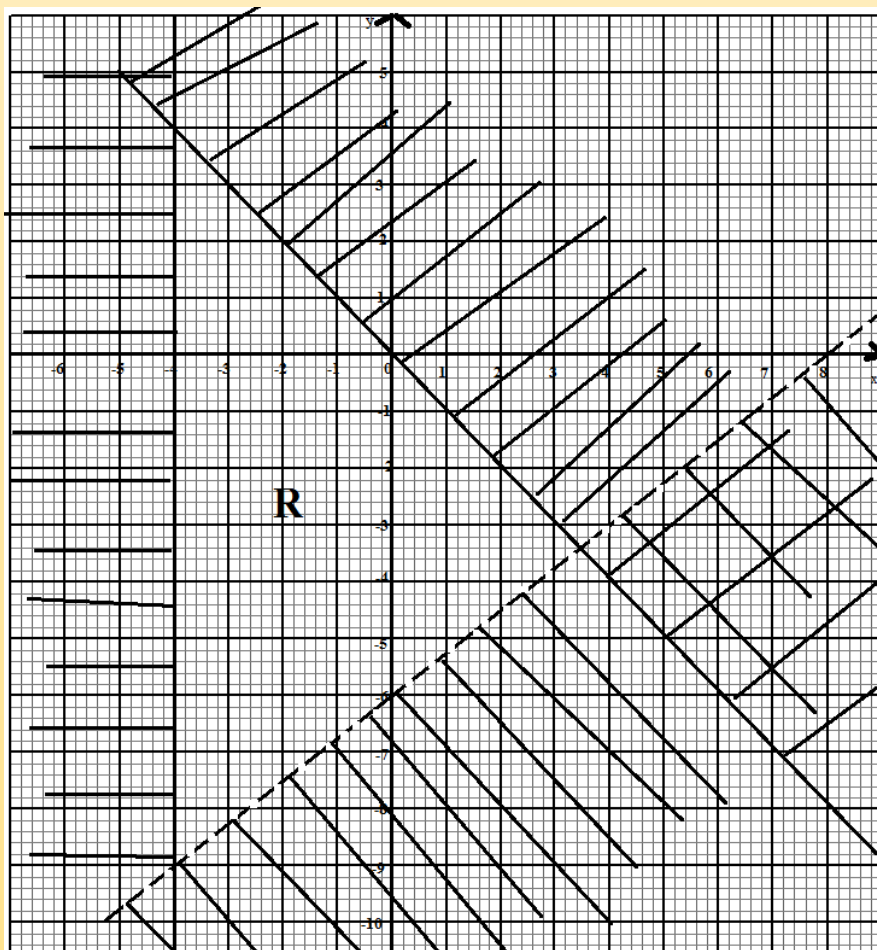
5. Solve for Y in the equation. $8^{y+1} - 2^{3y+1} = 48$ (3 marks)
6. Simplify the expression; $\frac{12x^2+ax-6a^2}{9x^2-4a^2}$ (3 marks)
7. A line P whose equation is $y = \frac{1}{3}x + 4$ is parallel to another line Q. Find the equation of line Q in the form $y = mx + c$ given that it passes through Point (3, 6) (3 marks)
8. Simplify without using tables or calculators; $\frac{1}{1-\sin 45^\circ}$ (3 marks)
9. The figure below shows a triangle ABC in which AB = 6cm, BC = 11cm and angle ABC = 110° . Calculate to the decimal places the length of AC. (3 marks)



10. The figure below shows a triangular –based pyramid. If the solid is made up of a material of density 1.25g/cm^3 , calculate the mass of the solid. (3 marks)



11. A football match between Arsenal FC and Chelsea FC started at 1500hrs. It lasted for the official 90 minutes with a half time break of 15 minutes. The Referee added five extra minutes for injuries and other stoppages. Find the time the match ended. (3 marks)
12. Write down the inequalities that satisfy the unshaded region labelled R. (3 marks)



13. The width of a rectangular hall of Ruiri Girls Secondary School is 16m less than its length. Calculate the length of the hall if its area is 132m^2 . Hence calculate its perimeter. (4 marks)
14. Town A is 80km due east of town B. Town C is on a bearing of 234° from town B. If town C is 100km from town A, by scale drawing find the distance of town C from town B. (4 marks)
15. a) Find the inverse of the matrix $\begin{pmatrix} 7 & 4 \\ 3 & 2 \end{pmatrix}$. (1 mark)
- b) Using matrix method, solve the simultaneous equations. (2 marks)
- $$\begin{aligned} 7x + 4y &= 14 \\ 3x + 2y &= 8 \end{aligned}$$
16. Use tables of square roots and reciprocals to find the value of x. (3 marks)

$$x = \sqrt{\frac{1}{15.36} + \frac{3}{1.302}}$$

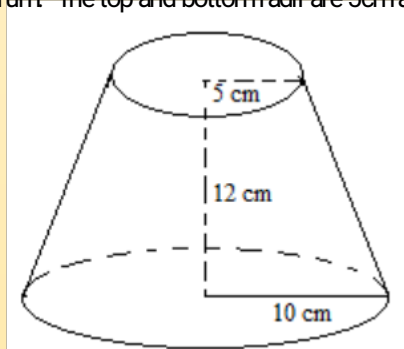
SECTION II(50 marks). Answer only five questions in this section in the spaces provided.

17. a) On the grid provided draw the quadrilateral PQRS whose vertices are P (-5, 4), Q (-3, 4), R (-5, 3) and S (-4, 3). (1 mark)
- b) On the same grid draw:-
- P'Q'R'S' the image of PQRS under a reflection in the line $y = 0$ (2 marks)
 - P''Q''R''S'' the image of P'Q'R'S' under a rotation of $+180^\circ$ about (0,0) (2 marks)
 - P'''Q'''R'''S''' the image P''Q''R''S'' under an enlargement scale -2, centre (4, 0) (2 marks)
- c) Name the quadrilaterals that are
- Directly congruent (1 mark)

ii) Oppositely congruent

(2 marks)

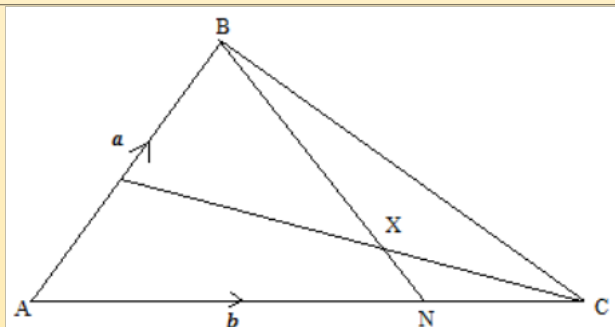
18. The figure below shows a frustum. The top and bottom radii are 5cm and 10cm respectively, while the vertical height of the frustum is 12cm.



10cm respectively, while the vertical height of the

Find the:-

- Slant height of the frustum. (3 marks)
 - Curved area of the frustum. (3 marks)
 - Volume of the frustum. (4 marks)
19. Kiriari is a market centre 600km from Kisumu town. A bus starts from Kisumu for Kiriari at 7.00am at an average speed of 80 km/h. At 8.30 am a car started from Kisumu to Kiriari and moved at an average speed of 120 km/hr.
- The distance bus covered before the car started moving. (3 marks)
 - The relative speed for the two vehicles. (2 marks)
 - The time the car overtook the bus. (1 mark)
 - Distance covered by the car before overtaking the bus. (2 marks)
 - Distance from Kiriari to the car at the time the car was overtaking the bus. (2 marks)
20. The height of 36 student in a class was recorded to the nearest centimeter as follows:-
- | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 148 | 159 | 158 | 163 | 166 | 155 | 155 | 179 | 158 |
| 161 | 160 | 157 | 165 | 165 | 175 | 173 | 172 | 178 |
| 147 | 168 | 157 | 172 | 165 | 154 | 170 | 157 | 167 |
| 155 | 159 | 173 | 171 | 168 | 160 | 172 | 156 | 167 |
- Make a frequency distribution table using a class interval of 5 and starting with the class 145 – 149. (2 marks)
 - From the table above
 - Calculate the mean mark. (3 marks)
 - Calculate the median. (3 marks)
 - Draw a frequency polygon using the table in (a) above. (2 marks)
21. Kibirichia Boys Secondary School. Intends to buy a certain number of chairs For Ksh. 16,200. The supplier agreed to offer a discount of Ksh. 60 per chair Which will enable the school to get 3 chairs more. Taking y as the originally intended number of chairs:-
- Write an expression in terms of y for
 - Original price per chair. (1 mark)
 - Price per chair after discount. (1 mark)
 - Determine
 - The number of chair the school originally intended to buy. (4 marks)
 - Price per chair after discount. (2 marks)
 - The amount of money the school would have saved per chair of it got the intended number of chairs at a discount of 15%. (2 marks)
22. a) Without using a protractor, construct triangle ABC such that angle $ABC = 60^\circ$, $BC = 8\text{cm}$ and $AC = 9\text{cm}$. Measure AB. (3 marks)
- Draw a perpendicular from A to BC and measure its length. (2 marks)
 - Hence calculate the area of triangle ABC. (2 marks)
 - Locate a point D on BC such that the area of triangle ABC is three times that of triangle ABD. (3 marks)
23. In triangle ABC, shown below, $AB = a$ $AC = b$ point M lies on AB such that $AM: MB = 2:3$ and point N lies on AC such that $AN: NC = 5:1$ line BN intersects line MC at X.



a) Express the following in terms of $\mathbf{a}$ and $\mathbf{b}$

i) $\mathbf{BN}$

(1 mark)

ii) $\mathbf{CM}$

(1 mark)

b) Given that $\mathbf{BX} = k\mathbf{BN}$ and $\mathbf{CX} = r\mathbf{CM}$ where k and r are scalars

i) Write two different expressions for $\mathbf{AX}$ in term of $\mathbf{a}$, $\mathbf{b}$, k and r

(4 marks)

ii) Find the values of k and r

(4 marks)

24. A particle moves such that t seconds after passing a given point O is given by

$$S = t(t-2)(t-1)$$

a) Find its velocity when $t = 2$ second

(3 marks)

b) Find its minimum velocity.

(3 marks)

Find the time when the particles is momentarily at rest.

(3 marks)

Find its acceleration when $t = 3$ seconds.

(1 mark)

BUURI EAST STANDARDS

121/2

MATHEMATICS

. MOCKS KCSE PREDICTIONS .

PAPER 2

TIME: 2½ HOURS

SECTION I (50 MARKS):

Answer all the questions in this section in the spaces provided.

1. Make P the subject of the formula in; $x = \frac{\sqrt{y(p-y)}}{p-i}$ (3 marks)

2. The length of a rectangle is 8.3cm and its width is 5.45cm. Calculate.

a) The relative error in the area of the rectangle.

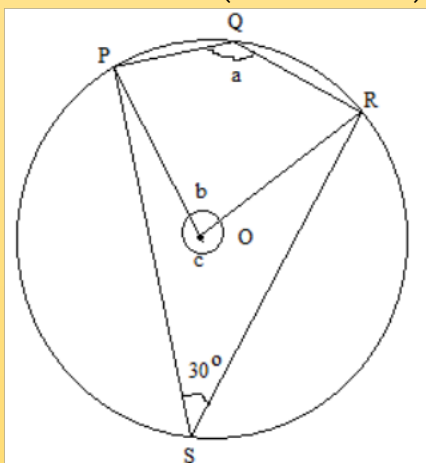
(3 marks)

b) The percentage error in the area.

(1 mark)

3. The figure shown below is a circle centre O (not drawn to scale). Find the value of angles a , b and c given that $\angle PSR = 30^\circ$.

(3 marks)



4. The first term of an arithmetic sequence is -5 and the common difference is 3.

a) List the first 5 terms of the sequence.

(1 mark)

b) Determine the sum of the first 40 terms of the sequence.

(2 marks)

5. a) Given the vectors $\mathbf{a} = 3\mathbf{i} - \mathbf{j} + 2\mathbf{k}$, $\mathbf{b} = 4\mathbf{i} + 2\mathbf{j} - \mathbf{k}$ and $\mathbf{p} = 2\mathbf{a} - \mathbf{b}$. Express $\mathbf{p}$ in terms of $\mathbf{i}$, $\mathbf{j}$ and $\mathbf{k}$

(2 marks)

b) Hence calculate $|\mathbf{p}|$ correct to 3 significant figures.

(1 mark)

6. A quantity X varies directly as Y and the square of Z when $Y = 2$ and $Z = 5$, $X = 150$.

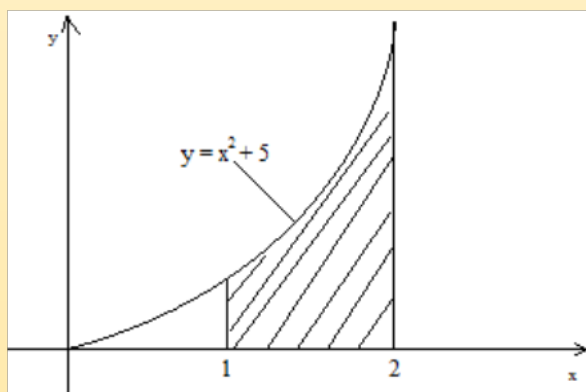
Find:-

- a) The law governing X, Y and Z
 b) The value of X when Y = 4 and Z = 3
 7. Find accurately the shaded area.

(2 marks)

(1 mark)

(3 marks)



8. Simplify the following surd leaving answer in the form $a + b\sqrt{c}$

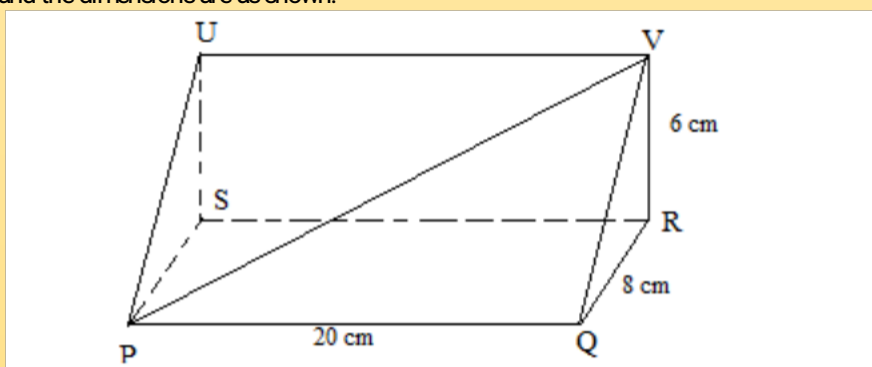
(3 marks)

$$\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$$

9. Evaluate the following expression without using mathematical tables or a calculator.
 $3\log_{10}4 + \log_{10}125 - 3\log_{10}2$

(3 marks)

10. The diagram below represents a wedge whose cross – section is a right angle triangle. PQVU is a rectangle and the dimensions are as shown.



Calculate to 2 decimal places:-

- a) The length of PV (2 marks)
 b) The size of the angle between PV and plane PQRS. (2 marks)
 11. a) Expand $(1 + x)^6$ upto the forth term (1 mark)
 b) Using the binomial expansion in (a) above estimate the value of 1.9^6 (2 marks)
 12. A transporter has two types of trucks to transport maize. Type A carries 2000bags whole type B carries 3000 bags per trip. The transporter has to transport 120,000 bags. He has to make not more than 50 trips. Type B trucks are to make atleast twice the number of trips made by type A. Taking x to be the number of trips made by type A truck and y to be the number of trips made by type B. Write down all the inequalities representing this information. (3 marks)
 13. The equation of a circle is $x^2 + y^2 - 4x + 8y = 5$. Find the centre and the radius of the circle. (3 marks)
 14. Solve for x in the equation below using the completing the square method. (3 marks)
 $x^2 - 7x + 10 = 0$
 15. Mr Sudan works for a company earning a basic salary of 30,000 and house allowance of 12,000. In a certain year the government charged tax on PAYE basis using the table below.

Income in Ksh per Month	Rate(% per Ksh)
1 – 10,000	5
10,001 – 20,000	10
20,001 – 30,000	20
Over 30,000	30

If Sudan is given a personal relief of sh. 3,000 per Month, find tax he pays in that month.

(3 marks)

16. Triangle A'B'C' is the image of triangle ABC under a transformation matrix $T = \begin{pmatrix} 1 & 3 \\ 2 & 2 \end{pmatrix}$

If the area of triangle A'B'C'D' is 25.6cm^2 , find the area of the object.

(3 marks)

SECTION II (50 marks).

Answer **only five** questions in this section in the spaces provided.

17. a) On the same diagram construct:-

i) Triangle PQR such that $PQ = 9\text{cm}$, $PR = 7\text{cm}$ and $\angle RPQ = 60^\circ$

(2 marks)

ii) The locus of a point M such that M is equidistant from P and Q.

(1 mark)

iii) The locus of a point N such that $RN \leq 3.5\text{cm}$

(1 mark)

b) On the diagram in part (a)

i) Shade the region B, containing all the points enclosed by the locus on M and the locus of N such that $PM \geq QM$.

(2 marks)

ii) Find the area of the region shaded in part (b) (i) above.

(4 marks)

18. An examination involves a written test and a practical test. The probability

That a candidate passes the written test is $\frac{6}{11}$. If the candidate passes the written test, then the probability of passing the practical test is $\frac{3}{5}$, otherwise it would be $\frac{2}{7}$.

Illustrate this information in a tree diagram.

(2 marks)

Determine the probability that a candidate

i) Passes both tests

(2 marks)

ii) passes the written test only

(2 mark)

iii) passes only one test

(2 marks)

v) fails both test

(2 marks)

19. Mr Rao is a water supplier in a certain market. He has a tank which holds 20,000 litres.

The tank is being filled with water from two pipes P and Q. water flows at the rate of 150L/minute through pipe P and 100l/minute through pipe Q.

- a) If the tank is empty and the two pipes are opened at the same time, calculate the time taken to fill the tank. (3 marks)

- c) On a certain day Mr Rao started with an empty tank, opened pipes P and Q for 30 minutes, after which he opened pipe R to supply his customers. R supplies water at a rate of 20 litres per minute. Calculate the time it took to fill the tank. (7 marks)

20. Complete the table below by filling in the blank spaces.

(2 marks)

x°	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
$\cos x^\circ$	1.00		0.50			-0.87		-0.87					
$2 \cos \frac{1}{2} x$	2.00	1.93					0.00						

- a) On the grid provided using a scale of 1cm to represent 30° on the horizontal axis and 4 cm to represent 1 unit on the vertical axis draw the graph of $y = \cos x^\circ$ and $y = 2\cos \frac{1}{2} x^\circ$

(4 marks)

- b) State the amplitude and period of $y = 2\cos \frac{1}{2} x$

(2 marks)

- c) Use your graph to solve the equation

(2 marks)

$$2 \cos \frac{1}{2} x - \cos x = 0$$

21. a) Taking the radius of the earth $R = 6371\text{km}$ and $\pi = \frac{22}{7}$, calculate correct to 2 d.p the distance between the two cities, A (60°N , 29°W) and B (60°N , 31°E) along the parallel of latitude.

(3 marks)

b) If it is 1200hrs at city A, what is the local time at city B?

(3 marks)

c) An aeroplane flew due South from a point P (60°N , 45°E) to point Q.

The distance covered by the aeroplane was 800km. Determine the position of Q.

(4 marks)

22. The marked price of a television set is 25,600. On cash payment a customer is given a discount of 5% on the marked price. The T.V can also be bought on hire purchase terms by paying a deposit of sh 12,640 and 16 equal Monthly installments of sh. 1450 each.

- a) Calculate

i) Cash price of the machine

(2 marks)

ii) The hire purchase value

(3 marks)

iii) Calculate the rate of compound interest charged per Month for hire purchase terms.

(4 marks)

iv) Find difference between cash price value and hire purchase value.

(1 mark)

23. The table below shows masses of 100 form 4 students.

Mass Kg	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
No of students	4	6	10	14	22	24	14	6

Find:-

a) Mean mass

(4 marks)

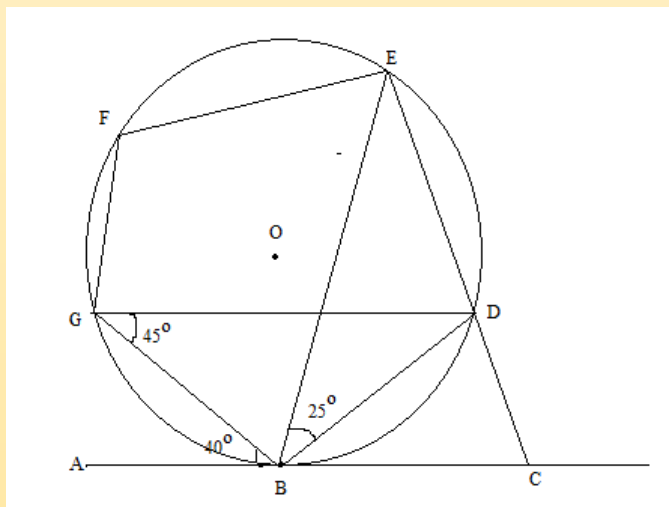
b) Variance

(5 marks)

c) Standard deviation

24.

In the figure below ABC is a tangent to the circle at B. Given that $\angle ABG = 40^\circ$, $\angle BGD = 45^\circ$ and $\angle DBE = 25^\circ$ (1 mark)



Find the size of the following angles giving reasons in each case

a) $\angle BDG$

(2 marks)

b) $\angle DGE$

(2 marks)

c) $\angle EFG$

(2 marks)

d) $\angle CBD$

(2 marks)

e) $\angle BCD$

(2 marks)

SUKELE

121/1

MOCK EXAMINATION

. MOCKS KCSE PREDICTIONS .

The Kenya Certificate of Secondary Education

MATHEMATICS

Paper 1

2 ½ hours

SECTION I (50 MARKS)

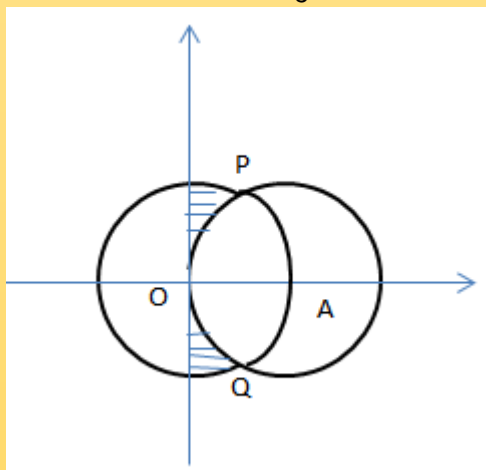
Answer all the questions in this section.

1. Without using mathematical tables or calculator, evaluate

$$\left(\frac{2860 \times 1400 \times 1170}{143 \times 637 \times 504} \right)^{-\frac{1}{2}}$$

(4marks)

2. Two circles of equal radius have their centres at O (0, 0) and A(5, 0) respectively as shown below. Given that angle PAQ = 120° , Calculate the area of the shaded region. (4marks)



3. Simba village is 74km North West of Nyati village. Kifaru village is 42km west of Nyati village. By using appropriate scale drawing, find the bearing of Kifaru village from Simba village. (3marks)

4. Simplify the expression

$$\frac{(w^2 - wy - wz + yz)(w + z)}{z^2 - w^2}$$

(3marks)

5. Mutua sold a car to Kyalo at a loss of 20%. Kyalo sold the car to Muema at a profit of 50%. Muema sold the car to Musyoka at a loss of 25%. Calculate the percentage profit Kyalo would have made had he sold the car directly to Musyoka. (3marks)

6. One of the interior angles of a polygon is 84° . If each of the other angles is 147° , how many sides does the polygon have? (3marks)

7. Two brands of sugar X and Y costing sh. 45 and sh. 50 respectively. In what ratio must they be mixed in order to make a 25% profit by selling the mixture at sh. 60? (3marks)

8. Simplify completely

$$\frac{3x^2 - 1}{x^2 - 1} - \frac{2x + 1}{x + 1}$$

(3marks)

9. A cylindrical iron pipe is 2.1m long and 12cm is its external diameter. The metal is 1cm thick and has a density of 7.8g/cm^3 .

Taking $\pi = 3\frac{1}{7}$, find its mass of the material used to make the iron pipe in kilograms.

(3marks)

10. Find a if $(a+1)i + 4j$ is parallel to $-2i + 6j$. (3marks)

11. From a point 20m away on a level ground, the angle of elevation to the lower window line is 27° and the angle of elevation to the top line of the window is 32° . Calculate the height of the window. (3marks)

12. The curve $y = ax^2 + bx - 10$ intersects with the line $y = 2x - 5$ at the points A(-1, -7) and B(2.5, 0). Determine the values of a and b . (3marks)

13. Evaluate $\frac{3^{n+2} - 3 \times 3^{n-4}}{4 \times 3^{n+2}}$ (3marks)

14. A particle moving in a straight line moves from point P to point Q, a distance of 168metres. It starts from rest and accelerates uniformly for 5 seconds. It then travels at a constant speed for 10 seconds and finally decelerates uniformly for 3 seconds to come to rest. Calculate the maximum speed attained in km/h. (3marks)

15. Two similar containers have masses 256kg and 108kg respectively. If the surface area of the smaller container is 810cm^2 , what is the surface area of the larger container? (3marks)

16. Six weeks after planting, the height of maize plants were measured to the nearest centimetre. The frequency distribution is given in the table below.

Height(x)	$0 \leq x < 5$	$5 \leq x < 15$	$15 \leq x < 20$	$20 \leq x < 35$	$35 \leq x < 55$
Frequency	3	8	19	15	30

Draw a histogram to represent the above information.

(4marks)

SECTION II (50MARKS)

Answer any five questions from this section

17. Using a ruler and a pair of compasses only

- (a) Construct a parallelogram ABCD such that, AB = 8cm, AC = 12cm and angle BAC = 22.5° . Drop a perpendicular from C to AB produced. (4marks)

- (b) Find the size of angle BAD. (1mark)

- (c) In the diagram in (a) above show the loci of point P such that

- (i) $AP > PB$ (1mark)

- (ii) Angle APB $\geq 90^\circ$. (2marks)

- (iii) $BP > 2\text{cm}$ (1mark)

- (iv) Shade the locus of P. (1mark)

18. (a) Find the equation of the perpendicular bisector of the line joining A(3, 9) and B(7, 5) in the form $ax + by + c = 0$. (3marks)

- (b) The perpendicular bisector in (a) intersects with the line joining the points (2, 4) and (-3, 1) at C. Find

- (i) The coordinates of C. (3marks)

- (ii) The length of C from line AB (2marks)

- (c) The line through (2, 4) and (-3, 1) makes an angle of θ with the positive x- axis. Find the value of θ . (2marks)

19. Draw the quadrilateral A(-6, -1); B(-6, -4); C(3, -7) and D(3, 2). (1mark)
On the same grid draw the image

- (a) $A_1B_1C_1D_1$ the image of ABCD under enlargement centre (0, -1) scale factor $\frac{1}{3}$. (2marks)
- (b) $A_2B_2C_2D_2$ the image of $A_1B_1C_1D_1$ under a rotation centre (1, 0) through an angle of $+90^\circ$. (2marks)
- (c) $A_3B_3C_3D_3$ the image of $A_2B_2C_2D_2$ under a reflection in the line $y = x$. (2marks)
- (d) $A^4B^4C^4D^4$ the image of $A_3B_3C_3D_3$ under a translation $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$ and write down the coordinates of the final image. (3marks)

20. A particle travelling in a straight line passes through a fixed point O with a velocity of 0.5m/s. The acceleration $a \text{ m/s}^2$, t seconds after passing O, is given by $a = 1.4 - 0.6t$. Find

- (a) The time when the particle is instantaneously at rest. (4marks)
- (b) The maximum velocity of the particle. (3marks)
- (c) The total distance travelled by the particle between $t = 0$ and $t = 10$ seconds. (3marks)

21. A rectangular tank whose internal dimensions are 2.04m by 1.68m by 2.64m is seven-eighth full of milk.

- (a) If the tank is made of metal of thickness 30mm. Calculate the external volume of the tank when closed. (3marks)
- (b) Calculate the volume of milk in the tank in m^3 leaving your answer to 3 significant figures. (2marks)
- (c) The milk is to be packed in small packets. Each packet is in the shape of a right pyramid on an equilateral triangular base of side 19.2cm. The height of each packet is 13.6cm. Full packets obtained are sold at sh.35 per packet. Calculate
- (i) The volume of milk in cubic centimetres contained in each packet to 4 significant figures. Hence find the number of full packets. (3marks)
- (ii) The exact amount that will be realised from the sale of all the packets of milk. (2marks)

22. A stadium can fully maximize on profits if 72000 people are accommodated. Each row accommodates the same number of people. On a certain day 25 rows were defective and it was therefore decided that each of the remaining rows would have to squeeze 40 more people for the stadium to have the maximum number of people. Calculate

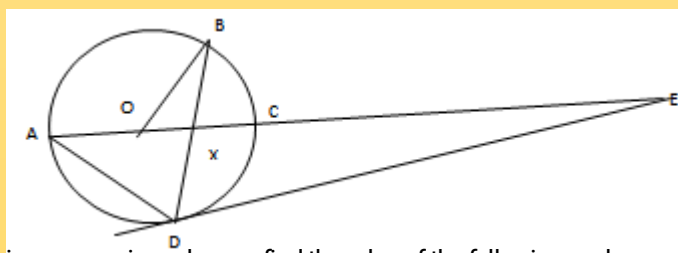
- (a) How many people each row of seats holds. (6marks)
- (b) The number of rows in the stadium. (1mark)
- (c) From the total tickets sales; if $\frac{1}{8}$ is used on repairs of the defective rows and $\frac{1}{7}$ of the remainder on expenses, sh. 4,320,000 is left. Calculate the value of each ticket. (3marks)

23. Copy and complete the table for the function of $y = 5 + 3x - 2x^2$ (2marks)

x	-3	-2	-1	0	1	2	3	4
$-2x^2$	-18		-2	0	-2			-32
$5+3x$	-4		2	5		11	14	
y	-22			5		3		-15

- (a) Use the values from the table to plot a graph of $y = 5 + 3x - 2x^2$. (3marks)
- (b) Use your graph to solve
- (i) $5 + 3x - 2x^2 = 0$ (1mark)
- (ii) $2x^2 - 2x - 3 = 0$ (2marks)
- (c) Determine the range of values of x which satisfy the inequality $5 + 3x - 2x^2 \geq -2$ (2marks)

24. In the figure below, O is the centre of the circle. A, B, C and D are points on the circumference of the circle. A, O, X and C are points on a straight line. DE is a tangent to the circle at D. Angle BOC = 48° and angle CAD = 36° .



