TOP NATIONAL SCHOOLS TRIAL EXAMS 2024

MATHEMATICS

- **MARANDA SCHOOL**
- **ASUMBI GIRLS**
- **PANGANI GIRLS**
- **KENYA HIGH**
- **KABARAK AND SACHO JOINT**
- **ALLIANCE BOYS**
- **ALLIANCE GIRLS**
- **NAIROBI SCHOOL**
- **MANG'U SCHOOL**
- **MOI GIRLS ELDORET**
- **FRIENDS SCHOOL**

ASUMBI GIRLS HIGH SCHOOL

PAPER 1

SECTION A (50 marks)

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

1. Without using a calculator evaluate

$$\frac{5x6 + (-76)\div4+27\div3}{(-5)\div3 \text{ x } (-4)}$$ (3mks)

2. (a) Express 2268 in terms of its prime factors (1mk)

(b) Hence determine the smallest positive number x such that 2268x is a perfect square. (2mks)

3. Elvis arrived in Kenya with 5000 sterling pound, he exchanged it to Kenya Shilling and spent sh. 267 100. Before jetting out of the country, he exchanged the balance into Euros. Using the exchange rates below, calculate the amount he obtained in Euros in Kenya shillings. (3mks)

Currency	Buying	Selling
1 Sterling pound	114.20	114.50
1Euro	101.20	101.30

4. Simplify the expression (3mks)

$$\frac{2x^2+3x-2}{x^3-4x}$$

5. When two wires of length 179m and 234m are divided into pieces of equal lengths a remainder of 3m is left in each case. Find the least number of pieces that can be obtained. (3mks)

6. Without using calculator, solve for n in the equation $1 - \left(\frac{1}{3}\right)^n = \frac{242}{243}$ (3mks)

7. Solve for y in the equation $\frac{7-y}{4}$ - $\frac{9-2y}{3} = \frac{1}{2}$ (3mks)

8. Two similar solids have surface area of 48cm^2 and 108cm^2 respectively. Find the volume of the smaller solid if the bigger solid has a volume of 162 cm^3 (3 mks)

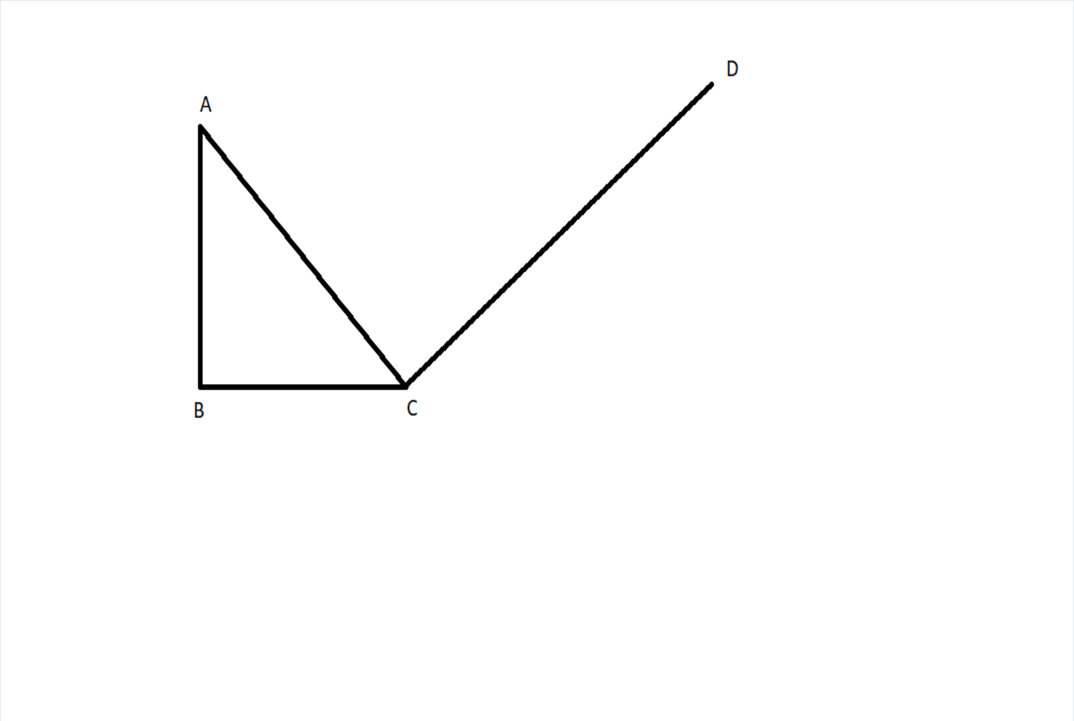
9. Use reciprocal table only to evaluate $\frac{1}{0.325}$ (3mks)

Hence, evaluate $\frac{\sqrt{0.25}}{0.325}$ to 1.d.p

10. A plot measuring 1.2m by 19.1 m is surrounded by a path 0.5m wide. Find the area of the path in square metres. (3mks)

11. The interior angle of a regular polygon is 60^0 more than its exterior angle, find the number of sides of the polygon. (3mks)

12. Complete the following solid given that ABC is its cross-section (3mks)



13. If $\tan x = \frac{1}{\sqrt{3}}$ find without using tables or calculator the value of

Sin (90-x)+ cos (90-x) leaving your answer in simplified surd form (3mks)

14. A line perpendicular to the line 3y-2x=2 passes through the point (-3,2). Determine the equation of the line and write it in the form ax +by = c where a, b, and c are constant. (3mks)

15. Given that **A** = $\begin{pmatrix} 4 & 3 \\ -1 & -2 \end{pmatrix}$ and **C** = $\begin{pmatrix} 3 & 7 \\ -1 & -2 \end{pmatrix}$ (4mks)

Find **B** such that $\mathbf{A}^2 + \mathbf{B} = \mathbf{C}^{-1}$

16. Ali travelled a distance of 5km from village A to village B in direction of $N60^0E$. He then changed direction and travelled a distance of 4km in the direction of 135^0 to village C.

a) Using a scale of 1cm to represent 1.0 km represent the information on an accurate diagram. (2mks)

b) Using scale drawing (a) above determine

(i) distance between A and C (1mk)

(ii) bearing of A from C (1mk)

SECTION B (50mks)

Answer **only five** questions in this section, in the spaces provided below each question.

17. The table below shows marks obtained by 100 candidates at Highway secondary school in a 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

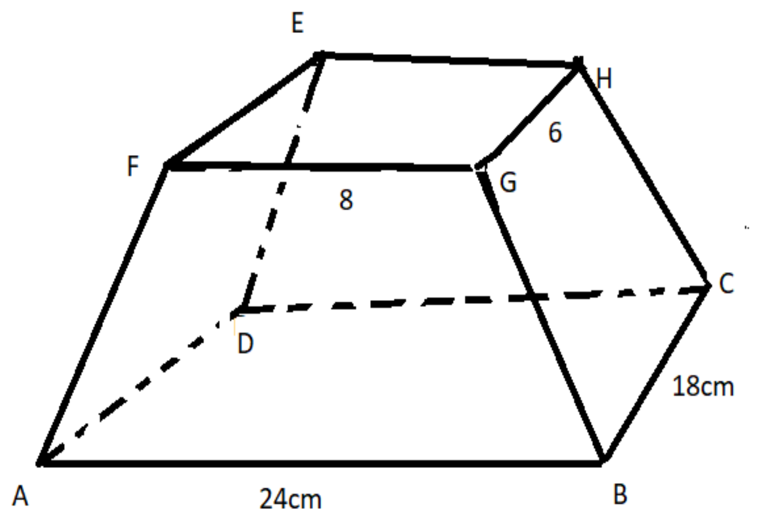
a) Determine the value of x (2mk)

b) State the modal class (1mk)

c) Calculate the median mark to 4 significant figures (3mks)

d) Using an assumed mean of 59.5 calculate the mean mark (4mks)

18. the diagram below represents a frustum of a right pyramid with a rectangular base ABCD measuring 24cm by 18cm. the frustum was made by cutting off a small pyramid exactly 2/3 up the vertical height



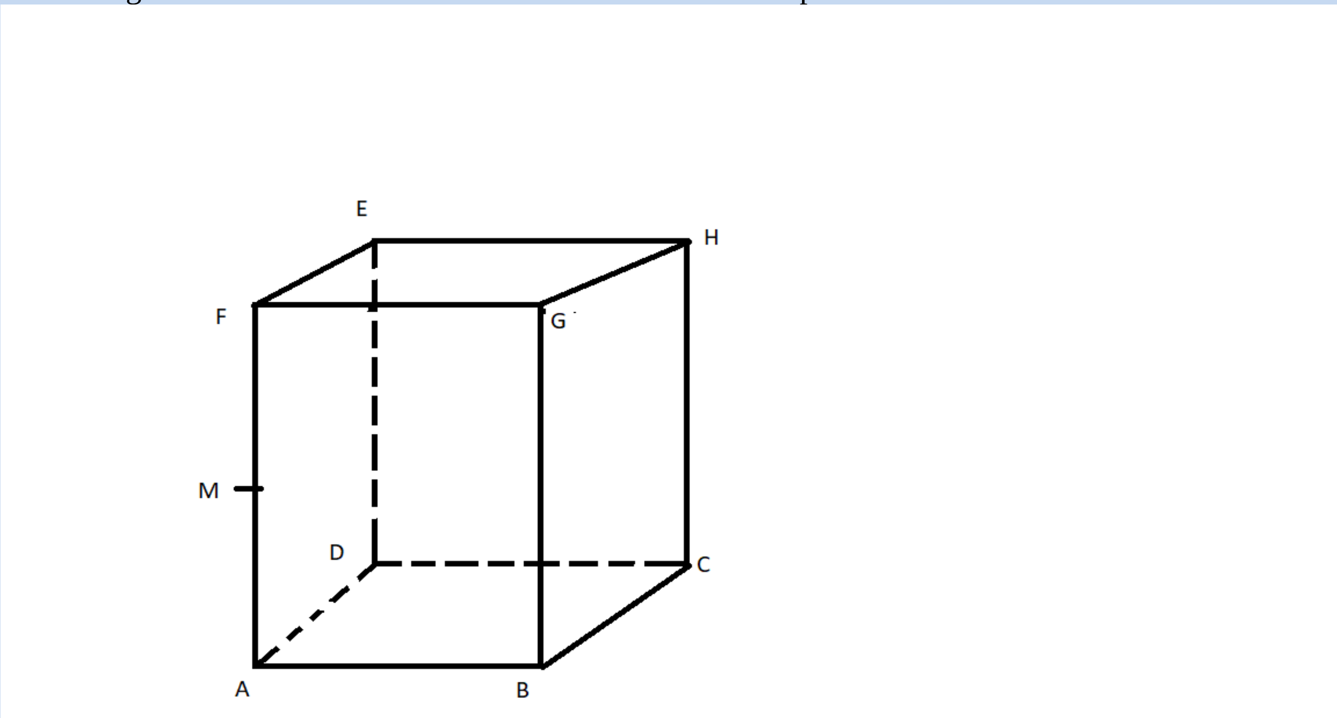
The slant height of the original pyramid is 36cm. Calculate to 1 decimal place;

a) Vertical height of the original pyramid. (3mks)

b) Volume of the frustum. (4mks)

c) Surface area of the original pyramid. (3mks)

19. The figure below shows a cube of side 10cm. M is the midpoint of AF



Find;

a) Length HM (4mks)

b) The angle between HM and ABCD (2 mks)

c) Angle between HM and MC (4mks)

20. (a) Complete the table below for y= $3x^2+4x+6$ (2mks)

X	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
y											

(b) Using a trapezium rule with 5 strips determine the area enclosed by the curve $y= 3x^2 +4x+6$. The lines x= 1 and x= 6 and the x-axis. (2mks)

(c) Use mid-ordinate rule with 5 strips to determine the area under the curve $y= 3x^2+4x+6$ the lines x= 1, x=6 and x- axis. (2mks)

(d) Find the exact area enclosed by the curve $y= 3x^2+4x+6$ the lines x= 1, x=6 and x- axis. (2mks)

(e) Find percentage error in using trapezium rule. (2mks)

21. a) Given that $\mathbf{A} = \begin{pmatrix} 3 & 4 \\ 2 & 3 \end{pmatrix}$ find inverse of **A** **(1mk)**

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 matrix method to find the price of one bag of each item .
(6marks)

C) The price of beans later decreased in the ratio 4: 5 while that of rice increased by 20 %. A businessman bought 20 bags of beans and 30 bags 0f rice. How much did he pay? (3mks)

22. A commuter train moves from station A to D via B and C in that order, the distance from A to C via B is 70km and that of B to D via C is 88km. Between stations A and B the train travels at an average speed of 48km/h and it takes 15minutes. The average speed of the train between C and D is 45km/h. Find;

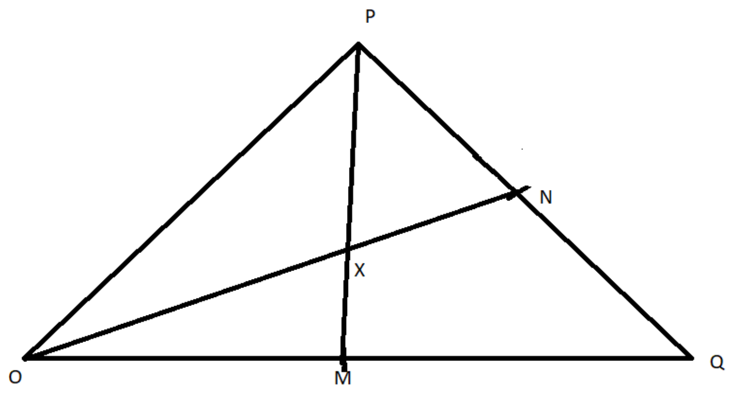
a) Distance between B and C (2mks)

b) Time taken between C and D (2mks)

c) If the train halts at B for 3 minutes and at C for 4 minutes and average speed for the whole journey is 50km/h. Find its average speed between B and C. (4mks)

d) If the return journey was 54km/h how long did it take for the whole journey? (2mks)

23. In a triangle OPQ, **OP** =**P** and **OQ**= **q** and that N is a point on PQ such that PN = $\frac{2}{3}$ PQ, M is the midpoint of OQ.



(a) Find in terms of **p** and **q** the vecors

(i) **PQ** (1mk)

(ii) **PM** (1mk)

(iii) **PN** (1mk)

(b) Given further that PX= nPM and OX -= mON where m and n are scalars and that x is a point of intersection of PM and ON.