- (a) Giving reasons in each case, find the value of the following angles
- (i) CBA (2marks)
- (ai) BDE (2marks)
- (bi) CED (2marks)

(b) It is also given that $AX = 12\text{cm}$, $XC = 4\text{cm}$ and $DB = 14\text{cm}$ and $DE = 15\text{cm}$. Calculate the length of

(i) DX

(2marks)

(ii) AE

(2marks)

SUKELE JOINT EXAMINATION

121/2

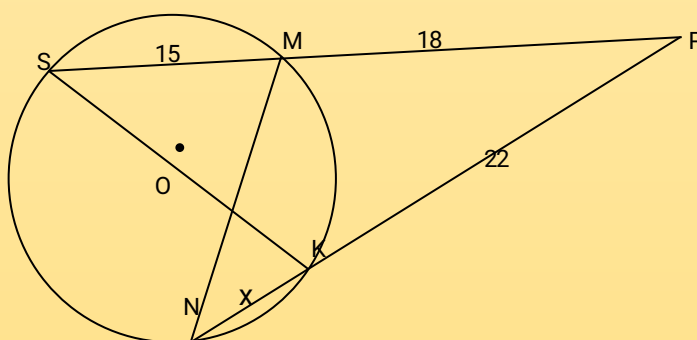
MATHEMATICS PAPER 2

2 ½ Hours

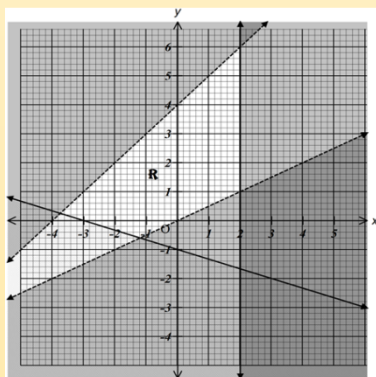
SECTION I (50 marks)

Answer all the questions

- Find matrix X given that $AX - X = \begin{pmatrix} -4 \\ -10 \end{pmatrix}$ where $A = \begin{pmatrix} 2 & 3 \\ -2 & 4 \end{pmatrix}$ (3 marks)
- The cost of providing a commodity consists of transport, labour and raw material in the ratio 8:4:12 respectively. If the transport cost increases by 12 % labour cost 18 % and raw materials by 40 %, find the percentage increase of producing the new commodity (3 mks)
- Find the number of terms in the series $\frac{8}{81} - \frac{4}{27} + \frac{2}{9} - \dots - 1 \frac{11}{16}$ (3marks)
- Using binomial expansion simplify $\frac{(2 + \sqrt{3})^4}{(2 - \sqrt{3})^4}$ leaving your answer in the form $a + b\sqrt{c}$ where a , b and c are rational numbers (3marks)
- The figure below shows external intersection of two chords SM and NK which are produced to meet at P . Given that SOK is the diameter of the circle and that $SM=15\text{cm}$, $MP=18\text{cm}$ and $PK=22\text{cm}$



- Calculate the value of x representing length of chord NK . (1 marks)
 - Calculate the radius of the circle (2marks)
- Determine the equation of a circle if the coordinates of the end points of its diameter are $A(-4, 4)$ and $B(6, -12)$ leaving your answer in the form of $ax^2 + by^2 + cx + dy + e = 0$ where a , b , c , d and e are integers. (3 marks)
 - Make ' c ' the subject of the formula if $v^2 = \frac{r}{3} + \sqrt{\frac{1+c^2}{r^2}}$ (3marks)
 - Find the area enclosed by the curve $y = 81 - x^2$ and the x -axis using mid-ordinate rule with 9 strips. (4mks)
 - Without using a calculator or tables, find the value of x in $\log_{2.5} \left(\frac{1}{x} \right) - 1 - \log_{2.5} (x) = 3 \log_{2.5} \left(\frac{1}{x} \right) - \log_{0.5} 2$ (3marks)
 - Solve for θ in the equation $6\cos^2 \theta - \sin \theta - 4 = 0$ in the range $-180^\circ \leq \theta \leq 180^\circ$ (3 mks).
 - Wambua deposited 6,400 in an investment account which pays 30% interest rate per annum compounded semi – annually for 3 years. Muinde invested one and a half times that of Wambua at $12\frac{1}{2}\%$ per annum simple interest for 6 years. Find whose investment earned more interest and by how much give your answer to the nearest shilling. (3mks)
 - Form inequalities that satisfy the given region R. (4 marks)



13. Use logarithms to evaluate $\sqrt[3]{\frac{5.27 \times \cos^2 82.48}{\log 6.7}}$ (3mks)
14. Given that $\frac{dy}{dx} = \frac{x^4 + 1}{x^2}$ and that $y=1$ when $x=1$, find the relationship between x and y . (3marks)
15. A biased coin is weighted such that its tail is twice as likely to appear as the head. Find the probability that a tail and a head appear when the coin is tossed twice. (3marks)
16. The point $U(0, -4)$ is mapped onto $U'(-2, 2\sqrt{3})$ under an anticlockwise rotation about the origin. Find the angle of rotation. (3marks)

SECTION II (50 marks)

Answer **only five** questions from this section

17. ABCD is a quadrilateral with coordinates A (2, 1), B (3, 2), C (3, 4) and D (0, 3). ABCD is mapped onto A'B'C'D' under transformation **T** given by a shear with x - axis invariant such that A' (4, 1).
- a) Determine the 2×2 transformation matrix representing **T** and hence determine the coordinates of B', C' and D'. (2 marks)
- b) A'B'C'D' is transformed to A''B''C''D'' under a transformation **H** such that A'' (-6, -9) and D'' (-12, -15). Determine the 2×2 matrix representing **H** and hence determine the coordinates of B'' and C'' (3 marks)
- c) A''B''C''D'' mapped onto A'''B'''C'''D''' under a transformation **V** representing a reflection in the line $y = -x$. Determine the 2×2 matrix representing **V** and hence determine the coordinates of A'''B'''C'''D''' (3 marks)
18. The following table shows heights of 200 seedlings of the same species measured to the nearest cm.

Height(cm)	frequency					
70- 79	7					
80-84	30					
85-89	66					
90-94	57					
95-99	27					
100-109	13					

- a) Calculate the:-
- i) Quartile deviation (3marks)
- b) Standard deviation using a working mean of 102 (3marks)
- c) Draw an ogive curve representing the above information and use it to determine the percentage number of seedling whose height ranges between $85 \leq H \leq 93$. (4marks)
19. In order to ensure optimal health a lab technician needs to feed the rabbits on a daily diet containing a minimum of 24grams of fat, 36grams of carbohydrates and 4grams of protein. Rather than order rabbit food that is custom blended it is cheaper to order food X and food Y and blend them for an optimal use. One packet of food X contains 6grams of fat, 12 grams of carbohydrates, 2 grams of proteins and costs Sh 50. While one packet of food Y contains 12grams of fat, 12 grams of carbohydrates, 1 gram of proteins and it costs Sh 60
- a). Form all the inequalities to represent the information above. (4 mks).
- b). Graph all the inequalities (4marks)
- c). Determine the number of packets of type X and Y feed that should be used for optimal health at minimum cost. (2marks)
20. Mr Kibet's PAYE per month is ksh 29,522. The ratio of his basic salary to taxable allowances is 13:9. He is housed by his employer and pays a nominal rent of ksh 9000. His taxable pay is his gross pay plus 15% of his gross pay less the nominal rent. He is entitled

to a personal relief of ksh 1056 per month. The following tax rates are used in the tax computation.

Income per annum (k£ per annum)	Rates (Ksh per K£)
1-5808	2
5809-11280	3
11281-16756	4
16753-22224	5
22225 and over	6

Calculate:

- His basic salary per month. (7marks)
 - The percentage change in his PAYE if his taxable pay increases by 10% (3marks)
21. A group of students wish to build up a pile of toy bricks so as to have 2 bricks in the top row, 4 bricks in the second row, and 6 bricks in the third row and so on. If they have 3000 bricks
- How many rows can they complete and how many bricks are they left with? (4marks)
 - Calculate the least number of bricks they should add to have all bricks used with no remainder? (2marks)
- c) Counting from the top, the 3rd row, 9th row, 27th row and so on form a geometric progression. If rows forming this progression are to be summed up, calculate the total number of bricks forming this arrangement after the number of bricks in (b) above have been included. (4marks)
22. P and Q are two points on latitude 60° S. Their longitudes are 30° E and 150° W respectively. Find to one decimal place : (Take the radius of the earth = 6370km and $\pi = \frac{22}{7}$)
- The distance in km between P and Q along the parallel of latitudes. (2marks)
 - The shortest distance along the earth's surface between P and Q. (3marks)
 - A weather forecaster reports that the center of a cyclone at (30° S 120° W) is moving due south at 24 knots. How long will it take to reach a point (45° S, 120° W). (2marks)
 - A plane leaves P at 1400hrs to Q at a speed of 900 knots along the shortest route. Determine the time at Q when the plane arrived. (3marks)
23. A curve is represented by the following function; $y = x^3 - 4x^2 + 5x - 2$. Use the curve to answer the following questions;
- Find $\frac{dy}{dx}$ (1 mk)
 - (i). Determine the values of the stationery points of the curve. (4mks)
(ii). Determine the nature of each stationery point on the curve (2 mks)
 - In the space provided, sketch the curve of $y = x^3 - 4x^2 + 5x - 2$ (3 mks)
24. Three quantities A, B and C are such that A varies directly as the square root of B and inversely as the square of C.
- Given that A = 4 when B = 64 and C = 5, find
 - The law connecting A, B and C (4 mks)
 - A when B = 16 and C = 10 (2 mks)
 - If B is increased by 44% and C decreased by 20%, find the percentage change in A. (4 mks)

KIENI EAST
121/1

MATHEMATICS
PAPER 1

. MOCKS KCSE PREDICTIONS/ .

SECTION 1 : (50 MKS)

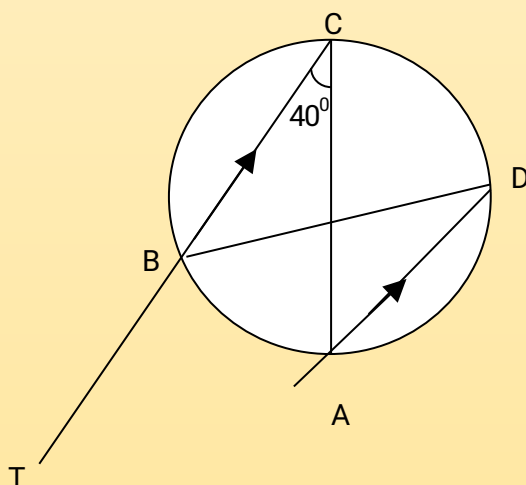
Answer all the questions in this section in the space provided.

- Without using a calculator, evaluate;

$$\frac{-8 + (-5) \times (-8) - (-6)}{-3 + (-8) \div 2 \times 4}$$
(3 mks)
- Factorize and simplify the expression.

$$\frac{x^2 - 9}{5x^2 - 13x - 6}$$
(3 mks)
- Use cube root and reciprocal tables to evaluate correct to 2 decimal places. (3 mks)

$$\frac{1}{0.489} - \sqrt[3]{0.512}$$
- In the figure below ABCD is a cyclic quadrilateral. Line TBC is parallel to line AD and angle ACB = 40°.



Find the size of;

a) Angle CAD

b) Angle TBD

(1mk)

(2 mks)

5. Given that $m = i + 2j - 3k$ and $n = 4i - j - k$ find $|n - m|$ correct to one decimal place. (3 mks)

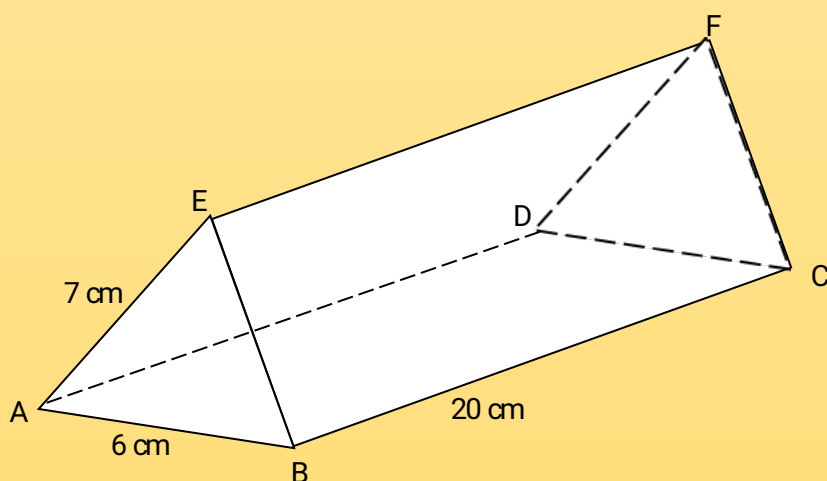
6. Given that $X = -2$, find the value of y and z for the simultaneous equation. (3 mks)

$$x + y - z = -1$$

$$x - 2y + z = -7$$

7. The equation of line L_1 is $2y - 5x - 8 = 0$ and L_2 passes through points $(-5, 0)$ and is perpendicular to L_1 . Find the equation of L_2 leaving it in double intercept form. (3 mks)

8. The diagram below shows a triangular prism ABCDEF. $AB = 6\text{cm}$, $AE = BE = 7\text{cm}$ and $BC = 20\text{cm}$.



Find the surface area of the prism.

(3 mks)

9. A Forex Bureau in Kenya buys and sells foreign currencies as shown below.

	Buying (Ksh)	Selling (Ksh)
1 Euro	137.65	138.20
1 US dollar	94.33	94.84

A businessman from America converted 20,730 Euros into Kenya shillings.

- a) Calculate the amount of money, in Kenya shillings that he received. (1 mk)
 b) The businessman spent Ksh 2,410,300 while in Kenya. He then converted the remaining Kenya shillings to US dollars. Calculate the amount of money, to the nearest US dollar, that he received. (2 mks)

10. Two matrices P and Q are such that

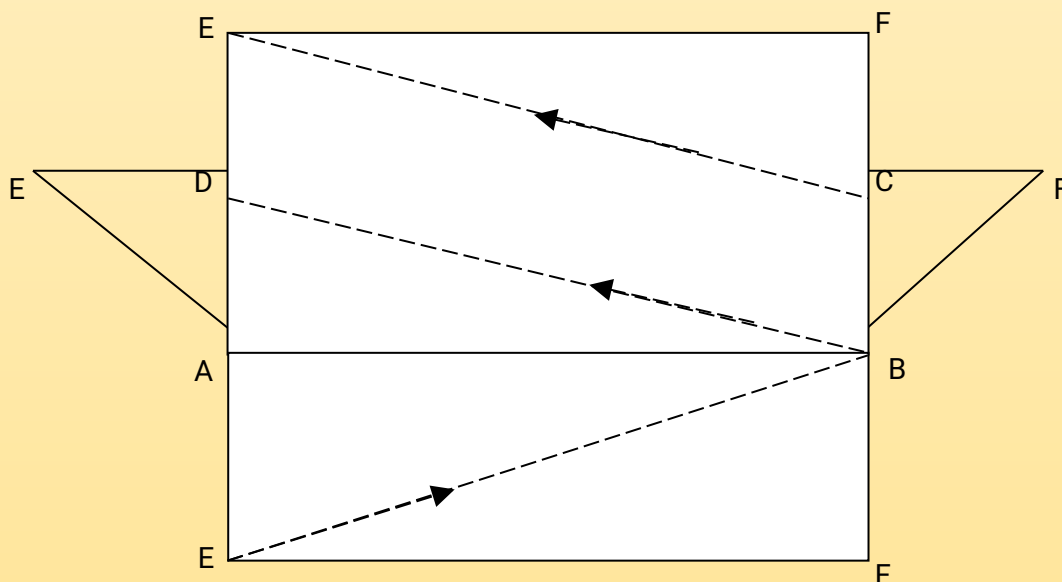
$$P = \begin{pmatrix} k & 4 \\ 3 & 2 \end{pmatrix} \text{ and } Q = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$$

Given that the determinant of PQ = 4 find the value of k.

(3 mks)

11. Construct a line XY 9.2cm long. By construction divide XY into 5 equal parts. (3 mks)

12. The following figure represents a net with a path marked on it.



- a) What solid does the net represent. (1 mk)
 b) Draw the solid and mark the path on it. (3 mks)

13. Two towns A and B are 3000 nautical miles apart. Both towns are situated on the equator such that B is to the east of A. Calculate;

- a) The longitude difference between A and B. (1 mk)
 b) The local time at A if the local time at B is 2:15 a.m. (2 mks)

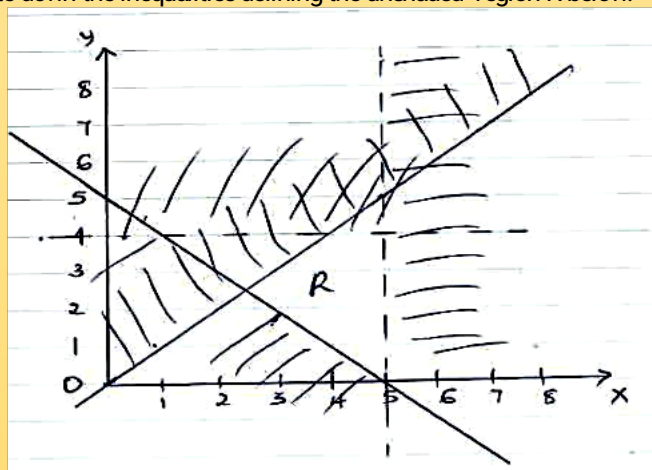
14. Solve the equation.

$$2 \cos 2\theta = 1 \quad \text{for } 0^\circ \leq \theta \leq 360^\circ$$

(4 mks)

15. A police patrol car travelling at 120 km/h is chasing a suspect car which is 5km away and traveling at 80 km/h. how far away must the police travel in order to catch up with the suspect. (3 mks)

16. Write down the inequalities defining the unshaded region R below.



SECTION II: (50 MKS)

Answer only five questions in this section in the space provided.

17. The length of 45 pea pods were measured to the nearest millimeters and tabulated as shown below.

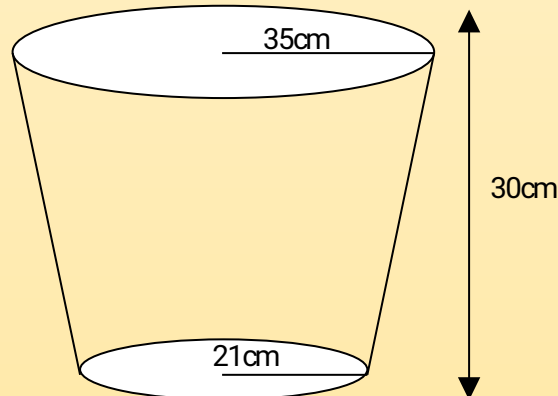
Length (mm)	10-19	20-29	30-39	40-49	50-59	60-69	70-79
frequency	2	7	11	13	6	4	2

Calculate;

- i) The mean length.

(2 mks)

- ii) The median length. (3 mks)
- iii) Given that pea ponds of length above 54.5 mm were considered for export, what percentage of the pea ponds qualified for export. (2 mks)
- iv) On the grid provided, draw a histogram to represent the data. (3 mks)
18. The diagram below represents a solid frustrum with base radius 21cm and top radius 35 cm. the height of the frustrum is 30cm



Using $\pi = 3.142$, Calculate to 1 decimal place,

- i) The volume of metal in the frustrum. (4 mks)
- ii) The frustrum is melted and recasted into solid sphere. In the process 20% of the metal cast is lost. Calculate the radius of the sphere. (3 mks)
- iii) The total surface area of the solid. (3 mks)
19. Three traders Mary, Aketch and Wambua decided to buy a trailer. The market price of the trailer was Ksh 4,200,000. Before they could pay the deposit, the figure was decreased in the ratio 5:6. The dealer agreed that the three could pay a deposit of 40% of the money and the rest to be paid within one year. The ratio of contribution of Mary to Aketch was 2:3, whereas the ratio of contribution of Aketch to Wambua was 4:5. The balance was to be paid to the dealer from the proceeds of the trailer in the same ratio as the deposits. The three shared the proceeds from the trailer in the same ratio as the deposits. During the year, the trailer realized Sh 1,400,000.
- i) How much did the trailer actually cost? (2 mks)
- ii) How much deposit did Aketch contribute? (2 mks)
- iii) How much of the remaining amount did Wambua pay at the end of the year?
- iv) After paying the remaining amount at the end of the year, how much money was Mary left with?
20. a) Solve the equation.
- $$x + y = 17$$
- $$xy - 5x = 32$$
- b) The St. Thomas Mathematics teacher planned to share out 240 sweets to a class. However six more students joined the class. As a result, each of the increased number of students got twenty sweets less.
- i) Find the original number of students in the class. (4 mks)
- ii) In the second week the Principal agreed to increase the number of sweets by a $66\frac{2}{3}\%$ of the previous week. Calculate the total number of sweets shared out in the second week. if only the original number of students were present. (2 mks)
21. The vertices of a triangle ABC are A (6, 1) B (6, 3) and C (8, 1). The vertices of $A^1B^1C^1$ are A^1 (4, 5) B^1 (2, 5) and C^1 (4,7). $A^1B^1C^1$ is a rotation of ABC.
- a) On the grid provided plot the triangles ABC and $A^1B^1C^1$. (2 mks)
- b) Find by construction the centre and angle of rotation. (3 mks)
- c) Determine the vertices of triangle $A^{11}B^{11}C^{11}$ where $A^{11}B^{11}C^{11}$ is the image of triangle $A^1B^1C^1$ under a reflection in the line $y = -x$. (3mks)
- d) Draw $A^{111}B^{111}C^{111}$ the image $A^{11}B^{11}C^{11}$ under reflection along $X = 0$. (1 mk)
- c) From the triangles drawn, state one pair that is
- i) Directly congruent. (1 mk)
- ii) O positively congruent. (1 mk)
22. A particle moves along a straight line such that its displacement S metres from a given point is $S = \frac{1}{3}t^3 - 3t^2 + 9t + 5$ where t is the time in seconds. Find.
- a) the displacement of the particle at $t=5$ correct to 2 decimal places. (2 mks)
- b) the velocity of the particle when $t = 6$. (3 mks)
- c) the value of t when the particle is momentarily at rest. (3 mks)
- d) the acceleration of the particle when $t=2$. (2 mks)
23. The boundaries of a ranch are straight lines, AB, BC, CD and AD. D is 32km on a bearing of 233° from A, C is directly North of D and

due west of A; B is 25 km on a bearing of 318° from C.

- i) using a suitable scale, represent the information above in the scale drawing. (3 mks)
- ii) From the scale drawing in (i) above find
 - a) the distance and bearing of B from D. (2 mks)
 - b) the distance and bearing of A from B. (2 mks)
- iii) Find the area of the ranch in square kilometers. (3 mks)

24. A triangle OPQ is such that $OP = p$ and $OQ = p$. A point R divides OP in the ratio 1:2 and a point S divides PQ in the ratio 5:2. OS and RQ meets at T. Determine.

- i) OS (1 mk)
- ii) QR (1 mk)
- iii) Given that $QT = nQR$ and $OT = mOS$ find the scalars m and n. (6 mks)
- iv) Show that point O, T and S are collinear. (2 mks)

KIENI EAST

121/2

MATHEMATICS

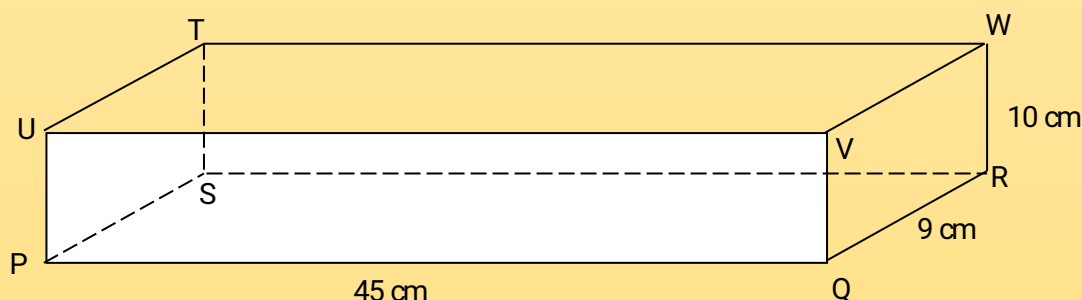
PAPER 2

. MOCKS KCSE PREDICTIONS/ .

Section I consists of 16 questions.

1. Use logarithm tables to evaluate; (3 mks)

$$\sqrt[3]{\frac{41.34 \times 0.02357}{2.149}}$$
2. Juma can paint a hall in 9 days and Keya can paint the hall in 18 days. How long would it take to paint the same hall if they work together? (2 mks)
3. A quantity A varies partly as B and partly as the square root of B. When $B = 4$, $A = 22$ and when $B = 9$ $A = 42$. Find A when $B = 25$. (5 mks)
4. The figure below represents a cuboid PQRSTUWV. $PQ = 45\text{cm}$, $QR = 9\text{cm}$ and $RW = 10\text{cm}$.



Calculate the angle between line PW and plane PQRS correct to 2 decimal places.

(3 mks)

5. Make q the subject of the formula in;

$$\frac{m}{n} = \frac{d}{\sqrt{q-3}}$$

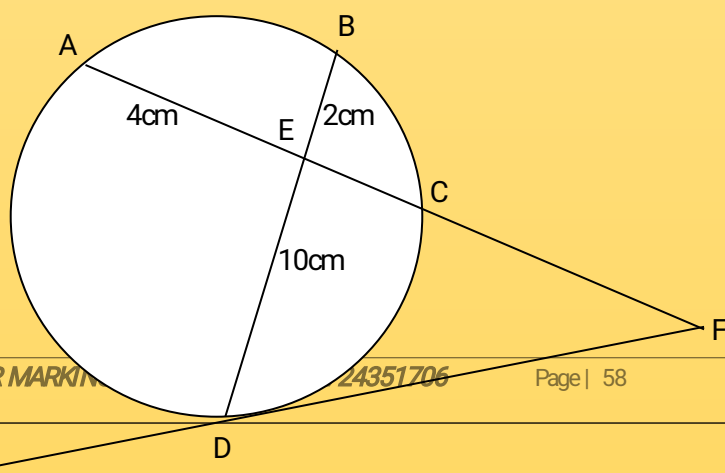
(3 mks)

6. a) Expand $(2-x)^5$ (2 mks)
- b) Use expansion in (a) above upto the term in x^3 to approximate 1.99^5 to 4 s.f. (2 mks)
7. Without using mathematical tables nor calculator, simplify;

$$\frac{3}{5-\sqrt{13}} - \frac{3}{5+\sqrt{13}} \text{ in the form } a\sqrt{b}$$

(3 ,mks)

8. In the figure below, GDF is a tangent to circle ABCD at D. AECF and BED are straight lines. $AE = 4\text{cm}$, $BE = 2\text{cm}$, $ED = 10\text{cm}$ and $DF = 10\text{cm}$.



10 cm

Find the length of AF.

(3 mks)

9. Find X if, $\log(x-1) + 2 = \log(3x+2) + \log 25$

(3 mks)

10. The table below shows some values of the function $y = X^2 + 3$.

X	0	$\frac{1}{2}$	1	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4	$4\frac{1}{2}$	5	$5\frac{1}{2}$	6
Y	3		4	$5\frac{1}{4}$	7		12	$15\frac{1}{4}$	19		28		39

a) Complete the table.

(2 mks)

b) Use the mid ordinate Rule with six ordinates to estimate the area bounded by $y=x^2+3$, the y axis, the x axis and the line $x=6$.

(2 mks)

11. Find the radius and the coordinates of the centre of a circle whose equation is

$x^2 + y^2 + 7x - 2y + 7 = 0$

(3 mks)

12. 9 pupils in a certain school stated the number of story books they had as 11, 8, 5, 12, 15, 13, 14, 19, 11. Find the standard deviation of the data.

(3 mks)

13. Solve the equation $4 \sin^2 \theta + 4 \cos \theta = 5$ for $0^\circ \leq \theta \leq 360^\circ$. Give your answer in degrees.

(3 mks)

14. A rectangle has sides of length 18 cm and 7.5 cm. What is the percentage error in calculating its area?

(3 mks)

15. The first, third and 9th terms of an A.P form the first three consecutive terms of a G.P. Given that the common difference of the AP, $d = 6$, find;

a) the first term of the AP.

(3 mks)

b) the common ratio r of the G.P.

(1 mk)

16. Gibson bought a motorbike for sh 75,000. Its depreciation rate is 12% per annum. What will be the value of the motorbike at the end of sixth year, to nearest 5 cents.

(2 mks)

SECTION B: (50 MKS)

17. A company employee earns a monthly basic salary of sh 25,000. He is housed by the employer and thus 15% of his basic salary is added for the purposes of taxation. He receives medical allowance of sh 4,800 and house allowance of sh 2760.

a) find the employee's taxable income.

(2 mks)

Use the table of taxation below;

Monthly taxable income in Ksh.	Rate in %
1- 4,550	10%
4,550 - 9,200	15%
9,201 - 13,800	20%
13,801 - 18,620	25%
18,621 - 23,940	30%
23,941 and above	35%

b) If the employee is entitled to a personal relief of sh 960 per month, determine the net tax.

(5 mks)

c) The employee was given a 40% increase in his basic salary. Calculate the percentage increase in his income tax.

(3 mks)

18. a) Find the inverse of the matrix $\begin{bmatrix} 1 & 4 \\ 3 & 2 \end{bmatrix}$

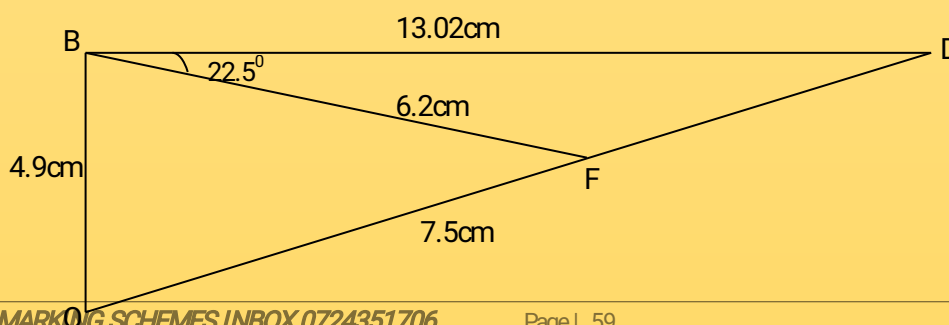
(2 mks)

b) In a certain week a business man bought 60 pens and 240 pairs of socks for a total of Ksh 4,200. In the second week, he bought 90 pens and 60 pairs of socks for a total of Ksh 1,800. Using matrix method, find the price of each pen and a pair of socks.

(4 mks)

c) Another business man bought 100 pens and 300 pairs of socks. He was allowed a discount of 10% on each pen and a discount of 3% was allowed for each pair of socks.

Calculate the percentage discount allowed on the cost of all goods bought by the second businessman. (4 mks)

19. In the figure below (not drawn to scale), $BQ = 4.9\text{cm}$, $QF = 7.5\text{cm}$, $BF = 6.2\text{cm}$, $BD = 13.02\text{cm}$ and $\angle FBD = 22.5^\circ$.