Express OX in terms of;

i. P**, q** and m (1mk)

ii. **P, q** and n (1mk)

(c)Determine the values of m and n. (5mks)

(d) find ratio OX= ON (1mk)

24. The floor of a rectangular room can be covered completely by a carpet costing sh. 200 per square metre. The total cost of the carpet would be sh. 5600. Taking the length of the room to be x m;

a) Express width of the room in terms of x (2mks)

b) If a uniform width of $\frac{1}{2}$ m is left uncovered all round. The cost is sh. 2000 less. Form and solve an equation to determine the value of x. (5mks)

c) Later it was decided that the floor left uncovered in (b) above should also be covered. However the cost of the carpet had then gone up by sh. 150 per square metre. Determine the cost in covering the previously uncovered region. (3mks)

PAPER 2
SECTION 1 (50 MARKS)

Answer **all** questions in this section

1. Use logarithm tables to evaluate to 4 significant figures

$$\left(90.35 + \frac{1}{0.03506}\right)^{1/3}$$ (4mks)

2. Simplify $\frac{3}{2+\sqrt{2}} + \frac{4-\sqrt{2}}{2-\sqrt{2}}$. Write your answer in the form $a + b\sqrt{C}$ (3mks)

3. Expand $(p - 3q)^5$ (1mks)
hence state
i. Coefficient of p^4q (1mks)
ii. Fourth term in the expansion (1mk)

4. Make c the subject of the formula b = $\sqrt{k - ac}$, hence find the value of c when k= 1, a=4 and b= 2 (3mk

5. Given that A= $\begin{bmatrix} 3x & x - 36 \\ -6 & 2x - 2 \end{bmatrix}$ Find value of x such that A is a singular matrix. (3mks)

6. The dimensions of a rectangle are 40cm and 45cm. If there is an error of 5 % in the dimensions find the percentage error in calculating area of the rectangle. (3 mks)

7. Solve the equation

$$\text{Log}_2 (2 + 3x) + 3\log_2 2 = 2 + \log_2 (2x+6)$$ (3mks)

8. The cash price of a TV set is Ksh 13800. A customer opts to buy the set on hire purchase terms by paying a deposit of Ksh. 2280. If the simple interest of 20% p.a is charged on the balance and customer is required to pay 24 equal monthly instalments calculate the amount of each instalment. (2mks)

9. Chords PQ and RS intersect internally at point T. Given that PT = 3.2 cm, TQ= 4.7cm and TS = 5.2cm, find the length of chord RS. (3mks

10. On the line AB below show by shading the region R above the line such that

i. R is nearer A than B
ii. R is not more than 3.0 cm from A (4mks)
iii. $< ARB \geq 90^0$

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

$$3x^2 + 3y^2 - 18x + 12y - 9 = 0$$ (3mks)

12. Grade A coffee costs sh.100 per kg while grade B costs sh150 per kg. Find the ratio in which the two grades should be mixed so that by selling the mixture at sh.147 per kg a 5% profit is realised. (3mks)

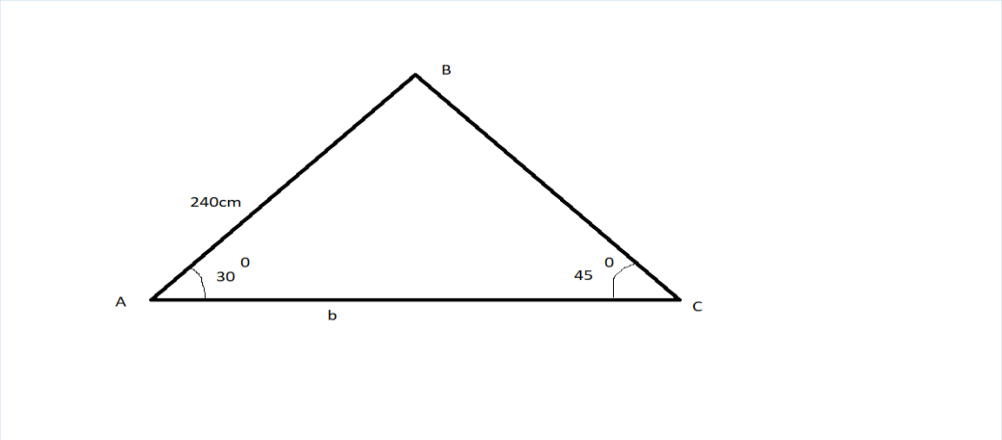
13. The following table shows income tax rates

Income Ksh per month	**Rate in ksh per every sh.20**
1-8400	2
8401-18000	3
18001-30000	4
Above 30000	5

Mr Ngondu is a non-director of a company, he is housed freely therefore for purpose of taxation 15 % of his basic salary is added to his income to obtain a taxable income. He is also entitled to a family relief of sh. 1162 and his P.AY.E is sh. 3038. Determine his income. (3 mks)

14. In a transformation, an object A of area $4cm^2$ is mapped into B of area $48cm^2$ by a transformation whose matrix is $\begin{pmatrix} y & 1 \\ 4 & 2 \end{pmatrix}$ determine possible values of y. (3mks)

15. The figure below shows a triangle ABC not drawn to scale. Calculate the length marked b given that AB= 240cm <BAC = 30^0 and <ACB =45^0 (3mks)



16. Two variables R and V are such that R= kv^n where k and n are constants. The table below shows values of logR and logV to 2d.p.

Log V	0.48	0.60	0.70	0.78	0.85	0.90
Log R	1.43	1.68	1.88	2.03	2.16	2.28

On the grid provided draw a graph of Log R against log V hence find value of n (4 mks)

SECTION II (50 MARKS)

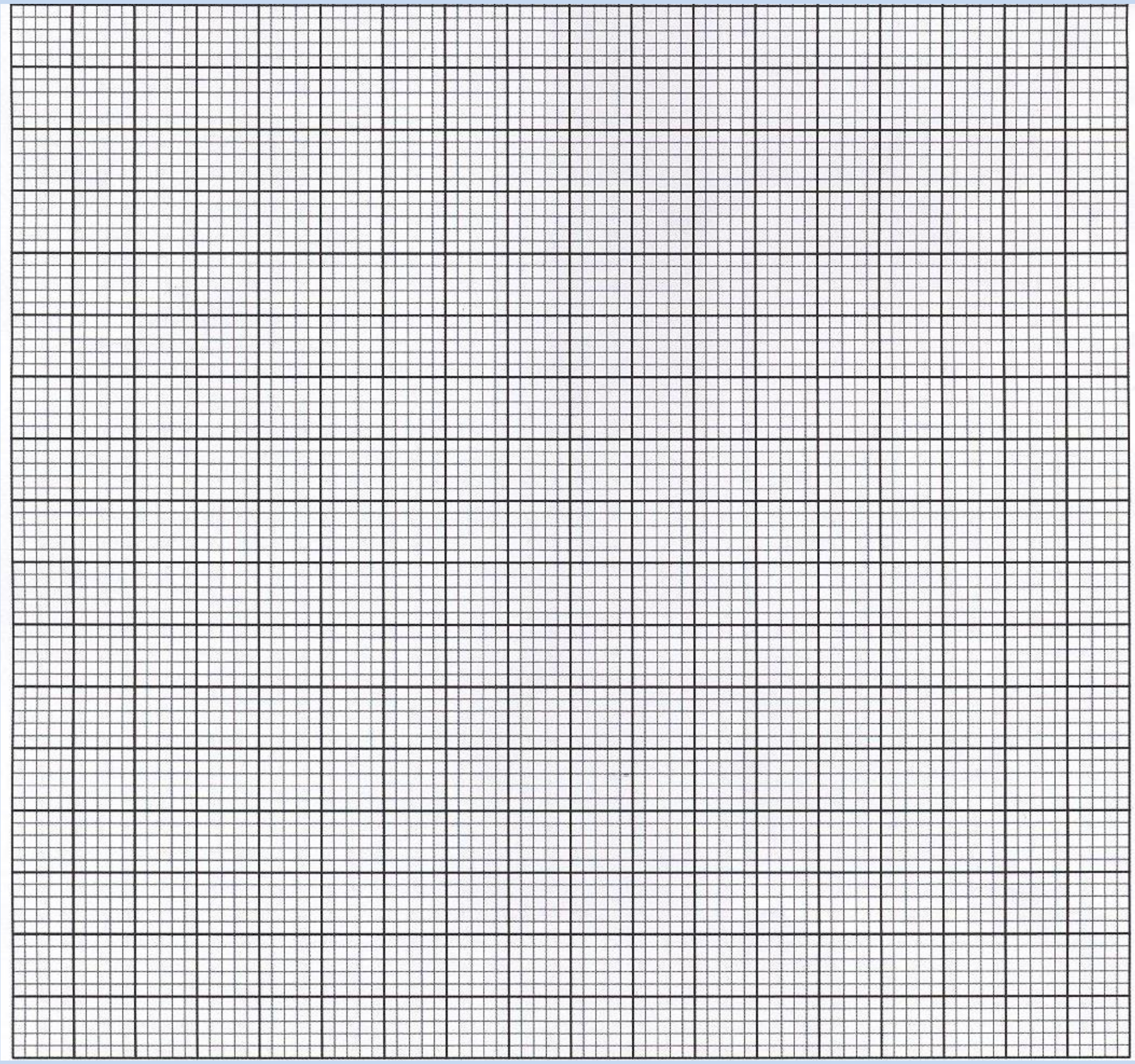
ANSWER ONLY *FIVE* QUESTIONS IN THIS SECTION

17. (a) Complete the table below for values of y for the curve

$Y= x^3-5x^2+2x+9$ for $-2\leq x \leq 5$ (2mks)

X	-2	-1.5	-1	0	1	2	3	4	5
y									

(b) Draw a graph of $y= x^3-5x^2+2x+9$ for $-2 \leq x \leq 5$ (3mk



(c) Use your graph to solve the equations

- $X^3-5x^2+2x+9=0$ (2mks)

- $X^3-5x^2+6x=-5$ (3 mks)

18. The cost Y of producing a number of items varies partly as X and partly inversely as X. To produce 2 items it costs sh. 135 and to produce 3 items it costs sh.140.

a) find Law connecting Y and X. (5mks)

b) Cost of producing 10 items. (2mks)

c) Number of items produced at a cost of sh.180 (3mks)

19. The first, fourth and thirteenth terms of an AP correspond to the first three consecutive terms of an increasing Geometric progression.
Given that the first term of the AP is **a** and common difference is **d**

(a) Write down the first three terms of the GP in terms of **a** and **d**. (1mk)

(b) The sum of the third and eleventh terms of the AP is 30.
Calculate;

(iii)The first term and common difference of the AP (5mks) (iv)Common ratio of the GP (2mks)

(v) Sum of the first 10 terms of the GP (2mks)

20. (a) Two towns on latitude 30^0 N are 3000km apart. Find the longitude difference of the two towns. (Take $\pi = \frac{22}{7}$ and radius of earth to be 6370km) (2mks)

(b) The position of the airport P and Q are P (60^0N, 45^0W) and Q (60^0N, K^0E)
It takes a plane 5 hrs to travel due East from P to Q at an average speed of 600 knots.

d) Calculate the value of K (3mks)

e) The local time at P is 10.45 am when is the local time at Q when the plane reached there? (3mks)

(c) Calculate the shortest distance between A(30^0S, 36^0E) and B (30^0S, 144^0W) (2mks)

21. The probability that Andrew goes to bed on time is $^2/_3$. If he goes to bed on time the probability that he wakes up early is $^3/_5$ otherwise it is $^1/_7$. If Andrew wakes up late, the probability that he will be punctual for class is $^1/_4$ otherwise its is $^2/_7$.

(a) Draw a tree diagram to represent above the information. (2mks)

(b) Determine the probability that;

(b) He will wake up late (2mks)

(c) He will wake up early and arrive in class late (2mks)

(d) He will go to bed late but arrive class early (2mks)

(e) He will be late for class. (2mks)

22. A shear parallel to x-axis (x-axis invariant) maps point (3,1) onto (5,1). If **S** is the transformation find the matrix that defines **S** (3mks)

(b) A transformation X maps points (1,3) and -2,3) onto (2,4) and (-3, -1) respectively. Determine the matrix of transformation ` (4mks)

(c) Transformations **R** and **T** are represented by matrices $\begin{pmatrix} 2 & 1 \\ 0 & 2 \end{pmatrix}$ and $\begin{pmatrix} 3 & 0 \\ 1 & 3 \end{pmatrix}$ respectively, point P has coordinates (3,-2)

(iii)Find coordinates of **RT**(P) (3mks)

23. A transport company runs a fleet of two types of buses operating between Meru and Nairobi. Coach buses and Minibuses. A coach bus carries 52 passengers and 200kg of luggage while a minibus carries 32 passengers and 300kg of luggage. On one Saturday, there were 500 passengers with 3500 kg of luggage to be transported, the company could only use a maximum of 15 buses all together.

(a) if the company uses x coach buses and y minibuses write down all inequalities that satisfy the given conditions. (4mks)

(b) Represent the inequalities graphically in the grid provide (use a scale of 1cm to represent 1 unit) (3mks)

(c) if the cost of running one coach bus is sh.7200 and that of running one minibus is sh. 6000 use the graph above to determine the minimum cost of running the vehicles (3 mks)

24. The velocity of a particle after **t** seconds is given by $\mathbf{V= t^2 - 4t+4.}$

(a) Find displacement of the particles during the third second (4mks)

(b) Determine the time when the particle is momentarily at rest (3mks)

(c) The acceleration of the particle after 2 seconds (3mks)

MARANDA SCHOOL

PAPER 1

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

1. Mr. Oralph withdrew some money from a bank. He spent $\frac{3}{8}$ of the money to pay for Grace's school fees and $\frac{2}{5}$ to pay for Namaje's fees. If he remained with Kshs. 12,330,calculate the amount of money he paid for Namaje's school fees. (4 marks)

2. A straight line L passes through the point $(3, -2)$ and is perpendicular to a line whose equation is $2y - 4x = 1$. Find the equation of L in the form $y = mx + c$, where m and c are constants**.** (3 marks)

3. A Kenyan company received US Dollars 200,000.The money was converted into Kenya shillings in a bank which buys and sells foreign currencies as follows:

	Buying (in Kenya shillings)	Selling (in Kenya shillings)
1 US Dollar	77.24	77.44
1 Sterling Pound	121.93	122.27

(a) Calculate the amount of money, in Kenya shillings, the company received. (2 marks)

b) The company exchanged the Kenya shillings calculated in (a) above, into sterling pounds to buy a car from Britain. Calculate the cost of the car to the nearest sterling pound. (2 marks)

4. Tap A fills a tank in 6 hours, tap B fills it in 8 hours and tap C empties it in10 hours. Starting with an empty tank and all the three taps are opened at the same time, how long will it take to fill the tank? (4 marks)

5. Given that $\sin(90 - x)^0 = 0.8$, when x is a cute angle, find without using mathematical tables the value of $\tan x$. (2 marks)

6. The length of a rectangle is increased by 20% , while the width is decreased by 10% . Find the percentage change in area. (3 marks)

7. Three bells ring at intervals of 15 minutes, 21 minutes and 30 minutes. The bells will next ring together at 12: 30 pm .Find the time the bells had last rang together. (3 marks)

8. Simplify fully the expression (3 marks)

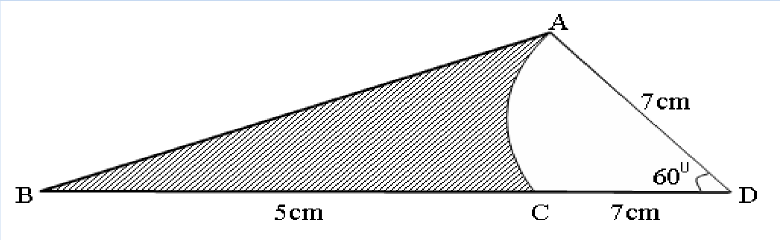
$$\frac{6x^2 - 9xy - 6y^2}{8x^2 - 2y^2}$$

9. Solve $4 \leq 3x - 2 < 9 + x$,hence list the integral values that satisfies the inequality. (3 marks)

10. The sum of interior angles of a regular polygon is 1800^0 . Find the size of each exterior angle. (3 marks)

11. The first three terms of a sequence are given a 10, 14 and 18. Find the sum of the first 10 terms of the sequence. (2 marks)

12. In the figure below, AC is an arc of a circle centre D. Angle ADC = 60^0, AD = DC = 7cm and CB = 5cm.



Calculate

a) The area of triangle ADB (2 marks)

b) The area of the shaded region. (2 marks)

13. Use the table of reciprocals, cube roots and square roots to evaluate; leaving your answer in 4 d.p. (4 marks)

$$\frac{3}{\sqrt[3]{6.859}} + \sqrt{0.2468}$$

14. A square brass plate of side 20mm has a mass of 1.05kg. The density of the brass is $8.4g/cm^3$. Calculate the length of the plate in centimeter. (3 marks)

15. The production of wool in grams of 20 sheep on a certain month was recorded as follows ; 22, 26, 15, 19, 22, 16, 27, 22, 20, 18, 28, 30, 22, 20, 15, 16, 22, 20, 17,18.

Determine;

a) The mode (1 mark)

b) Median (2 marks)

16. A transformation whose matrix is given by $\begin{pmatrix} 2x-1 & -3 \\ 2 & x \end{pmatrix}$ maps a triangle with area 8 cm^2 onto another triangle with area 72 cm^2, calculate the value of x (3 marks)

SECTION II (50 Marks)

Answer any ***five*** questions in this section in the spaces provided

17. A straight line L passes through P $(-2,-1)$ and $Q\ (x,y)$. It has a gradient of $-\frac{2}{3}$.

(a) Find the equation of the line L in the form $ax+by=c$, where a, b and c are integers. (3 marks)

(b) The line L is perpendicular to another line M. If the two lines meet at point P, find the equation of the line M in the form $\frac{x}{a}+\frac{y}{b}=1$. (4 marks)

c) If the line M is parallel to line N which passes through point $R(-1,2)$, find the equation of the line N. (3 marks)

18. Using a ruler and a pair of compasses only construct triangle ABC such that angle BAC= 90^0, AC= 5 cm and BC = 10 cm. (3 marks)

(a) Circumscribe a circle on the triangle ABC constructed above (3 marks)

(b) Measure the radius of the circle (1 mark)

(c) Find the difference in the area of the circumcircle and the triangle. (3 marks)

19. A and B are two points on latitude 40^0 N. The two points lie on the longitude 80^0 W and 100^0 E respectively. (taking $\pi = \frac{22}{7}$ and R = 6370 km) .

(a) Calculate;

(i) The distance from A to B along the parallel of latitude. (3 marks)

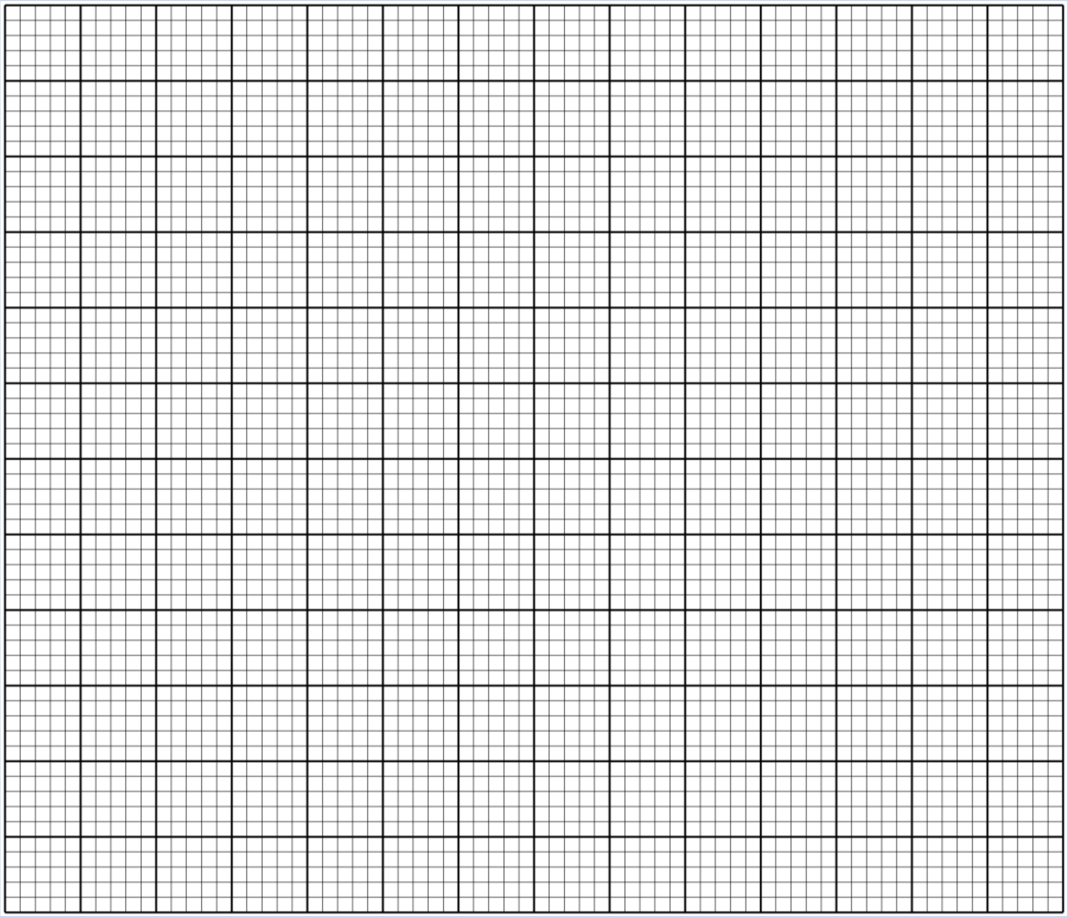
(ii) The distance from A to B along the greater circle. (3 marks)

(b) Two planes P and Q left A for B at 400 knots and 600 knots respectively. If P flew along the great circle and Q along the parallel of latitude, which one arrived earlier and by how much? Give your answer to the nearest minute. (4 marks)

20. (a) Complete the table below for the equation $y = x^3 + 4x^2 - 5x - 5$ for $-5 \leq x \leq 2$ (2 marks)

x	-5	-4	-3	-2	-1	0	1	2
y		15					-5	

(b) On the grid provided , draw the graph of $y = x^3 + 4x^2 - 5x - 5$ for $-5 \leq x \leq 2$ (3 marks)



(c) Use your graph to solve the equation $x^3 + 4x^2 - 5x - 5 = 0$ (2 marks)

(d) By drawing a suitable straight line on the graph, solve the equation $x^3 + 4x^2 - 5x - 5 = -4x + 1$ (3 marks)

21. The displacement, S meters of a moving particle after t seconds is given by $S = 2t^3 - 5t^2 + 4t + 3$
Determine:

(a) The velocity of the particle when $t = 4$ seconds (3 marks)

(b) The value of t when the particle is momentarily at rest (3 marks)

(c) The displacement when the particle is momentarily at rest (2 marks)

(d) The acceleration of the particle when $t = 10$ seconds (2 marks)

22. A bus left Bondo at 8:00 a. m. and travelled towards Kisumu at an average speed of 80 km/hr. At 8:30 a.m. a car left Kisumu for Bondo at an average speed of 120 km/hr. Given that the distance between Bondo and Kisumu is 400 km. Calculate:

(a) The time the car arrived in Bondo (2 marks)

(b) The time the two vehicles met. (4 marks)

(c) The distance from Bondo to the meeting point (2 marks)

(d) The distance of the bus from Kisumu when the car arrived in Bondo. (2 marks)

23. A solid consists of a cone and hemisphere. The common diameter of the cone and hemisphere is 16 cm and the height of the cone is 6 cm. Using π=3.142

Calculate correct to two decimal places:

(a) The surface area of the solid (3 marks)

(b) The volume of the solid (4 marks)

(c) If the density of the material used to make the solid is 1.5 g/cm^3, calculate its mass in kilograms (3 marks)

24. The coordinates of a triangle ABC are $A(1,1)$, $B(3,1)$ and $C(1,3)$.

(a) Plot the triangle ABC on the grid provided. (1 mark)

(b) Triangle ABC undergoes a translation vector $\binom{2}{2}$. Obtain $A'B'C'$, the image of ABC under the transformation, write the coordinates of $A'B'C'$. (3 marks)

(c) $A'B'C'$ undergoes a reflection along the line $x = 0$ to obtain $A''B''C''$. On the same pair of axes, plot $A''B''C''$ and state its coordinates . (2 marks)

(d) $A''B''C''$ undergoes an enlargement scale factor -1, centre (0, 0) to obtain $A'''B'''C'''$. Draw triangle $A'''B'''C'''$ (2 marks)

(e) Describe fully, the transformation that maps triangle $A^{IV}B^{IV}C^{IV}$ with coordinates $A^{IV}(-3,-3)$, $B^{IV}(-3,-5)$ and $C^{IV}(-5,-3)$ onto triangle. (2 marks)

PAPER 2

SECTION I (50 MARKS)

Answer ALL the questions in this section.

1. Use logarithms to evaluate:

$$\sqrt[3]{\frac{45.3 \times 0.00697}{0.534}}$$

(4 marks)

2. a) Expand $\left(1 - \frac{1}{2}x\right)^6$ to fourth term. (2 marks)

b) Use the expansion above to evaluate $(0.98)^6$ (2 marks)

3. The price of a new car is shs. 800,000. If it depreciates at a constant rate to shs. 550,000 within 4 years, find the annual rate of depreciation. (3 marks)

4. Object A of the area $10cm^2$ is mapped onto its image B of area $60cm^2$ by a transformation whose matrix is given by P = $\begin{pmatrix} x & 4 \\ 3 & x+3 \end{pmatrix}$. Find the positive values of x. (3 marks)

5. Without using a calculator or mathematical tables, express $\frac{\sqrt{3}}{1-Cos\ 30^0}$ in surd form and simplify. (3 marks)

6. The position vector of A and B are a = 4**i** + 4**j** – 6**k** and b = 10**i** + 4**j** + 12**k.** D is a point on AB such that AD:DB is 2:1. Find the co-ordinates of D. (3 marks)

7. A variable Z varies directly as the square of X and inversely as the square root of Y. Find percentage change in Z if X is increased by 20% and Y decreased by 19%. (3 marks)

8. Pipe A can fill a tank in 2 hours, Pipe B and C can empty the tank in 5 hours and 6 hours respectively. How long would it take:

a) To fill the tank if A and B are left open and C is closed. (2 marks)

b) To fill the tank with all pipes open. (2 marks)

9. Given that Sin $\left(\frac{2}{3}x + 20^0\right)$– Cos $\left(\frac{5}{6}x + 10^0\right)$ = 0. Without using a mathematical table or a calculator, determine $\tan(x + 20^0)$. (3 marks)

10. Make P the subject of the formula $XY^P = Q^{PX}$ (3 marks)

11. The coordinates of the end points of diameter are A(2,4) B(−2,6). Find the equation of a circle in the form $ax^2 + by^2 + cx + dy + e = 0$ (3 marks)

12. A bag contains 10 balls of which 3 are red, 5 are white and 2 green. Another bag contains 12 balls of which 4 are red, 3 are white and 5 are green. A bag is chosen at random and a ball picked at random. Find the probability the ball so chosen is red. (3 marks)

13. The first, the second and sixth terms of an increasing arithmetic progression are the three consecutive terms of a geometric progression. If the first term of the arithmetic progression is 2, find:

a) Common difference of the arithmetic progression (2 marks)

b) Common ratio of the geometric progression. (1 mark)

14. Solve for x in the equation

$\frac{6x-4}{3} - \frac{2x-1}{2} = \frac{6-5x}{6}$ (2 marks)

15.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)

16.Given that 4y = 3 Sin $\frac{2}{5}x$ for $0 \leq x \leq 360.$ Determine:

a) Amplitude of the curve. (1 mark)

b) Period of the curve. (2 marks)

<u>SECTION II</u> (50 MARKS)

Answer any FIVE questions in this section.

17.Asteel manufacturing factory had a sample of 5 iron rods of various lengths. The lengths of the rods were measured and recorded in the table below:

Length (cm)		8-10	11-13	14-16	17-19	20-22	23-25	26-28
No. of rods		4	7	11	15	8	5	3

a) State the frequency of the modal class. (1 mark)

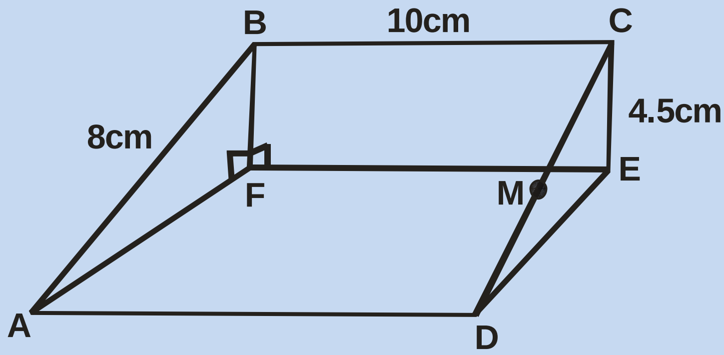
b) Using 18 as an assumed mean, calculate:

i) Actual mean (5 marks)

ii) Variance (3 marks)

iii) Standard deviation (1 mark)

18.



The above diagram represents a wooden prism. ABCD is a rectangle. Points E and F are directly below C and B respectively. M is the midpoint of CD. AB = 8cm, BC= 10cm and CE= 4.5cm.

a) The size of angle CDE. (2 marks)

b) Calculate:

i) Length of AC. (2 marks)

ii) The angle CAE makes with the plane ADEF. (2 marks)

c) Find the:

i) Length of MB. (2 marks)

ii) Angle CBM. (2 marks)

19.Anaeroplane flies from a point P(60^0N, 45^0W) to a point Q(60^0N, 135^0E). Given that the radius of the earth is 6370km,

a) Calculate the shortest distance between P and Q:

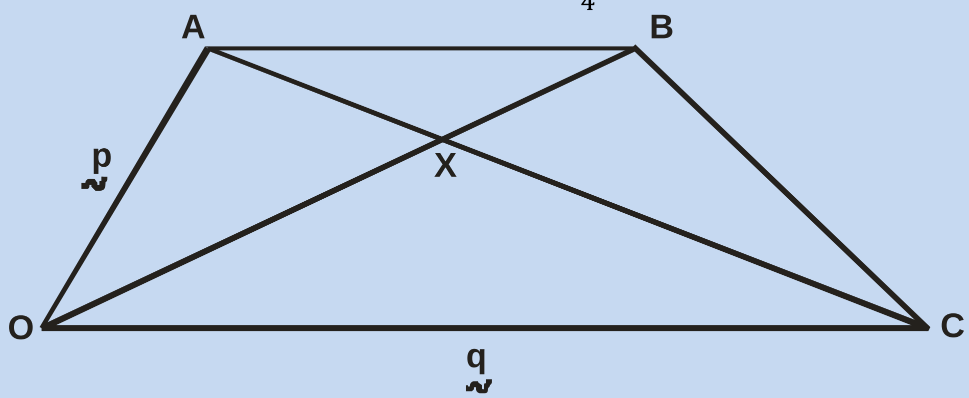
i) inkilometres (km) (3 marks)

ii) in nautical miles (nm) (1 mark)

b) If the plane flew at a speed of 600 knots, how long did it take to move from P to Q.? (2 marks)

c) The plane left P at 10.00a.m on Monday. At what time did it arrive at Q if it travelled along a parallel latitude at the same speed. (4 marks)

20.In the figure belowOA = **p** and OC = **q**. Vector AB =$\frac{3}{4}$OC. Express in terms of unit vectors **p** and **q** the vectors.



a)

i) AC (1 mark)

ii) OB (1 mark)

iii) BC (1 mark)

b) Vector AC intersects with vector OB at X such that AX = tAC and OX = hOB. By expressing OX in two ways in terms of t and h,
Find:

i) Scalars t and h (5marks)

ii) the ratio OB: BX (2 marks)

21.Two fair dice one a regular tetrahedron (4 faces) and the other a cube are thrown. The scores are added together. Complete the table below to show all possible outcomes. (2 marks)

		CUBE					
		1	2	3	4	5	6
ETRAHEDRON	1						

2
3
4

a) Find the probability that:

i) The sum is 6. (1 mark)

ii) The sum is an odd number. (1 mark)

iii) The sum is 6 or 9. (2 marks)

b) If a player wins a game by throwing a sum of 6 or 9, draw a tree diagram and use it to find probability that he wins at least once when the dice are thrown twice. (4 marks)

22.The table below shows the income tax rates for a certain year.

Taxable pay per month Ksh	Tax rate
1 -9680	10%
9681 – 18800	15%
18801 – 27920	20%
27921 – 37040	25%
37040 – and above	30%

That year Mary paid net tax of Ksh.5,512 p.m. Her total monthly taxable allowances amounted to Ksh.15220 and he was entitled to a monthly relief of Ksh. 162. Every month the following deductions were made.

- NHIF – Ksh.320
- Union dues – Ksh.200
- Co-operative shares – Ksh.7500

a) Calculate Mary's monthly basic salary in Ksh. (7 marks)

b) Calculate her monthly net salary. (3 marks)

23. A number of people working at a factory decided to raise 72000 to buy a plot of land. Each person was to contribute the same amount. Before contributions five people retired from working at the factory and thus did not contribute. The same target of 72000 was still to be met by the remaining.

a) If n stands for the number of people working in the factory originally, show that the increase in the contribution per person was shs. $\frac{360000}{n\,(n-5)}$ (3 marks)

b) If the increase in contribution per person was sh.1200, find the number of people originally working at the factory. (4 marks)

c) Calculate the percentage increase in the contributions per person caused by retirement, giving your answer to one decimal place. (3 marks)

24. a) Complete the table below for the functions y = 3Sin x and y = 4Cos (2x - 10) (2 marks)

x	0	15	30	45	60	75	90	105	120	135	150	165
3Sin x	0	0.78						2.90			1.50	
4Cos (2x-10)	3.94		2.57			3.06				-0.69		3.06

b) Using a scale of 1cm to rep 1 unit on the vertical axis and 1cm to rep 150 on the horizontal axis, draw both curves on the same axes. (5 marks)

c) Use your curves to solve 3 Sin x – 4 Cos (2x -10) = 0 (2 marks)

d) State the phase angle of the curve y = 4 Cos (2x -10) (1 mark)

PANGANI GIRLS

PAPER 1

SECTION I (50 marks)

Answer ALL the questions in this section

1. Evaluate $\frac{3/_4 + 1\,5/_7 \div 4/_7\ of\ 2\,1/_3}{1\,3/_7 - 5/_8 \times 2/_{15}}$ (3 marks)

2. Simplify $\frac{4x^2 - 9}{8x^2 + 6x - 9}$ (3 marks)

3. Two similar solid cones made of the same material have masses of 800g and 100g respectively. If the base area of the smaller cone is 38.5cm^2, calculate;

   a) The base area of the larger cone (2 marks)

   b) The radius of the larger cone (2 marks)

4. Given that $cos(2x)° - sin(2x - 30)° = 0$. Calculate the value of sin x (3 marks)

5. A line L passes through point (-5, 3) and is parallel to the line $y + {}^{1}/_{2}\,x - 5 = 0$. Determine the equation of the line L in the $y = mx + c$. (3 marks)

6. A Kenyan bank buys and sells foreign currency as shown in the table below.

	Buying (Kshs.)	Selling (Kshs.)
1 US dollar	95.34	95.87
1 UK pound	124.65	125.13

A tourist arrived in Kenya with 15000 pounds which he converted into Kshs. at a commission of 8%. He later used half of the money before changing the balance into dollars at no commission. Calculate to the nearest dollar the amount he received. (3 marks)