Calculate to two decimal places;

- a) the length FD. (2 mks)
- b) the size of angle BDF (3 mks)
- c) the size of angle FBQ (3 mks)
- d) the area of triangle BDF (2 mks)

20. A box has 32 compact disks. 4 of them are music disks, 12 have comedy movies and the rest are action movies.

- a) Find the probability of randomly picking;
 - i) a music compact disk. (1 mk)
 - ii) an action movie or a comedy movie compact disk. (2 mks)
- b) A girl picks two compact disks from the box at random, one at a time, without replacement. Find the probability that;
 - i) one compact disk is that of an action movie and the other is that of a comedy movie (3 mks)

ii) both compact disks are of the same type. (4 mks)

21. Complete the table given below by filling in the blank spaces.

X	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
3 Cos 2x	3.00	2.60	1.50	0	-1.50		-3.00	-2.60	-1.50			2.60	
2 Sin (2x+30°)	1.00		2.00	1.73		0	-1.00	-1.73		-1.73	-1		1.00

- b) On the grid provided, and on the same set of axes, draw the graphs of $y = 3 \cos 2x$ and $y = 2 \sin (2x + 30^\circ)$ for $0^\circ \leq X \leq 180^\circ$. Take the scale for 1cm for 15° on the X axis and for 2 units on the Y axis. (4 mks)
- c) use your graph to estimate the range of values of X for which;
 - i) $3 \cos 2x = -2.2$ (2 mks)
 - ii) $3 \cos 2x \leq 2 \sin (2x + 30^\circ)$ (2 mks)

Give your answer to the nearest degree.
- 22. a) Use a ruler and a pair of compasses only to construct a triangular diagram representing a field PQR, such that $QR = 9\text{cm}$, $\angle PQR = 45^\circ$ and $\angle PRQ = 30^\circ$. (4 mks)
- b) Measure lengths
 - i) PQ (1mk)
 - ii) PR (1 mk)
- c) Draw the locus of points equidistant from end points P and R. (1mk)
- d) Draw the locus of a point A that moves such that $\angle QRA = \angle PRA$ (1 mk)
- e) A coin is lost inside triangle PQR within a region which is nearer to or equal distance P than to R. Shade the region the coin could be found. (2 mks)

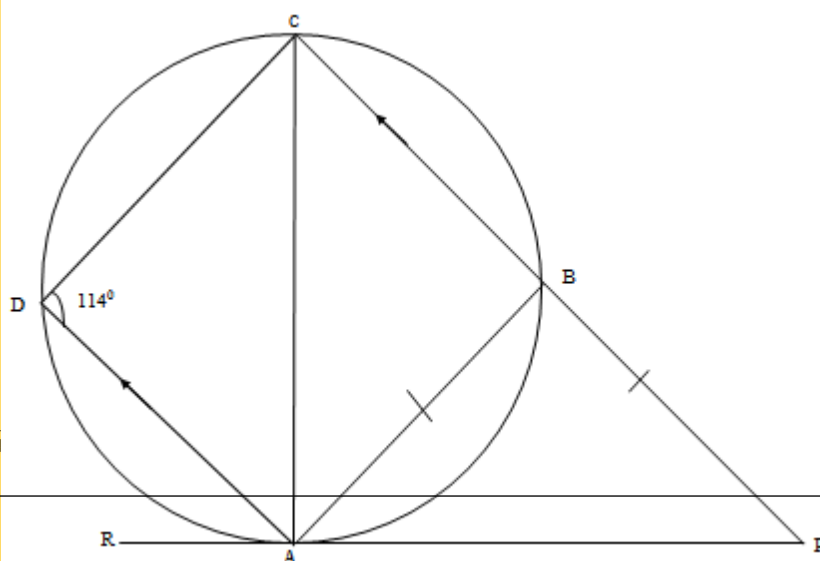
23. The table below shows values of x and some values of y for the curve;
 $y = x^3 + 3x^2 - 4x - 12$ in the range $-4 \leq X \leq 2$.

a) Complete the table by filling in the missing values of y. (2 mks)

X	-4.0	-3.5	-3.0	-2.5	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1	1.5	2.0
Y		-4.1		-1.1		-2.6		-9.4		-13.1		-7.9	

- b) On the grid provided, draw the graph of;
 $y = x^3 + 3x^2 - 4x - 12$ for $-4 \leq X \leq 2$.
 Use scale; Horizontal axis 2cm for 1 unit and vertical 2 cm for 5 units. (3 mks)
- c) Using the graph in (b) above, solve the equations;
 - i) $x^3 + 3x^2 - 4x - 12 = 0$ (1 mk)
 - ii) $x^3 + 3x^2 - 5x - 6 = 0$ (4 mks)

24. In figure below, RAP is a tangent to the circle ABCD. AD is parallel to the straight line CBP, $\angle ADC = 114^\circ$ and $AB = BP$



Calculate giving your reasons in full, the size of ;

- | | |
|-----------------|---------|
| a) $\angle ABC$ | (2 mks) |
| b) $\angle BAP$ | (2 mks) |
| c) $\angle DAC$ | (2 mks) |
| d) $\angle ACB$ | (2 mks) |
| e) $\angle RAD$ | (2 mks) |

KAKAMEGA NORTH SUBCOUNTY JOINT EXAMINATIONS

KCSE Trial Exam
FORM 4
MATHEMATICS PAPER 1

TIME: 2 ½ HOURS

Answer all questions in this section.

1. Without using a calculator or mathematical table evaluate: (3 marks)

$$\frac{2\frac{1}{5} + \frac{2}{3} \text{ of } 3\frac{3}{4} - 4\frac{1}{6}}{1\frac{1}{4} - 2\frac{2}{5} \div 1\frac{1}{3} + 3\frac{3}{4}}$$

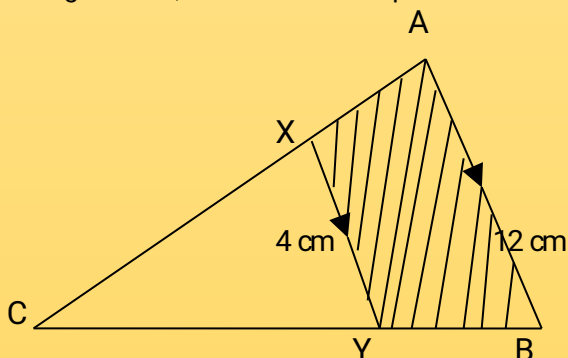
2. Simplify: (3 marks)

$$\left[\frac{a^3 - ab^2}{a^4 - b^4} \right]^{-1}$$

3. A straight line passes through the point $(-3, -4)$ and is perpendicular to the line whose equation is $3x + 2y = 11$ and intersects the x -axis and y -axis at points A and B respectively. Find the length of AB. (3 marks)
4. Evaluate using squares, cubes and reciprocal tables. (4 marks)

$$\left[\frac{1}{\sqrt[3]{27.56}} + \frac{3}{(0.071)^2} \right]^{-2}$$

5. Given that $2 - 5x \leq \frac{1}{3}(x+7) \leq 6 - \frac{1}{3}x$ and that x is an integer, find the sum of the smallest and the largest value of x . (3 marks)
6. Makau and Kilonzo live 20km apart. Makau leaves home at 10:00 am and walks to meet Kilonzo who started walking at 9:30 am to meet Makau. The speed of Makau and Kilonzo are in the ratio of 3:4. If they met at 11:30 am find their speeds. (3 marks)
7. In the figure below, lines AB and XY are parallel.



If the area of the shaded region is 36 cm^2 , find the area of triangle CXY.

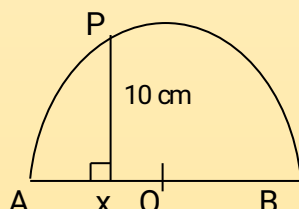
(3 marks)

8. Given that $\log a = 0.30$ and $\log b = 0.48$ find the value of $\log \frac{b^2}{a}$.

(2 marks)

9. In the figure below O is the centre of the circle diameter AB. $\angle AXP = 90^\circ$, AX = 4cm and PX = 10 cm. Calculate the radius of the semi-circle.

(3 marks)



10. The gradient function of a curve that passes through the point $(-1, -1)$ is $2x + 3$. Find the equation of the curve.

(3 marks)

11. Evaluate:

(3 marks)

$$\frac{\left(\frac{1}{27}\right)^{\frac{1}{3}} \times (256)^{\frac{1}{2}} \times 3^6}{(729)^{-\frac{1}{3}} \times 72^2}$$

12. Estimate the area bounded by the curve $y = \frac{1}{2}x^2 + 1$, $x = 0$, $x = 3$ and the x-axis using the mid-ordinate rule. Use three strips.

(3 marks)

13. ABCD is a rhombus. The measure of angle ABC is 150° . The diagonals of the rhombus intersect at E. The shorter diagonal measures 10cm. Calculate the length of the sides of the rhombus to the nearest integer hence calculate the area of the rhombus.

(3 marks)

14. Three police posts are such that Q is on a bearing of 210° and 12 km from P while R is on a bearing of 150° and 8 km from P.

(a) Using a suitable scale, draw a diagram to represent the above situation.

(2 marks)

(b) From the scale drawing determine:

(i) the bearing of Q from R

(1 mark)

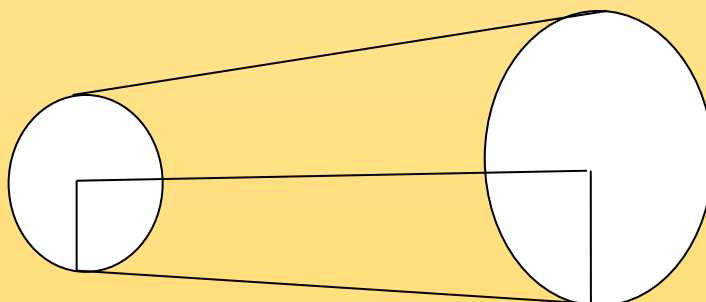
(ii) the distance of R from Q.

(1 mark)

15. A student expands $(x - y)^2$ incorrectly as $x^2 + y^2$. Find his percentage error if he used this incorrect expansion for $x = 4$ and $y = -5$. Give your answer correct to 2 d.p.

(3 marks)

16. A pulley is made up of two wheels of radii 6 cm and 9 cm respectively and the distance between their centres is 18 cm.



If a belt passes round the two pulleys, find its length.

(4 marks)

SECTION II

Answer any five questions in this section.

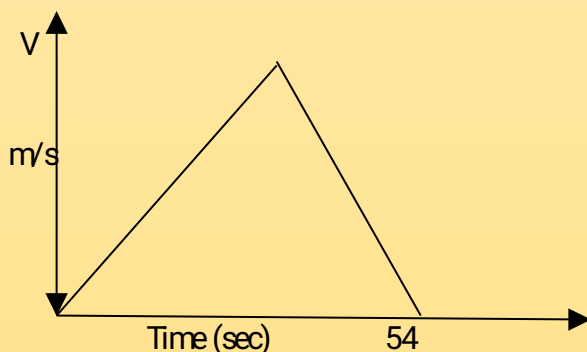
17. A circular lawn is surrounded by a path of uniform width of 7m. The area of the path is 21% that of the lawn.

(a) Calculate the radius of the lawn.

(4 marks)

- (b) Given further that the path surrounding the lawn is fenced on both sides by barbed wire on posts at intervals of 10 metres and 11 metres on the inner and outer sides respectively. Calculate the total number of posts required for the fence. (4 marks)
- (c) Calculate the total cost of the posts if one post costs sh 105. (2 marks)
18. A frustum with a regular pentagonal base is such that its top is of side 12cm and bottom is of side 24cm. If its perpendicular height is 20cm. Calculate:
- (a) The length of the slant edge. (5 marks)
- (b) The volume of the frustum. (5 marks)
19. Four trucks A, B, C and D take 10 days to transport 42,000 bags of maize to a depot. However, trucks A and B together take 30 days to transport the same number of bags while trucks C and D together take 15 days. Truck A carries $1\frac{1}{2}$ times the number of bags B carries and C carries $1\frac{4}{5}$ times as much as D.
- (a) Determine the number of bags of maize transported by each truck per day. (5 marks)
- (b) All the trucks A, B C and D work together for 5 days, after which truck C and D are withdrawn. A and B work together for another 5 days after which truck A breaks down. How long does truck B take to complete the rest of the remaining bags? (5 marks)
20. Eunice bought some oranges worth Ksh 45, while Sharon spent the same amount of money but bought the oranges at a discount of 75 cents per orange.
- (a) If Eunice bought an orange at Sh x , write down a simplified expression for the total number of oranges bought by Eunice and Sharon. (3 marks)
- (b) If Sharon bought 2 more oranges than Eunice. Find how much each spent on an orange. (5 marks)
- (c) Find the total number of oranges bought by Eunice and Sharon. (2 marks)

21. (a) The figure shows a velocity time graph of an object which accelerates from rest to a velocity V m/s then decelerates to rest in a total time of 54 seconds. If the whole journey is 810 m,



- (i) Find the value of V . (2 marks)
- (ii) Find the deceleration given the initial acceleration is $1\frac{2}{3}$ m/s². (2 marks)
- (b) A bus left town x at 10:45 am and travelled towards town Y at an average speed of 60 km/hr. A car left town X at 11:15am on the same day and travelled along the same road at an average speed of 100 km/hr. The distance between town X and town Y is 500 km.
- (i) Determine the time of day when the car overtook the bus. (3 marks)
- (ii) Both vehicles continued towards town Y at their original speeds. Find how long the car had to wait in town Y before the bus arrived. (3 marks)
22. The velocity of a particle t seconds after passing a fixed point O, is given by $V = at^2 + bt$ m/s, where a and b are constants. Given that its velocity is 2 m/s when $t = 1$ sec and it returns to 0 when $t = 4.5$ secs, calculate;
- (a) The values of a and b . (4 marks)
- (b) Hence find;
- (i) The values of t when the particle is instantaneously at rest. (2 marks)
- (ii) The total distance travelled by the particle during the first 4 seconds. (2 marks)
- (iii) The maximum velocity attained by the particle. (2 marks)
23. (a) Complete the table below for the function $y = -4 - 6x + 3x^2 + 2x^3$. (3 marks)

x	-4	-3	-2	-1	0	1	2
y							

- (b) Draw the graph of $y = -4 - 6x + 3x^2 + 2x^3$ for values of x from -4 to 2. (3 marks)
- (c) Use your graph to solve.
- (i) $2x^3 + 3x^2 - 4x - 2 = 0$ (2 marks)

(ii) $4x^3 + 6x^2 - 12x - 8 = 0$

(2 marks)

24. A parallelogram OACB is such that $\mathbf{OA} = \mathbf{a}$, $\mathbf{OB} = \mathbf{b}$. D is the mid-point of BC, $\mathbf{OE} = h\mathbf{OC}$ and $\mathbf{AE} = k\mathbf{AD}$.

(a) Express the following in terms of $\mathbf{a}$, $\mathbf{b}$, h and k .

(i) $\mathbf{OC}$

(1 mark)

(ii) $\mathbf{OE}$

(1 mark)

(iii) $\mathbf{AD}$

(1 mark)

(iv) $\mathbf{AE}$

(1 mark)

(b) Find the values of h and k .

(4 marks)

(c) Determine the ratios:

(i) $\mathbf{AE} : \mathbf{ED}$

(1 mark)

(ii) $\mathbf{OE} : \mathbf{OC}$

(1 mark)

KAKAMEGA NORTH SUBCOUNTY JOINT EXAMINATIONS

FORM 4

MATHEMATICS PAPER 2

TIME: 2 ½ HOURS

1. Evaluate without using tables or a calculator

(4marks)

$$\sqrt{\frac{(0.000125)^{\frac{1}{3}} \times 0.0049 \times 3.9 \times 10^3}{0.325 \times \sqrt{0.0036}}}$$

2. Find the value of the term independent of x in the expansion of

(3marks)

$$\left(3x^2 + \frac{1}{3x} \right)^6$$

3. Simplify the following giving your answer in the simplest form possible.

$$\frac{\sqrt{6} + \sqrt{3}}{2} - \frac{\sqrt{7} - \sqrt{5}}{5}$$

(3marks)

4. Without using tables or a calculator evaluate

(3marks)

$$\frac{\tan 225^\circ - \cos 330^\circ}{\sin 210^\circ + \cos 840^\circ}$$

5. Given that $a = b + \sqrt{b^2 + c^2}$ make c the subject of the formula.

(3marks)

6. Two matrices A and B are such that

$$A = \begin{pmatrix} K & 4 \\ 3 & 2 \end{pmatrix} \quad B = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$$

Given that the determinant of $AB = 4$ find the image of triangle ABC where A = (2, 0), B (3, 2) and C (3, 4) under stretch, stretch factor K, parallel to the X axis.

(3marks)

7. a. Find the position vector $\mathbf{OC}$ of the centre of a circle C, whose equation is

$$2x^2 + 2y^2 + 4x - 6y - 26 = 0$$

(2marks)

b. If the circle passes through P (3, 2), use vector method to find the diameter of the circle.

(2marks)

8. The sum of the digits in a three digit number is nine. The tens digit is half the sum of the other two and the hundreds digit is half the units digit. Find the total value of the number.

(3marks)

9. Given that y is inversely proportional to x^n and β is the constant of proportionality and that $x = 2$, when $y = 12$, and $x = 4$, when $y = 3$, find the values of n and β .

(4marks)

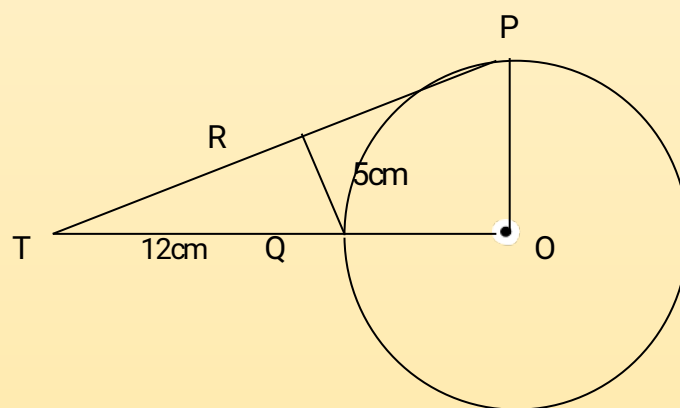
10. Find the exact area of the region bounded by the curve $y = 9x - x^3$ and the x axis.

(4marks)

11. In the figure below, RP and RQ are tangents to the circle centre O, radius r cm. OQ produced meets PR produced at T. QT = 12cm and QR = 5cm

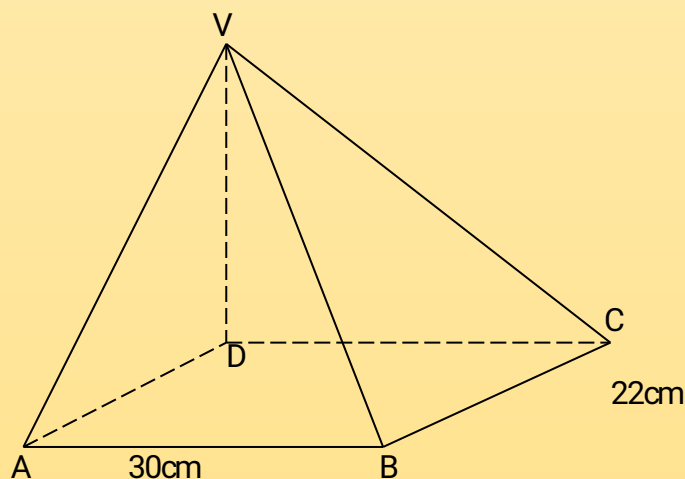
Calculate the radius of the circle.

(3marks)



12. The figure below represents a right pyramid with a vertex V and a rectangular base, ABCD. $VA = VB = VC = VD = 40$ cm
 $AB = 30$ cm and $BC = 22$ cm. X is the mid-point of BC.
 Calculate the size of the angle between planes VBC and ABCD

(3mks)



13. Given that $\mathbf{a} = 3\mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$ and
 $\mathbf{b} = 2\mathbf{i} - 4\mathbf{j} - 3\mathbf{k}$

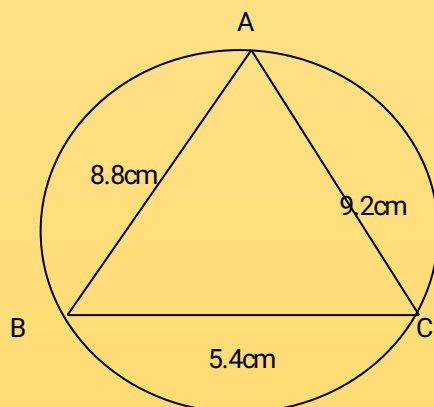
Find $|2\mathbf{a} - 3\mathbf{b}|$

(3mks)

14. If $25x^2 + k + 9$ is a perfect square find x

(2mks)

15. The figure below shows a circle centre O touching the vertices A, B, C of triangle $AB = 8.8$ cm, $BC = 5.4$ cm and $AC = 9.2$ cm

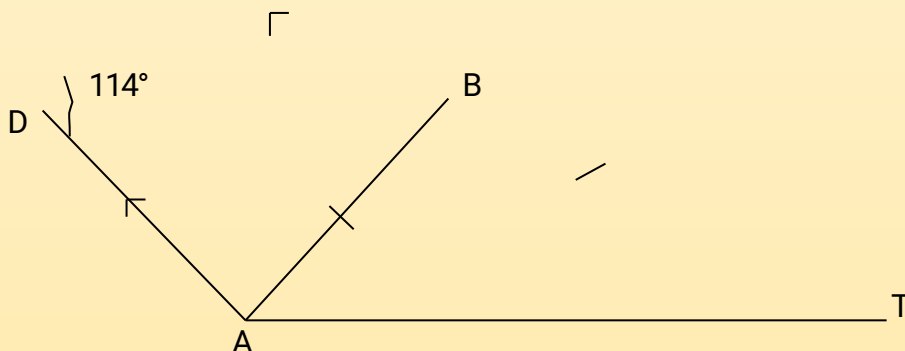


Calculate the radius of the circle to the nearest whole number.

(3mks)

16. XAY is a tangent to the circle ABCD. AD is parallel to the straight line CBY. Angle $ADC = 114^\circ$, and $AB = BY$





Calculate angles

ABC

(1mk)

BCA

(1mk)

17. The following table shows individual rates of income tax

Income K£ PA	Rate (sh. Per K£)
1 – 4512	2
4513 – 9024	3
9025 – 13536	4
13537 – above	5

Mr. Kariuki lives in a company house for which he pays a nominal rent of Ksh.610 per month. For taxation purpose, his basic salary is increased by 15%. He is insured and pays sh.1200 as premiums per month and claims insurance relief of K£ 36 per annum. He also claims a family relief of sh.660 per month. In addition, he is a member of a co-operative society, to which he remits Ksh.1500 per month, as shares. If Mr. Kariuki's P.A.Y.E is ksh.2400 per month, calculate his net salary in shillings per month.

(10marks)

18. a. using a ruler and a pair of compasses only construct

i. Triangle ABC, such that $AB = 9\text{cm}$, $AC = 7\text{cm}$ and $\angle CAB = 60^\circ$

(2mks)

ii. The locus of P, such that $AP \leq BP$

(2mks)

iii. The locus of Q such that $CQ \leq 3.5\text{cm}$ iv. Locus of R such that $\angle ACR \leq \angle BCR$

(2mks)

b. Find the area of the region satisfied by both P and Q

(2mks)

19. Points D(
- 0°
- ,
- 24°
- E), E(
- 0°
- ,
- 21°
- W), F(
- 60°
- S,
- 120°
- W), G(
- 60°
- S,
- 110°
- E) are marked in a globe representing the earth with radius = 0.7m (Taking
- π
- as
- $\frac{22}{7}$
-)

a. Find the length of the arc DE.

(3mks)

b. If A is the centre of the latitude 60° S, and B is the centre of the latitude 0° find the length AB

(3mks)

the area of the major sector AFG

(4mks)

20. In a group of 40 people, 10 are healthy and every person of the remaining 30 has either high blood pressure, a high level of cholesterol or both. 15 have high blood pressure and 25 have high level of cholesterol. If a person is selected at random from this group, what is the probability that he/she

a. Has high blood pressure only

(4mks)

b. Has high level of cholesterol only

(2mks)

c. Has high blood pressure and high level of cholesterol

(2mks)

d. Has either high blood pressure or high level of cholesterol

(2mks)

21. Three consecutive terms in a G.P are
- 3^{2x+1}
- ,
- 9^x
- and 81 respectively.

a. Calculate the value of x

(2mks)

b. Find the common ratio of the series.

(2mks)

c. Calculate the sum of the first 10 terms of the series.

(3mks)

d. Given that the 5th and 7th terms of the G.P in (a) above form the 1st two consecutive terms of an A.P. Calculate the sum of the 1st 20 terms of the A.P.

(3mks)

22. Two variables y and x are believed to be related by the equation
- $y = x + ax^b$
- . The table below shows the corresponding values of x and y.

X	1	1.5	2	2.5	3	3.5	4
y	7.54	9.33	11.00	12.59	14.12	19.90	27.23

a. By drawing a suitable line graph, estimate the values of a and b.

(9mks)

b. Write down the equation connecting y and x.

(1mk)

23. The marks obtained by fifty candidates were recorded in the table below.

Marks	0 - 9	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69
No. of candidates	6	8	12	9	7	5	3

- iii. a. Draw a cumulative frequency graph and use it to estimate. (3mks)
 i. Median (1mk)
 ii. Quartile deviation (2mks)
 The percentage number of candidates failing if the pass mark was 25 marks. (2mks)
 iv. The range of marks scored by the middle 30% of the candidates. (2mks)
24. A theatre has a seating capacity of 250 people. The charges are sh.100 for an ordinary seat and sh.160 for a special seat. It costs sh.16, 000 to stage a show and the theatre must make a profit. There are never more than 200 ordinary seats and for a show to take place, at least 50 ordinary seats must be occupied. The number of special seats is always less than twice the number of ordinary seats.
- a. Taking x to be the number of ordinary seats and y the number of special seats, write down all the inequalities representing the information above. (4mks)
 b. On a graph paper, show the region represented by the above inequalities. (4mks)
 c. Determine the number of seats of each type that should be booked in order to maximize profit. (2mks)

LANG'ATA

121/1

MATHEMATICS

Paper 1

PRE MOCK.

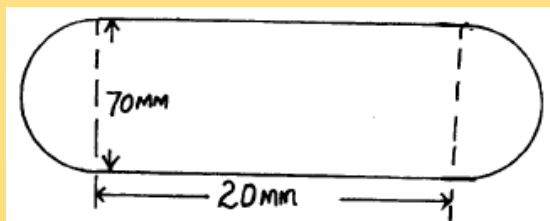
Time: 2 ½ Hours

SECTION A

Answer all questions in this section

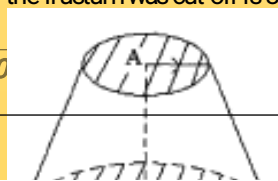
1. Given that $\frac{\frac{3}{5} \text{ of } 60 - 2\frac{3}{5} \times 1\frac{1}{2}}{5\frac{3}{5} \times 1\frac{1}{5} - \frac{5}{4} \text{ of } 4\frac{1}{5} + 2\frac{1}{5} \div \frac{7}{10}} = M^n$ Find the value of M (3marks)
2. Find the range of values that satisfy the inequality. (2marks)
 $x - 4 \leq 3x + 2 < 2(x + 5)$
3. Determine the value of x for which the matrix below is a singular. (3marks)

$$\begin{pmatrix} x & 4 \\ 1 & x - 3 \end{pmatrix}$$
4. Solve the simultaneous equation. (3marks)
 $2x - y = 3$
 $x^2 - xy = -4$
5. The figure below (not drawn to scale) shows the cross-section of a metal bar of length 3 metres. They are equal semi-circles.



Determine the mass of the metal bars in kilograms if the density of the metal is 8.87g/cm^3 . (3marks)

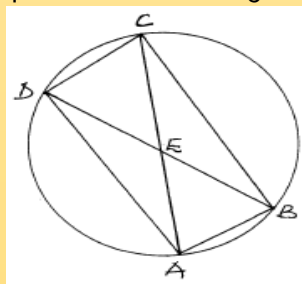
6. The equation of a line is. $-\frac{3}{5}x + 3y = 6$ Find;
 a) The gradient of the line. (1mark)
 b) The equation of a line passing through the point (1, 2) and perpendicular to the given line. (2marks)
7. The figure below show a solid conical frustum with top and bottom parallel circular planes of $9\pi\text{cm}^2$ and $16\pi\text{cm}^2$ respectively. If the volume of the cone from which the frustum was cut off is 320cm^3 , calculate the volume of the frustum (4marks)



8. The position vectors of points x, y and z are, $\vec{x} = ti + 2j$; $\vec{y} = 2i + 5j$ and $\vec{z} = 3i + 4j$ respectively. If the Points x, y and z are collinear, find the value of t. (3marks)
9. If $T = \frac{n}{p^2 + nr}$, make P the subject of the formula. (3marks)
10. Two flag posts 4.7m and 6.5m in height stand a distance of 8.1m apart, and a straight rope joins their tops. Find:
 a) The length of the rope. (3marks)
 b) The angle of depression of the rope. (1mark)
11. Kipyego bought a Television set and marked it at Sh. 32,500. He later sold the TV set at 10% discount and still made a profit of 30%. Calculate the price at which Kipyego sold the T.V set. (3marks)
12. Find the values of θ which satisfy the trigonometric equation.
 $2\sin^2\theta - 5\cos\theta + 1 = 0$ for (3marks)
13. The L.C.M of three numbers is 7920 and their G.C.D is 12. Two of the numbers are 48 and 264. Using factor notation find the third number if one of its factors is 9. (3mark)
14. Two similar cans have different heights 8cm and the other one 10cm. if the surface area of the larger can is 480cm^2 , find the surface area of the smaller can. (3marks)
15. Two types of coffee are available in a shop. Grade A cost Sh. 150 per kilogram and grade B cost Sh. 160 per kilogram. If Grade A and B are mixed in the ratio 2: x, find x such that the selling price will give a 25% profit if the mixture is sold at Sh. 1950 for 10kg. (3marks)
16. A tank is supplied by two pipes. The larger pipe can fill the tank in 10 minutes less than the smaller pipe. Running the two pipes together fill the tank in 12 minutes. Find the time taken by each pipe separately to fill the tank. (4marks)

SECTION B**Answer ANY five questions**

17. In the figure below ABCD is a cyclic quadrilateral and that angle $\angle ABD = 42^\circ$, $\angle BAC = 58^\circ$ and $\angle DBC = 36^\circ$.



Giving reasons find the values of;

- a) Angle DAC. (2marks)
 b) Angle ADB. (2marks)
 c) Angle ACB. (2marks)
 d) Angle CDB. (2marks)
 e) Angle CEB. (2marks)
18. Using the same axes a horizontal scale of 1cm to represent 30° and vertical scale of 4cm represent 1 unit.
 a) Fill in the table. (2marks)

x	0	30	60	90	120	150	180	210	240	270	300	330	360
$\sin(x - 15)$	-2.59		0.707					-0.259		-0.966			
$2\cos x$				0.00		-1.732						1.732	2.00

Draw the graph of $y = \sin(x - 15)$ and $y = 2\cos x$ on the graph paper provided, (5marks)

- b) Use your graphs, solve the equations:

i) $\sin(x - 15) = 0.5$ (1mark)

ii) $\sin(x - 15) = 2\cos x$ (2marks)

19. A pirate boat sailed from port A on a bearing of 050° at a speed of 112km/h, for $2\frac{1}{2}$ hours to port B. From B it changes its course

and traveled on bearing of 170° at a speed of 75km/h for hours towards port C. From C it traveled to port D. D is on a bearing of 130° and 160km from A.