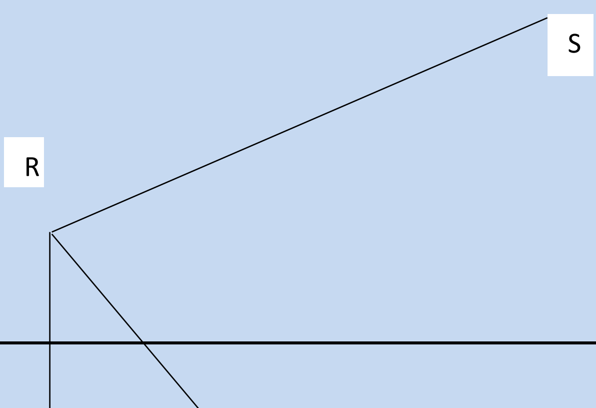
7. Find all the integral values of x which satisfy the inequalities (3 marks)

$20 - x > 5 + 2x \geq x + 5$

8. A man is now three times as old as his daughter. In twelve years' time he will be twice as old as his daughter. Find their present ages. (3 marks)

9. The point P(5, 4) is mapped onto $P^1(9, 3)$ under a translation T. Find the co-ordinates of the image of Q(6, 8) under the same translation. (3 marks)

10. The figure below shows a solid wedge PQRSTU. Complete the solid showing all the hidden edges with dotted lines. (3marks)



P

11. Two machines X and Y working together can do some work in 6 days. After 2 days machine X breaks down and it takes machine Y 10 days to finish the remaining work. How long will it take machine X alone to finish the whole work if it does not break down. (3 marks)

12. Solve for X in the equation. (3 marks)

$$(\log_4 X)^2 = \frac{1}{2}\log_4 X + \frac{3}{2}$$

13. The area of a rhombus is 60cm^2 given that one of its diagonals is 15cm long, calculate the perimeter of the rhombus. (4 marks)

14. The sum of interior angles of a regular polygon is 24 times the size of the exterior angle. Find the number of sides of the polygon and hence name it. (3 marks)

15. Using tables, find the reciprocal of 0.432 and hence evaluate $\frac{\sqrt{0.1225}}{0.432}$ (3 marks)

16. a) Matrices P and Q are given by P = $\begin{pmatrix} 3 & 1 & 2 \end{pmatrix}$and Q = $\begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix}$ Find the product PQ. (1 mark)

b) Given A = $\begin{pmatrix} 10 & 7 & 5 \\ 9 & 11 & 12 \end{pmatrix}$ and B $\begin{pmatrix} 3 & 4 \\ 1 & 6 \\ 0 & 3 \end{pmatrix}$ find AB (2 marks)

SECTION I (50 marks)

Answer ANY five questions in this section

17. Four towns P, Q, R and S are such that Q is 160km from town P on a bearing of 065°. R is 280km on a bearing of 152° from Q. S is due west of R on a bearing of 155° from P. Using a scale of 1cm to represent 40km.

a) Show the relative positions of P, Q, R and S. (6 marks)

b) Find the bearing of;

(i) S from Q (1 mark)

(ii) P from R (1 mark)

c) Find the distance

(i) PS (1 mark)

(ii) RS (1 mark)

18. (a) Complete the table below for the function $y = 2x^2 + 3x - 5$. (2 marks)

x	-4	-3	-2	-1	0	1	2
$2x^2$		18			0		
$3x$	-12			-3			6
-5							
y							

(b) On the grid provided draw the graph of $y = 2x^2 + 3x - 5$ for $-4 \leq x \leq 2$ (4 marks)

(c) Use your graph to state the roots of

(i) $2x^2 + 3x - 5 = 0$ (1mark)

(ii) $2x^2 + 6x - 2 = 0$ (3marks)

19. A particle moves from rest and attains a velocity of 10m/s after two seconds it then moves with 10m/s velocity for 4 seconds. It finally decelerates uniformly and comes to rest after 6 seconds.

a) Draw a velocity time graph for the motion of this particle (3 marks)

b) From the graph find;

(i) the acceleration during the first two seconds. (2 marks)

(ii) the uniform deceleration during the last six seconds. (2 marks)

(iii) the total distance covered by the particle (3 marks)

20. a) Find the gradient of a line L_1 perpendicular to the line whose equation is $y = x + 4$ (2 marks)

b) Calculate the angle in which line L_1 is making with

(i) x-axis (2 marks)

(ii) y-axis (1 mark)

c) Line L_2 is passing through the x-axis at 2 and point T(-2, k) and it is parallel to line L_1. Calculate the value of K. (2 marks)

d) Another line L_3 is perpendicular to line L_2 and passes through point T. Calculate the equation of line L_3 leaving your answer in the form $ax + by + c = 0$ (3 marks)

21. In the figure below P, Q, R and S are points on the circle centre O. PRT and USTV are straight lines. Line UV is a tangent to the circle at S. Angle RST is 50^0 and angle RTV is 150^0.

a) Calculate the size of:

i. angle ORS (2 marks)

ii. angle USP (1 mark)

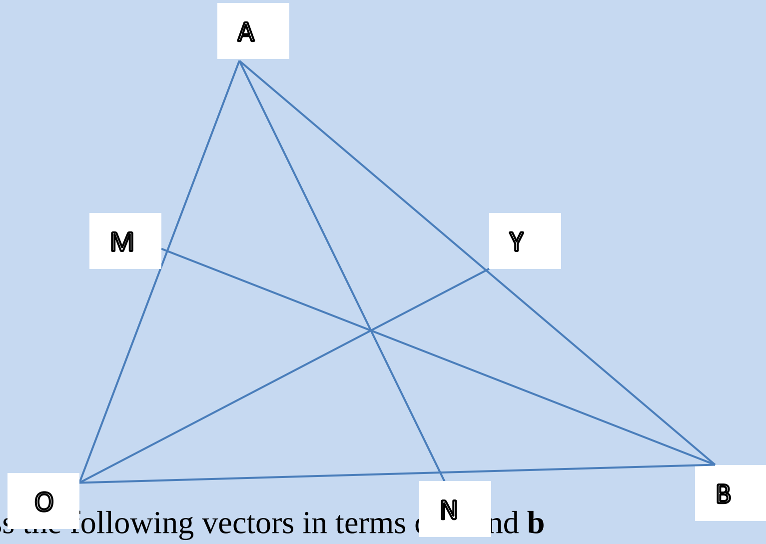
iii. angle PQR (2 marks)

b) Given that RT=7cm and ST=9cm, calculate to three significant figures:

i. the length of line PR (2 marks)

ii. the radius of the circle. (3 marks)

22. The figure below is triangle OAB in which **OA** = **a** and **OB** = **b**. M and N are points on **OA** and **OB** respectively such that OM:MA = 1:3 and ON:NB = 2:1.



(a) Express the following vectors in terms of **a** and **b**

(i) **AN** (1 mark)

(ii) **BM** (1 mark)

(iii) **AB** (1 mark)

(b) Lines AN and BM intersect at X such that AX=hAN and BX=kBM. Express OX in two different ways and find the value of h and k. (6 marks)

(c) OX produced meets AB at Y such that AY:YB =3:2. Find AY in terms of a and b. (1 mark)

23. Two circles with centres O_1 and O_2 have radii 10cm and 8cm respectively and intersect at points A and B. Angle $AO_1B = 90°$ and angle $AO_2B = 124.23°$. Calculate to two decimal places;

a) The length AB (2 marks)

b) The length O_1O_2 (2 marks)

c) Area of minor segment centre O_1 (3 marks)

c) Area of quadrilateral O_1AO_2B (3 marks)

24. PQR is a triangle with coordinates; P(3, 3), Q(5, 1) and R (2, 1). P'Q'R' is the image of PQR under an enlargement such that the coordinates are P'(-3, 0), Q'(-7, 4) and R'(-1, 4). Using a scale of 1:1 on both axes;

(a) (i) Plot PQR and P'Q'R' hence locate the centre of enlargement by construction. (4 marks)

(ii) State the scale factor of the enlargement. (2 marks)

(b) P''Q''R'' is the image of PQR under a translation $T\begin{pmatrix}1\\3\end{pmatrix}$. Plot P"Q"R". (2 marks)

(c) P'''Q'''R''' is the image of PQR under a reflection whose mirror line is $y = -2$. Plot P'''Q'''R'' (2 marks)

PAPER 2

SECTION I (50 marks)

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

1. Evaluate without using tables or calculators. (3 marks)

$$\frac{\log {}^{1}\!/_{2} + \log 64}{\log\left(\frac{1}{32} \div \frac{1}{8}\right)}$$

2. Make *w* the subject of the formulae. $2x = \sqrt{\frac{2w+8}{3w-5}}$ (3marks)

3. Two pipes, P and Q can fill an empty tank in 3 hours and 4 hours respectively. It takes 5 hours to fill the tank when an outlet pipe R is opened the same time with the inlet pipes. Calculate the time pipe R takes to empty the tank. (3 marks)

4. Given that ***OM=i – 3j + 4k, ON= 6i + 3j – 5k*** and ***OQ* = 2OM + 5ON**, find the magnitude of **OQ** to 3 significant figures. (3 marks)

5. A triangle ABC is such that a =14.30 cm, b =16.50 cm and B =56º. Find the radius of a circle that circumscribes the triangle. (3 marks)

6. The third and sixth terms of a geometric progression (G.P.) are -64 and 8 respectively. Find;

(a) The common ratio, (2marks)

(b) The first term of the G.P. (1mark)

7. Calculate the standard deviation of the set of numbers
29. 31, 28, 29, 31. 46, 39, 31, (3 marks)

8. Grace deposited Ksh 16 000 in a bank that paid simple interest at the rate of 14% per annum. Joyce deposited the same amount of money as Grace in another bank that paid compound interest semi-annually. After 4 years, they had equal amounts of money in the banks.

Determine the compound interest rate per annum, to I decimal place, for Joyce's deposit.(3 marks)

9. Simplify $\frac{3\sqrt{2}}{\sqrt{5}-\sqrt{2}}$, leaving the answer in the form a + b $\sqrt{c}$, where a, b and c are rational numbers

(3 marks)

10. The table below shows income tax rates in a certain year.

Monthly income in Ksh	Rate in each Ksh
1 – 9680	10%
9681 – 18800	15%
18801 – 27920	20%
27921 – 37040	25%
Over 37040	30%

In that year, a monthly personal tax relief of Ksh. 1056 was allowed. If the monthly income tax paid by an employee was Ksh 4249 calculate his monthly taxable income. (3 marks)

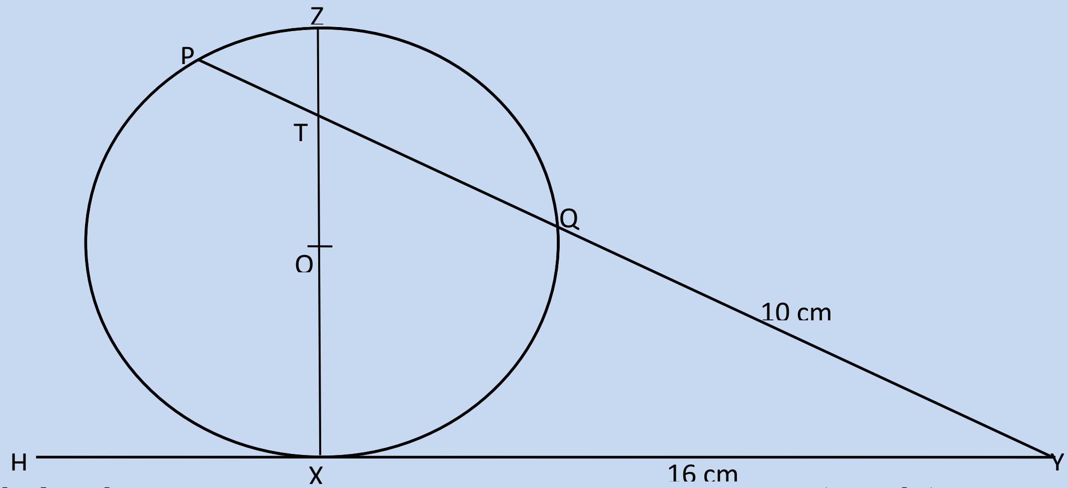
11. Grade I coffee cost sh 500 per kilogram while grade II coffee costs sh 400 per kilogram. The grades are mixed to obtain a mixture that costs sh 420 per kilogram. In what ratio should the two grades be mixed? (3 marks)

12. The base length and height of parallelogram were measured as 8.4 cm and 4.5 cm respectively. Calculate the percentage error in the area of the parallelogram. (3 marks)

13. The equation of a circle is $x^2 + y^2 + 6x — 14y + 58 = r^2$ If the circle passes through the point (2, 7). Determine its radius and the coordinates of it centre. (4 marks)

14. Find the gradient of the curve $y = x^2\left(x + \frac{1}{2} - \frac{1}{x}\right)$ at point $\left(1, \frac{1}{2}\right)$ (3marks)

15. In the figure below, the tangent HXY meets chord PQ produced at Y. Chord XZ passes through the centre, O, of the circle and intersects PQ at T. Line XY = 16 cm and QY = 10 cm.



(a) Calculate the length PQ. (2 marks)

(b) If ZT = 4 cm and PT: TQ = 3:5, find XT. (2 marks)

16. Quantity P varies partly as Q and partly varies inversely as square of Q. When Q = 1, P = 1 and when Q = ½, P = -3. Find the equation of the relationship connecting P and Q. (3 marks)

SECTION II (50 Marks)

Answer any five questions from this section.

17. A certain Sub-county advertised for a tender to construct its headquarters. Two contractors A and B assessed the work. Contractor A indicated would do the same work in 12 months while contractor B indicated would do the same work in 18 months. The two contractors were awarded the tender. Contractor B did the work for three months then it was joined by contractor A.

(a) Determine;

(i) The fraction of the work done by contractor B in 3 months, (2 marks)

(ii) How long the two contractors took to complete the remaining work. (4 marks)

(c) Given that contractors A and B would incur expenditure amounting to sh 120 000 per month and sh 90 000 per month respectively, calculate the total expenditure of each contractor.

(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 $\frac{2}{7}$

(a) Illustrate this information on a tree diagram. (2marks)

(b) Determine the probability that a candidate is awarded

(i) Credit for passing both tests. (2marks)

(ii) Pass for passing the written test. (2marks)

(iii) Retake for passing one test. (2marks)

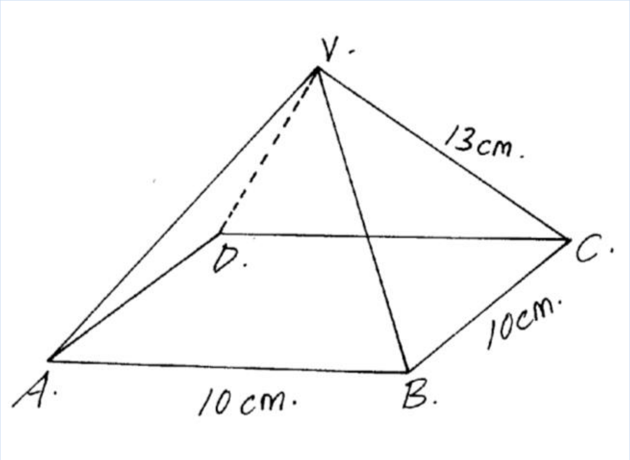
(iv) Fail for not passing the written test. (2marks)

19. (a) Construct triangle PQR with PQ = 7.2cm, QR = 6.5cm and angle PQR = 48^0 (3marks)

(b) The locus L1, of points equidistant from P and Q, and locus , L2 of points equidistant from P and R, meet at M. Locate M and measure QM (4marks)

(c) A point x moves within triangle PQR such that QX ≥ QM. Shade and label the locus of X. (3marks)

20. The figure below shows a square ABCD point V is vertically above middle of the base ABCD. AB = 10cm and VC = 13cm.



Find;

(a) The length of diagonal AC (2marks)

(b) The height of the pyramid (2marks)

(c) The acute angle between VB and base ABCD. (2marks)

d) The acute angle between BVA and ABCD. (2marks)

e) The angle between AVB and DVC. (2marks)

21. The table below shows the distribution of ages in years of 50 adults who attended a clinic:-

Age	21-30	31-40	41-50	51-60	61-70	71-80
Frequency	15	11	17	4	2	1

(a) State the median class (1 mark)

(b) Using a working mean of 45.5, calculate:-

(i) The mean age (3 marks)

(ii) The standard deviation (3 marks)

(iii) Calculate the 6^{th} decile. (3 marks)

22. An aircraft leaves A(60^0N,13^0W) at 1300 hours and arrives at B(60^0N, 47^0E) at 1700 hrs

(a) Calculate the average speed of the aircraft in knots. (3marks)

(b) Town C (60^0N, 133^0W)has a helipad. Two helicopters S and T leaves B at the same time. S moves due West to C while T moves due North to C. If the two helicopters are moving at 600 knots.