- Using a scale of 1cm to represent 40km, draw a diagram showing the positions of the ports A, B, C and D. (5marks)
 - Use your diagram to find;
 - The distance of C from D. (1mark)
 - The bearing of C from D. (1mark)
 - A marine police post leaves port A to intercept the pirate boat at M as it moves from B to C in the shortest time possible.
 - How far from port A will the two boats meet at M? (2marks)
 - If the boats meet after 2 hours, what is the speed of the marine police boat? (1mark)
20. The table below represents marks scored in maths.

Marks	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70 - 79
No. of students	2	6	7	13	6	4	2

Use the above frequency table to calculate:

- Mean (3marks)
 - Standard deviation. (4marks)
 - Upper quartile. (3marks)
21. The cash price of a tractor is Ksh. 1.8million. The tractor can also be bought through a bank loan. The customer is supposed to raise a down payment of 20% of the cash price. The balance is paid through the loan at 10% compound interest. Simba bought the tractor through the loan.
- Calculate the amount of money he borrowed. (3marks)
 - Simba paid the loan in 4 years. Calculate the total amount he paid for the tractor. (3marks)
 - Find how long he would take to repay the loan if he paid a total of Sh. 2,276,640. (4marks)
22. a) A factory manufactures 100,000 sweets in the first hour. The rate of production decreases by 20% every hour.
- Calculate the number of sweets produced in the 4th hour. (3marks)
 - Calculate the total number of sweets produced in the first 5 hours. (3marks)
- b) The eleventh term of an Arithmetic progression is four times the second term. The sum of the first seven terms of the same progression is 175. Find;
- The first term. (3marks)
 - The common difference. (1mark)
23. The probability that a pupil goes to school by a boda-boda is $\frac{2}{3}$ and by a matatu is $\frac{1}{4}$ if he uses a boda-boda the probability that he is late is $\frac{2}{5}$ and if he uses matatu the probability of being late is $\frac{3}{10}$. If he uses other means of transport the probability of being late is $\frac{3}{20}$.
- Draw a tree diagram to represent this information. (3marks)
 - Find the probability that he will be late for school. (3marks)
 - Find the probability that he will be late for school if he does not use a matatu. (2marks)
 - What is the probability that he will not be late to school? (2marks)
24. The table below shows the values of x and some values of y for the curve $y = x^3 + 3x^2 - 4x - 12$ in the range $-4 \leq x \leq 2$.
- Complete the table by filling in the missing values of y. (2marks)

X	-4	-3.5	-3	-2.5	-2.0	-1.5	-1.0	-0.5	0	0.5	1.0	1.5	2.0
Y		-4.1		1.1		-2.6		-9.4		-13.1		-7.9	

- On the grid provided draw the graph of $y = x^3 + 3x^2 - 4x - 12$ in the range $-4 \leq x \leq 2$. (4marks)
- By drawing a suitable straight line on the same grid solve the equation $x^3 + 3x^2 - 5x - 6 = 0$. (4marks)

LANG'ATA

121/2

MATHEMATICS

Paper 2

PRE MOCK.

Time: 2 ½ Hours

SECTION A (Answer ALL questions in this section)

- Evaluate without using mathematical tables or calculator $\frac{450 \times \sqrt{0.36}}{27^{\frac{2}{3}} - 81^{\frac{1}{3}}}$ (3marks)
- Given that $A = 4 + \sqrt{2}$ and $B = 2 + \sqrt{2}$ and that $\frac{A}{B} = c + d\sqrt{e}$ where c, d and e are constants. Find the values of c, d and e. (3marks)
- An underground water tank is in the shape of a hemispherical bowl. Given that the volume of the tank is 19,404 litres, find the radius of the tank in metres. (3marks)
- Solve for x in the trigonometric equation.

$$\log_2(3x + 1) = 2 + \log_2(x - 1)$$

(3marks)

5. The probability of a school winning in 2/3 football is $\frac{2}{3}$ and winning in volleyball is $\frac{1}{4}$. Find the probability of winning at least one game. (3marks)
6. The eleventh term of an A.P is four times the second term. If the sum of the first seven terms of the A.P is 175 find the
 i) the first term (2marks)
 ii) The common difference (1mark)
7. The data below shows the age of 10 students picked at random in a secondary school 6, 11, 13, 14, 8, 7, 12, 20, P and 9.

$$\text{If } \sum fx^2 = 1360$$

- i) Determine the value of P (2marks)
 ii) Find the standard deviation of the distribution. (2marks)
8. Solve the simultaneous equations (3marks)

$$x - 3y = 11$$

$$2x + y^2 = 13$$

9. The measurements $a = 6.3$, $b = 15.8$, $c = 14.2$ have maximum possible errors 1%, 2% and 3% respectively. Find the

$$\text{maximum value of } \frac{ac}{b}$$

(2marks)

10. The price of a new car is Sh. 800,000.00. If it depreciates at a constant rate to Sh. 550,000 within 4 years. Find the annual rate of depreciation. (3marks)
11. A tangent from an external point A (7, 5) meets a circle centre O whose equation is $x^2 + 4x + y^2 = 0$. Find the length of the tangent AT. (3marks)
12. Mwangi and Otieno live 60km apart. Mwangi leaves his home at 7.00a.m cycling towards Otieno's house at 20km/h. Otieno leaves his home at 8.00a.m cycling towards Mwangi's house at 8km/h.
 a) At what time did they meet? (2marks)
 b) How far is the meeting point from Mwangi's house? (1mark)
13. Expand $(2 + x)^6$ upto the fourth term. (2marks)

Hence use the above expansion to evaluate $(1.96)^6$ correct to 4 d.p. (2marks)

14. Find the radius and centre of a circle whose equation is

$$4x^2 + 4y^2 + 56x - 104y - 152 = 0$$

(3marks)

15. If P varies directly as R and inversely as the square root of Q. Find the percentage change in P if R is increased by 40% and Q decreases by 36%. (4marks)
16. Solve for x in, $3^{-2x+1} - 10(3^{-x}) + 3 = 0$ without using tables. (3marks)

SECTION B (Answer ANY 5 questions in this section)

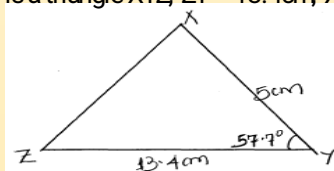
17. A quadrilateral ABCD has vertices A (4, -4), B (2, -4), C (6, -6) and D (4, -2).
 a) On the grid provided, draw the quadrilateral ABCD. (2marks)
 b) $A'B'C'D'$ is the image of ABCD under positive quarter turn about the origin. On the same grid draw the image $A'B'C'D'$ and state its co-ordinates. (3marks)
 c) $A''B''C''D''$ is the image of $A'B'C'D'$ under the transformation given by $T = \begin{pmatrix} 1 & -2 \\ 0 & 1 \end{pmatrix}$
 i) Determine the co-ordinates of $A''B''C''D''$. (3marks)
 ii) On the same grid draw the quadrilateral $A''B''C''D''$. (2marks)
 d) Determine a single matrix that maps ABCD onto $A''B''C''D''$. (2marks)
18. The table below shows the income tax rates during a certain year.

Monthly Taxable income (K£)	Tax rate Sh. Per (K£)
0 – 506	2
507 – 1012	3
1013 – 1518	4
1519 – 2024	5
2025 – 2530	6
2531 – 3036	7
3037 – Above	7.50

A bank clerk earns a basic salary of Sh. 55,240 and a house allowance of Sh. 30,600 per month. She is also paid taxable allowance amounting to Sh. 15,760 per month.

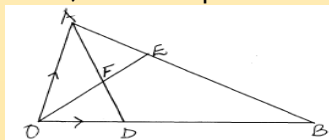
- a) Calculate:
 i) Her monthly taxable income in K£. (2marks)
 ii) The gross tax payable. (6marks)
- b) The clerk is entitled to a personal tax relief of Ksh. 1312 per month. Calculate her net monthly tax. (2marks)

19. The figure below is a triangle XYZ, $ZY = 13.4\text{cm}$, $XY = 5\text{cm}$ and angle $XYZ = 57.7^\circ$.



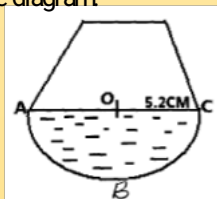
Calculate

- Length XZ. (2marks)
 - Angle XZY. (2marks)
 - The circumradius of triangle XYZ. (2marks)
 - If a perpendicular is dropped from point X to cut ZY at M. Find the ratio MY: ZM. (2marks)
 - Find the area of triangle XYZ. (2marks)
20. In the figure below, E is the midpoint of AB. OD: OB = 2: 5 and F is the point of intersection of OE and AD.



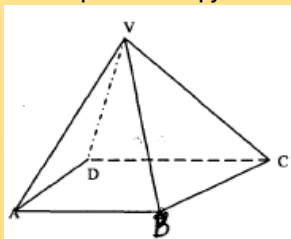
Given that $\vec{OA} = \vec{a}$ and $\vec{OB} = \vec{b}$ express in terms of $\vec{a}$ and $\vec{b}$.

- $\vec{OE}$ (1mark)
 - $\vec{AD}$ (1mark)
 - Given further that $\vec{AF} = t\vec{AD}$ and $\vec{OF} = h\vec{OE}$ where t and h are scalars, find the values of the scalars t and h . (5marks)
 - Show that the points O, F and E are collinear. (3marks)
21. The diagram below shows a cross-section of a bottle. The lower part ABC is a hemisphere of radius 5.2cm and the upper part is a frustum of a cone. The top radius of the frustum is one third of the radius of the hemisphere. The hemisphere part is completely filled with water as shown in the diagram



When the container is inverted, the water now completely fills only the frustum part.

- Determine the height of the frustum part. (5marks)
 - Find the surface area of the frustum part of the bottle. (5marks)
22. The figure below represents a square based pyramid with equilateral triangles, $AB = 5\text{cm}$



Calculate the;

- Height of the triangular faces. (2marks)
 - Length of AC. (2marks)
 - Angle between VA and ABCD. (2marks)
 - Angle between VAD and ABCD. (2marks)
 - Angle between VAB and VBC. (3marks)
23. The table below show masses of 200 people from Kapsoya Village.

Masses (kg)	40 - 49	50 - 59	60 - 69	70 - 79	80 - 89	90 - 99	100 - 109
No. of people	9	27	40	50	26	12	6

- Draw a cumulative frequency curve for the above data. (5marks)
- Use your graph to estimate;

- i) The median mass. (1mark)
 ii) The number of people whose mass lies between 70.5kg and 75.5kg. (2marks)
 c) Find the following from your graph.
 i) The lower quartile. (1 mark)
 ii) The upper quartile. (1mark)
24. a) Using a ruler and compasses only, construct triangle ABC such that $AB = AC = 4.3\text{cm}$ and angle $ABC = 30^\circ$. (3marks)
 b) Measure BC. (1mark)
 c) A point P is always on the same side of BC as A. Draw the locus of P such that angle BAC is always twice angle BPC. (2marks)
 d) Drop a perpendicular from A to meet BC at D. Measure AD. (2marks)
 e) Calculate the area of triangle ABC. (2marks)

EMBU NORTH SUB-COUNTY

FORM 4 END OF TERM 2 EXAM.

121/1

MATHEMATICS

PAPER 1

. MOCKS KCSE PREDICTIONS/ . .

2 ½ HRS

SECTION 1 (50 MARKS)

Answer all the questions from this section

1. Without using tables or calculator evaluate (3mks)

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

2. Express the following as a single fraction (3mks)

$$\frac{2x-3}{3} - \frac{x-2}{2} - \frac{1-x}{4}$$

3. Use reciprocal and square tables to evaluate to 4 significant figures, the expression

$$\frac{1}{24.56} + 4.362^2 \quad (3\text{mks})$$

4. A Kenyan bank buys and sells foreign currencies as shown in the table below

	Buying (Kshs)	Selling (kshs)
1 Euro	84.15	84.26
1 sterling pound	118.35	121.47

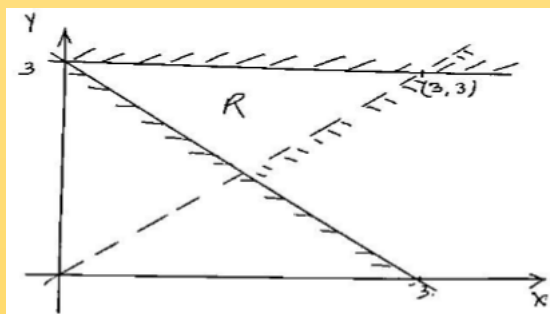
A tourist came to Kenya from London with 5000 Euros which he converts to Kenya shillings at the bank. While in Kenya he spent a total of shs 289,000 then converted the balance into sterling pounds at the same bank.

Calculate the amount in sterling pound that he received. (3mks)

5. A closed rectangular box is made of wood of density 0.4g/cm^3 . If the wood is 1.5cm thick and its external measurements are 30cm by 240cm by 20cm. calculate the mass of wood making the box. (Give your answer in Kg). (4marks)
6. The exterior angle of a regular polygon is equal to one- third of the interior angle. Calculate the number of sides of the polygon (2mks)

7. Simplify $\frac{2x^2 - y^2 + xy}{x^2 - y^2}$ (3mks)

8. Determine the inequalities that satisfy the region R in the figure below (3mks)

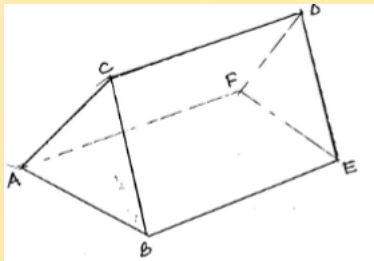


9. Find the equation of a perpendicular bisector of line PQ, in the form $y = mx + c$. If the co-ordinates of P and Q are $(-2, 6)$ and $(4, -2)$

respectively.

(3mks)

10. Using a ruler and a pair of compasses only construct triangle PQR such that PQ=7cm, QR=5cm and $\angle PQR=30^\circ$. Construct the locus L of points equidistant from RP and RQ (3mks)
11. Three years ago, a father was three times as old as his son. In three years' time, the sum of their ages will be 76 years. Determine their present ages. (3mks)
12. Solve $8^x = 4^{2y+1}$ and $27^{2x} = 9^{y-3}$ giving your answers as an exact fraction. (4mks)
13. A piece of wire is bent into the shape of an isosceles triangle. The base angles are each 48° and perpendicular height to the base is 6cm. Calculate correct to 1 decimal place the length of the wire. (3mks)
14. The figure below is a prism whose cross-section is an equilateral triangle AB=3cm, BE=5cm



- i) Draw the net of the prism (2mks)
- ii) Calculate the surface area of the prism (2mks)
15. Given that $P = 5\vec{a} - 2\vec{b}$ where $\vec{a} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ and $\vec{b} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$ find $|P|$ (3mks)
16. Express the number 1470 and 7056 each as a product of prime factors. Hence evaluate $\frac{1470^2}{\sqrt{7056}}$ leaving your answer in prime factor form. (3mks)

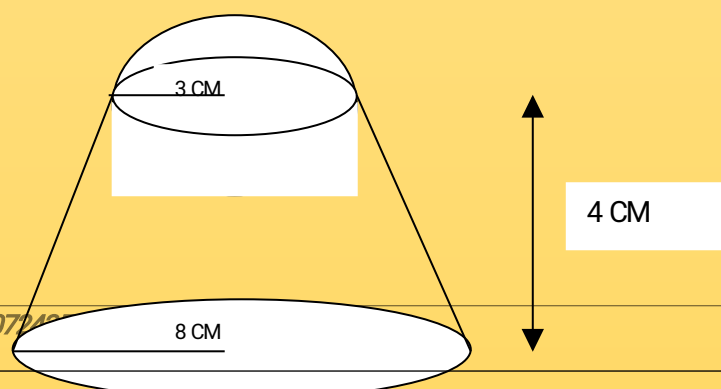
SECTION II (50 MARKS)

Answer any five questions from this section

17. Patients who attended clinic in one week were grouped by age as shown in the table below

Age in (years)	No. of patients
0-5	14
5-15	41
15-25	59
25-45	70
45-75	15

- a) State the modal frequency (1mk)
- b) Estimate the mean age (4mks)
- c) On the grid provided, draw a histogram to represent the distribution. (5mks)
18. A bus left Kisumu at 9.30 a.m towards Nairobi at an average speed of 81Km/hr. A matatu left Nairobi at 10.10a.m at an average speed of 72km/ hr. The distance between Kisumu and Nairobi is 360km.
- a) Determine
- i) The time taken before the two vehicles met. (3mks)
- ii) The distance between the two vehicles 40 minutes after meeting. (2mks)
- b) A car left Kisumu towards Nairobi at 9.50 a.m at an average speed of 90km/hr. Determine
- i) The time when the car caught up with the bus. (3mks)
- ii) The distance of Nairobi from the place where the car caught up with the bus. (2mks)
19. The diagram below shows a hemisphere on top of a frustum. The top radius of the frustum is 3cm and the bottom radius is 8cm. The height of the frustum is 4cm.



Calculate

- a) The height of the cone from which the frustrum was taken (3mks)
- b) The volume of the frustrum (4mks)
- c) The total volume of the solid (3mks)
20. Three ports A, B and C are situated in such a way that port A is 140km on a compass bearing N65°E of B. Port C is 200km on a compass bearing S32°E of A. A ship S is docked in sea, 86km on a bearing of 190° from port B.
- a) Using a scale of 1cm to represent 20km, draw a diagram to show the position of ports A, B C and ship S (4mks)
- b) Using your diagram find
- i) The distance between the ship and port A (1mk)
- ii) The bearing of the ship from port C (1mk)
- iii) The distance from B to C (1mk)
- iv) Find how far C is South of A (2mks)
- v) Compass bearing of S from A (1mk)
21. A construction company is to use 144 tonnes of stones in site A and site B. Kimani and James are to supply the company with stones from their quarry. The company pays sh 24000 to transport 48 tonnes of stones for every 28km.
- a) Kimani transported 96 tonnes to site A, 49km away.
- i) Find how much he was paid (4mks)
- ii) If Kimani spends kshs 3000 to transport every 8 tonnes of stones to site A. Calculate his total profit. (3mks)
- b. James transports the remaining 48 tonnes to site B, 84km away. If he made 44% profit, find the money he spent on transporting the stones (3mks)
22. A certain number of people agreed to contribute equally to buy books worth sh.12000 for a school library. Five people pulled out so that others agreed to contribute an extra shs 100 each. Their contribution enabled them to buy books worth shs 2000 more than they originally expected.
- a) If the original number of people was x. Write down
- i) An expression of how much each was to contribute originally (1mk)
- ii) Two distinct expressions of how much each contributed after the five pulled out (2mks)
- b) Calculate the original number of people (4mks)
- c) The ratio of the supposed original contribution to the new contribution (3mks)
23. The quadrilateral PQRS and P'Q'R'S' have co-ordinates P(-2,5) Q(-1,6) R(-4,7) S(-4,5) and P'(4,2) Q'(2,0) R'(8,-2) and S'(8,2)
- a) On the grid provided plot PQRS and P'Q'R'S' (2mks)
- b) Given that P'Q'R'S' is image of PQRS after an enlargement. Find the co-ordinates of the centre and the scale factor of enlargement (2mks)
- c) On the same axes plot P²Q²R²S² the image of P'Q'R'S' after a rotation centre (0, -1) through -90°. Write down the co-ordinates of P²Q²R²S² (3mks)
- d) P³Q³R³S³ is the image of P²Q²R²S² after a translation vector $\begin{pmatrix} -4 \\ 2 \end{pmatrix}$. Plot P³Q³R³S³ on the same axes (3mks)
24. The displacement S metres covered by a moving particle after time t seconds is given by
- $$S = 2t^3 + 4t^2 - 8t + 3$$
- Find
- a) The displacement of the particle at t = 5 seconds (2mks)
- b) The velocity of the particle at t = 5 seconds (3mks)
- c) The value of t when the particle is momentarily at rest (3mks)
- d) The acceleration of the particle at t = 2 seconds (2mks)

EMBU NORTH SUB-COUNTY
FORM 4 END OF TERM 2 EXAM.

121/2

MATHEMATICS

PAPER 2

. MOCKS KCSE PREDICTIONS/ . .

2 ½ HRS

1. Use tables of logarithms to evaluate (4mks)

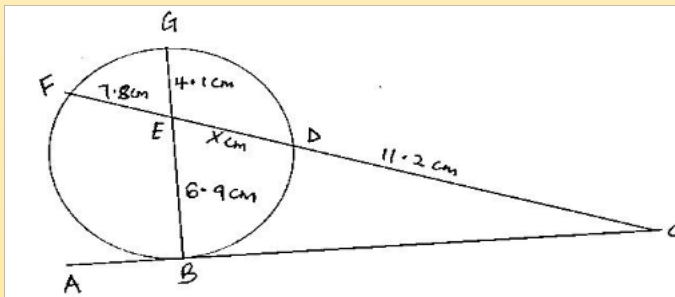
$$\sqrt[3]{\frac{58.32 \times (0.9823)^2}{693.5}}$$

2. Simplify $\frac{3}{\sqrt{7}-2} + \frac{1}{\sqrt{7}+2}$ (3mks)

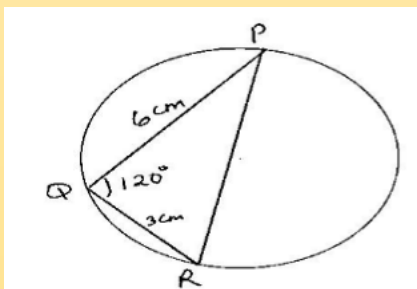
3. Make y the subject of the formula given

$$q = m \sqrt{\frac{r^2 - y^2}{y^2 + 3}} \quad (3\text{mks})$$

4. Find the percentage error in the area of a parallelogram whose base is 23.2m and height is 11.5cm. (3mks)
5. In what ratio should grade P of tea costing sh 450 per kg be mixed with grade Q of tea costing sh 350 per kg so that a profit of 10% is made by selling the mixture at sh 451 per kg? (3mks)
6. In the figure below ABC is a tangent to the circle at point B. Given that BE = 6.9cm, FE = 7.8cm, GE = 4.1cm, DC = 11.2cm and ED = xcm. Determine the length BC, give your answer to four significant figures. (3mks)



7. Find Y without using tables. If $2 + \log_2 3 + \log_2 y = \log_2 5 + 1$ (3mks)
8. Three quantities X , Y and Z are such that X varies directly as the square of Y and inversely as the square root of Z . Given that Y increases by 5% and Z decreases by 36%. Find the percentage change in X . (3mks)
9. The figure below shows triangle PQR inscribed in a circle PQ = 6cm, QR = 3cm and angle PQR = 120°



Calculate the length PR and the radius of the circle

(4mks)

10. Given that the matrix $\begin{pmatrix} 5-x & 2 \\ 3x & 4 \end{pmatrix}$ has no inverse. Find x (2mks)
11. a. Expand and simplify the first four terms $(2 - \frac{1}{2}x)^6$ (2mks)
 b. Use the first three terms of the expansion above to find the approximate value of $(1.97)^6$ (2mks)
12. Determine the quartile deviation for the set of data given below (3mks)
 20, 40, 30, 42, 10, 18, 26, 32
13. The points A (-4,2) and B (-8,-4) are the end points of a diameter of a circle. Find the equation of the circle and leave your answer in the form $ax^2 + bx^2 + cx + dy + e = 0$ where a, b, c, d and e are constants (4mks)
14. Solve for θ in the equation $6 \cos^2 \theta - \sin \theta - 4 = 0$ in the range $0^\circ \leq \theta \leq 180^\circ$ (3mks)
15. Mrs. Kazi deposits shs 15,000 in a bank that pays compound interest at 12% p.a. If the interest is compounded quarterly, Calculate the amount at the end of 2 years (Round off your values to 4 decimal places) (3mks)
16. The probability that a student gets grade A in Mathematics is $\frac{9}{10}$. If she gets grade A in mathematics then the probability that she gets A in physics is $\frac{4}{5}$. If she does not get grade A in mathematics then the probability that she get grade A in physics is $\frac{3}{8}$. Calculate the probability that she gets grade A in physics only. (2mks)

SECTION II (50 MARKS)

Answer any five questions from this section

17. Mr. Njagi, a civil servant earns a basic salary of sh 38,300 house allowance of sh 12,000 and medical allowance of shs 3600 every month. He claims a family relief of sh 1172 and insurance relief of 3% of the premium's paid. Using tax table below

Taxable income (£)p.a	Tax Ksh/£
1 - 8800	2
8801 - 16800	3
16801 - 24800	5
24801 - 36800	7

36801 - 48800	9
Over 48800	10

- a) Calculate Mr. Njagi's annual taxable income in Kenya pounds per annum (2mks)
- b) Tax due every month from Mr. Njagi to 2 decimal places (5mks)
- c) If further deductions are made every month from his salary

- WCPS of 2 % of basic salary
- Life insurance premium of shs. 4600
- Sacco loan repayment shs. 14200

Calculate

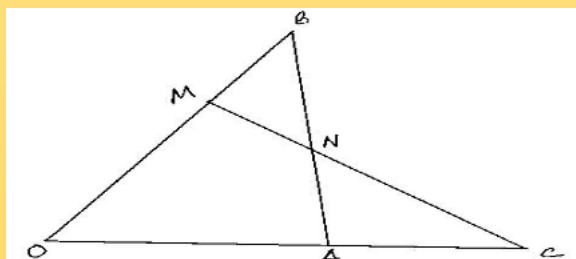
- i) Total deductions (1mk)
- ii) His net pay per month (2mks)

18. Complete the table below for the trigonometric function $y=2 \cos \theta$ and $y = \sin \frac{1}{2} \theta$ (2mks)

θ	0	30	60	90	120	150	180	210	240	270	300	330	360
$Y=\sin \frac{1}{2} \theta$	0			0.71									
$Y=2 \cos \theta$	2						-2				1.73		

- b. Using the table above draw the graph of $y = \sin \frac{1}{2} \theta$ and $y = 2 \cos \theta$ on the same axes (5mks)
(Use the scale: 1cm to represent 30° on the x axis and 2cm to represent 1 unit on the y axis)
- c. Use your curves to find solution to the equation $\sin \frac{1}{2} \theta - 2 \cos \theta = 0$ (1mk)
- d. State the
- i) Amplitude of the curve $y = 2 \cos \theta$ (1mk)
- ii) Period of the curve $y = \sin \frac{1}{2} \theta$ (1mk)
19. A point P (50°N , 10°W) is on the earth's surface. A plane flies from P due east on a parallel of latitude for 6 hours at 300 knots to port Q.
- a) Determine the position of Q to the nearest degree. (4mks)
- b) If the time at Q when the plane lands is 11.20a.m what time is it at P. (2mks)
- c) The plane leaves Q at the same speed and flies due north for 7 hours along a longitude to airport R. Determine the position of R. (4mks)
- 20) . The sum of 21st and 65th terms of an arithmetic sequence is 368. Given that the seventh term of the sequence is 40. Find
- a) The common difference (3mks)
- b) The first term (2mks)
- c) The sum of the first 16 terms of the A.P. (2mks)
- d) Given further that the 1st, 5th and 13th terms of the arithmetic sequence form the first three consecutive terms of a geometric progression,
- Find
- i) The common ratio . (1mk)
- ii) The sum of the first 20 terms of the G.P. (2mks)

21. In the figure below $OA = a$ $OB = b$ and $OC = 3O$ A . Point M divides OB in the ratio 3:2



a) Express in terms of $\underline{a}$ and $\underline{b}$

- i) AB (1mk)
 ii) MC (1mk)
 iii) MA (1mk)

b. Given that $MN = kMC$ and $AN = hAB$ where k and h are scalars, express MN in two ways hence find

- i) The value of k and h (5mks)
 ii) The ratio of $AN:NB$ (1mk)
 iii) Express MN in terms of $\underline{a}$ and $\underline{b}$ only (1mk)

22a. Complete the following table for the equation $y = 2x^3 + 3x^2 - 6x - 4$

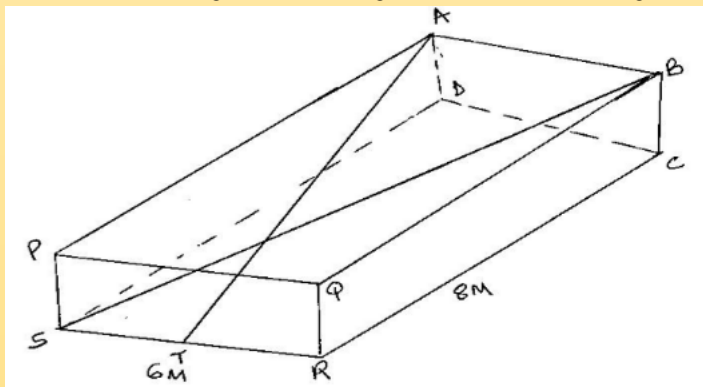
x	-4	-3	-2	-1	0	1	2
$2x^3$	-128		-16		0	2	16
$3x^2$	48	27	12	3	0		12
$-6x$	24				0		-12
-4	-4	-4	-4	-4	-4	-4	-4
y	-60		4		-4		12

b. On the grid provided draw the graph of $y = 2x^3 + 3x^2 - 6x - 4$ (3mks)

c) By drawing a suitable straight line use your graph to solve the equations

- i) $2x^3 + 3x^2 - 4x - 2 = 0$ (3mks)
 ii) $2x^3 + 3x^2 - 6x - 4 = 0$ (2mks)

23. The figure below shows a rectangular tank of length 8m, width 6m and height 4m. SB is a diagonal of the tank and T is the midpoint of SR .



Calculate

- a) The length SB (3mks)
 b) The angle between SB and the plane $CDSR$ (2mks)
 c) The length AT to 1 d.p (3mks)
 d) Angle ATD (2mks)
 24 a) Complete the table below for the function $y = x^2 + 3$ (2mks)

x	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
y	4		7			15.25	19		28		39

- b) Use the mid-ordinate rule with five strips to estimate the area bounded by the curve, the line $x = 1$ and the line $x = 6$ (2mks)
 c) Use integration to find the exact area in (b) above (3mks)
 d) Calculate the percentage error arising from the use of the mid-ordinate rule (3mks)

LUGARI SUB COUNTY

121/1

MATHEMATICS ALT. A

Paper 1

June/. MOCKS KCSE PREDICTIONS, .