(i) The time taken by S to reach C (2marks)

(ii) The time taken by T to reach C (2marks)

(c) The local time at a town D (23^0N, 5^0W) is 1000 hours. What is the local time at B.? (3marks)

23). A certain uniform supplier is required to supply two types of shirts: one for girls labelled G and the other for boys labelled B. The total number of shirts must not be more than 400.He has to supply more of type G than of type B. However the number of type G shirts must not be more than 300 and the number of type B shirts must not be less than 80. By taking x to be the number of type G shirts and y the number of type B shirts,

(a) Write down in terms of x and y all the inequalities representing the information above. (3 marks)

(b) On the grid provided draw the inequalities and shade the unwanted regions. (4marks)

(c) Given that type G costs Shs. 500 per shirt and type B costs Shs. 300 per shirt.

(i) Use the graph in (b) above to determine the number of shirts of each type that should be made to maximize profit. (1mark)

(ii) Calculate the maximum possible profit. (2marks)

24. A transformation represented by the matrix $\begin{pmatrix} 2 & 1 \\ 1 & -2 \end{pmatrix}$ maps the points A(0, 0), B(2, 0), C(2, 3) and D(0, 3) of the quad ABCD onto $A^1B^1C^1D^1$ respectively.

a) Draw the quadrilateral ABCD and its image $A^1B^1C^1D^1$. (3marks)

b) Hence or otherwise determine the area of $A^1B^1C^1D^1$. (2 marks)

b) Another transformation $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ maps $A^1B^1C^1D^1$ onto $A^{11}B^{11}C^{11}D^{11}$.
Draw the image $A^{11}B^{11}C^{11}D^{11}$. (2mks)

c) Determine the single matrix which maps $A^{11}B^{11}C^{11}D^{11}$ back to ABCD. (3mks)

KENYA HIGH

PAPER 1

1. Without using a calculator, evaluate (3mks)

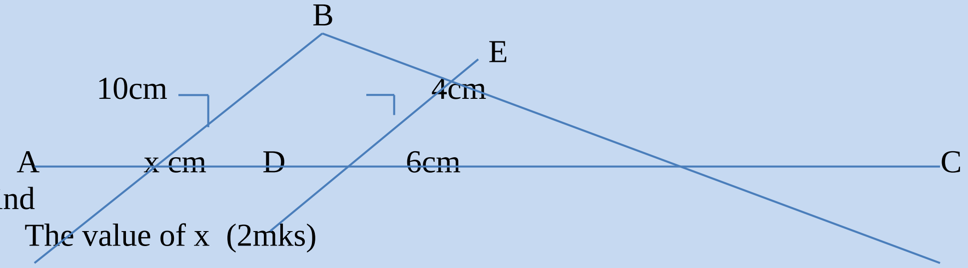
$$\frac{2\frac{1}{4}+\frac{3}{5}\div\frac{5}{6}of\ 2\frac{2}{5}}{1\frac{7}{10}}$$

2. A number n is such that when it is divided by 3,7,11 or 13, the remainder is always one. Find the number n (2mks)

3. Solve the inequality $3-2x \leq x \leq \frac{2x+5}{3}$ and show the solution on the number line (3mks)

2

4. In the figure below AB is parallel to DE and area of triangle DEC is $8cm^2$.



Find

a. The value of x (2mks)

b. The area of quadrilateral ABED (2mks)

5. A bank in Kenya buys and sells foreign currencies as follows;

Currency	Buying(Ksh)	Selling (Ksh)
1 sterling Pound	132.40	132.75
1 US dollar	70.40	70.84

A tourist arrived in Kenya with US dollar 3500. He converted all the dollars to Kenya shillings at the bank. While in Kenya, he spent Ksh115,000 and then converted the remaining amount to sterling Pounds. Calculate the amount he received in Sterling pounds (3mks)

6. Solve for x given that; (2mks)
$\cos(2x - 40)° = \sin(-20 + 3x)°$

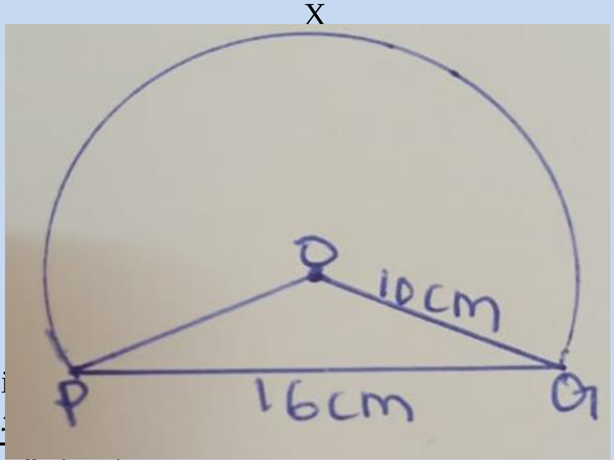
7. The size of an interior angle of a regular polygon is 3x° while its exterior angle is (x-20)°. Find the number of sides of the polygon. (3mks)

8. Log 5 -2 +log (2x+10) = log (x-4) (3 mks)

9. Find the equation of the perpendicular bisector of a straight line passing through the points P(2,7) and Q(4,3) giving your answer in the form ax +by +c =0 (4mks)

10. The figure below shows a sector of a circle with centre O, radius 10cm. The chord PQ=16cm Calculate the area of the sector PXQ (4mks)

X



11. Si

3

$9x^2-y^2$

12. Use the reciprocal tables to evaluate (3mks)

$$\frac{5}{0.00321}+\frac{23}{0.586}$$

5

13. The volumes of two similar solid cylinders are $4752cm^3$ and $1408cm^3$. If the area of the curved surface of the smaller cylinder is $352cm^2$, find the area of the curved surface of the larger cylinder (4mks)

14. A bus takes 195 minutes to travel a distance of (2x +30) km at an average speed of (x-20)km/h. Calculate the actual distance travelled. Give your answer in kilometres (3mks)

15. Given that OA =3i -2j and OB=4i+j. Find the distance between points A and B correct to 1 decimal place (2mks)

6

16. Murimi and Naliaka had each 288 tree seedlings.Murimi planted equal number of seedlings per row in x rows while Naliaka planted equal number of seedlings in (x+1) rows. The number of tree seedlings planted by Murimi in each row were 4 more than those planted by Naliaka in each row. Calculate the number of seedling Murimi planted in each row. (4 mks)

7

SECTION II.(ANSWER FIVE QUESTIONS ONLY

17. Two business partners Mary and John contributed Ksh.60000 and Ksh90000 respectively to start up a business. After 6 months, Lucy joined the business partnership and contributed Ksh.100000. At the end of the year, a gross profit of Ksh.720000 was realized. They then agreed to re-invest 30% of the profit accrued back into the business and use 20% of the profit for running the business operations. The remainder was to be shared among the business partners in the ratio of their contribution.
    a. Calculate the amount;
        i. Re-invested into the business (2mks)
        ii. Used for business operations (1mk)
    b. Calculate the amount of profit each partner got (4mks)

c. If the amount put back into the business was added to individual's shares proportional to their initial contribution, find the amount of each partner's shares (3mks)

18. A bus left Nairobi at 7.00a.m and travelled towards Eldoret at an average speed of 80km/h. At 7.45a.m a car left Eldoret towards Nairobi at an average speed of 120km/h. Given that the distance between Nairobi and Eldoret is 300km. Calculate;

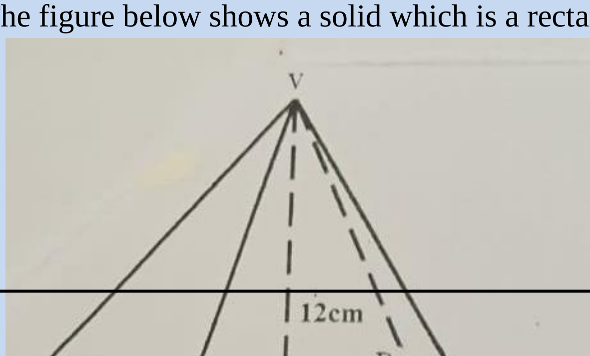
a. The time the bus arrived at Eldoret (2mks)

b. The time of the day, the two met (3mks)

c. The distance from Nairobi where the two met (2mks)

d. The distance of the bus from Eldoret when the car arrived in Nairobi (3 mks)

19. The figure below shows a solid which is a rectangular based pyramid of height 12cm.



a. Calculate the slanting length VC (2mks)

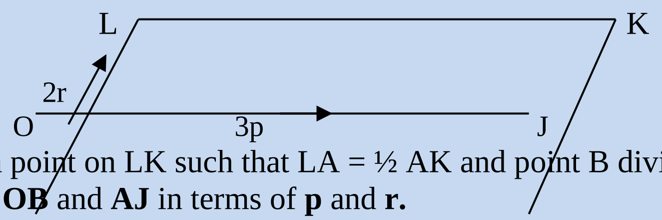
b. Calculate the surface area of the pyramid (4mks)

c. Calculate the volume of the pyramid (2mks)

d. Determine the density of the metal which make this solid if its mass is 1.632kg (2mks)

10

20. In the figure below OJKL is a parallelogram in which OJ = $3\tilde{p}$ and OL = $2\tilde{r}$



a) If A is a point on LK such that LA = ½ AK and point B divide the line JK externally in the ratio 3:1, express **OB** and **AJ** in terms of **p** and **r.** (2 marks

b) Line OB interests AJ at X such that **OX** = m**OB** and **AX** = n**AJ.**

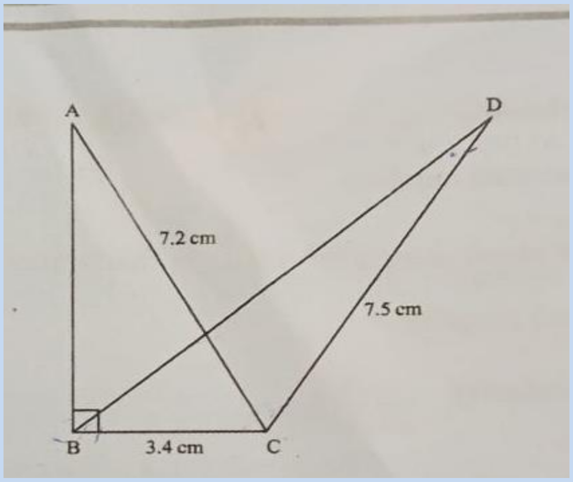
i) Express OX in terms of p, r and m. (1 mark)

ii) Express OX in terms of p, r and n (1 mark)

iii) Determine the value of *m* and *n* and hence the ratio in which point x divides line AJ. (6 marks)

11

21. The figure below shows two triangles, ABC and BCD with a common base BC=3.4cm, AC=7.2cm, CD=7.5cm and <ABC=90°. The area of triangle ABC=Area of triangle BCD.



Calculate correct to one decimal place;

a. The area of triangle ABC (3mks)

b. The size of <BCD (3mks)

c. The length of BD (2mks)

d. The size of <BDC (2mks)

12

22. The equation of a curve is $y=x^3+4x^2 -3$.

a. Fill in the table below for the curve $y=x^3+4x^2 – 3$ (2mks)

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

b. On the grid provided, draw the curve $y=x^3+4x^2 -3$ for the range $-4\leq x \leq 1$ scale: Horizontal axis 2cm represent 1 unit vertical axis 1cm rep 1 unit (3mks)

c. Use your graph to solve

i. $x^3 +4x^2 – 3 = 0$ (2mks)

ii. $4x^3 +16x^2 –x – 16 = 0$ (3mks)

23. (a) A straight line L_1 whose equation is $y-2x=4$ meets the x-axis at M. Determine co-ordinates of M. (1mk)

(b) A second line L_2 is perpendicular to L_1 at M. Find the equation of Line L_2 in the form $ax+by+c=0$ where a,b and c are integers. (3mks)

(c) A third line L_3 passes through (2,3) and is parallel to L_1. Find;

i. The equation of L_3 in the form $y=mx +c$ (3mks)

ii. Point N, the intersection of L_2 and L_3 (3mks)

24. A curve is represented by the function $y=x^3 +x^2 – x$

a. Find $\frac{dy}{dx}$ (1mk)

b. Determine the values of y at the turning points of the curve $y =x^3 +x^2 –x$ (4mks)

c. Determine the nature of the turning points (2mks

d. In the space provided below, sketch the curve of $y=x^3+x^2-x$ (3mks)

PAPER 2

1. The length and width of a rectangle were measured as 12.4cm and 5.0cm respectively. Find to 4 significant figures, the percentage error in the area of the rectangle (3mks)

2. Simplify ; $\frac{\sqrt{24}+3\sqrt{2}}{\sqrt{2}}$ (2mks)

3. A chord AB whose length is 8cm subtends an angle APB =60° at the circumference of a circle. Calculate to 4 significant figures;
   a. The perpendicular distance from the centre of the circle to the chord (2mks)

   b. The radius of the circle (2mks)

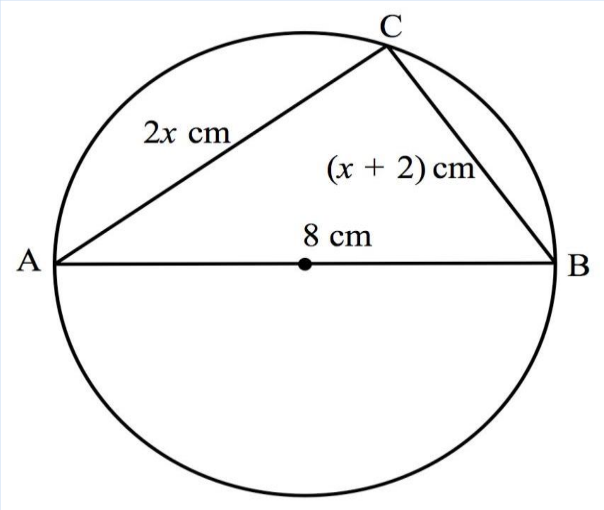
4. Make h the subject of the formula (3mks)

   2

   $S=\sqrt{\frac{wd}{h}(h-\frac{d}{2})}$

5. Tap A takes 4 hours to fill a tank when empty, tap B takes 3 hours to fill the same tank when empty. Tap C takes 6 hours to empty the same tank when full. Tap A is opened then one hour later tap B and tap C are opened simultaneously. Calculate the total time it takes to fill the tank (3mks)

6. In the figure below, AB is a diameter of the circle and AB=8cm, BC=(x+2)cm and AC=2x cm.   Calculate the length of AC to 2 decimal places (4mks)

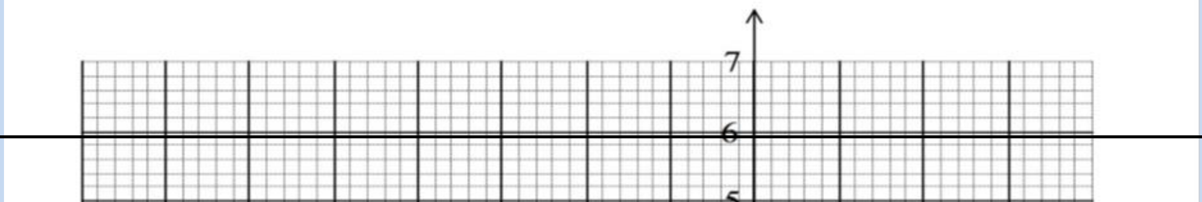


7. Given that Cos 2x°=0.8070, find x to 1 decimal place when $0° \leq x \leq 360°$ (4mks)

8. (a) Expand$(3+x)^6$ upto the terms in x^3 (2 marks)

(b) Use the expansion in (a) above to estimate $(2.97)^6$ correct to 4 decimal places. (2 marks)

9. The equation of a circle is $x^2 + y^2 + 4x - 2y - 20 = 0$. On the grid provided below, draw the circle.(4 mark



10. The weights of six boys in kilograms are 10,11, 12, 13, 14, and 15 while those of six girls are 8, 9, 10, 11,12 and 13. A boy and a girl are picked at random and the sum of their weight is recorded.

(a) Draw a probability space to show all the possible outcomes. (2 marks)

(b) Find the probability that the sum of their weights is at most 22 kilograms. (1 mark)

5

11. Use completing the square method to solve: $3x^2 + x - 10 = 0$ (3 marks)

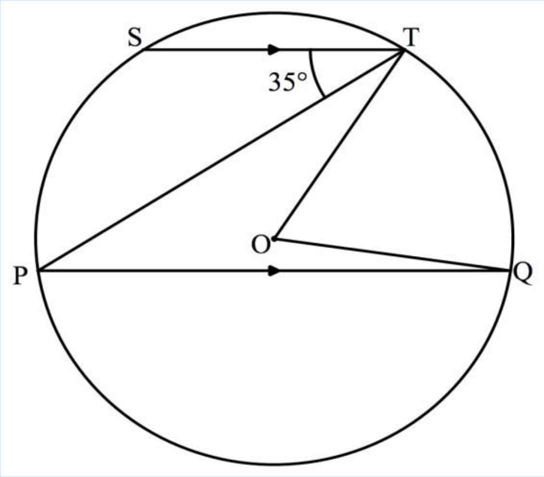
12. The value of a piece of land was Ksh. 400000 five years ago. Currently the piece of land is valued at Ksh. 587731.20 . Find the annual rate of appreciation of the piece of land. (3 marks)

13. Find the length of an arc of a circle which subtends an angle of 0·8 radians at the centre of the circle. The radius of the circle is 15 cm. (3 marks)

14. Lisa, a retailer buys two grades of rice. Grade A costing sh.90 per kilogram and grade B costing sh.120 per kilogram. She mixes the two grades of rice and sells the mixture at a cost of sh.127.5 per kilogram, making a profit of 25%. Find the ratio at which she mixed the two grades of rice. (3 marks)

6

15. The figure below O is the centre of the circle. PQ is parallel to ST and angle PTS = 35º. Find the size of reflex angle QOT (2 marks)



16. Given that **OP** = $-4\tilde{i}+10\tilde{j}$, **OQ** = $2\tilde{i}+\tilde{j}$ and **OR** = $6\tilde{i}-5\tilde{j}$. Show that the points P, Q and R are collinear. (3 marks)

Section II(50 marks)

Answer any five questions from this section in the spaces provided

17. The income tax rate of a certain year was as shown in the table below;

Monthly taxable income in Kenya shillings (Ksh)	Tax rate percentage (%) in each shilling.
0 to 9680	10
9681 to 18800	15

18801 to 27920	20
27921 to 37040	25
37041 and above	30

In that year Mwaniki's monthly earnings were as follows; Basic salary Ksh 35400, House allowance Ksh 7000, Medical allowance Ksh 5000, Transport allowance Ksh 4520, Hardship allowance Ksh10400 . Mwaniki was entitled to a monthly tax relief of Ksh 1162.

(a) Calculate Mwaniki's;

(i) Taxable income (2 marks)

(ii) Net tax (5 marks)

(b) Apart from income tax, the following monthly deductions were made; NHIF of Ksh 600, Sacco contributions of Ksh 1500 and 2% of his basic salary for widow and children pension scheme. Calculate Mwaniki's monthly net income from his employment. (3mks)

8

18. (a) A quantity y varies directly as the square of x and inversely as the square root of z. Given that $y = 16$ when $x = 4$ and $z = 25$,

(i) find the equation connecting y, x and z. (3 marks)

(ii) if *x* is increased by 20% and *z* decreased by 36%, find the percentage change in *y*. (3 marks)

(b) The cost (C) per day of feeding examiners in a marking centre partly varies as the number of senior examiners (S) present and partly inversely as the number of ordinary examiners (P) present. It costs sh.32000 to feed 60 senior examiners and 400 ordinary examiners. The cost of feeding 80 senior examiners and 640 ordinary examiners is sh.41250. Find the cost of feeding 100 senior examiners and 500 ordinary examiners. (4 marks

19. (a) The 8th and the 15th terms of an Arithmetic sequence are 31 and 59 respectively.

(i) Find the first term and the common difference (3 marks)

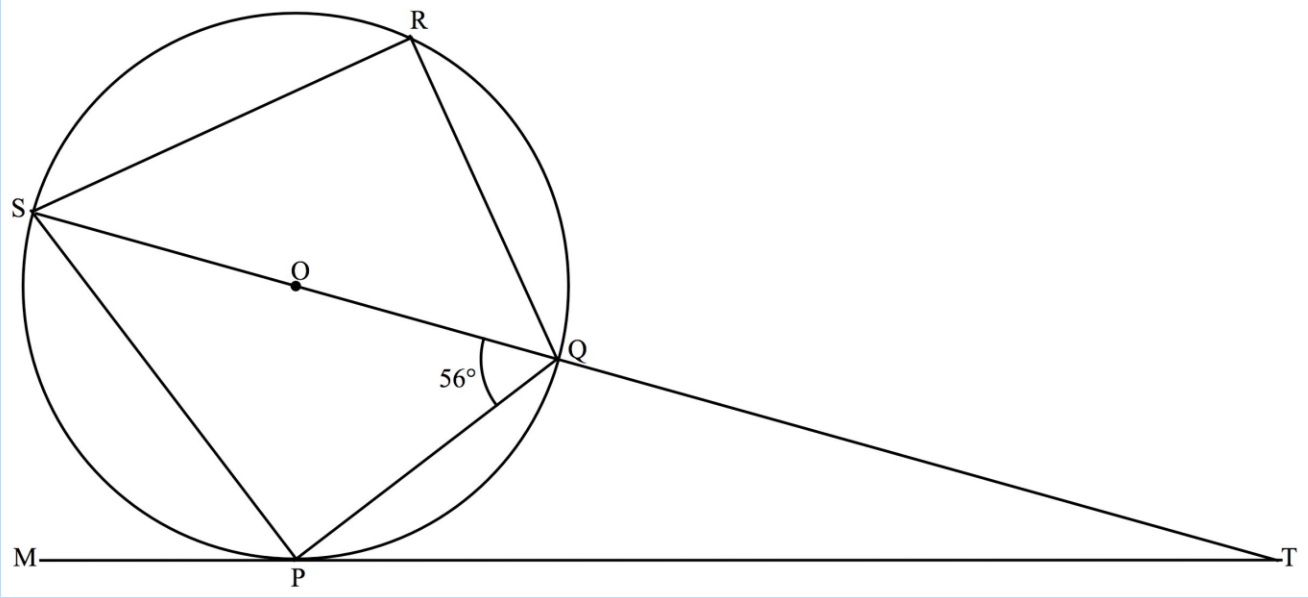
(ii) List the first 4 terms of the sequence (1 mark)

(iii) Find the sum of the first 20 terms of the sequence (3 marks)

(c) Jeremy’s salary is Ksh980000 per annum. His salary increases by 10% annually. Calculate the total amount to the nearest Ksh he will have earned in 7 years. (3 marks)

10

20. In the figure below O is the centre of the circle. MT is the tangent to the circle at point P. Angle PQS = 56°. PQRS are points on the circumference of the circle. SQT is a straight line.



Find:

(i) Angle PRQ (2 marks)

(ii) Angle QPT (2 marks)

(iii) Angle PTQ (2 marks)

(b) Given that QT = 5 cm and PT = 9.4 cm, calculate to 1 decimal place the area of the circle.
(Use ∏= 3.142) (4 marks

21. Find the area enclosed by the curve $y=x^2 - 2x + 5$ with the x-axis between x=2 and x=5 by using;

a. Trapezium rule using 6 trapezia (4mks)

b. Mid-ordinate rule using 3 mid-ordinate (4mks)

c. Find the percentage error in using the mid-ordinate rule as compared to the trapezium rule (2mks)

22. The marks scored by 40 students in mathematics test were as shown in the table below.

Mark	48-52	53-57	58-62	63-67	68-72	73-77
No of students	3	4	10	12	8	3

a. Using an assumed mean of 64, calculate the mean mark (4mks)

b. (i) On the grid provided, draw the cumulative frequency curve for the data (3mks)

c. Use the graph to estimate the semi interquartile range (3mks)

23. A ship sails from A(0°,70°W) due North to B (25°N, 70°W) then due east to C$(25°N, 12°E)$ and finally a further 1800 nautical miles due East to D

a. Calculate the total distance covered in nautical miles (4mks)

b. If the whole journey took a total time of 300 hours, find its average speed in knots correct to 1 decimal place (2mks)

c. Find to the nearest degree the final position of the ship (4mks)

24. A quadrilateral ABCD has vertices A(4,−4),B(2,−4),C(2,−2) and D(4,−2)

(a) On the grid provided, draw the quadrilateral ABCD. (1 mark)

(b) A′B′C′D′ is the image of ABCD under a transformation represented by the matrix

$$\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$$

Find the coordinates of A′, B′, C′ and D′,hence draw the quadrilateral A′B′C′D′ on the same grid provided. (3 marks)

16

(c) Given that A'(4,4) is mapped onto A''(−4,4) by a shear with the x −axis invariant, draw the quadrilateral A''B''C''D'' ,the image of A'B'C'D' under the shear. (3 marks)

(d) Determine a single matrix that maps ABCD onto A''B''C''D'' (3 marks)

ALLIANCE BOYS

PAPER 1

SECTION 1 (50 marks) Answer all questions in this section

1. Simplify without using a calculator. (3marks)

$$\frac{1\frac{4}{5} \text{ of } \frac{25}{18} \div 1\frac{2}{3} \text{ x } 24}{2\frac{1}{3} - \frac{1}{4} \text{ of } 12 \div \frac{5}{3}}$$

2. Find the size of each interior angle of a regular pentagon. (3marks)

3. Find all the integral values of x which satisfy the inequalities. (3marks)

$x + 8 > 4x - 6 \geq 3(4 - x)$

4. Three types of tea A, B and C are mixed in the ratio 2:3:5 by mass. Type A, B and C tea cost Ksh210, Ksh160 and Ksh120 respectively per kilogram. The blend is to be sold at a 30% profit. Determine the selling price of the blend per

kilogram. (3marks)

5. Determine the radius of a uniform cylindrical block 1.4m long and of density of $2.2 g/cm^3$ if the mass is 47432g ($\pi = \frac{22}{7}$) (3marks)

6. A boy whose height is 1.5 stands on the horizontal ground and observes that the top of flag pole, 10m away, makes angle of elevation of 40^0. Calculate the height of the flag post. (3marks)

7. Two similar cylinders have total surface areas of $45cm^2$ and $20cm^2$. If the larger has a mass of 81g . Find the mass of the smaller one. (3marks)

8. Find the values of x and y in (4marks)

$$2^{3x+y} \times 3^{4x-y} = 648$$

9. Simplify the following expression. (3marks)

$$\frac{3x^2 - 14xy - 5y^2}{3x^2 - 75y^2}$$

10. Use tables of reciprocals and cubes to evaluate to four significant figures. (3marks)

$$\frac{3}{0.375^3} - \frac{2}{981.7}$$

11. On Saturday October 15, 2017 the following were the buying and selling prices of foreign currencies in a certain bank.

	Buying(Ksh)	Selling(Ksh)
1 Euro	111.53	112.01
100 Japanese Yen	97.32	97.70

A Japanese travelling from Sweden arrived in Kenya with X Euros. He converted all the X Euros to Kenya shillings at the bank while in Kenya he spent a total of kenya shillings 350000 and then converted the remaining

Kenya shillings to Japanese Yen at the same bank at the same rates. If the Japanese received 32669396 Yen. Calculate the value of X. (3marks)

12. The GCD is 1620, 1800 and a third number is 180. The LCM of the three numbers is 8100. Find the difference between greatest and smallest possible third number. (3marks)

13. The position vectors of points A and B are $\begin{pmatrix} 6 \\ -2 \\ 9 \end{pmatrix}$ and $\begin{pmatrix} -9 \\ 4 \\ 3 \end{pmatrix}$ respectively, point C divides AB externally in the ratio 5:2. Find the position vector of C. (3marks)

14. The average mark scored by the first 27 students in a mathematics test is 52. The average mark scored by the remaining 37 is 58. Calculate the mean mark for the whole class. (3marks)

15. Five years ago, a mother's age was four times that of the daughter. In four years to come, she will be 2 ½ times the age of her daughter . Calculate the sum of their present ages. (3marks)

16. (a) Using a pair of compasses and a ruler only construct a triangle ABC and such that AB=4cm, BC=6cm and angle ABC=135^0. (2marks)

(b) Construct the height of triangle ABC in (a) above taking AB as the base, hence calculate the area of triangle ABC. (2marks)

SECTION II(50 MARKS) ATTEMPT FIVE QUESTIONS ONLY

17. (a) In a safari rally drivers are to follow a route ABCD. B is 250km from A on a bearing of 075^0, C is on a bearing of 110^0 from A and 280km from B. The bearing C from D is 220^0 and at a distance of 300km. By scale drawing, show the relative position of ABC and D. (5marks)

(b) Determine

(i) the distance of A from C (1mark)

(ii) the compass bearing of B from C. (2marks)

(iii) The distance and the true bearing of A from D. (2marks)

18. The vertices of triangle PQR are P(2,4) Q(4,6) and R(5,1). The vertices of its image under a rotation are $P^1(-3,-1)$ $Q^1(-5,1)$ and $R^1(0,2)$

(a) (i) On the grid provided, draw PQR and $P^1Q^1R^1$ (2marks)

(ii) By construction, determine the centre and the angle of rotation. (3marks)

(b) On the same grid as in a (i) above, draw.

(i) Triangle$P^{11}Q^{11}R^{11}$ the image of PQR under a reflection in the line y=0 and state its coordinates. (2mks)

(ii) Triangle $P^{111}Q^{111}R^{111}$ is the image of $P^{11}\,Q^{11}\,R^{11}$ under an enlargement scale factor -1, centre(0,-4) and state its coordinates. (3marks)

19. A modern coast bus left Nairobi at 10.45 am and travelled towards Mombasa at an average speed of 60km/h. A Nissan matatu left Nairobi at 1.15pm on the same day and travelled towards Mombasa along the same road at an average speed of 100km/h. The distance between Nairobi and Mombasa is 500km.

(a) Determine the time of the day when the Nissan matatu overtook the bus (5marks)

(b) Both vehicles continued towards Mombasa at their original speeds. Find how long the matatu had to wait in Mombasa before the bus arrived. (5marks)

20. Jane bought 3 bags of sugar and 5 bags of rice for a total of sh29, 750. Had she bought 4 bags of sugar and 2 bags of rice she could have spent sh5250 less.

(a) Form two equations that represent the information above. (2mks)

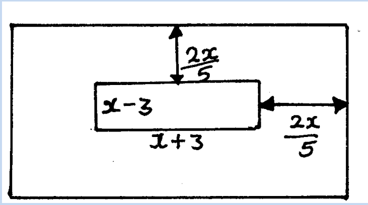
(b) Calculate the cost of a bag of sugar and that of rice using the matrix method. (4marks)

(c) Jane's profit per bag of sugar was 18% while her profit per bag of rice was 30%

(i) Find the total amount that she received from her sales. (2marks)

(ii) Calculate her percentage profit from the sale of all the sugar and rice. (2marks)

21. The following figure represents a dancing floor with a carpeted margin all around of $\frac{2}{5}$x wide leaving a dancing space of (x–3) cm by (x–3) cm.