Time: 2 ½ Hours

1. Without using calculators evaluate:

(3mks)

$$\frac{\frac{1}{2} + 2\frac{4}{5} \text{ of } 8 \div 6(2 \times 4\frac{2}{5})}{\frac{1}{2} \text{ of } 6(8 \div 3\frac{1}{5})}$$

2. The interior angle of a regular polygon is 4 times the exterior angle. How many sides does the polygon have? (3mks)
3. Mr. Makasembo has a triangular plot that measure 170m, 190m and 210m. Find the area of this plot in hectares

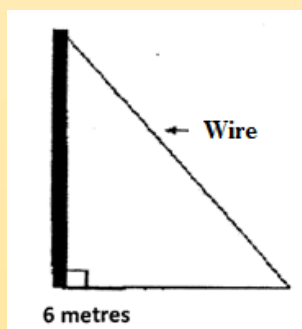
(3mks)

4. Use tables of reciprocals only to find the value of

(4 mks)

$$\frac{5}{0.829} - \frac{14}{0.581}$$

5. An electric pole is supported to stand vertically on a level ground by a tight wire. The wire is pegged at a distance of 6 metres from the foot of the pole as shown.

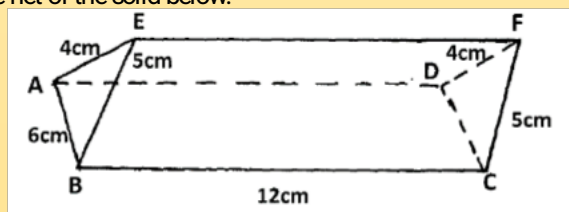


The angle which the wire makes with the ground is three times the angle it makes with the pole. Calculate the length of the wire to the nearest centimeter.

(3 mks)

6. Draw the net of the solid below.

(2mk)



7. A triangle ABC whose area is 4cm^2 is mapped onto triangle $A^1B^1C^1$ whose area is 64cm^2 under a transformation matrix $\begin{pmatrix} n & 6 \\ -1 & n+3 \end{pmatrix}$

a) Calculate the possible values of n

(2 marks)

b) Find the image of A(3, 4) under the above matrix transformation where $n < 0$

(2 marks)

8. Express $\frac{1}{x-2} - \frac{2}{x+5} = \frac{3}{x+1}$ in the form of $ax^2 + bx + c = 0$. Where a, b and c are constants hence solve for x

(4mks)

9. Two similar solids have masses of 80 kg and 270 kg respectively. Find the surface area of the larger solid if the smaller solid has a surface area of 48cm^2

(2mks)

10. A Kenyan bank buys and sells foreign currencies using the rates shown below;

Buying (ksh)	selling (ksh)
Euro 86.25	86.97
100 Japanese yen 66.51	67.26

A Japanese travelling from France arrives in Kenya with 5000 Euros, which he converts to Kenyan shillings at the bank. while in Kenya he spent a total of ksh 289,850 and then converted the remaining Kenyan shillings to Japanese Yen at the bank. Calculate the amount of Japanese Yen that he received

(3mks)

11. Three liters of water (density 1 g/cm^3) is added to twelve liters of alcohol (density 0.8 g/cm^3) what is the density of the mixture

(3mks)

12. The angle of elevation of the top of a cliff from point P is 45° . From a point Q which is 10m from P towards the foot of the cliff, the angle of elevation is 48° . Calculate the height of the cliff.

(3mks)

13. A circle centre O has the equation $x^2 + y^2 = 4$. The area of the circle in the first quadrant is divided into 5 vertical strips each of width 0.4m.

- (a) Use the equation of the circle to complete the table below for values of y correct to 2d.p.

(1mk)

x	0	0.4	0.8	1.2	1.6	2.0
y	2.00			1.60		0

- (b) Use the trapezoidal rule to estimate the area of the circle.

(3 marks)

14. A trader sells a bag of beans for ksh 2,100 and that of maize at ksh.1,200. He mixed maize and beans in the ratio of 3:2. Find how much the trader should sell a bag of the mixture to realize the same profit

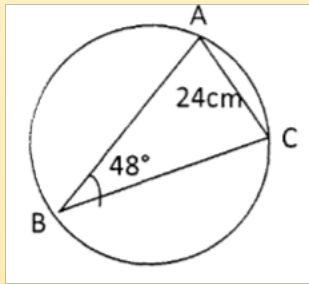
(3mks)

15. Solve for x
 $27^x + 3^{3x-1} = 108$

(3mks)

16. Find the area of the circle in the diagram below

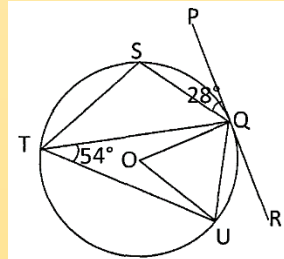
(3mks)



SECTION 11(50 MARKS)

Answer any five questions in this section

17. A group of people planned to contribute equally towards a local Abolition project which needed Ksh 200000 to complete. However, 40 members of the group left the project. As a result, each of the remaining members were to contribute Ksh2500.
- Find the original number of members in the group. (5mks)
 - Forty five percent of the value of the project was funded by a sanitary NGO, Calculate the amount of contribution that would be made by each of the remaining members of the group. (3mks)
 - Member's contributions were in terms of labour provided and money contributed. If the ratio of the value of labour to the money contributed was 6:9; calculate the total amount of money contributed by the members. (2mks)
18. In the figure below PQR is tangent to the circle at Q and the angle PQS=28° and angle UTQ=54° and UT=TQ



Stating reasons, determine the values of angles named below

- $\angle STQ$ 2mks
- $\angle TQU$ 2mks
- $\angle TQS$ 2mks
- Reflex angle UOQ 2mks
- $\angle TQR$ 2mks

19. On the grid provided below:

- Draw triangle ABC whose coordinates are A (8,6), B(6,10) and C(10,12) and its image $A'B'C'$ after undergoing a reflection in the line $y=x$. Write the co-ordinates of $A'B'C'$ (4 Marks)
- Triangle $A'B'C'$ undergoes an enlargement centre (0,0) scale factor $\frac{1}{2}$ to form triangle $A''B''C''$. Draw triangle $A''B''C''$. (3 Marks)
- Triangle ABC is stretched with y-axis invariant and stretch factor of $\frac{1}{2}$ to obtain triangle $A'''B'''C'''$. Draw triangle $A'''B'''C'''$. (3 Marks)

20. a). Using a ruler and a compass only, construct a triangle ABC such that AB = 6.8 cm, BC = 5.6 cm and angle ABC = $37\frac{1}{2}^\circ$ (3mks)

- Locate the:
 - Locus P such that angle APB= angle ACB (3mks)
 - Locus Q such that Q is equidistant to points A and B (2mks)
 - Locus R such that R is equidistant to lines AB and AC (2mks)

21. a) Three points A (0,4) B(2,3) and C(-2,-1) are vertices of a triangle. Find;

- The gradient of AC 1mk
- The gradient of the perpendicular bisector of line AC 1mk
- The coordinates of the mid-point of line AC 1mk
- The gradient of AB 1mk
- The gradient of the perpendicular bisector of lines AB 1mk
- The coordinates of the mid-point of AB 1mk
- find the equation of the perpendicular bisector of AC 1mk
- The equation of perpendicular bisector of AB 1mk
- Hence find the coordinates of the circumcentre of the triangle 2mks

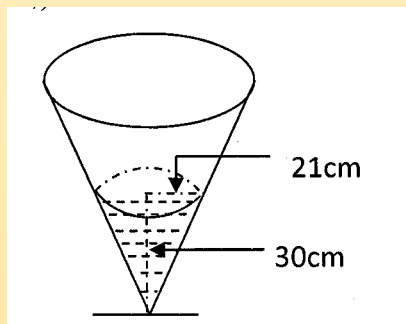
22. The displacement of a particle S metres, t seconds after passing a fixed point O is given by $S=3+2t-5t^2$

Calculate:

- (a) The displacement of the particle 2 seconds later (2mks)
 (b) The time taken for the particle to return to O (2mks)
 (c) The maximum displacement of the particle (3mks)
 (d) The initial velocity of the particle (2mks)
 (e) The acceleration of the particle after t seconds (1mk)

23. The diagram below represents a conical vessel which stands vertically.

The vessel contains water to a depth of 30 cm. the radius of the water surface in the vessel is 21 cm (take $\pi = \frac{22}{7}$)



- (a) Calculate the volume of the water in the vessel in cm^3 (2mks)
 (b) When a metal sphere is completely submerged in the water, the level of the water in the vessel rises by 6 cm. calculate (2mks)
 i) the radius of the new water surface in the vessel (3 mks)
 ii) the volume of the metal sphere in cm^3 (2 mks)
 iii) the radius of the sphere
 24. The table below shows patients who attend a clinic in one week and were grouped by age as shown in the table below.

Age x years	$0 \leq x < 5$	$5 \leq x < 15$	$15 \leq x < 25$	$25 \leq x < 45$	$45 \leq x < 75$
Number of patients	14	41	59	70	15

- (a) Estimate the mean age (4mks)
 (b) On the grid provided draw a histogram to represent the distribution. (3mks)
 Use the scales: 1 cm to represent 5 units on the horizontal axis 2 cm to represent 5 units on the vertical axis.
 (c) (i) State the group in which the median mark lies (1mk)
 (ii) A vertical line drawn through the median mark divides the total area of the histogram into two equal. Using this information estimate the median mark. (2mks)

LUGARI SUB COUNTY

121/2

MATHEMATICS ALT. A

Paper 2

June/. MOCKS KCSE PREDICTIONS, .

Time: 2 ½ Hours

SECTION I: (50 MARKS)

1. Use logarithm tables to evaluate: (4 marks)

$$\sqrt[3]{\frac{45.3 \times 0.00697}{0.534}}$$

2. Evaluate by rationalizing the denominator and leaving your answer in surd form. (3 marks)

$$\frac{\sqrt{8}}{1 + \cos 45^\circ}$$

3. Make n the subject of the formula. (3 marks)

$$M = \sqrt[4]{\frac{ax^2n}{w-n}}$$

4. The first, third and the seventh terms of an increasing arithmetic progression are three consecutive terms of a G.P. If the first term of the AP is 10. Find the common difference of the AP (3 marks)

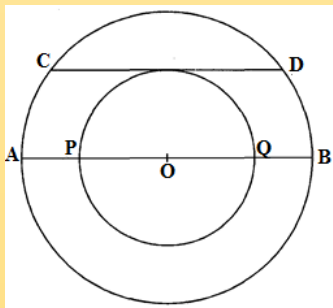
5. Factorise completely (2 marks)

$$45 - 5x^2$$

6. a) Find the expansion in ascending powers of X of $\left(1 - \frac{x}{3}\right)^7$ upto the term in x^2 . (2 marks)

- b) Hence evaluate $(0.99)^7$ to four significant figures. (2 marks)

7. The figure below shows two concentric circles with diameters AB = 10cm and PQ = 5cm. Find the length of CD which is a tangent to the inner circle and also a chord of the larger circle. (3 marks)



8. A body is moving in a straight line such that its velocity V m/s after t seconds is given by $v=5t^2 - \frac{1}{2}t + 3$. Find the distance travelled during the third second. (4 marks)

9. Calculate the standard deviation of the data: (3 marks)

34, 61, 49, 57, 53, 37, 59

10. If $x = 44$ and $y = 20.1$ calculate the greatest possible percentage error in $x - y$. Give your answer to 1 decimal place. (3 marks)

11. Find the radius and centre of a circle whose equation is $x^2 + y^2 + 3x + 2 = 0$. (3 marks)

12. Fill in the table below and use mid-ordinate rule to find the area bounded by the circle $y = x^2 - 1$ from $x = -7$ to $x = 1$ using 6 strips. (3 marks)

X	-7	-6.5	-6	-5.5	-5	-4.5	-4	-3.5	-3	-2.5	-2	-1.5	-1
y	48		35		24		15		8		3		0

13. Solve the equation $2 \cos (3t + 60^\circ) - 0.5$ for $0^\circ \leq t \leq 180^\circ$ (3 marks)

14. Find without using log tables or calculators the value of x which satisfies the equation $\log_3(x^2 - 9) = 2 \log_2 3 + 1$ (3 marks)

15. A quantity V is partly a constant and partly varies as u . If $u = 1$ when $v = 12$ and $u = 3$ when $v = 22$. Find the value of v when $u = 5$. (3 marks)

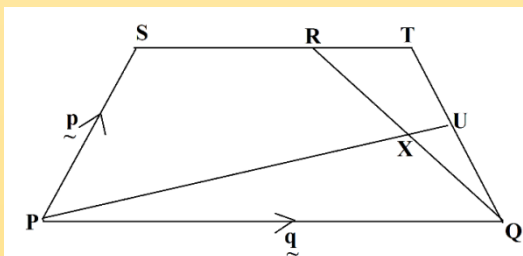
16. A man deposits sh.50,000 in an investment account which pays 12% interest p.a compounded semi - annually Find the amount in the account after 3 years. (3 marks)

SECTION B (50 marks)

17. A bus travelling from Nakuru to Mandera averages at a speed of 70km/hr and on the return journey, the bus averages 20km/hr slower and takes 4 hours longer than on the journey from Nakuru to Mandera.
- Find the distance between Nakuru and Mandera. (4 marks)
 - Diesel consumption is 0.32 litres per kilometre on the journey from Nakuru to Mandera. However, this rate increases by 25% on the return journey. Calculate the amount of diesel the bus consumes for the trip. (3 marks)
 - If diesel costs sh.65 per litre and the bus makes 3 round trips in a week, determine the total cost of diesel required to run the bus for 5 months. (3 marks)
18. Kimutai earns K£12,000p.a and is housed by the company at a nominal rate of Ksh.2000 per month. 15% of his basic salary is added to his income for the purposes of taxation. He gets a family relief of K£1320p.a and is entitled to a relief of 10% of his insurance of K£800p.a.
- | Income K£p.a | Rate per K£ |
|--------------|-------------|
| 1-2100 | 10% |
| 2101-4200 | 15% |
| 4201 - 6300 | 25% |
| 6301 - 8400 | 35% |
| Over 8400 | 45% |
- Calculate the taxable income. (2 marks)
 - Calculate his PAYE (5 marks)
 - Kimutai's other deductions includes W.C.P.S sh.600p.m, NHIF sh.500p.m. Calculate his net monthly salary. (3 marks)

19. In the trapezium below, $\vec{PQ} = 3\vec{ST}$. T divides SR in the ratio 4: 1 and U is the midpoint of QT. PU and QR intersect at X. $\vec{PX} = h\vec{PU}$ and $\vec{QX} = k\vec{QR}$.

Given that $\vec{PQ} = \vec{q}$ and $\vec{PS} = \vec{p}$



- Express $\vec{QR}$ in terms of $\vec{p}$ and $\vec{q}$ (1 mark)
 - Express $\vec{PX}$ in terms of $\vec{p}$, $\vec{q}$ and h. (2 marks)
 - Express $\vec{PX}$ in terms of $\vec{p}$, $\vec{q}$ and k. (3 marks)
 - Hence obtain the values of h and k. (3 marks)
 - Determine the ratio in which X divides QR. (1 mark)
20. The probability of a candidate passing her secondary examination is $\frac{4}{5}$. If she passes her examination the probability of her joining university is $\frac{2}{3}$. If she fails her examination the probability of her joining the university is $\frac{1}{4}$. If she joins the university the probability of her getting a job is $\frac{6}{7}$ and if she doesn't join the university the probability of her getting a job is $\frac{2}{9}$. Using a tree diagram find:
- the probability that she fails her examination. (3 marks)
 - find the probability that she got a job after failing her secondary examination. (2 marks)
 - the probability that she joins the university. (2 marks)
 - the probability that she did not get a job. (3 marks)
21. A particle moving in a straight line is such that its displacement s metres from a given point is $s = t^3 - 6t + 2t + 3$ where t is time in seconds. Find:
- The displacement of the particle at t 3. (2 marks)
 - The velocity of the particle where t = 4. (2 marks)
 - The value of t where the particle is momentarily at rest. (3 marks)
 - The acceleration of the particle when t =4 (3 marks)
22. The manager of a cinema wishes to divide the seats available into two classes A and B. He has the following constraints.
- There are not more than 120 seats available
 - There must be at least twice as many B class seats as there are A class seats
 - Class A seats are priced at sh.30 each and class B at sh.20 each and at least sh.2000 should be collected at each show to

meet the expenses.

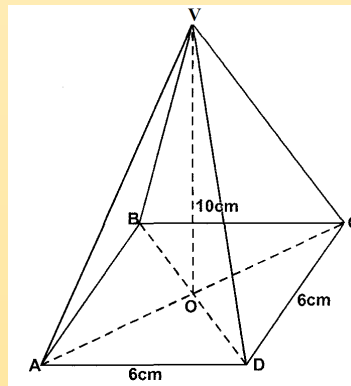
- a) Write inequalities from the constraints listed above. (3 marks)
 b) On the grid provided plot the inequalities. (4 marks)
 c) Find the number of seats of each kind which will give the maximum profit and calculate this maximum profit. (3 marks)

23. The positions of airport P and Q are $(60^\circ \text{ N}, 45^\circ \text{ W})$ and $(60^\circ \text{ N}, K^\circ \text{ E})$ respectively. It takes a plane 5 hours to travel due East from P to Q at an average speed of 600 knots. Taking $R = 6370 \text{ km}$ and $\pi = \frac{22}{7}$

- a) Calculate the value of k. (3 marks)
 b) The local time at P is 10:45a.m. What is the local time at Q when the plane reaches there. (4 marks)
 c) Find the distance PQ measured along a circle of latitude to the nearest km. (3 marks)

24. The figure below is a square based pyramid ABCDV with $AD=DC = 6\text{cm}$ and height $V = 10\text{cm}$

- a) State the projection of VA on the base ABCD. (1 mark)



- b) Find:
 i) the length of VA (3 marks)
 ii) the angle between VA and ABCD (2 marks)
 iii) the angle between the planes VDC and ABCD (2 marks)
 iv) volume of the pyramid (2 marks)

TETU

121/1

Mathematics Paper 1

2 ½ Hours

Term 2 .

1. Evaluate: $\frac{1}{2} \text{ of } 18 \div -3 + 2\frac{1}{2} \times \frac{3}{-5}$ (3 marks)

2. The heights of two similar pails are 12cm and 8cm. The larger pail can hold 2 litres. What is the capacity of the smaller pail? (3 marks)

3. Given that $\cos A = \frac{5}{13}$ and angle A is acute, find the value of $2 \tan A + 3 \sin A$ (3marks)

4. A tourist arrived in Kenya with sterling pound (£) 4680 all of which he exchanged into Kenyan money. He spent Ksh. 52,352 while in Kenya and converted the rest of the money into U.S dollars. Calculate the amount he received in U.S dollars. The exchange rates were as follows. (3 marks)

Currency	Buying	Selling.
US \$	65.20	69.10
Sterling Pound (£)	123.40	131.80

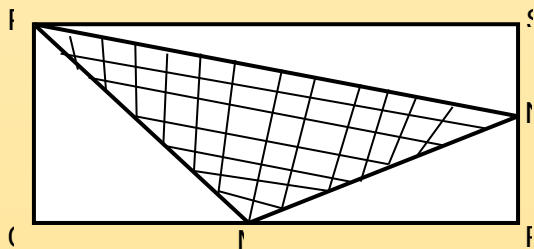
5. Two boys and a girl shared some money. The elder boy got $\frac{4}{9}$ of it, the younger boy got $\frac{2}{5}$ of the remainder and the girl got the rest. Find the percentage share of the younger boy to the girl's share. (4marks)

6. Simplify: $\frac{9x^2 - 1}{3x^2 + 2x - 1}$ (3 Marks)

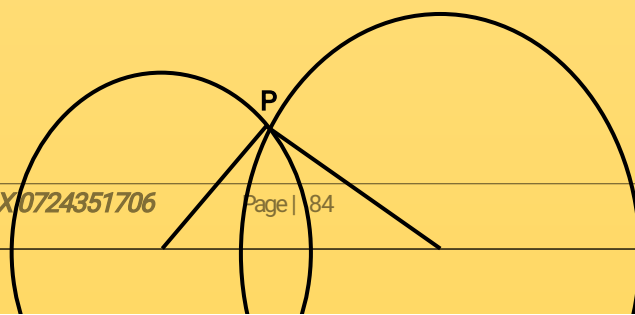
7. A two digit number is formed from the first four prime numbers.

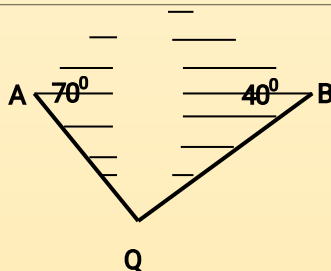
- (a) Draw the table to show the possible outcomes. (1 Mark)
 (b) Calculate the probability that a number chosen from the two digit numbers is an even number. (1 Mark)

8. A carpenter constructed a closed wooden box with internal measurements 1.5 metres long, 0.8 metres wide and 0.4 metres high. The wood used in constructing the box was 1.0cm thick and has a density of 0.6g/cm^3 . Determine the mass, in kilograms, of the wood used in constructing the box. (Leave your answer to 1 decimal place). (3 marks)
9. Solve the following inequality and show your solution on a number line. (3 marks)
- $$4x - 3 \leq \frac{1}{2}(x+8) < x + 5$$
10. Solve for x given that
 $\log(x-4) + 2 = \log 5 + \log(2x+10)$ (3 marks)
11. From a viewing tower 30 metres above the ground, the angle of depression of an object on the ground is 30° and the angle of elevation of an aircraft vertically above the object is 42° . Calculate the height of the aircraft above the ground. (3 marks)
12. The position vectors of A and B are given as $\mathbf{a} = 2\mathbf{i} - 3\mathbf{j} + 4\mathbf{k}$ and $\mathbf{b} = -2\mathbf{i} - \mathbf{j} + 2\mathbf{k}$ respectively.
 Find to 2 decimal places, the length of vector **AB**. (3 Marks)
13. A regular polygon has internal angle of 150° and side of length 10cm.
 (a) Find the number of sides of the polygon. (2 Marks)
 (b) Find the perimeter of the polygon. (2 Marks)
14. In the figure below PQRS is a rectangle in which PS = 10Kcm and PQ = 6Kcm M and N are midpoints of QR and RS respectively. Find the area of the shaded part. (4 marks)



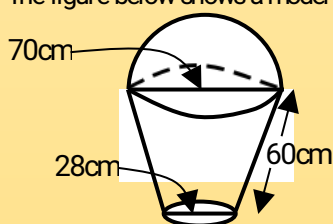
15. Using a pair of compasses and a ruler only, construct trapezium ABCD in which $AB = 8\text{cm}$, $BC = 5\text{cm}$, $CD = 4.1\text{cm}$ and angle $ABC = 60^\circ$ and AB is parallel to DC. Determine through construction, the height of the trapezium. (4mks)
16. Two numbers are in the ratio 5: 7. When 15 is added to each number, the ratio changes to 5: 6. Find the two numbers. (3mks)
17. (a) (i) Fill the table below for the function.
 $y = 2x^2 + 5x - 12$ for $-8 \leq x \leq 4$ (2 marks)
- | | | | | | | | | | | | | | |
|---|----|----|----|----|----|----|----|----|---|----|---|---|----|
| x | -8 | -7 | -6 | -5 | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| y | 76 | | | | | -9 | | | | -5 | | | 40 |
- (ii) Using the table, draw the graph of the function $y = 2x^2 + 5x - 12$. Use the scale 1cm to 1 unit on the x-axis and 1cm for 10 units for the y - axis (4 marks)
- (b) Use the graph drawn above to solve the following equations.
 (i) $2x^2 + 5x - 12 = 0$ (2 marks)
 (ii) $3 - 7x - 3x^2 = 0$ (2 marks)
18. The following are masses of 25 students in form 4 class.
 49, 51, 50, 60, 55, 45, 56, 51, 58, 59, 40, 54, 44
 44, 42, 59, 50, 62, 46, 43, 57, 56, 52, 43, 41,
 (a) Prepare a frequency distribution table with a uniform class size starting with the class 40 – 43. (4 marks)
 (b) Estimate the median mass (3 marks)
 (c) Draw a histogram for the data. (3 marks)
19. A solution whose volume 80 litres is made up of 40% of water and 60% of alcohol. When x litres of water is added the percentage of alcohol drops to 40%.
 a) Find the value of x (4marks)
 b) Thirty litres of water is added to the new solution. Calculate the percentage of alcohol in the resulting solution. (2 marks)
 c) If 5 liters of the solution in (b) above is added to 2 liters of the original solution. Calculate in the simplest form, the ration of water to that of alcohol in the resulting solution. (4 marks)
20. The diagram below shows two circles, centre A and B which intersect at points P and Q.
 Angle PAQ = 70° , angle PBQ = 40° and PA = AQ = 8cm





Use the diagram to calculate

- (a) PQ to correct to 2 decimal places (2 Marks)
 (b) PB to correct to 2 decimal places (2 Marks)
 (c) Area of the minor segment of the circle whose centre is A (2 Marks)
 (d) Area of shaded region (4 Marks)
- 21 A straight line passes through the points (8, -2) and (4, -4).
 (a) Write its equation in the form $ax + by + c = 0$, where a, b and c are integers. (3 Marks)
 (b) If the line in (a) above cuts the x-axis at point P, determine the coordinates of P. (2 Marks)
 (c) Another line, which is perpendicular to the line in (a) above passes through point P and cuts the y axis at the point Q. Determine the coordinates of point Q. (3 Marks)
 (d) Find the length of QP (2 Marks)
22. a) Train A leaves a station 45 minutes before train B. Both trains travel in the same direction and their speeds are 36km/h and 48km/h respectively.
 i) How long will it take train B to catch up with train A? (3 marks)
 ii) How far from the start were the two trains when they met. (2 marks)
 b) A car accelerated from rest to a velocity of 10m/s in 10 seconds. It travelled at this velocity for 20 seconds and then came to a stop in 5 seconds. Find;
 i) The initial acceleration. (2 marks)
 ii) The distance travelled. (2 marks)
- iii) The average velocity. (1 mark)
23. The figure below shows a model of a solid in the shape of a frustum of a cone with a hemispherical top.



The diameter of the hemispherical top is 70cm and is equal to the diameter of the top of the frustum.
 The frustum has a base diameter of 28cm and a slant height of 60cm.

- (a) Calculate the area of the hemispherical surface. (1 mark)
 (b) Calculate the slant height of the cone from which the frustum was cut. (4marks)
 (c) Calculate the total surface area of the model (5 marks)
24. (a) (i) Draw the quadrilateral A (-6,-1), B (-6,-4), C (-3,-7) and D (-3,-2) On the same grid draw the image (ii) A'B'C'D' of ABCD under an enlargement centre (-1,-1) and scale factor Y. (2mks)
 (b) A''B''C''D'' of image A'B'C'D' under a rotation centre (0,0) through 90° (2mks)
 (c) A'''B'''C'''D''' the image of A''B''C''D'' under a reflection in the line $y = x - 2$ (2mks)
 (d) A''''B''''C''''D'''' the image of A'''B'''C'''D''' under a translation $\begin{pmatrix} 2 \\ 8 \end{pmatrix}$ and write down the co-ordinates of the final image. (2mks)

TETU

121/2

Mathematics Paper 2

2 ½ Hours

Term 2 .