If the total area of the entire room is 315m^2

(a) Calculate the value of x (5marks)

(b) Calculate the area of the carpeted margin (3marks)

(c) If the carpet cost sh750 per m^2, calculate the total cost of the sealed margin. (2marks)

22. A straight line L_1 has a gradient – ½ and passes through point P(-1, 3). Another line L_2 passes through the points Q(1,-3) and R(4,5). Find:

(a) The equation of L_1 (2marks)

(b) The gradient of L_2 (1mark)

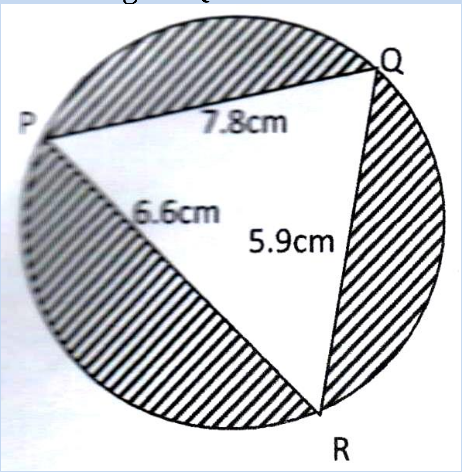
(c) The equation of L_2 (2marks)

(d) The equation of a line passing through a point S(0,5) and is perpendicular to L_2

(2marks)

(e) The equation of a line through R parallel to L_1 (2marks)

23. Triangle PQR is inscribed in the circle PQ=7.8cm, PR=6.6cm and QR=5.9cm.



Find

(a) The radius of the circle, correct to one decimal place. (4marks)

(b) The angles of the triangle (2marks)

(c) The area of shaded region (4marks)

24. A particle travels in a straight line through a fixed point O. Its distance S metres from O is given by

$S=3t^3 - 27t^2 + 72t + 4$ where t is the time in seconds after passing O. Calculate

(a) It distance after 3 seconds (2marks)

(b) The value of t for which the particle is momentarily at rest. (3marks)

(c) The velocity of the particle when t=5 seconds. (2marks)

(d) The maximum velocity of the particle. (3marks)

PAPER 2

SECTION 1 (50 marks) Answer all questions in this section

1. Use logarithms to evaluate , (4marks) $\sqrt[3]{\frac{24.36\ x\ 0.066547}{1.48^2}}$

2. Make d the subject of the formula (3marks)

$a^2 = \sqrt{\frac{1-d^2}{b^2} - \frac{b}{3}}$

2. Simplify the following surds leaving your answer in the form a+ b$\sqrt{c}$
3.

(3marks)

$\frac{\sqrt{5}}{2\sqrt{2}-\sqrt{5}} + \frac{\sqrt{2}}{2\sqrt{2}+\sqrt{5}}$

4. (a) Expand the binomial expression $\left(x-\frac{1}{x}\right)^4$ up to the third term. (1mark)

(b) Use the expansion above (where x > 1) to estimate the value of $(99)^4$ to 3 s.f.
(2marks)

5. A(3,2) and B(7,4) are points on the circumference of a circle. Given that chord AB passes through the centre of the circle determine the equation of the circle.
(4marks)

6. Without using logarithms tables of calculator: Evaluate. (3marks)

$$\log_{10} 96 + \frac{3}{4}\log_{10} 625 - \log_{10} 12$$

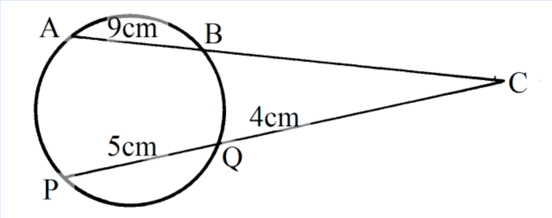
7. Solve for x given that the following is a singular matrix. (3mks)

$$\begin{pmatrix} 1 & 2 \\ x^2 & x+3 \end{pmatrix}$$

8. The sides of a triangle were measured and recorded as 8.4 cm, 10.5 cm and 15.32 cm . Calculate the percentage error in it's perimeter 2d.p. (3marks)

9. Given that 64, b, 4…. are in continued proportion, find the value of b. (3marks)

10. The figure below shows a circle centre O. AB and PQ are chords intersecting externally at a point C. AB=9cm, PQ=5cm and Qc =4cm, find the length BC.
(3marks)



11. Two variables x and y are such that y varies directly as x^n where n is a constant. Given that y=320 when x=16 and y = 2560 when x = 64. Find the value of n. (3marks)

12. A man sold a motor cycle at 84000. The rate of depreciation was 5% per annum. Calculate the value of the motor cycle after 3 years to 1d.p. (3marks)

13. Vector **r** has a magnitude of 14 and is parallel to vector **s**. Given that **s** = 6**i** – 2**j** +3**k**, express vector **r** in terms of **i, j** and **k**. (3marks)

14. Solve for x in the range $0 \leq x \leq 360^0$
If $2\sin^2 x + \sin x - 1 = 0$ (4marks)

15. The prefects body of a certain school consists of 7 boys and 5 girls. Three prefects are to be chosen at random to represent the school at a certain function at Nairobi. Find the probability that the chosen prefects are boys. (2mks)

16. A trigonometric function is given as (4mks)
$y = 0.5 \cos (2x - 40)^0$

Determine (a) Amplitude

(b) Period

(c) Phase angle

SECTION B(50 MARKS)

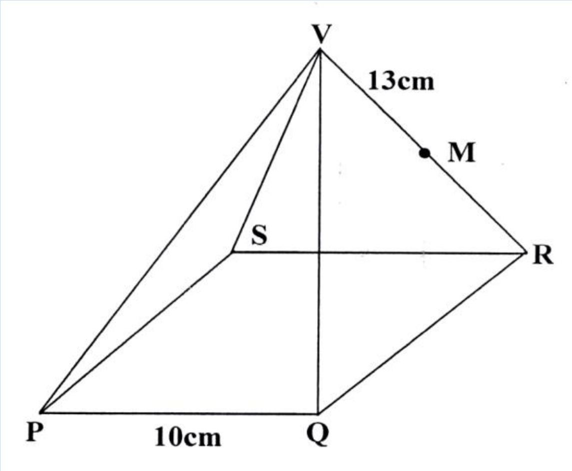
Answer any five questions from this section in the spaces provided.

17. (a) (i) Taking the radius of the earth, R=6370km and $\pi = \frac{22}{7}$, calculate the shortest distance between two cities P(60^0N, 29^0W) and Q(60^0N, 31^0E) along the parallel of latitude. (3marks)

(ii) If it is 1200hrs at **P**, what is the local time at **Q** (3marks)

(b) An aeroplane flew due south from a point A(60^0N, 45^0E) to a point B, the distance covered by the aeroplane was 8000km, determine the position of B. (4marks)

18. The diagram below shows a square based pyramid **V** vertically above the middle of the base. PQ=10cm and **VR**=13cm. **M** is the midpoint of **VR.**



Find

(a) (i) the length **PR.** (2marks)

(ii) the height of the pyramid (2marks)

(b) (i) the angle between **VR** and the base **PQRS** (2marks)

(ii) the angle between **MR** and the base **PQRS** (2marks)

(iii) the angle between the planes **QVR** and **PQRS**. (2marks)

19. Complete the following table for the equation

$y = 2x^3 + 3x^2 - 6x - 4$ for the values $-3 \leq x \leq 2$ (2marks)

x	-3	-2	-1	0	1	2
$2x^3$		-16		0	2	16
$3x^2$	27		3	0		12
-6x		12		0		-12
-4	-4	-4	-4	-4	-4	-4
y		4		-4		12

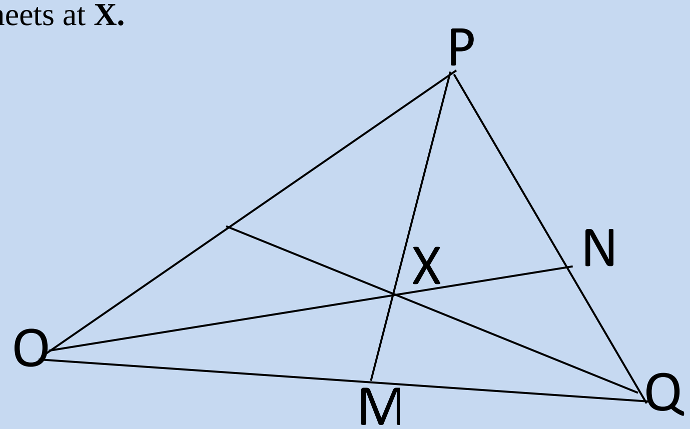
On the grid provided draw the graph of $y=2x^3 + 3x^2 - 6x - 4$ (3marks)

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

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

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

20. The diagram below 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** meets at **X.**



(a) Given that **OP** = **p** and **OQ**= **q** express in term of **p** and **q** the vectors.

(i) **PQ** (1mark)

(ii) **PM** (1marks)

(iii) **ON** (1marks)

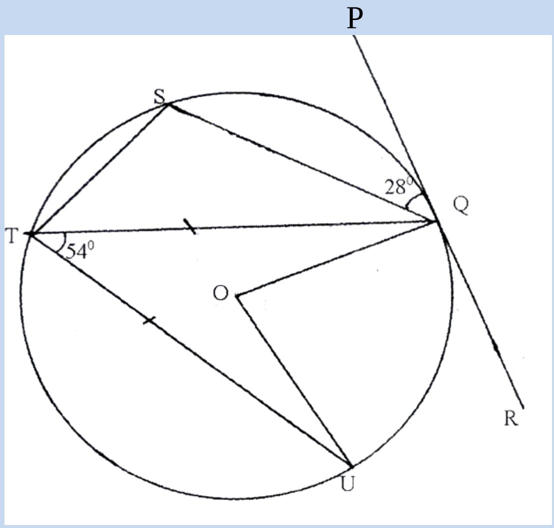
(b) You are further given that **OX**=**KON** and **PX**=**hPM**.

(i) Express **OX** in terms of P and q in two different ways. (2marks)

(ii) Find the value of h and **K**. (4marks)

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

21. In the figure below , O is the centre of the circle.PQR is a tangent to the circle at Q. Angle PQS=28^0, angle UTQ=54^0 and UT=TQ



Giving reasons, determine the size of

(a) Angle STQ (2mks)

(b) Angle TQU (2mks)

(c) Angle TQS (2mks)

(d) Reflex angle UOQ (2mks)

22. Mr. Kimutai a teacher from Tuiyotich Secondary School earns K£12000 per annum and lives in a house provided by the employer at a minimum rent of Ksh2000 per month. He gets a family relief of K£1320p.a and is entitled to a relief of 10% of his insurance of K£800p.a.

(a) Calculate his annual tax bill based on the table below. (6mks)

Income slab in k£p.a	Rate
1 – 2100	10%
2101 – 4200	15%
4201 – 6300	25%
6301 – 8400	35%
Over 8400	45%

(b) Kimutai other deductions include.

- W.C.P.S = sh600.00pm
- NHIF = sh500.00pm

Calculate Kimutai's net salary monthly. (4mks)

23. (a) Use the mid-ordinate rule with five strips to estimate the area bounded by the curve $y = x^2 + 1$, the x–axis, lines x=1 and x=6 (4mks)

(b) Find the exact area of the region in (a) above (3mks)

(c) Calculate the percentage error in area when mid-ordinate rule is used. (3mks)

24. An arithmetic progression AP has the first term a and the common difference d.
(a) Write down the third, ninth and twenty fifth terms of the AP in terms of a and d. (2mks)

(b) 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 sum of the seventh and twice the sixth term of AP is 78. Calculate

(i) The first term and common difference of the A.P (5mks)

(ii) The sum of the first 5 terms of the G.P (3mks)

ALLIANCE GIRLS HIGH SCHOOL

PAPER 1

SECTION I (50 marks)

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

1. All odd numbers from $1-10$ are arranged in descending order to form a number.

(a)(i) Write the number (1 mark)

(ii) Write the total value of the second digit of the number formed in (a) (i) (1 mark)

(iii) Express the value of the number in (a) (ii) as a product of its prime factors in power form. (2 marks)

2. A shopkeeper bought a bag of sugar. He intends to repack the sugar in 40 g, 250 g and 750 g. Determine the least mass in grams of sugar that was in the bag. (3 marks)

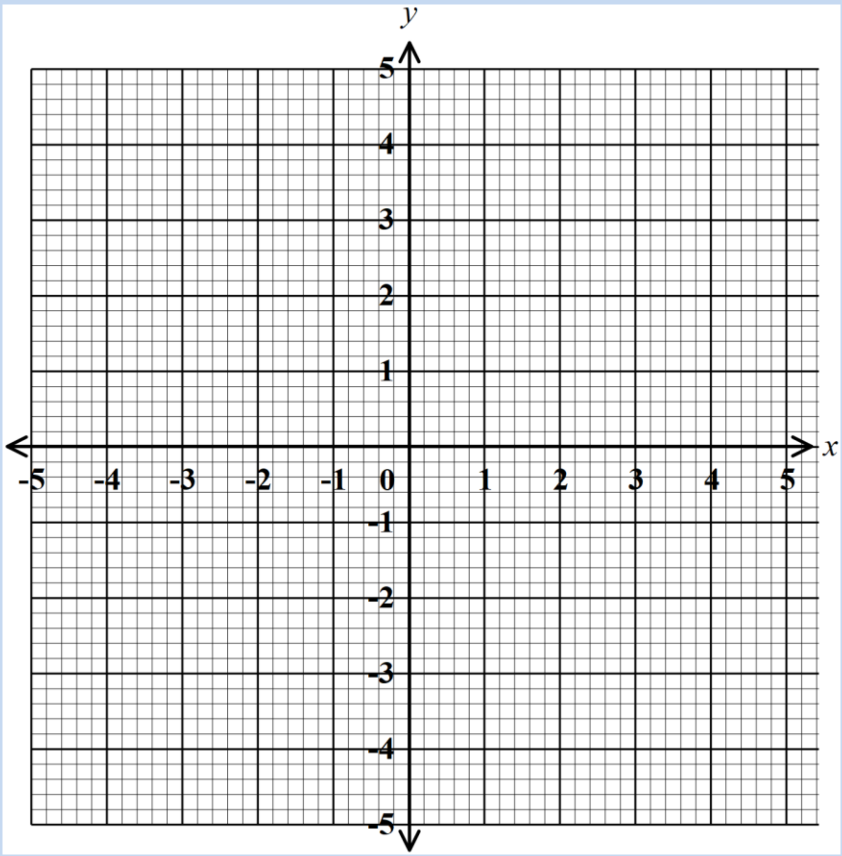
3. Given that $\log_{10} 2 = 0.3010$ and $\log_{10} 3 = 0.4771$ without using tables or calculator find $\log 0.036$ correct to 4 significant figures. (3 marks)

4. Evaluate $\dfrac{\frac{1}{2}\,of\,\frac{3}{2}+1\frac{1}{2}\left(2\frac{1}{2}-\frac{2}{3}\right)}{\frac{3}{4}\,of\,2\frac{1}{2}\div\frac{1}{2}}$ (3 marks)

5. Using the grid provided below, solve the simultaneous equation (3 marks)

$3x-4y=10$

$5x+7y=3$



6. Given that a chord of length 10 cm subtends an angle of 1.2^c at the circumference of the circle. Calculate the radius of the circle. (3 marks)

7. When a shopkeeper sells articles at Ksh 24.05, he makes a 30% profit on the cost price. During a sale, he reduced the price of each article to Ksh 22.95. Calculate the percentage profit on an article sold at the sale price. (3 marks)

8. The size of one interior angle of an irregular polygon is 80^0. Each of the other interior angles is 128^0. Find the number of sides of the polygon. (3 marks)

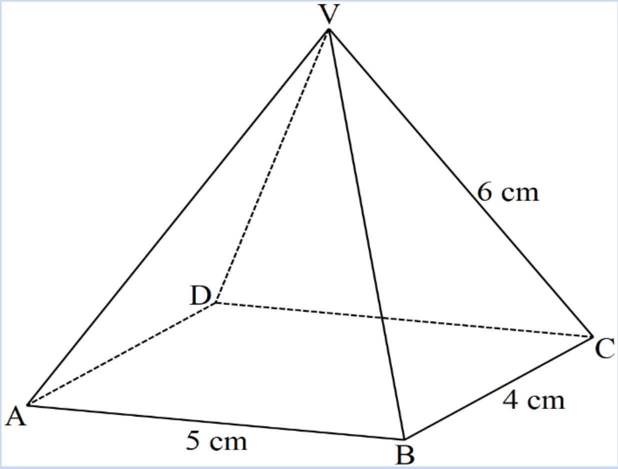
9. Simplify $81^{\frac{3}{4}} - \left(\frac{1}{5}\right)^{-1} - 27^0$ (2 marks)

10. Given the inequalities $x - 6 \leq -3x + 2 < -2x + 9$

(a)Solve the inequality (3 mark

(b)Represent on a number line (1 mark)

11. The diagram below represents a right rectangular based pyramid of 5 cm by 4 cm. The slant edge of the pyramid is 6 cm. Draw and label the net of the pyramid. (3 marks)



12. Vectors $\mathbf{OA} = 4i + 3j$, $\mathbf{OB} = -2i - j$ and $\mathbf{OC} = -5i - 3j$. Show that points A, B and C are collinear. (3 marks)

13. Find the period , amplitude and phase angle of the function $2y = 3\sin\left(\frac{1}{2}x - 60^0\right)$ (3 marks)

14. Simplify $\frac{20-11x-3x^2}{16x-12x^2}$ (3 marks)

15. Write the following ratios in ascending order $2:3$, $15:16$, $7:6$, $13:15$ (3 marks)

16. Under an enlargement, the image of the points $\mathrm{A}(3,1)$ and $\mathrm{B}(1,2)$ are $\mathrm{A}'(3,7)$ and $\mathrm{B}'(7,5)$. Find the centre and scale factor of enlargement. (4 marks)

SECTION II (50 marks)

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

17. A straight line passes through $\mathrm{P}(-1,1)$ and $\mathrm{Q}(3,4)$.

(a)Find the length of line PQ (2 marks)

(b) Find the equation of the perpendicular bisector of line PQ, leaving the equation in the form $y = mx + c$ (4 marks)

(c) Determine the equation of line parallel to line PQ and passes through point $(2,3)$, leaving your answer in double intercept form. Hence state the y intercept. (4 marks)

18. The marks scored by 30 students in test were recorded as follows

41	43	34	28	19	22
32	38	22	18	25	33
30	41	36	31	28	37
35	34	19	22	29	23
29	44	26	27	29	36