1. Use mathematical tables to evaluate: (4 marks)
- $$\sqrt[3]{\frac{4 \cos 60^\circ + 0.1324}{5 \log 7}}$$
2. Make d the subject of the formula: (3 marks)
- $$a^2 = \sqrt{\frac{1+d}{b}} - \frac{b}{3}$$
3. Solve for x in the equation: (3 marks)

$$\sin(4x - 10)^\circ - \cos(x + 60^\circ) = 0$$

4. Simplify leaving your answer the form $a + b\sqrt{c}$ where a , b and c are rational numbers. (3 marks)

$$\frac{3}{\sqrt{7-2}} + \frac{1}{\sqrt{7}}$$

5. The equation of a circle centre (M,N) is $2x^2 + 2y^2 - 8x + 5y + 10 = 0$

Find the values of M and N (3 marks)

6. Solve for x given that the following matrix is singular (2 marks)

$$\begin{pmatrix} 1 & 2 \\ x & x-3 \end{pmatrix}$$

7. A quantity A is partly constant and partly varies inversely as a quantity B.

Given that $A = -10$ when $B = 2.5$, $A = 10$ when $B = 1.25$

Find the value of A when B is 1.5 (4 marks)

8. Find the quartile deviation for the set of data below: (2 marks)

16, 18, 10, 8, 5, 11, 4 and 7

9. P and Q are two points such that $OP = i + 2j + 3k$, $OQ = 4i + 5j - 3k$. M is a point that divides PQ externally in the ratio 3 : 2. Find the coordinates of M (3 marks)

10. Without using mathematical tables or calculator, evaluate: (3 marks)

$$2 \log 5 - \frac{1}{2} \log 16 + 2 \log 40$$

11. A coffee dealer mixes two brands of coffee x and y to obtain 40kg of the mixture worth Ksh. 2600. If brand x is valued Ksh. 70 per kg and brand y is valued at Ksh 55 per kg, calculate the ratio in its simplest form in which brands x and y are mixed (4 marks)

12. The coordinates of two airports M and N are $(60^\circ \text{N } 35^\circ \text{W})$ and $(60^\circ \text{N } 15^\circ \text{E})$ respectively. Calculate:

a) Longitudinal difference (1 mark)

b) The shortest time an aeroplane whose speed is 250 knots will take to fly from M to N along a circle of latitude. (2 marks)

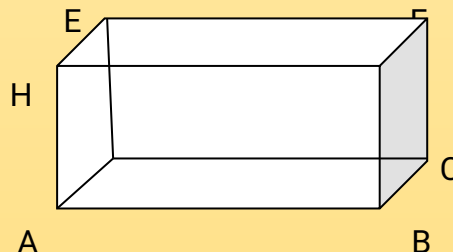
13. Find integral values of x for which; (3 marks)

$$5 \leq 3x - 2 \text{ and } 3x - 14 < -2$$

14. Expand $(1 - 2x)^4$ upto term in x^3 . Use the expansion to evaluate: (3 marks)

$$(1.02)^6 \text{ to 4 decimal places.}$$

15. The figure below is a cuboid ABCDEFGH. $AB = 12\text{cm}$, $BC = 5\text{cm}$, $CF = 6.5\text{cm}$



- a) State the projection of AF on the plane ABCD (1 mark)

b) Calculate the angle between AF and the plane ABCD correct to 2 decimal places (3 marks)

16. Using a ruler and a pair of compass only construct a triangle PQR in which $QR = 6.6\text{cm}$, $PR = 3.8\text{cm}$ and $PQ = 5.6\text{cm}$

Locate point (X) inside triangle PQR which is equidistant from P and R such that angle $PXR = 90^\circ$ (3 marks)

SECTION B: (50 MARKS)

ATTEMPT FIVE QUESTIONS ONLY

17. A youth group decided to raise Ksh. 480,000 to buy a piece of land costing Ksh. 80,000 per hectare. Before the actual payment was made, four of the members pulled out and each of those remaining had to pay an additional Ksh. 20,000:

- a) If the original number of group members was x , write down;

i) An expression of how the remaining members were to contribute after the four pulled out (1 mark)

ii) An expression of how the remaining members were to contribute after the four pulled (1 mark)

iii) Determine the members who actually contribute towards the purchase of land (3 marks)

b) Calculate the ratio of the supposed original contribution to the new contribution (2 marks)

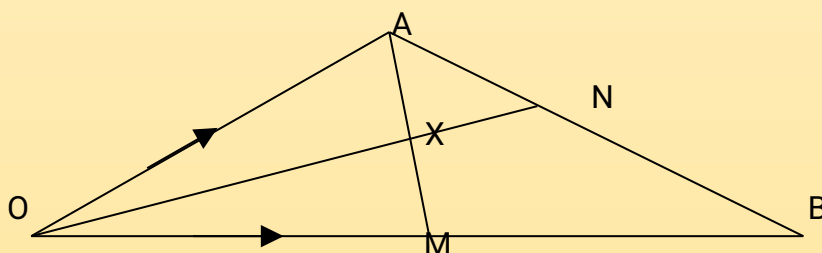
c) If the land was sub-divided equally, find the size of land each member got (3 marks)

18. a) Complete the table below:

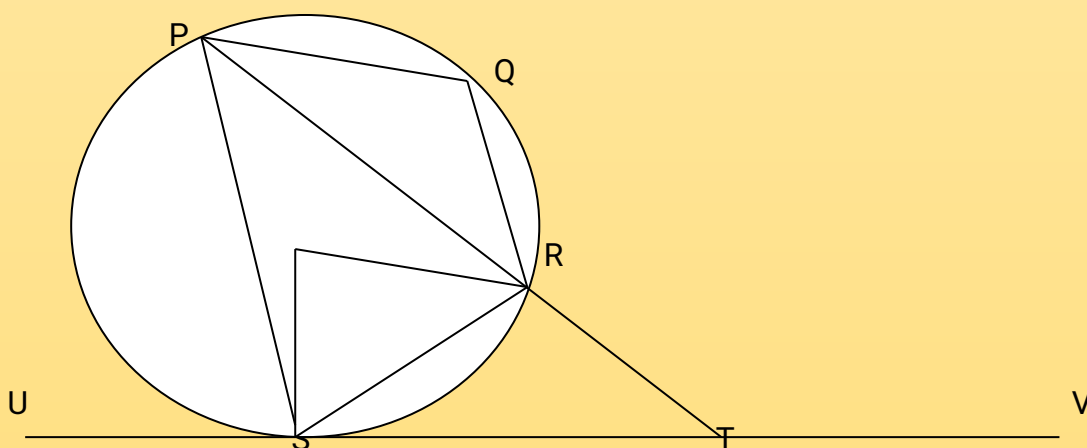
X	0	15°	30°	45°	60°	75°	90°
$4\cos X$	4.00		2.00	0			-4.00
$2\sin(2X-30^\circ)$	-1.00		1	1.732		1.732	1

X	105°	120°	135°	150°	165°	180°
$4\cos X$		-2.00				4.00
$2\sin(2X-30^\circ)$		-1			-1.732	-1

- b) On the grid provided draw the graph of $y = 4 \cos 2x$ and $y = 2 \sin (2x - 30^\circ)$ for $0^\circ \leq x \leq 180^\circ$. Take the scale 1cm for 15° on the x-axis and 2cm for 1 unit on the y-axis. (5 marks)
- c) i) State the amplitude of $y = 4 \cos 2x$ (1 mark)
 ii) Find the period of $y = 2 \sin (2x - 30^\circ)$ (1 mark)
- d) Use your graph to solve:
 $4 \cos 2x - 2 \sin (2x - 30^\circ) = 0$ (1 mark)
19. In the figure below M and N are points on OB and BA respectively such that OM: MB = 2: 3 and BN: NA = 2: 1. ON and AM intersect at X



- a) Given that $\mathbf{OA} = \mathbf{a}$ and $\mathbf{OB} = \mathbf{b}$
 Express: (4 marks)
- i) $\mathbf{ON}$
 ii) $\mathbf{AM}$
 iii) $\mathbf{AB}$ in terms of $\mathbf{a}$ and $\mathbf{b}$
- b) By taking $\mathbf{OX} = h \mathbf{ON}$ and $\mathbf{AX} = k \mathbf{AM}$ where h and k are scalars, find two expressions for $\mathbf{OX}$ in terms of $\mathbf{a}$ and $\mathbf{b}$ hence determine values of h and k and the ratio in which x divides AM (6 marks)
20. In the figure below P, Q, R and S are points on the circle centre O. PRT and STV are straight lines. Line UV is a tangent to the circle at S. Angle RST = 50° and angle RTV = 150°



- a) Giving reasons, calculate: (2 marks)
- i) angle ORS (1 mark)
 ii) Angle USP (2 marks)
 iii) Angle PQR
- b) Given that $RT = 7\text{cm}$, $ST = 9\text{cm}$, calculate to 3 significant figures: (2 marks)
- i) Length of line PR (3 marks)
 ii) The radius of the circle

21. The table below shows the distribution of marks scored by Form 4 students in mathematics examination:

Marks	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
No. of students	1	5	12	14	21	24	25	8	5	3	2

- a) State the modal class..... (1 mark)
- b) Calculate the median mark (3 marks)
- c) Using 57 as the assumed mean mark,
 Calculate (i) the actual mean for the groups data (3 marks)

(ii) the standard deviation

(3 marks)

22. The probability that 3 candidate: Jane, Martin and Edith will pass an examination are $\frac{3}{4}$, $\frac{2}{3}$ and $\frac{4}{5}$ respectively. Find the probability that:-
- All the three candidates will pass (2 marks)
 - All the three candidates will not pass (2 marks)
 - Only one of them will pass (2 marks)
 - Only two of them will pass (2 marks)
 - At most two of them will pass (2 marks)
23. A triangle has vertices A(1, 2), B(4, 4), C(6, 2)
- Draw triangle ABC on the Cartesian plane (1 mark)
 - $A^1B^1C^1$ is the image of triangle ABC under a rotation of 90° clockwise about origin .
State the coordinates of $A^1B^1C^1$ (2 marks)
 - $A^{11}B^{11}C^{11}$ is the image of $A^1B^1C^1$ under reflection in the line $y = x$,
Determine the coordinates of $A^{11}B^{11}C^{11}$ (3 marks)
 - Draw triangle $A^{111}B^{111}C^{111}$ the image of $A^{11}B^{11}C^{11}$ under a reflection in the line $y=0$ (2mks)
 - Describe a single transformation that maps triangle $A^{111}B^{111}C^{111}$ on to the triangle ABC (2 marks)
- An arithmetic progressive (AP) has the first term (a) and the common difference (d)
- Write down the third, ninth and twenty fifth terms of the AP in terms of a and d (1mk)
 - The AP above is increasing and the third, ninth and twenty fifth terms form the first three consecutive terms of a Geometric progression (G.P). The sixth terms of the AP is 78.
Calculate:
 - The first term and common difference of the A.P (5 marks)
 - Sum of the first nine terms of the AP (2 marks)
- The difference between the fourth and seventh terms of an increasing A.P (2 mks)

KIGUMO**121/1****MATHEMATICS ALTA**

Paper 1

. MOCKS KCSE PREDICTIONS/. .

2 ½ hours

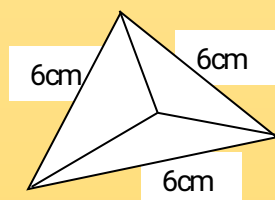
SECTION I (50 marks)*Answer **all** the questions in this section in the spaces provided.*

- Evaluate (3 marks)

$$\frac{-36 \div (6) \times 4 - (-3)}{-6 - 8 \div 2 + 17}$$
- Use reciprocal tables to evaluate (4 marks)

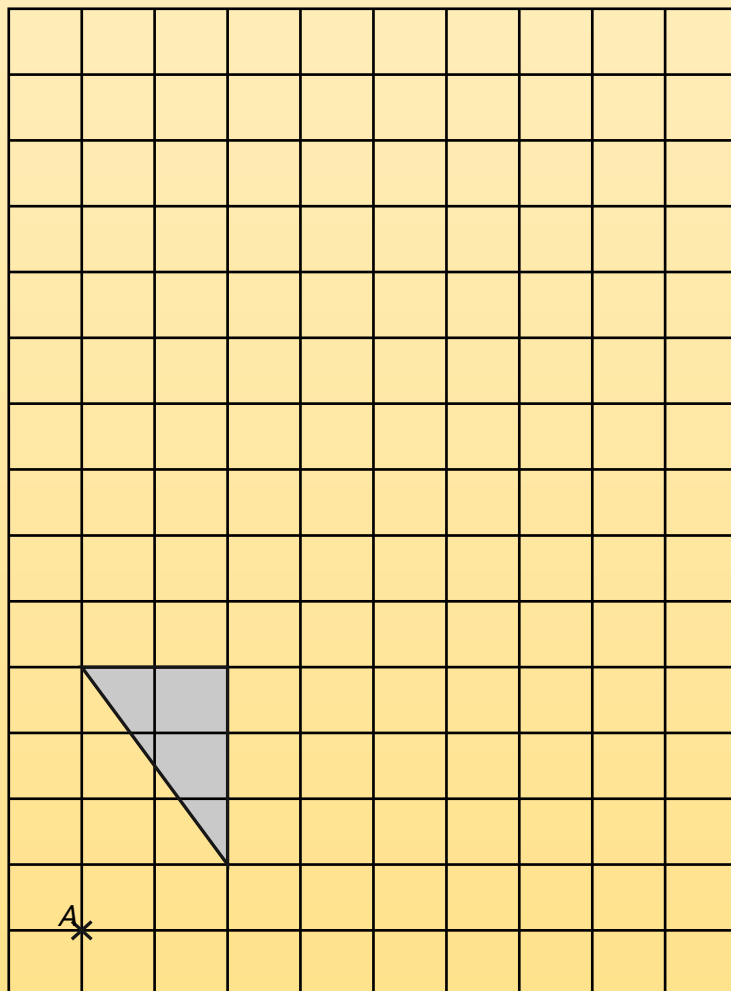
$$\frac{2}{0.346} - \frac{400}{79.6}$$
- Solve for x in the following equation. (3 marks)

$$2 \sin (2x + 30^\circ) - 1 = 0 \quad \text{for } 0^\circ \leq x \leq 270^\circ$$
- The figure below shows a solid regular tetra pack of sides 6cm.



- Sketch the net of the solid (1 mark)
 - Find the surface area of the solid (2 marks)
- Find the range of value of x which satisfy the inequality below: (3 marks)

$$\frac{1}{4}(2x - 1) < \frac{1}{4}(x + 3) < 3(x + 4)$$
 - Using the triangle shown on the grid, enlarge the object by a scale factor of 2, centre A. (2 marks)



7. Find the value of t in the equation:

(3 marks)

$$\left(\frac{1}{64}\right)^t \times (512)^{\frac{10}{9}} = 4096$$

8. Solve the following simultaneous equations

(4 marks)

$$x^2 + y^2 = 16$$

$$y = 2x + 1$$

9. A Kenyan bank buys and sells foreign currencies at the exchange rates shown below.

	Buying (Kshs)	Selling (Kshs)
1Euro	148.56	149.00
1U.S Dollar	94.22	94.50

An American arrived in Kenya with 20,000 Euros. He converted all the Euros into Kenyan Shillings at the bank. He spent Kshs.2, 510,200 while in Kenya and converted the remaining Kenya shillings into U.S Dollars at the bank. Find the amount in dollars that he received.

(4marks)

10. Solve for y in the equation.

(3 marks)

$$\frac{6y-4}{3} - \frac{2y-1}{2} = \frac{6-5y}{6}$$

11. A number is formed by finding the difference between the products of prime numbers between 20 and 30 and that of prime numbers between 1 and 15. Find the number formed. Write the number in words.

(3 marks)

12. Find **OB** and the coordinates of **B** given that $OA = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ and $AB = \begin{pmatrix} -7 \\ 4 \end{pmatrix}$

(3marks)

13. Work out and give your answer in a simplified form.

$$\frac{2}{7} \text{ of } 1\frac{3}{4} \left(\frac{6}{11} \times \frac{21}{12} \right) - 3\frac{1}{4} \div 2\frac{1}{2}$$

(3 marks)

14. Three trees M, N and O are such that N is the south M and to the East of O. How far is M from O given that from M to N is 1.7 m and from N to O is 4.6 m

(3 marks)

15. Factorise $h^2 - k^2$, hence evaluate $3282^2 - 3272^2$

(3marks)

16. A curve whose gradient function is $3x^2 - 3$ has its two stationary points, one at point (-1, 8) and the other at point (1, b). Find its equation and the value of b.

(3 marks)

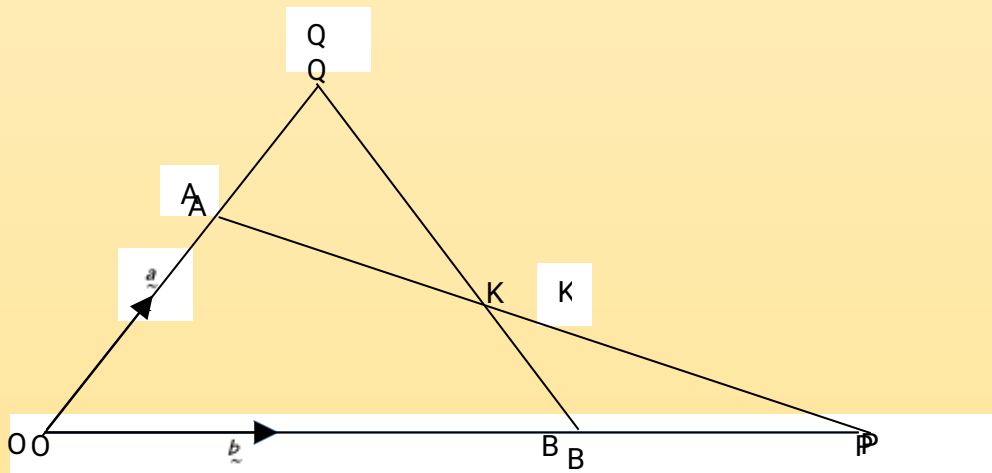
SECTION II (50 marks)*Answer any Five (5) questions only in this section.*

17. A house is to be sold either on a cash basis or through a loan. The cash price is sh1,750,000. The loan conditions are as follows: there

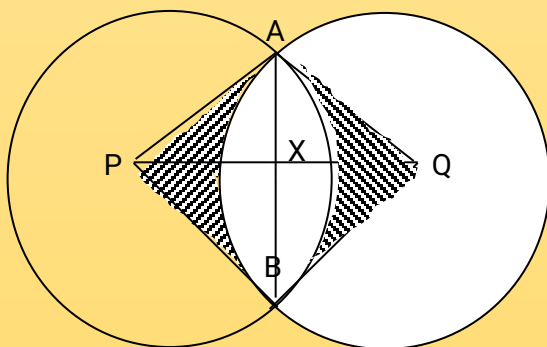
is to be a down payment of 10% of the cash price and the rest of the money is to be paid through a loan at 10% per annum compound interest.

A customer decided to buy the house through a loan.

- (a) (i) Calculate the amount of money loaned to the customer. (2 marks)
 (ii) The customer paid the loan in 3 years. Calculate the total amount paid for the house. (4 marks)
 (b) Find how long the customer would have taken to fully pay for the house if she paid a total of sh 1, 891,750. (4 marks)
18. a) Draw the graph of $2x^2 + 3x - 6$ for the values of x from -3 to 3. (5 marks)
 b) Use the graph to solve the equation:
 i) $2x^2 + 3x - 6 = 0$ (1 mark)
 ii) $2x^2 + 3x - 3 = 0$ (1 mark)
- a) Solve the equation $2x^2 + x - 7 = 0$ using the graph. (2 marks)
19. In the figure below, vector $\mathbf{OA} = \underline{a}$ and $\mathbf{OB} = \underline{b}$. $\mathbf{OP} = 2\underline{b}$ and $\mathbf{OQ} = \mathbf{OA} = 3:2$.

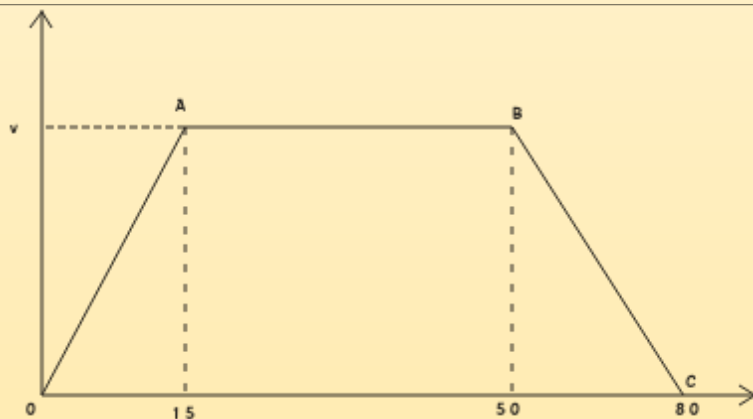


- (a) Express the following vectors in terms of $\underline{a}$ and $\underline{b}$.
 (i) $\mathbf{QB}$ (2 marks)
 (ii) $\mathbf{AP}$ (1 mark)
- (b) The line QB and AP intersect at K. Given that $\mathbf{QK} = m\mathbf{QB}$ and $\mathbf{AK} = n\mathbf{AP}$ where m and n are scalars, by expressing OK in two different ways, find the ratio AK: KP. (7 marks)
20. Three villages R, S and T are such that S is 3km on a bearing of $N30^\circ E$ from R and T is 4km on a bearing of 120° from S.
 (a) (i) Using a scale of cm to represent 0.5km, draw a diagram to show the relative position of villages R, S and T. (3 marks)
 (ii) Find the distance and bearing of village R from T. (2 marks)
- (b) A straight main road runs from village R to T. Find the length of the shortest path from village S to the main road. (2 marks)
- (c) After walking for 2.2km from the junction on RT along the path towards village S, a student notices that the angle of elevation to the top of a tree in the village is 22° . Estimate the height of the tree in metres. (3 marks)
21. Two equal circles with centres P and Q and radius 7cm intersect at points A and B as shown in the figure below. Given that the distance between P and Q is 10cm. Line AB meets line PQ at X.



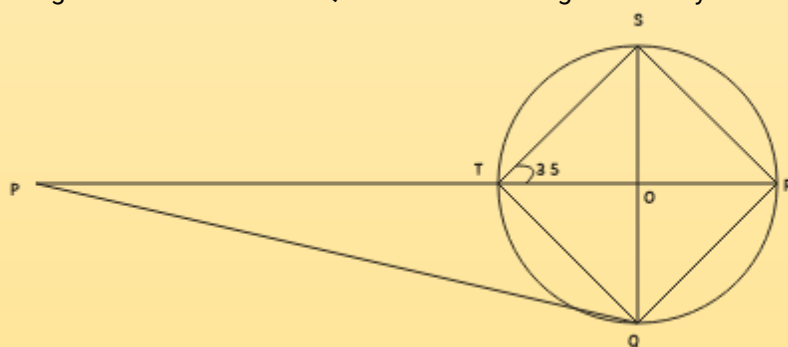
Calculate:

- (a) The length of the chord AB correct to 2d.p. (2 marks)
 (b) The angle APQ hence angle APB (2 marks)
 (c) The area of the shaded region. (6 marks)
22. The figure below is the speed – time graph of a journey



If the total distance travelled in the 80 seconds is 920m, calculate:

- The value of V . (4 marks)
 - The acceleration during the first 15 seconds (3 marks)
 - The distance travelled in the final 40 seconds. (3 marks)
23. The diagram below a circle, centre O . PQ is a tangent to the circle at Q and $PTOR$ is a straight line. $QRST$ is a cyclic quadrilateral in which angle $RTS = 35^\circ$ and RT and QS are diameters. Giving reasons for your answer, find the size of:



- Acute angle ROS . (2 marks)
- Angle RQS . (2 marks)
- Angle PQR . (2 marks)
- Angle QPT . (2 marks)
- Angle PQT . (2 marks)

24. The table below shows a field book with measurements of a rice field. ($AG = 250\text{m}$)

- Make a sketch drawing of the rice field. (3 marks)

	G	
	200	F 70
E 60	130	
	100	D 80
C 40	60	
	40	B 50
	A	

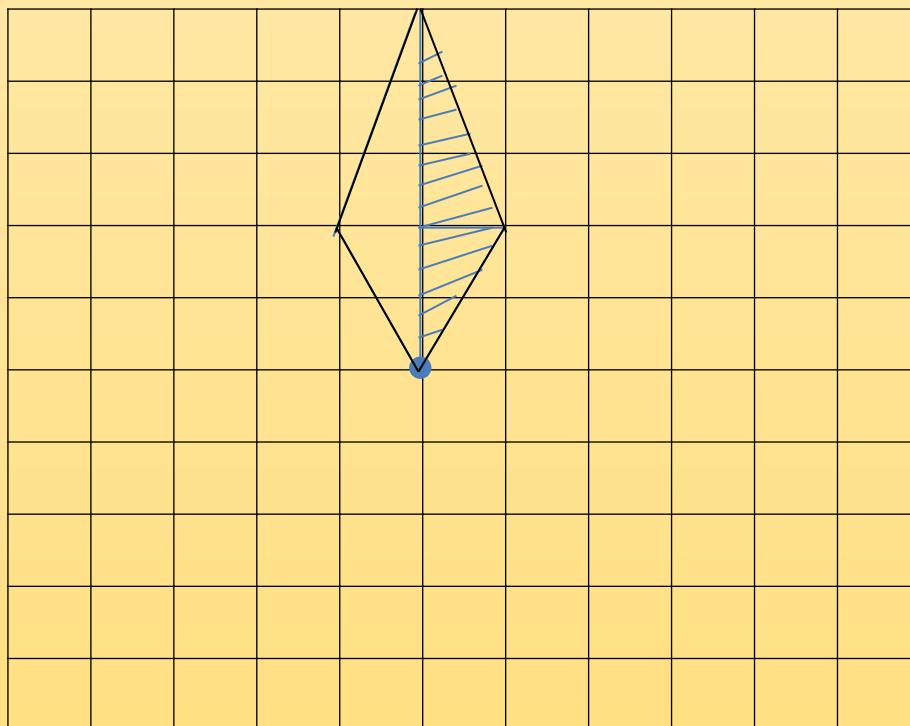
- Find the area of the rice field in hectares. (7 marks)

**KIGUMO CLUSTER
MATHEMATICS ALTA**
Paper 2
. MOCKS KCSE PREDICTIONS/ .
2 ½ hours
SECTION I (50 marks)

 Answer **all** the questions in this section.

1. Use logarithm tables to evaluate the following to four significant figures. (4 marks)

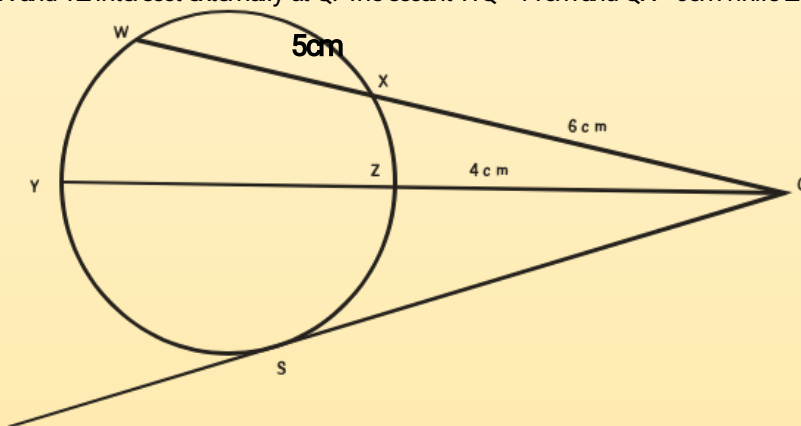
$$\sqrt{\frac{4.562^2 \times 0.038}{6.82 \times 0.35}}$$
2. The fifth term of an arithmetic progression is 11 and twenty fifth terms is 51. Find the first term and common difference. (2 marks)
3. Given that matrices P, Q, R are such that $P = QR$ and $P = \begin{pmatrix} 2 & 3 \\ 1 & 2 \end{pmatrix}$ and $Q = \begin{pmatrix} 4 & 0 \\ 2 & 1 \end{pmatrix}$. Find matrix R. (3 marks)
4. Solve for x in the equation. (3 marks)
 $\text{Log}(x + 11) - 2\log 3 = \log(9 - x)$
5. Given that the mean 9, 8, 5, 5 and 8 is 7; find the standard deviation of the number to 2 d.p. (3 marks)
6. Find the equation of a straight line passing through (2, 1) and is Parallel to $3y = 2x + 6$ in the form $ax + b + c = 0$ (3 marks)
7. A bus travelling at 80km/h leave a station at 11.15pm. Another bus travelling at 75 km/h leaves the same station at 11.45 pm in the same direction as the first one. At what time will their distance apart be 55km? (3 marks)
8. The figure below shows part of a church badge which has a rotational symmetry of order 4 about the point marked with a dot. Draw the complete badge. (3 marks)



9. Simplify the expressions (3 marks)

$$\frac{15t^2y - 10ty^2}{3t^2 - 5ty + 2y^2}$$
10. a) Expand and simplify $(2 - x)^5$ in ascending powers of x upto and including the term in x^3 (2 marks)
 b) Hence approximate the values of $(1.98)^5$ to four significant figures. (2 marks)

11. Chord QX and YZ intersect externally at Q. The secant WQ = 11 cm and QX = 6 cm while ZQ = 4 cm



- a) Calculate the length of chord YZ (2 marks)
 b) Use the answer in i) above to find the length of the tangent SQ (2 marks)
 12. Make n the subject of the formula in

$$S = \frac{a(1-r^n)}{1-r} \quad (3 \text{ marks})$$

13. A man deposits Sh. 500,000 in an investment which pays 12% per annum interest compounded quarterly. Find how many years it takes for the money to double. (3 marks)
 14. A variable V varies jointly as the variable A and h . When $A = 63$ and $h = 4$, $V = 84$, find;
 (a) The value of V when $A = 9$ and $h = 7$ (1 mark)
 (b) The value of A when $V = 4.5$ and $h = 0.5$ (2 marks)
 15. Rationalize and simplify

$$\frac{3\sqrt{5}}{\sqrt{45} + \sqrt{15}} \quad (3 \text{ marks})$$

16. Given that x , y and z are integers and that $8 \leq x \leq 10$, $5 \leq y \leq 7$, $4 \leq z \leq 6$.

Find the percentage error in $\frac{x+y}{z}$ (3 marks)

SECTION II (50 marks)

Answer any **Five (5) questions only** in this section.

17. a) Using the first Principles and a small increment h , determine the derivative of $y = 3x^2 - 2$. (4 marks)
 b) Find the equation to the normal of $3x^2 - y = 2$ at $x = 1$ in the form $y + mx = c$. (4 marks)
 c) Determine the stationary point and identify the nature of point. (2 marks)
 18. The table below shows marks obtained by 50 students in Mathematics Examination

32	64	68	55	52	68	37	46	65	26
45	87	44	58	39	54	21	44	76	23
65	42	82	87	75	44	47	48	52	32
23	76	74	91	28	33	27	48	56	66
45	56	98	21	34	31	83	65	77	76

- (a) Starting with 21 and using equal class intervals of 10, make a frequency distribution table. (2 marks)
 (b) On grid provided, draw the cumulative frequency curve for the data. (4 marks)
 (c) Using the graph (b.) above estimate:
 (i.) The upper quartile (2 marks)
 (ii.) The lower quartile (2 marks)
 19. Linnet's basic salary is sh.100,000. She is housed by her employer and pays a nominal rent of sh.2000 which is deducted from her salary. She is entitled to an entertainment allowance of sh.5,000 and a responsibility allowance of sh.10,000. She has a bank loan and hire purchase repayments which she repays at the rate of sh.15,000 and sh.3,000 per month. She also makes cooperative share contributions of sh.5,000 per month. Calculate:
 (a) Her gross salary (1 mark)
 (b) Her taxable income in Ksh. (1 mark)

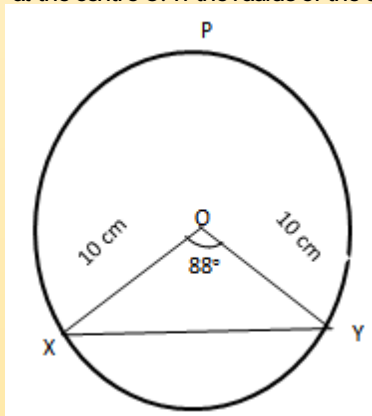
During that month, the table below was used to determine individual rate of income tax.

Income K£ p.m	Rate (sh. per £)
1 - 484	2
485 - 940	4
941 - 1396	6
1397 - 1852	7
Over 1852	9

- (c) Use the table to determine;
 (i) Her monthly gross tax
 (ii) Her net tax given that she is entitled to a tax relief of sh.1056 per month.
 (iii) Her net salary.

(5 marks)
 (1 mark)
 (2 marks)

20. The Chord XY subtends an angle of 88° at the centre O. If the radius of the circle is 10cm, calculate:



- (i) The area of the circle. (2 marks)
 (ii) The area of the major sector XPY, (3 marks)
 (iii) The area of triangle OXY (2 marks)
 (iv) The area of major segment (2 marks)
 (v) The area of the Minor segment (1 mark)

21. a) Complete the table below for the curves $y = 3\cos 2x$ and $y = 2\sin(2x + 30)^\circ$ (2 marks)

x	0	15	30	45	60	75	90	105	120	135	150	165	180
$3\cos 2x$	3	2.598	1.5	0	-1.5		-3	-2.598	-1.5	0		2.598	3
$2\sin(2x+30)^\circ$	1		2						-2	-1.732	-1		1

- b) On a graph paper, draw on the same axes the graph of $y = 3\cos 2x$ and $y = 2\sin(2x + 30)^\circ$ for $0^\circ \leq x \leq 180^\circ$ (4 marks)
 a) State the amplitude period and phase angle of each curve (2 marks)

b) Use your graph to:-

- i) Estimate the value of x for which $3\cos 2x - 2\sin(2x + 30)^\circ = 0$ (1 mark)
 ii) Estimate the range of values of x for which $3\cos 2x < 2\sin(2x + 30)^\circ$ (1 mark)

22. Mungai, Koskei and Kandie are participating in an athletic competition. The probability that Mungai, Koskei, and Kandie completes the race in $\frac{3}{5}$, $\frac{1}{6}$, and $\frac{4}{7}$ respectively. Find the Probability that in a competition.

- (a) Only one of them completes the race. (3 marks)
 (b) All the three completes the race. (1 mark)
 (c) None of them completes the race. (1 mark)
 (d) Two of them completes the race. (3 marks)
 (e) At least one completes the race. (2 marks)

23. Use a pair of compasses and a ruler only in this question.

- (a) Construct triangle ABC in which $AB = 5.8\text{cm}$, $AC = 4.2\text{cm}$ and $\angle BAC = 45^\circ$. Measure BC. (3 marks)
 (b) (i) Draw escribed (external) circle of triangle ABC which touches BC. (3 marks)
 (ii) Draw P_1 the locus of points which move such that the area of triangle APB is half the area of triangle ABC. (3 marks)
 Mark P_1 and P_2 the points where P and the circle meet. Measure P_1P_2 . (1 mark)

24. A potter wants to make and sell serving bowls and plates. A bowl uses 5 kg of clay. A plate uses 4 kg of clay. The potter has 40 kg of clay and wants to make at least 4 bowls. The profit a bowl is ksh 35 and the profit on a plate is ksh. 30.

- (a) Form all the inequalities. (3 marks)
 (b) On the grid provided draw the inequalities (4 marks)
 (c) How many bowls and how many plates should the potter make in order to maximize profit? (3 marks)

MUGOIRI /KAHURO JOINT EVALUATION

121/1

MATHEMATICS

. MOCKS KCSE PREDICTIONS/ . .

2 ½ HOURS

Section I (50mks) Answer all questions in this section

1. Evaluate the following (3mks)

$$\frac{\frac{2}{3} - 1\frac{1}{4} + \frac{5}{6}}{\frac{2}{7} + 3\frac{1}{5} \text{ of } \frac{7}{8} \div \frac{6}{11} - \left[5\frac{1}{3} + \frac{9}{10} \right]}$$

2. Use square roots, reciprocal and square table to evaluate to 4 significant figures the expression (4mks)

$$(0.06458)^{\frac{1}{2}} + \left(\frac{2}{0.4327} \right)^2$$

3. Solve the following inequalities and represent the solution on a single number line (3mks)
- $$3-2x < 5$$
- $$4-3x \geq -8$$
4. The point A, B and C lie on a straight line. The position vectors of A and C are $2\mathbf{i}+3\mathbf{j}+9\mathbf{k}$ and $5\mathbf{i}-3\mathbf{j}+4\mathbf{k}$ respectively; B divides AC internally in the ratio 2:1. find
- a) Position vector of B (2 marks)
- b) Distance of B from the origin. (1mark)

5. Without using tables, evaluate
- $\frac{0.51 \times 5700}{6.8 \times 0.0095}$
- giving your answer in standan form (3marks)

6. If the interior angle of a regular polygon is
- m°
- and each exterior angle is
- $\left(\frac{m-36}{3}\right)^\circ$
- . calculate the sum of the interior angles. (3mks)

7. Simplify
- $\frac{p^2 - 2pq + q^2}{p^3 - pq^2 + p^2q - q^3}$
- (3marks)

8. A straight line passes through the points (-3,-4) and is perpendicular to the line whose equation is
- $3x+2y=11$
- and intersect the x axis and y axis at point A and B respectively. Find the length of AB. (4 marks)

9. A Kenyan bank buys and sells foreign currencies at the exchange rates shown below.

BUYING (KSHS)

SELLING (KSHS)

1Euro

147.56

148.00

1U.S Dollar

74.22

74.50

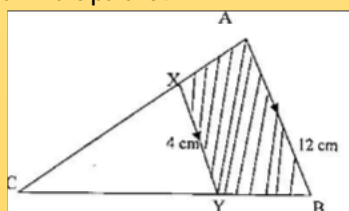
An American arrived in Kenya with 20,000 Euros. He converted all the Euros into Kenyan Shillings at the bank. He spent Kshs.2,510,200 while in Kenya and converted the remaining Kenya shillings into U.S Dollars at the bank. Find the amount in dollars that he received. (3mks)

10. 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)

11. Given that
- $\cos A = \frac{16}{25}$
- , without using mathematical table or calculator find:

- a) $\sin A$ (2marks)
- b) $\tan(90-A)$ (1marks)

12. In the figure below, line AB and XY are parallel.



If the area of the shaded region is 36cm^2 , find the area of triangle CXY (3marks)

13. A liquid spray of mass 384g is packed in a cylindrical container of internal radius 3.2 cm. Given that the density of the liquid is 0.6g/cm^3 , calculate to 2 dp the height of the liquid in the container (3marks)

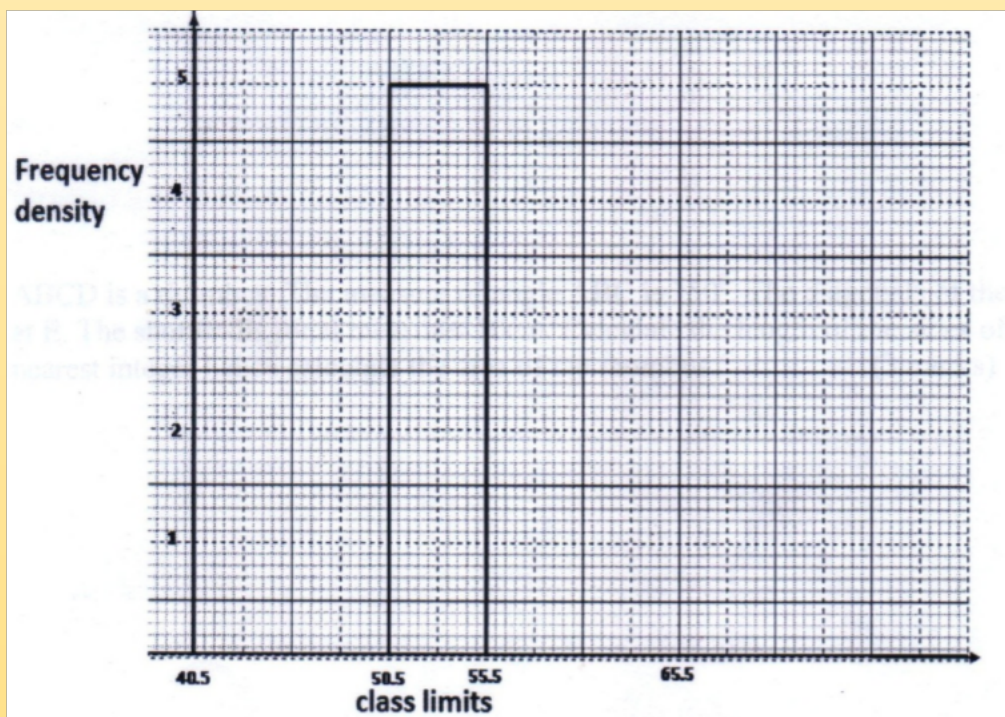
14. (a) Find the inverse of the matrix $\begin{pmatrix} 4 & 3 \\ 3 & 5 \end{pmatrix}$ (1marks)

- b) Hence solve the simultaneous equation using the matrix method (2mks)
 $4x + 3y = 6$
 $3x + 5y = 5$

15. Evaluate: (3marks)

$$\frac{\left(\frac{1}{27}\right)^{\frac{1}{3}} \times (256)^{\frac{1}{4}} \times 3^6}{(729)^{-\frac{1}{3}} \times 72^2}$$

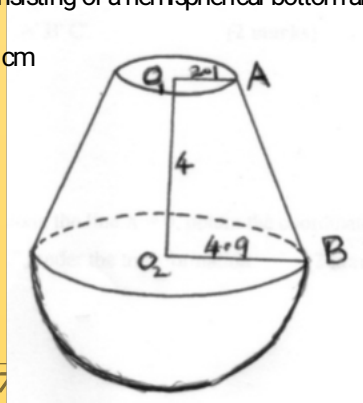
16. The following data was obtained from the mass of a certain animals. Complete the table and the histogram below. (3marks)



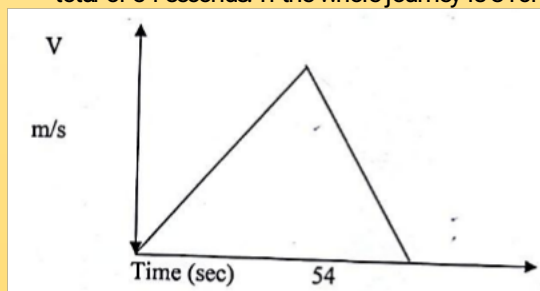
SECTION II 50mks. Answer any five question in the section

17. A circular lawn is surrounded by a path of uniform width of 7m the area of the path is 21% that of the lawn.
 a) Calculate the radius of the lawn (4 marks)
 b) Given further that the path surrounding the lawn is fenced on both sides by barbed wire on posts at intervals of 10 metres and 11 metres on the inner and outer sides respectively. calculate the total number of posts required for the fence (4 marks)
 c) Calculate the total cost of the posts if one post cost sh 105 (2mks)
- 18 The diagram below represents a solid consisting of a hemispherical bottom and a conical frustum at the top. $O_1O_2=4\text{cm}$, $O_2B=R=4.9\text{cm}$

$$O_1A=r=2.1\text{cm}$$



- a) Determine the height of the chopped off cone and hence the height of the bigger cone. (3mks)
- b) Calculate the surface area of the solid. (7mks)
- 19 The coordinates of a triangle ABC are A(1, 1) B(3, 1) and C(1, 3).
- (a) Plot the triangle ABC. (1 mark)
- (b) Triangle ABC undergoes a translation vector $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$. Obtain the image of A' B' C' under the transformation, write the coordinates of A' B' C'. (2 marks)
- (c) A' B' C' undergoes a reflection along the line $X = 0$, obtain the coordinates and plot on the graph points A'' B'' C'', under the transformation (2 marks)
- (d) The triangle A'' B'' C'', undergoes an enlargement scale factor -1, center origin. Obtain the coordinates of the image A''' B''' C'''. (2 marks)
- (e) The triangle A''' B''' C''' undergoes a rotation center (1, -2) angle 120° . Obtain the coordinates of the image A^{iv} B^{iv} C^{iv}. (2 marks)
- (f) Which triangles are directly congruent? (1 mark)
20. Using a ruler and compasses only, construct a triangle ABC such that BC=8 cm, angle ABC= 60° And angle BAC= 45°
- a) on the Same diagram, measure the length of. (5 marks)
- i) AC
- ii) BC
- b) Draw the circumcircle of the triangle ABC. (2mks)
- c) Construct the locus of a point P within the triangle by shading the unwanted region inside the circumcircle such that the following condition are satisfied: (3 marks)
- i) P is closer to A than B
- ii) Angle PAB=angle PAC
- 21 a) Draw the graph of the function below on the grid provided
 $y = 2x^2 - 7x - 2$ for the values of $-1 \leq x \leq 6$ (5mks)
- b) From your graph determine the roots of the function. $2x^2 - 7x - 2 = 0$. (1mk)
- c) By drawing a suitable graph of function $y = 2x - 7$ on the same axis, solve the simultaneous equations $y = 2x^2 - 7x - 2$ and $y = 2x - 7$. (4mks)
22. Eunice bought oranges worth ksh 45, while Sharon spent the same amount of money but bought at a discount of 75 cent per orange.
- a) If Eunice bought an orange at sh x, write down a simplified expression for the total number of oranges bought by Eunice and Sharon. (3mks)
- b) If Sharon bought 2 more oranges than Eunice, find how much each spent on an orange (5mks)
- c) Find the total number of oranges bought by Eunice and Sharon (2mks)
- 23.a) The figure below shows a velocity time graph of an object which accelerate from rest to a velocity Vm/s then decelerate to rest in a total of 54 seconds. If the whole journey is 810m



- a) Find the value of V (2mks)
- b) Hence find:
- i) The value of t when the particle is instantaneously at rest (2mks)
- ii) The total distance travelled by the particle during the first 4 seconds. (2mks)
- iii) The maximum velocity attained by the particle (2mks)

24. Auma, Hasssan and Kamau competed in a game of darts. Their probabilities of hitting the targets are $\frac{2}{5}$, $\frac{1}{5}$ and $\frac{3}{10}$ respectively.
- Draw a probability tree diagram to show all the possible outcome (2mks)
 - Calculate the probability that:
 - No one hit the target (2mks)
 - Only one of them hit the target (2mks)
 - At least one of them hit target (2mks)
 - At least one of them missed the target (2mks)

MUGOIRI /KAHURO JOINT EVALUATION**121/2****MATHEMATICS****. MOCKS KCSE PREDICTIONS/ . .****2 ½ HOURS****SECTION I****Answer all questions in this section in the space provided**

1. Use logarithms correct to 4 decimals place to evaluate (3mks)

$$\sqrt{\frac{0.3698 \sin 56}{2.548}}$$

2. Solve the equation

$$\log_2(x+5) - \log_2(x-3) = \frac{2}{3}$$

(3mks)

3. If $\frac{\sqrt{14}}{\sqrt{7}-\sqrt{2}} + \frac{\sqrt{14}}{\sqrt{7}+\sqrt{2}} = a\sqrt{7} + b\sqrt{2}$ find the value of a and b where a and b are rational numbers. (3mks)

4. Given the arithmetic sequence 4, 11, 18... Find

- The common difference (1mks)
- The sum of the first ten terms (2mks)

5. a) Expand $\left(1 - \frac{x}{5}\right)^9$ up to the term in x^4 (2mks)

- b) Hence evaluate $(0.95)^8$ (2mks)

6. A quantity **P** is partly constant and partly varies as the cube of **Q**. If **P**=25 when **Q**=1, **P**=44 when **Q**=2. Find the value of **P** when **Q**=5 (3mks)

7. Make **P** the subject of the formula

$$R = \sqrt{\frac{3T(P-T)}{P}} \quad (3mks)$$

8. Solve for θ in the range $0^\circ \leq \theta \leq 360^\circ$ given that $\sin 2\theta = -\sqrt{3} \cos 2\theta$ (3mks)

9. T is a transformation represent by the matrix $\begin{bmatrix} 5x & 2 \\ -3 & x \end{bmatrix}$. Under T, a square of area 10cm^2 is mapped onto a square of area

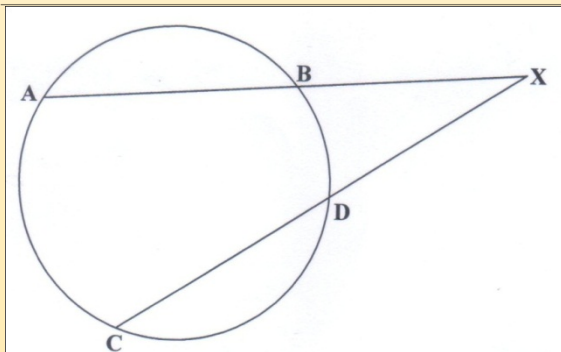
110cm^2 find the value of x. (3mks)

10. The gradient function of curve that passes through the point (-1,-1) is $2x+3$. find the equation of the curve. (3mks)

11. $2x^2+2y^2-6x+10y+9=0$ is the equation of a circle. Find the radius and the center of the circle. (4mks)

12. In what proportion must tea costing sh 76 and sh 84 per kg be mixed to produce tea costing sh 81 per kg (3mks)

13. Chords AB and CD of a circle meet at X (3mks)



If $AB=8\text{cm}$, $BX=5\text{cm}$ and $DX=6\text{cm}$. Calculate the length of chord CD to 2 dp (3mks)

14. A dam containing 4158m^3 of water is to be drained. A pump is connected to a pipe of radius 3.5 cm and the machine operates for 8 hours per day. Water flows at the pipe at the rate of 1.5m per second. Find the number of days it takes to drain the dam (3mks)

15. Solve the equation below (3mks)

$$7^{2x} - 8 \times 7^x + 7 = 0$$

16. $\frac{2}{3}$ is truncated to 2 d.p calculate the percentage error in doing so (3mks)

SECTION II (answer any five question)

Answers any five equation in this section

17. A businessman obtained a loan of ksh 450,000 from a bank to buy a matatu valued at the same amount. The bank charges interest at 24% per annum compounded quarterly

- Calculate the total amount of money the businessman paid to clear the loan in one and half years (4mks)
- The average income realised from the matatu per day was ksh 1500. The matatu worked for 3 years at an average of 280 days per year. Calculate the total income from the matatu, for the three years. (2mks)
- During the three years, the value of the matatu depreciated at the rate of 16% per annum. If the businessman sold the matatu at its new value, calculate the total profit he realised by the end of three years. (4mks)

18. a) i) Taking the radius of the earth, $R=6370\text{km}$ and $\pi=\frac{22}{7}$, calculate the shortest distance between the two cities $P(60^\circ\text{N}, 29^\circ\text{E})$ and $Q(60^\circ\text{N}, 31^\circ\text{E})$ along the parallel of latitude. (3mks)

ii) If it is 1200hrs at P, what is the local time at Q. (3mks)

iii) An aeroplane flew due south from a point A ($60^\circ\text{N}, 45^\circ\text{E}$) to a point B. The distance covered by the aeroplane was 8000km determine the position of B. (4mks)

19. (a) Fill the table below for the curves given by $y = 3 \sin (2\chi + 30^\circ)$ and $y = \cos 2\chi$ for χ values in the range $0^\circ \leq \chi \leq 180^\circ$. (2mks)

χ	0°	15°	30°	45°	60°	75°	90°	120°	150°	180°
$y = 3 \sin (2\chi + 30^\circ)$	1.50	2.60		2.60	1.50	0.00	-1.50			-2.60
$y = \cos 2\chi$	1.00	0.87	0.50		-0.50	-0.87		-0.87	-0.50	

(b) Draw the graphs of $y = 3 \sin (2\chi + 30^\circ)$ and $y = \cos 2\chi$ on same axes. (2mks)

(c) Use your graph to solve the equation $3 \sin (2\chi + 30^\circ) - \cos 2\chi = 0$. (2mks)

(d) Determine the following from your graph:

- Amplitude of $y = 3 \sin (2\chi + 30^\circ)$. (1mk)
- Period of $y = 3 \sin (2\chi + 30^\circ)$. (2mks)
- Phase difference for $y = 3 \sin (2\chi + 30^\circ)$. (1mk)

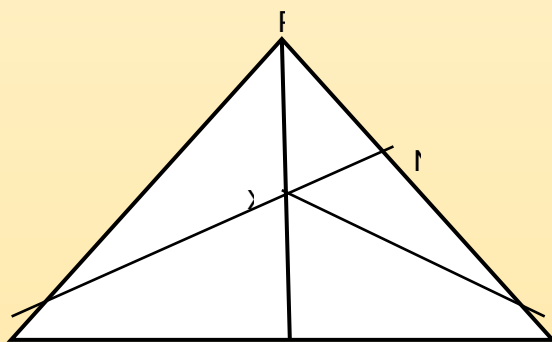
20. Draw a cumulative frequency curve for the following data which shows the marks obtained by 80 form four students in a school. (5mks)

Marks	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
frequency	3	5	5	9	11	15	14	8	6	4

Use your graph to find:

- The lower quartile (Q_1), median (Q_2) and upper quartile (Q_3) (3mks)
- The pass mark if 85% of these student are to pass (2mks)

21. The diagram below shows triangle OPQ in which M and N are points on OQ and PQ respectively such that $OM = \frac{2}{3} OQ$ and $PN = \frac{1}{4} PQ$. Lines PM and ON meet at X .



Given that vector $OP = p$ and vector $OQ = q$ Express the following in terms of p and q

- Vector PQ (1mk)
 - Vector PM (2mks)
 - Vector ON (1mk)
- By expressing vector OX in two different ways, determine the values of h and k such that vector $OX = kON$ and $PX = hPM$
- Express OX in term of p and q in two different ways. (2mks)
 - Find the value of h and k (2mks)
 - Find the ratio $PX : XM$ (1mks)

22. a) The first term of an arithmetic progression (AP) is 2. The sum of the first 8 terms of AP is 256.

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

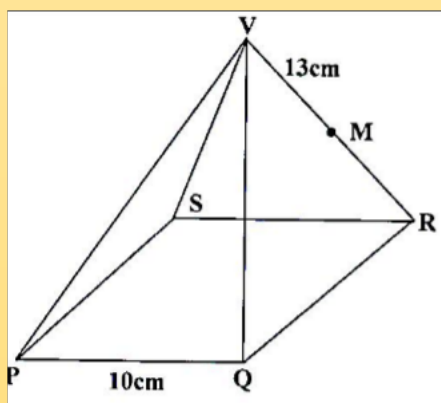
Given that the sum of the first n terms of the AP 416. Find n (2mks)

- b) The 3rd, 5th and 8th terms of another AP forms the first three terms of a geometric progression (GP). If the common difference of the AP is 3

Find

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

23. In the figure below, $VABCD$ is a right pyramid on a square base. Point V is vertically above the middle of the base. $PQ = 10\text{cm}$, $VR = 13\text{cm}$. M is the midpoint of VR .



Find

- The length PR . (2mks)
 - The height of the pyramid (2mks)
- The angle between
 - VR and the plane $PQRS$. (2mks)
 - The angle between MR and base $PQRS$. (2mks)
 - The planes QVR and $PQRS$. (2mks)

24. The vertices $A(-2, -2)$, $B(-4, -1)$, $C(-4, -3)$ and $D(-2, -3)$ is under a transformation by matrix

$$E = \begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$$

- a) i) find the coordinate of $A^1B^1C^1D^1$ (2mks)

ii) Another matrix $S = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ transforms $A^1B^1C^1D^1$. Find the coordinate of $A^{11}B^{11}C^{11}D^{11}$ (2mks)

- b) Matrix $R = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$ further gives $A^{11}B^{11}C^{11}D^{11}$ a transformation. find the coordinate of $A^{11}B^{11}C^{11}D^{11}$ and plot on the graph provided (2mks)
- c) Find the matrix representing the transformation mapping the image found in (a) (ii) above back to the object ABCD. (2mks)
- d) **A**(2,2) **B**(2,0) and **C**(3,2) are coordinate of the vertices of triangle ABC. Triangle ABC undergoes a shear factor 3 parallel to x axis. Determine the coordinates of $A^1B^1C^1$. (2mks)

GATANGA FORM 4 MATHEMATICS PAPER 1
MATHEMATICS PAPER 1
FORM FOUR
END TERM 2 EXAM.
TIME 2½ HOURS.

SECTION A (50 MARKS)

1. Without using mathematical tables or a calculator evaluate:- (3mks)

$$\frac{\sqrt{5184}}{6 \times 18 \div 9 + (5 - -3)}$$
 2. Simplify completely:

$$\frac{12x^2 - 11xy + 2y^2}{18x^3 - 8xy^2}$$
 3. Mary bought maize and beans from a wholesaler who sold them to her at shs. 36 and shs.60 per kg respectively. Mary mixed the maize and means in the ratio 5: 3. If she has to make a profit of 30%, at what price should she sell 1kg of the mixture? (4mks)
 4. A triangle has sides AB=8cm, BC= 10cm and AC=13cm. Calculate the area of triangle ABC correct to 1 d.p. (3mks)
 5. A half of the interior angles of an n-sided irregular polygon measures 135° each. The remaining half measures 165° each. Find n. (2mks)
 6. Evaluate: (3mks)

$$\sqrt{\frac{1}{9} \text{ of } 2\frac{1}{3} + \frac{2}{3}(\frac{5}{3} \frac{3}{2})}$$

$$\frac{2}{5} \text{ of } 3\frac{1}{3} \div \frac{1}{3}$$
 7. Find x if $\cos(3x - 30)^\circ = \sin(7x + 50)^\circ$ (3mks) (3mks)
 8. An arc of length 12cm subtends an angle of $5/6\pi^\circ$ at the centre of a circle. Find the radius of the circle in terms of. (2mks)
 9. A ladder which is 6cm long leans against a wall. If the top of the ladder is 4m above the ground, how far from the wall is the foot of the ladder. (Give your answer to 1.d.p.) (3mks)
 10. What integral values of x satisfy the following pairs of inequalities? (3mks)

$$\frac{5}{2} - x/2 \leq 3$$

$$\frac{1}{2}x + 2 > x - 1$$
 11. Find the value of y in the equation. (4mks)

$$\frac{243 \times 3^{2y}}{729 \times 3^y \div (3^{2y-1})} = 81$$
 12. Juma needs to import a car from Japan whose cost is US\$5000 outside Kenya. He intends to buy the car through an agent who deals in Japanese Yen. The agent will charge him 20% commission of the price of the car and a further sh.80325 Japanese Yen for shipment of the car. How many Kenya Shillings will be spent to obtain the car given the following exchange rates? (3mks)
- | Currency | Buying | Selling |
|------------------|--------|---------|
| 1 US Dollar | 81.70 | 82.50 |
| 100 Japanese Yen | 67.45 | 70.35 |
13. In a Kinyozi shop, a customer may be served by one of the two barbers. On average one barber takes 10 minutes while the other takes 12 minutes to serve one customer. If the two barbers start to serve customers at the same time, find the shortest time it takes to serve 44 customers. (3mks)
 14. Given that the position vectors of point P is $\underline{p} = 5\underline{a} - 2\underline{b}$ where $\underline{a} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ and $\underline{b} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$ find: - (2mks)
 - a) Column vector $\underline{p}$
 - b) $\underline{P'}$ the image of P under translation vector $\begin{pmatrix} -4 \\ -6 \end{pmatrix}$ (1mk)
 15. A bus 18.8m long moving at 50km/h overtakes a second bus moving at 45km/h in $22\frac{1}{2}$ s. Find the length of the second bus. (4mks)
 16. Dianah bought 15 shirts and 8 trousers for sh.11250. Her brother James bought 20% less similar shirts and 25% more similar trousers from the same shop for shs 11,700. Find the cost of a shirt. (4mks)

SECTION B (50MKS)

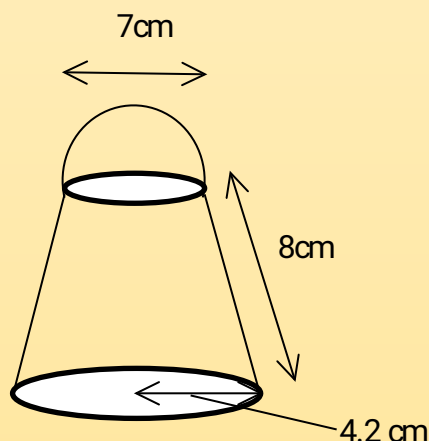
Answer only five questions from this section

17. A rhombus has its vertices PQRS. The co-ordinates of the vertex P, Q, and S of the rhombus are P(-1,3) Q(2,4) and S(0, y). The diagonals QS and PR meet at point M.
 Given that the equation of line PR is $y = x + 4$,
 - a) Find the equation of diagonal QS. (2mks)
 - b) Find the coordinates of the midpoint M of QS. (3mks)
 - c) Find the coordinates of S. (3mks)
 - d) Plot the rhombus on the grid provided and find the area of the rhombus. (3mks)

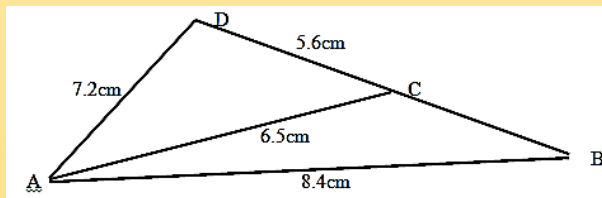
18. In an experiment the length of 100 rats were measured to the nearest 1 cm and tabulated as follows:-

Length in cm	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Frequency	1	4	x	20	25	26	7	1	1

- a) Find the value of x. (1mk)
 b) Using 42 as the assumed mean calculate the mean length. (5mks)
 c) Calculate the standard deviation of the above data. (4mks)
19. A solid is made up of a conical frustum and a hemispherical top as shown in the figure below. The dimensions are as indicated. (Use $\pi = 22/7$)



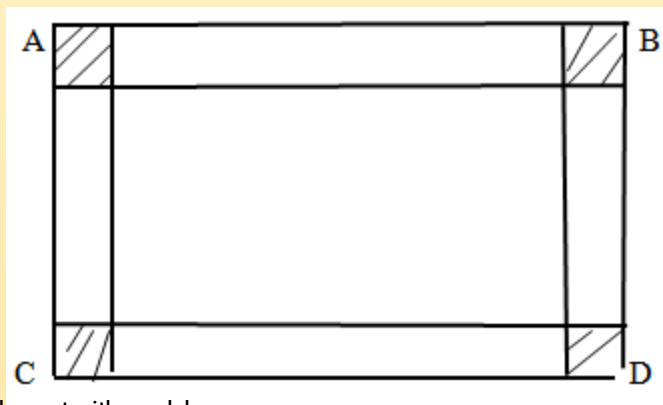
- a) Find the area of:
 i) The circular base (2mks)
 ii) The curved surface of the frustum (3mks)
 iii) The hemispherical surface. (2mks)
- b) A similar solid has a total surface area of 81.5cm^2 . Determine the radius of its base. (3mks)
20. In the figure below (not drawn to scale) $AB=8.4\text{cm}$, $AC= 6.5\text{cm}$, $AD=7.2\text{cm}$, $CD= 5.6\text{cm}$ and angle $CAB = 50^\circ$.



Calculate correct to 2 d.p.

- a) The length BC (2mks)
 b) The size of angle ABC (3mks)
 c) Size of angle CAD (3mks)
 d) Calculate the area of triangle ACD. (2mks)
21. Four towns C, S, T and Y are such that S is 150km on a bearing of 025° from C. T is 300km on a bearing of 145° from C and Y is due West of C and on a bearing of 300° from T.
 a) Using a scale of $1\text{cm}=50\text{km}$, draw an accurate scale showing the positions of S, C, T and Y. (5mks)
 b) By measurement from your scale drawing determine:-
 i) The distance and bearing of Y from S. (3mks)
 ii) The distance ST. (2mks)
22. Peter bought two bulls and nine sheep for a total of Ksh98,200. If he had bought three bulls and four sheep, he would have spent Kshs2,200 less.
 a) Form two equations to represent the above information. (1mk)
 b) Use matrix method to determine the cost of a bull and that of a sheep. (4mks)
 c) Peter later sold the animals he had bought making a profit of 25% per bull and 30% per sheep.
 i) Calculate the total amount of money he received. (2mks)
 ii) Determine correct to 1 d.p the percentage profit Peter made from the sales of the animals. (3mks)

23. The floor of a balcony measures 5.4m by 1.8m. Square slabs are placed in a path of uniform width around the balcony as shown. The shaded parts are those with corner slabs. The sides of the corner slabs are equal to the width of the path. All other slabs are smaller and of side 12cm. The area of rectangle part with no slabs 50,544cm².



- Find the width of the part with no slabs. (4mks)
 - Find the total number of slabs in the balcony. (4mks)
 - The cost of corner slab is sh.60 and the cost of each smaller slab is Ksh.8. Find the total cost of all slabs. (2mks)
24. Given that: $y = (x^2 - 9)(x + 3)$
- Find $\frac{dy}{dx}$ (1mk)
 - Find the gradient of the function $y = (x^2 - 9)(x + 3)$ at the points where it cuts the x-axis. (2mks)
 - Find the coordinates of the turning points. (3mks)
 - Sketch the curve $y = (x^2 - 9)(x + 3)$ (3mks)

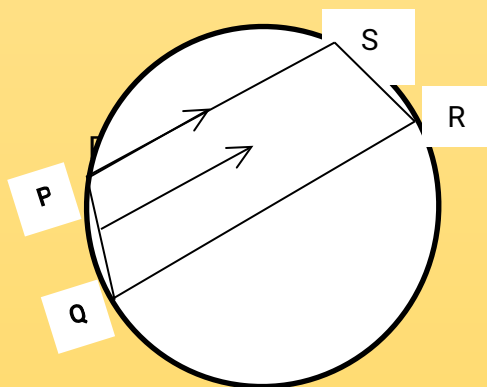
GATANGA FORM 4 MATHEMATICS PAPER 2
MATHEMATICS PAPER 2
FORM FOUR
END TERM 2 EXAM.
TIME 2½ HOURS.

SECTION A (50MKS)

1. Use logarithm table to evaluate. (3mks)

$$\frac{\sqrt[3]{0.0246 \times 142}}{\sqrt{0.002 \times 1.14}}$$

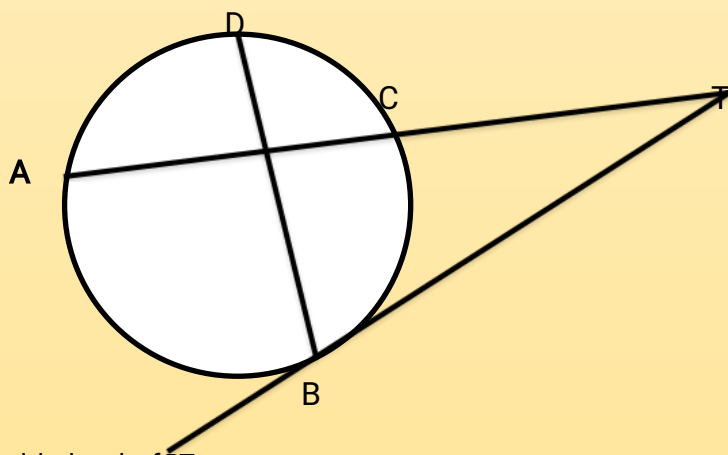
- Solve the equation; $2 \cos(3x + 12) = -1$ for $0^\circ \leq x \leq 180^\circ$ (3mks)
- Solve for x in the equation: (3mks)
 $\log_8(x+6) - \log_8(x-3) = 2/3$
- In the figure below PQRS is a cyclic quadrilateral. Line PS is parallel to QR and angle QPS = 105° . QR is the diameter of the circle centre O.



- Determine the size of angle PRS. (3mks)
- Each side of a regular hexagon measures 20.5cm. What is the maximum percentage error in calculating the hexagon's perimeter. (3mks)
 - Make A the subject of the formula. (3mks)

$$W = \frac{2p}{n} \sqrt{\frac{L-A}{3k}}$$

7. Simplify $\frac{\sqrt{2} + \sqrt{3}}{4 + \sqrt{6}}$ and give your answer in the form $\frac{a\sqrt{b} + c\sqrt{d}}{e}$ where a,b,c and e are Integers. (3mks)
8. Expand $(3 - \frac{1}{2}x)^5$ upto the 5th term. Hence use the expansion to evaluate $(3.25)^5$ correct to 1 decimal place. (4mks)
9. The co-ordinates of the longest chord of a circle are A (0, 2) and B (6, 10). Find the equation of the circle in the form $x^2 + y^2 + ax + by + c = 0$ where a, b, and c are constants. (3mks)
8. Tap A can fill a tank in 20 minutes while Tap B can fill the same tank in 15 minutes. When the tank is full, it can be emptied by C in 30 minutes. Initially when the tank is empty, all taps are opened. After 5 minutes tap B is closed. Find the total time taken for the tank to be full. (3mks)
11. In the figure below, BT is a tangent to the circle at B. AXCT and BXD are straight lines. AX= 6cm, CT=8cm, BX=4.8cm and XD=5cm. (2mks)



Find the length of BT

12. Two bags A and B each contain a mixture of yellow and green bananas all of the same size. Bag A contains 12 yellow and 15 green bananas. Bag B contains 8 yellow and 13 green bananas. Find the probability of picking a green banana at random. (3mks)
13. Find the quartile deviation of the data given below. (3mks)
12,17,6,9,8,9,16,15,10
14. The position vectors of P and q is $3i - 2j + k$ and $2i + j - 3k$ respectively. Determine the column vector PQ and hence calculate the length to 2 decimal places. (3mks)
15. A quantity P varies partly as n and partly as the square of n. When $P = -3$, $n = -1$ and when $P = 18$, $n = 2$. Find p when $n = 1$. (3mks)
16. Without using a set square or a protractor, construct triangle ABC such that $AB = AC = 5.4\text{cm}$ and angle $ABC = 30^\circ$. Determine shortest distance from A to BC. (4mks)

SECTION B (50MKS)

Answer any five questions from this section

17. The income tax rates of a certain year were as shown in the table below:-

Monthly income (Kshs)	Tax rate in Kshs per Kshs 20
1 - 18000	2
8401 - 30000	3
30001 - 36000	4
36001 - 48000	5
48001 - and above	6
	7

In the year Mr. Wandera's monthly earning were as follows:-

Basic salary	Ksh30000
House allowance	Kshs12000
Commuter allowance	Ksha 2500
Medical allowance	Kshs 3500

He was entitled to family relief of Kshs 1240 per month.

- a) Calculate his taxable income per month. (2mks)
- b) His net tax per month. (5mks)
- c) Apart from income tax the following monthly deductions were made; - NHIF of Kshs 250; service charge of Kshs 150; Loan repayment of Ksha 6000 and co-operative shares of Kshs 2600. Calculate Mr. Wandera's monthly net income from his employment.

(2mks)

18. A transformation represented by the matrix $\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$ maps P (1, 3), Q (3, 3) and R (2, 1) onto P'Q' and R' respectively.

- a) (i) On a grid, draw triangle PQR and its image P'Q'R' on the same set of axes. (3mks)
 (ii) Determine the area of triangle P'Q'R'. (2mks)

b) Another transformation represented by matrix $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ maps P'Q'R' onto P''Q''R''.

- i) Plot triangle P''Q''R'' on the same axes as above. (2mks)

ii) Describe the transformation represented by $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ (1mk)

c) Determine the matrix of the single transformation which maps P''Q''R'' onto PQR. (2mks)

19. A construction company has to transport 450 bags of cement and 360 iron sheets to a construction site. He has two vehicles at his disposal. A lorry which can carry 90 bags of cement and 30 iron sheets per trip. A pickup which can carry 45 bags of cement and 60 iron sheets per trip. Each vehicle makes at least one trip. It profits him 900 per trip for the lorry and Kshs600 per trip for the pickup. If X and Y represent lorries and pickups respectively,

- a) Write down two inequalities in X and Y apart from $X \geq 1$, and $Y \geq 1$ (2mks)

b) Represent the information graphically. (4mks)

c) If the construction company is to maximize profit, find:

i) Number of trips for each vehicle. (2mks)

ii) The total maximum profit. (2mks)

20. The position of two towns P and Q are given to the nearest degree as P(45°N, 20°W) and Q(45°N, 160°E). Find

a) Shortest distance between the two towns in:-

i) Kilometres (take radius of the earth as 6370km) (3mks)

ii) Nautical miles. (Take $\pi = 22/7$) and the earth's radius = 6370km. (2mks)

b) A ship leaves town P and sails due east for 120 hours to another town R at an average speed of 27 knots.

i) Calculate the distance between the two towns in nautical miles. (2mks)

ii) Find the position of town R. (3mks)

21. The 2nd and 5th terms of an arithmetic progression are 8 and 17 respectively. The second, 10th and 42nd terms of the AP form the first three terms of a geometric progression. Find

a) The first term and the common difference of the AP. (3mks)

b) The first three terms of the GP and the 5th term of the G.P (4mks)

c) The sum of the first 4 terms of the G.P. (3mks)

22. (a) Complete the table below (2mks)

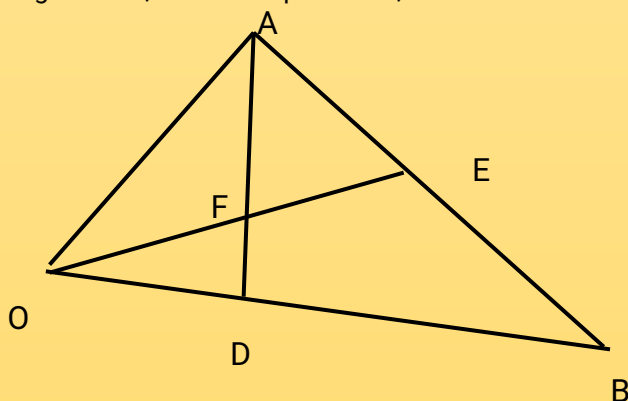
X	0	30	60	90	120	150	180	210	240	270	300	330	360
Sin x	0	0.5	0.87	1		0.5	0		-0.87	-1		-0.5	0
2 sin (X + 30)	1		2	1.73		0			-2		-1		1

b) Draw the graph of $y = \sin x$ and $y = 2\sin(x+30)$ on the same axis using a scale of 1cm to represent 300 on the x-axis and 4cm to represent 1 unit on the y axis. (4mks)

c) Find the period and amplitude of $y = 2\sin(x+30)$ (2mks)

d) From the graph find the roots of $2\sin(x+30) - \sin x = 0$ (2mks)

23. In the figure below, E is the mid-point of AB, OD: DB = 2:3 and F is the point of intersection of OE and AD.



a) Given that $\overrightarrow{OA} = a$ and $\overrightarrow{OB} = b$, express in terms of a and b.

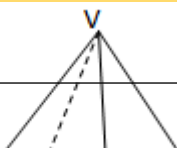
(i) OE (1mk)

ii) AD (1mk)

b) Given further that $\overrightarrow{AF} = t\overrightarrow{AD}$ and $\overrightarrow{OF} = s\overrightarrow{OE}$, find the values of s and t. (6mks)

c) Show that O, F and E are collinear (2mks)

24. The figure below shows a right pyramid PQRSV. PQRS is a rectangle with PQ = 8cm and QR = 12cm V is 25cm from the vertices P, Q, R and S.



Find to 2 d.p

- a) The height of the pyramid. (3mks)
 b) The angle between PV and the base PQRS. (2mks)
 c) The angle between QV and SV. (3mks)
 d) The angle between the planes SRV and PQRS. (3mks)

KASSU JET EXAMINATIONS

121/1

Mathematics Paper 1

2 ½ Hours

Term 2 .

SECTION I 50 MARKS

1. Without using tables, evaluate $\frac{0.51 \times 5700}{6.8 \times 0.0095}$ giving the answer in standard form. (3mks)

2. Find the value of t in the following equation $81^{-1} \times \left(\frac{1}{27}\right)^t = \frac{1}{243^{-1}}$ (3mks)

3. Simplify the expression (3mks)

$$\frac{x^2 - 9y^2}{2x^2 - 7xy + 3y^2}$$

4. Evaluate using tables of reciprocals and cubes only expressing your answer to 4 significant figures

$$\frac{4}{0.2356} + (0.9873)^3 \quad (3mks)$$

5. Simplify; $\frac{2}{3}$ of $5\frac{2}{5} - 2\frac{3}{10}$ (3mks)

$$\frac{3}{5} \div 4\frac{1}{2} + 1\frac{3}{5}$$

6. Find the equation of a line which passes through the point (2, 3) and is perpendicular to $y = 3x - 1$. Giving your answer in the double intercepts form (3mks)

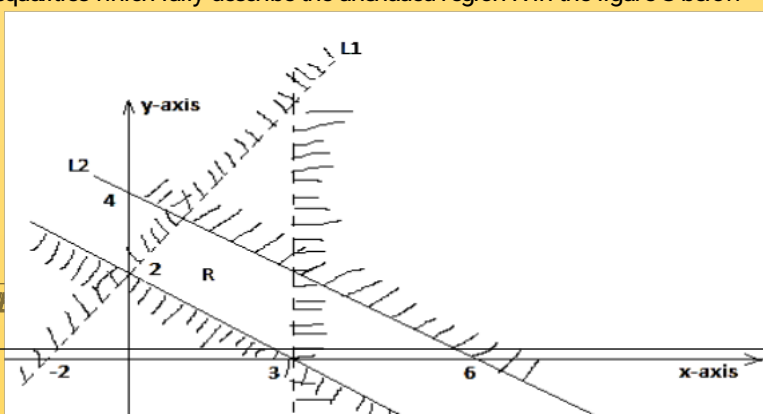
7. George received 10,000 Euros from his brother who stays in France .He sent to his sister who stays in Japan 10,000 Yen .In addition George bought a car worth sh.200,000. Exchange rates :

	Buying	Selling
1 Euro	73.4226	73.52953
100 Japanese yen	62.8011	62.8822

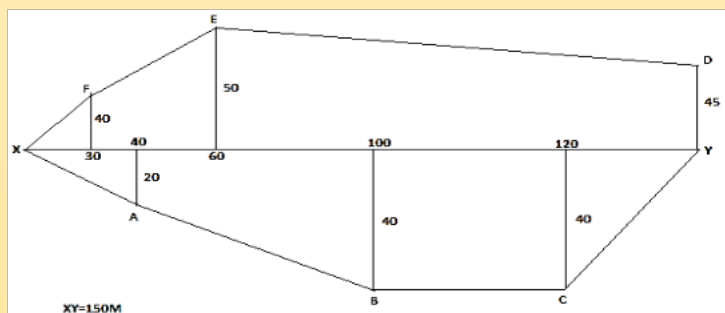
How much was left.

(3marks)

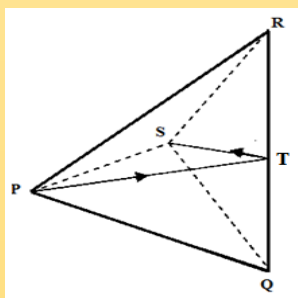
8. Write down four inequalities which fully describe the unshaded region R in the figure S below (4mks)



9. A line PQ = 12.5cm. By using another line, divide PQ into nine equal parts. (3mks)
10. The sum of the interior angles of a polygon is 1980° . Find the number of sides the polygon has. (3mks)
11. The diagram below is a sketch of a rice field (not drawn to scale), use it to generate a surveyor's field book. (All measurements are in metres) (4mks)



12. A boy walk directly from point Q towards the foot of a vertical flag post 200m away. After conveying a distance of 140m, he observes the angle of elevation of the top of the flag post is 75° . Calculate the angle of depression of point Q from the top of the flag post. (3mks)
13. Two similar blocks have masses of 729g and 216g respectively. If the surface area of the smaller block is 300cm^2 , calculate the surface area of the larger block. (3mks)
14. Using trapezoidal rule with 6 ordinates, find the area bounded by the curve $y=2x^3 - 5$, the x-axis and the lines $x=2$ and $x=8$. (3mks)
15. Kassim has a money box containing 100 mixed shs 5 and shs 10 coins with a total value of shs 600. How many of each type of coin does the box contain. (3mks)
16. The figure below shows a regular tetrahedron PQRS of edges 4cm. Draw its net and measure the length of the straight path of PS through the midpoint T over the edge QR. (3mks)



SECTION II (50 MARKS)

(Answer ANY FIVE questions in the spaces provided)

17. Complete the table below for the equation $y=2x^2+2x-8$ by filling the blank space. (2mks)

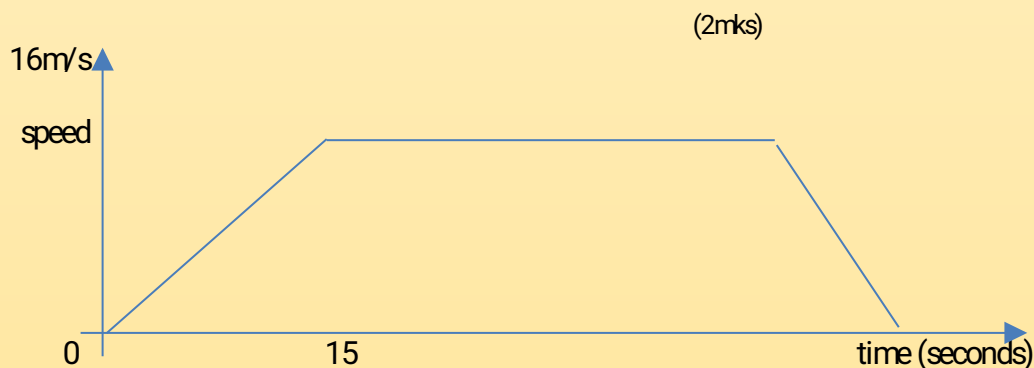
x	-5	-4	-3	-2	-1	0	1	2	3	4
y	32			-4		-8			16	

- a). On the graph provided below, plot the graph of $y=2x^2+2x-8$. (4mks)
(use the scale: y-axis=1 unit, x-axis=1 unit)
- b) Use your graph to solve:
- $2x^2+2x-8=0$ (1mk)
 - $2x^2+x+2=0$ (3mks)
18. a) a bus left Kisumu at 9.30 am towards Nairobi at an average speed of 81km/hr. A matatu left Nairobi for Kisumu at 10.10 a.m at an average speed of 72km/hr. The distance between Kisumu and Nairobi is 360km. Determine:
- The time taken before the two vehicles met. (3mks)
 - The distance between two vehicles 40 minutes after meeting. (2mks)
 - A car left Kisumu towards Nairobi at 9.50am at an average speed of 90km/hr. Determine the time the car caught up with

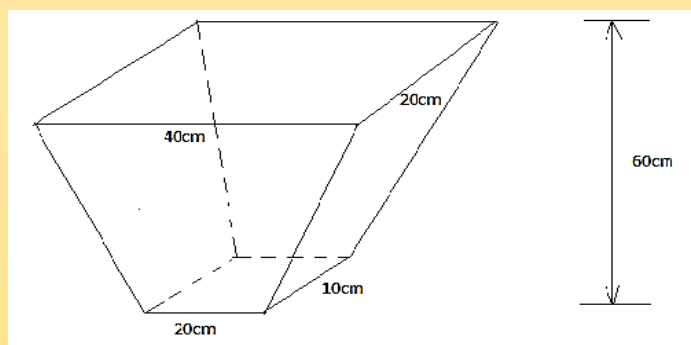
the bus

(3mks)

- (b) The figure below shows speed time graph of a journey. If total distance travelled in 80 seconds is 920m. Find the distance travelled in the final 40 seconds.



19. The Figure shows a frustum of a right pyramid open container for storing water.



Calculate:

- a) The height of the pyramid from which the frustum was cut from. (2mks)
 b) The surface area of the frustum. (4mks)
 c) The capacity of the frustum in litres. (4mks)

20. The table below represent marks in percentage scored by 50 students in a class

Marks	Frequency
40-44	6
45-49	4
50-54	7
55-59	6
60-64	12
65-69	4
70-74	5
75-79	3
80-84	3

- a) State the modal class. (1mk)
- b) Estimate:
- i) The mean mark. (2mks)
- ii) The median. (3mks)
- c) On the grid provided draw a frequency polygon to represent the above information. (4mks)

21. Given that the column vectors

$$p = \begin{pmatrix} -3 \\ 4 \end{pmatrix}, q = \begin{pmatrix} 16 \\ -4 \end{pmatrix}, r = \begin{pmatrix} 9 \\ 6 \end{pmatrix} \text{ and that } a = 2p - \frac{3}{4}q + \frac{2}{3}r$$

- Express as a column vector and hence calculate its magnitude (4mks)
- b) Given that the midpoints of PQ is (-3, 1) and Q (7,5), obtain the co-ordinates of P (3mks)
- c) A translation $T\begin{pmatrix} 2 \\ 1 \end{pmatrix}$ maps triangle ABC onto triangle $A^1B^1C^1$. Given the co-ordinates A(2,3), B(2,5) and C(4,4). Find the co-ordinates of A^1B^1 and C^1 . (3mks)
22. The coordinates of triangle ABC are A(1, 1), B(3, 1) and C(1, 3).
- (a) Plot the triangle ABC. (1mk)
- (b) Triangle ABC undergoes a translation vector $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$. Obtain the image of $A'B'C'$ under the transformation, write the coordinates of $A'B'C'$. (2mks)
- (c) $A'B'C'$ undergoes a reflection along the line $X=0$, obtain the coordinates and plot on the graph points $A''B''C''$ under the transformation. (2mks)
- (d) The triangle $A''B''C''$ undergoes an enlargement scale factor -1, centre origin. Obtain the coordinates of the image $A'''B'''C'''$. (2mks)
- (e) The triangle $A'''B'''C'''$ undergoes a rotation centre (1, -2) angle 120° . Obtain the coordinates of the image $A''''B''''C''''$. (2mks)
- (f) Which triangles are directly congruent? (1mk)
- A particle moves along a straight line such that its displacement s metres from a given point is $s = t^3 - 5t^2 + 3t + 4$ where t is time in seconds.
- Find:
- (a) The displacement of the particle at $t = 8$. (2 marks)
- (b) The velocity of the particle when $t = 10$. (3 marks)
- (c) The values of t when the particle is momentarily at rest. (3 marks)
23. A pilot intends to fly from A to D through B and C, B is 750km from A and on a bearing of $N50^\circ E$. C is on a bearing of $N 40^\circ W$ from B and their distance apart is 600km. D is on a bearing of $S 85^\circ W$ from C and at a distance of 1050km.
- a) Using the scale of 1cm for 100km, show the flight route. (4marks)
- b) If the pilot on its way back decides to fly directly from D to A;
- i) By use of compass bearing find the direction of A from D (1mk)
- ii) Find the distance from D to A in kilometers. (1mk)
- d) The plane flies at 500km/h. If it leaves D at 9.00a.m at what time did it arrive at A. (2mks)
- d) i) Using your diagram in (a) above, (i) find the distance between A and C (1mk)
- ii) Find the compass bearing of A from point C (1mk)

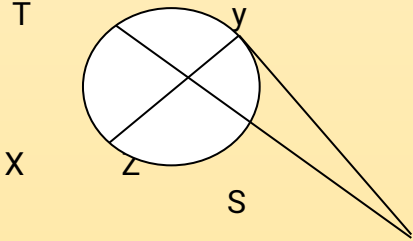
KASSU JET EXAMINATIONS

121/2

Mathematics Paper 2**2 ½ Hours****Term 2 .****SECTION I 50 MARKS**

1. Solve for x in the equation $-2x^2 + x + 36 = 0$ using completing the square method (3 mks)
2. Simplify by rationalizing the denominator in $\frac{4 - \sqrt{2}}{3 + \sqrt{2}}$ leaving your answer in the form $a + b\sqrt{c}$ where a, b and c are integers. (3mks)
3. Find the value of x in the equation $\cos(3x - 180^\circ) = \frac{\sqrt{3}}{2}$ in the range listed below.
 $0^\circ \leq x \leq 360^\circ$ (3mks)
4. Draw a line $AB=4cm$, P is a variable point in the plane of the paper, above AB, such that angle $APB = 60^\circ$ and the area of triangle $APB = 6cm^2$. Using a ruler and a pair of compasses only find the locus of P. (3 marks)
5. Expand and simplify the binomial $\left(2 + \frac{3}{x}\right)^5$. Hence use the first four terms of your expansion to find the value of $(2.5)^5$ (3mks)
6. The length and breadth of a rectangular floor garden were measured and found to be 4.1m and 2.2m respectively. Find the percentage error in its area. (3 marks)
7. Solve for x in the equation $3(\log x)^2 - \log x^5 + 2 = 0$ (3 marks)
8. Make S the subject of the formulae in the following; $sa = \sqrt{\frac{s^2 + q}{t^2}}$ (3mks)

9. Each member of a class take one and only one of the three foreign languages: French, German and Spanish. 15 pupils take French, 9 take German and 6 take Spanish. Two pupils are chosen at random. Represent the information in a tree diagram hence find the probability that both pupils take different subjects. (3mks)
10. The amount of oil used by a ship travelling at a uniform speed varies jointly with the distance and the square of the speed. If the ship uses 200 barrels of oil in travelling 200 miles at 36 mile per hour, determine how many barrels of oil are used when the ship travels 360 miles at 18 miles per. (3 marks)
11. Use logarithms to evaluate:

$$\sqrt[3]{\frac{45.3 \times 0.00697}{0.534}}$$
 (4 marks)
12. The figure below shows a circle of diameter XY. Chord TZ intersects XY at C. A tangent to the circle at Y meets TZ produced at S.
- 
- Given that TC = 14 cm, CY = 4 cm and YS = 7.5 cm. calculate the length of:
- CS (1 mark)
 - XC (2 marks)
13. Determine the values of x for which the matrix $\begin{pmatrix} 2x & x^2 \\ 2 & 1 \end{pmatrix}$ has no inverse (3 marks)
14. Mr. Kimbo, a local retailer bought imported rice at sh. 56 per kilogram and local rice at sh. 48 per kilogram. He wants to mix the two types of rice so as to make a profit of 20%. If he sold the mixture at sh. 120 per 2 kilogram packet, find the ratio the two types of rice was mixed. (3mks)
15. The sixth term of a geometric progression is 16 and the third term is 2. Determine the common ratio and the first term. (3 marks)
16. The equation of a circle is given by $x^2 + 4x + y^2 - 2y - 4 = 0$. Determine the centre and radius of the circle. (3 marks)

SECTION II

(Answer ANY FIVE questions in the spaces provided)

17. The table alongside shows the rates of taxation in a certain year.

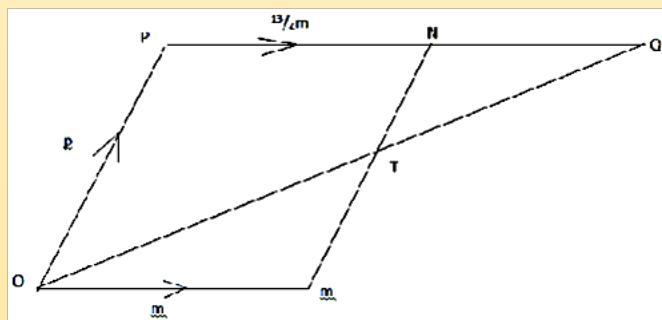
Income in K£p.a	Rate (Sh. Per K£)
1 - 3900	2
3901 - 7800	3
7801 - 11700	4
11701 - 15600	5
15600 - 19500	7
Above 19500	9

In that year Mr. Kariuki at teacher at Kangaru High School was earning a basic salary of Ksh. 27 000 per month. In addition he was entitled to other taxable allowances totalling to 11 000 per month and a personal relief of Ksh 1056 per month. He lives in teachers' quarters where he is paying a nominal rent of Ksh. 3 500 per month.

- Calculate how much income tax Mr. Kariuki is paid per month. (4 marks)
 - Mr. Kariuki's other deductions per month were co-operative society contribution of sh 2500 and loan repayment of sh. 3000, calculate his net salary per month. (3 marks)
 - Later the same year Mr. Kariuki was transferred to another school where he earned hardship allowance equivalent to 30% of his basic salary. On top of the deduction in (b) above, he also had a deduction of sh 2700 per month to KCT. Calculate the percentage change in his net salary per month (3 marks)
18. Given that $y = 2x^0 + \cos \frac{1}{2} x^0$, complete the table below for the missing values of y, correct to 1 decimal place (2mks)

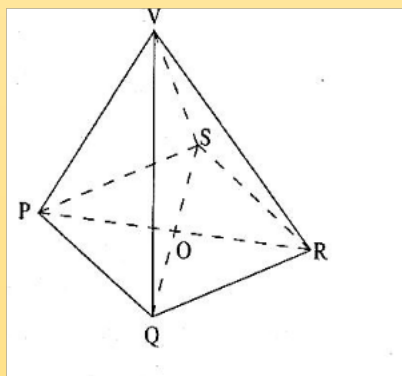
x^0	0^0	30^0	60^0	90^0	120^0	150^0	180^0	210^0	240^0	270^0	300^0	330^0	360^0
$Y = \sin 2x + \cos \frac{1}{2} x$	1.0	1.8			-0.4	-0.6			0.4	-0.7			-1.0

- (b) On the grid provide below, draw the graph of $y = \sin 2x + \cos \frac{1}{2} x$ for $0 \leq x \leq 360^\circ$. Take the scale 1 cm for 30° on the x-axis. 2 cm for 0.5 units on the y-axis. (4mks)
- (c) Use the graph to estimate
- (i) The minimum value of y (1mk)
- (ii) The value of X for which $\frac{1}{2} \sin 2x + \frac{1}{2} \cos \frac{1}{2} x \geq 0.25$ (3mks)
19. Quadrilateral **OMNP** is such that **OM** = m **OP** = p and **PN** = $\frac{13}{4}m$. **PN** is produced to Q such that **PN**: **PQ** = 13:15. T is a point on **MN** such that **MN** = 3**TN**



Show that O, T and Q are collinear. (10 marks)

20. The figure below represents a right pyramid on a square base PQRS of side 12 cm. O is the centre of the base and VO = 14 cm



Calculate;

- (a) The length of VP to 1 decimal place (3 marks)
- (b) The angle which VP makes with the base PQRS (2 marks)
- (c) The surface area of the pyramid to 1 decimal place (3 marks)
- (d) The volume of the pyramid (2 marks)

21. The table shows the goods (P) produced by a certain factory in time (t) since 2010 is believed to obey a law of the form $P = kA^t$ where k and A are constants and t is time in years.

t	2010	2011	2012	2013	2014	2015	2016
P	5000	6080	7400	9010	10960	13330	16200

- a) Express the law $P = kA^t$ where k and A are constants and t is time in years in the linear form $y = mx + c$ and fill the table appropriately. (3mks)
- b) Plot a suitable straight line graph (4mks)
- c) Use the graph above to find the values of A and k. (3mks)
22. A small scale farmer wishes to buy some sheep and goats for rearing. A sheep costs sh.400 and a goat costs sh.300. The farmer has

- enough space for only 20 animals and may spend at most sh.6800. The number of goats should not exceed twice the number of sheep.
- a) By letting x and y to represent the number of sheep and goats he can buy respectively, write down all inequalities from the above information. (4mks)
- b) Represent the inequalities on the grid provided. (4mks)
- c) From your graph; find the maximum number of animals he can buy at the lowest cost. (2mks)
23. (a) An aeroplane flies from town A($20^{\circ}\text{N}, 60^{\circ}\text{E}$) to town B($20^{\circ}\text{N}, 20^{\circ}\text{E}$). (Taking $R = 6400\text{km}$, $\pi = 3.142$) If it then flies due north from town B to town C, 420km away, calculate correct to the nearest degree, the latitude of town C. (3 marks)
- (b) Calculate the shortest distance in km between towns P($60^{\circ}\text{N}, 40^{\circ}\text{W}$) and Q($60^{\circ}\text{N}, 30^{\circ}\text{E}$) giving your answer to 2 decimal places (2 marks)
- (c) The local time at town T($33^{\circ}\text{N}, 15^{\circ}\text{W}$) is 1045hours. What is the local time at Q($50^{\circ}\text{N}, 30^{\circ}\text{E}$)? (2 marks)
24. Use Trapezoidal rule to find the area between the curve.
 $y = x^2 + 4x + 4$, the x -axis and the ordinates $x = -2$ and $x = 1$ (Use 7 ordinates)
- a) Complete the table correct to 2 d.p. (2 marks)
- | | | | | | | | |
|-----|----|------|----|------|---|-----|---|
| x | -2 | -1.5 | -1 | -0.5 | 0 | 0.5 | 1 |
| y | | | | | | | |
- b) Find the area enclosed by the curve, the x -axis, lines $x = -2$ and $x = 1$. (3 marks)
- c) Use integration to find the exact area and hence find the percentage error in your approximation. (5 marks)

FOR MARKING SCHEMES INBOX 0724351706