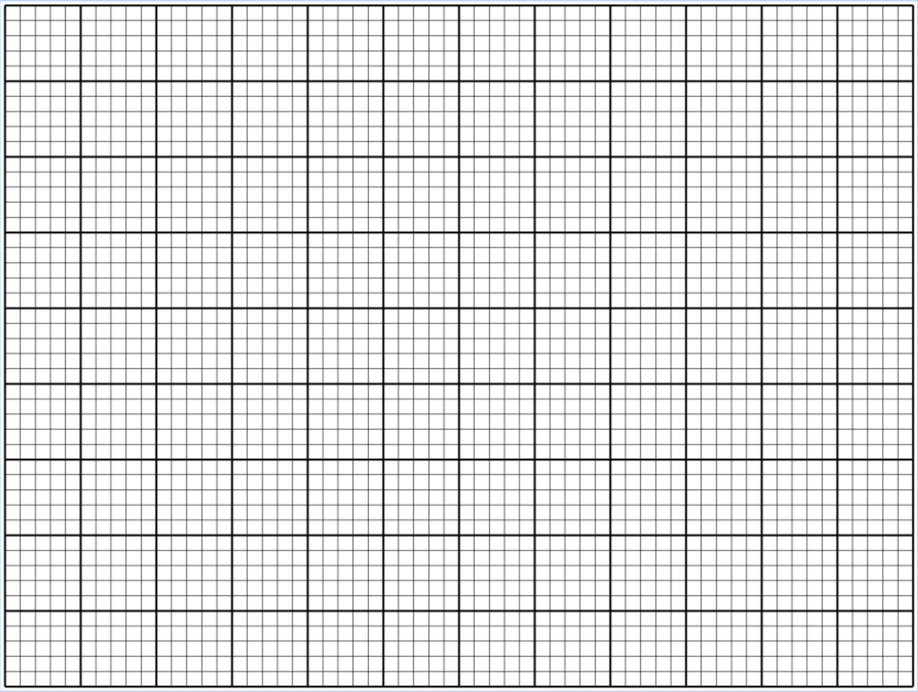
(a) Starting with the class $18-22$, make a frequency distribution table for the data. (2 marks)

(b) Using the frequency distribution in (a) above calculate :

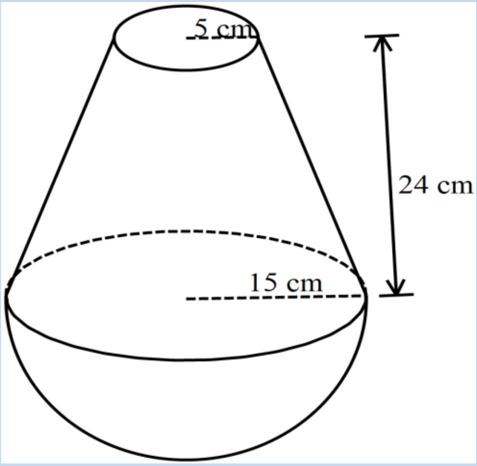
(i) the mean (2 marks)

(ii) the median (3 marks)

(c) Draw a frequency polygon to represent the data. (3 marks)



19. The solid below is made up of hemispherical part and a frustum of cone. The top and bottom radius of the frustum are 5 cm and 15 cm respectively. The vertical height of the frustum is 24 cm.



(a) Determine the vertical height of the cone from which the frustum was cut. (2 marks)

(b) Calculate

(i) The volume of the solid correct to 2 decimal places (3 marks)

(ii) The surface area of the solid correct to 2 decimal places (5 marks)

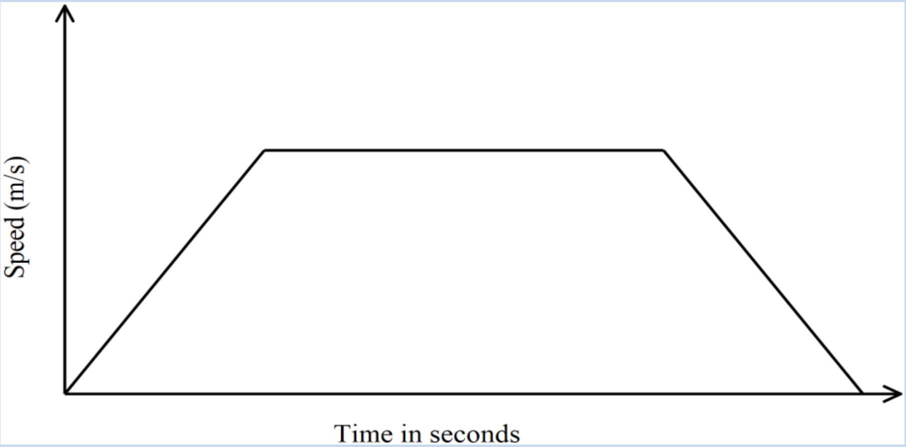
20. (a) (i) Draw the graph of the function $y = 2x^2 - 3x - 5$ for $-2 \le x \le 3$ (5 marks)

(ii) Use the graph to solve the equation $2x^2 - 3x - 5 = 0$ (1 mark)

(b) Use the graph to solve the simultaneous equation $y = 2x^2 - 3x - 5$ and $y = -2x - 2$ (3 marks)

(c) Write down the quadratic equation which the line $y = -2x - 2$ is solving. (1 marks)

21. The diagram below shows the speed time graph for a bus travelling between two stations, the bus starts from rest and accelerates uniformly for 75 seconds. It then travels at constant speed for 150 seconds and finally decelerates uniformly for 100 seconds.



(a) Given that the distance between the two stations is 5225 m. Calculate

(i) maximum speed in km/h attained by the bus. (3 marks)

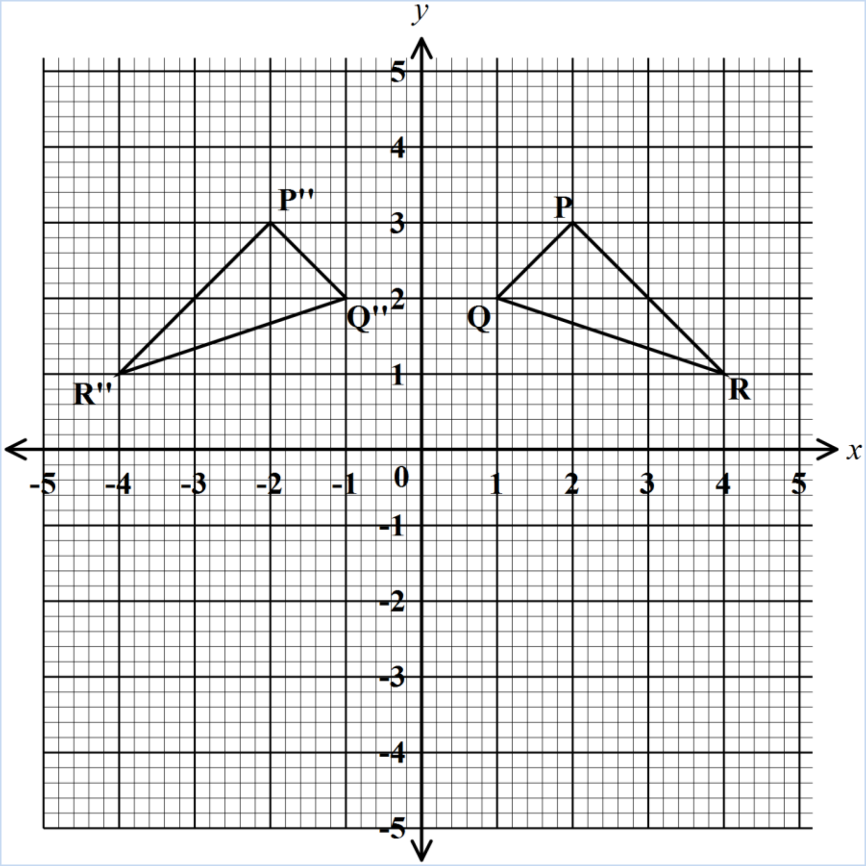
(ii) the acceleration of the bus (2 marks)

(c) A van left Nairobi at 8.30 a.m and travelled towards Mombasa at an average speed of 80 km/h . At 8.30 am a car left Nairobi and travelled along the same road at an average speed of 120 km/h .

(i) Calculate the distance covered by the car to catch up with the van. (4 marks)

(ii) Find the time of the day when the car caught up with van. (1 mark)

22. On the Cartesian plane below, triangle PQR has vertices P(2, 3), Q(1, 2) and R(4, 1) while triangle P''Q''R'' has vertices P''(-2, 3), Q''(-1, 2) and R''(-4, 1).



(a) Describe fully the transformation which maps triangle PQR onto triangle P''Q''R''.

(1 mark)

(b) On the same plane, draw triangle P'Q'R', the image of triangle PQR under a reflection in the line $y = -x$ (2 marks)

(c) Describe fully a single transformation which maps triangle P'Q'R' onto triangle P''Q''R'' (2 marks)

(d) Draw triangle P'''Q'''R''' such that it can be mapped onto triangle PQR by a positive quarter turn about (0, 0) (3 marks)

(e) State a pair of triangles that is
i) oppositely congruent (1 mark)

ii) directly congruent (1 mark)

23. The equation of the curve is $y = x^3 - 2x^2 - 1$

(a) Determine

(i) the stationary points (4 marks)

(ii) the nature of the stationary points in (a) (i) above (2 marks)

(b) Determine

(i) the equation of the tangent to the curve at $x = 1$ (2 marks)

(ii) the equation of the normal to the curve at $x = 1$ (2 marks)

24. The boundaries of ranch AB, BC, CD and DA are straight lines such that B is 075^0 from A and a distance of 50 km. C is due east of B and a bearing of $N80^0E$ from A. D is due south of C and a distance of 70 km.

(a) Using a scale of **1 cm** to represent **10 km.** show the relative positions of ABCD.
(3 marks)

(b) From the scale drawing, determine

(i) the distance in kilometres between B and C (2 marks)

(ii) the bearing of A from D (2 marks)

(iii) the shortest distance from A to border CD (1 mark)

(c) Calculate the area of the ranch in square kilometer. (2 marks)

PAPER 2

SECTION I

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

$$\sqrt[3]{\frac{23.56 \times 0.28^2}{4329}}$$

2. Make **s** the subject of the formula (3 marks)

$$d=p\left(\sqrt{\frac{s^2 - w^2}{r^2 + 5^2}}\right)$$

3. Without using tables or calculator, evaluate and simplify (4 marks)

$$\frac{\sin 30^0 + \sin 45^0}{\cos 60^0 - 1}$$

4. Given the position vectors $\overrightarrow{\boldsymbol{OA}} = 4\boldsymbol{i} + 8\boldsymbol{j} - 2\boldsymbol{k}$ and $\overrightarrow{OB} = 3\boldsymbol{k} - \boldsymbol{i} - 2\boldsymbol{j}$. Point C divides vector AB in the ratio of 3:-1. Find the magnitude of $\overrightarrow{OC}$. Give your answer to 2dp (3 marks)

5. Given that the values P=8.2 cm, A=4.1cm and B=7.0 cm were measured to 1dp. Find the percentage error in the evaluation of

(3 marks)

$$\frac{K}{A \times B}$$

6. Expand $\left(1 - \frac{1}{2}x\right)^{10}$ upto the 4th term in the ascending powers of x. Hence evaluate the value of $(0.95)^{10}$ to 3 decimal places. (3 marks)

7. Two types of coffee grade A and B retails at sh.240 and sh.300 respectively. Mohamed sell a mixture of both grades at shs.303 60, making a profit of 10%. Find the ratio in which he mixed the grades.

(3 marks)

8. Juma a form 2 student was told to pick two number x and y from a set of digits 0,1,2,3,4,5 and 6. Find the probability that the $[x-y]$ is atleast 3. (3 marks)

9. Two quantities $x \ and \ y$ are such that y varies partly as the square of x and partly inversely as the square root of x. Given that when $x=4, y=40$ and when $x=1, y=18$. Find the value of y when $x=0.25$. (4 marks)

10. In a triangle ABC, AB=7.2 cm, AC=6.8 cm and angle BAC=120^0.
Calculate;
(i) The length of BC to 3s.f (2 marks)

(ii) If a circle passes through the vertices A, B and C. Find the radius of the circle. (2 marks)

11. The table below shows income tax rates in a certain year

Monthly income in Kshs	Tax rate in each kshs
$1 \le x < 9681$	10%
$9681 \le x < 18801$	15%
$18801 \le x < 27921$	20%
$27921 \le x < 37040$	25%
Over 37040	30%

In that year Mr. Mogaka gets a total deduction of ksh5,000 he gets a personal tax relief of kshs.1056 and pays kshs.3944 for NHIF, WCPS and sacco loan repayment. Calculate
(i) P.A.Y.E. (1 mark)

(ii) Monthly income/salary (3 marks)

12. Given that the matrix $\begin{pmatrix} 3x & x \\ x-6 & -3 \end{pmatrix}$ maps a triangle A$(0,0)$,

B$(2, 1)$ and c$(3, 5)$ on to a straight line. Find the possible values of x. (3 marks)

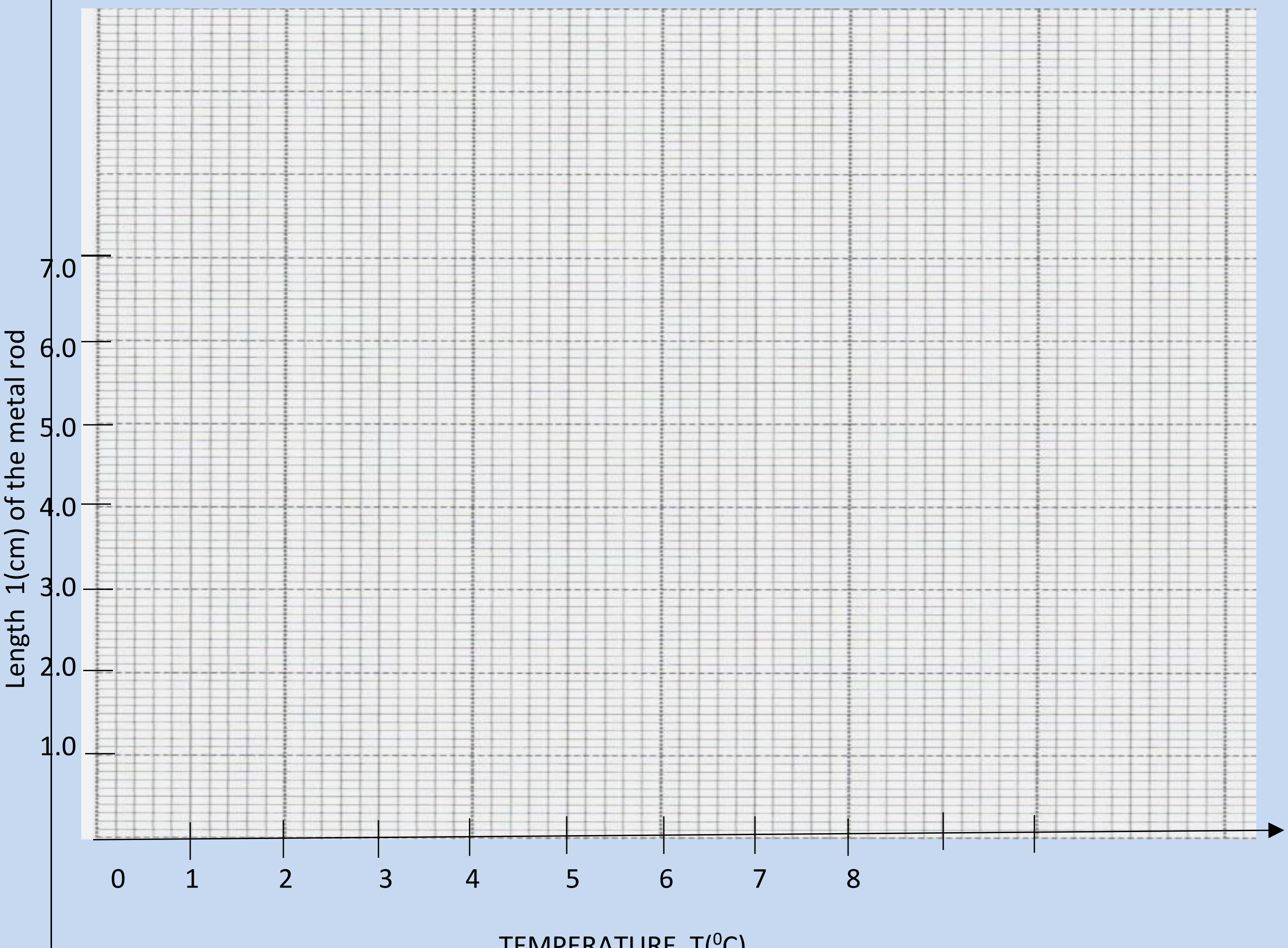
13. The 2^{nd}, 10^{th} and 42^{nd} terms of an A.P forms the first three terms of a geometric progression, if the common differences of the AP=3. Find the sum of the first 10 terms of the G.p. (4 marks)

14. Raw data collected from experimental observation normally have errors. Below is a table of results obtained results from an experiment. The results show how length l(cm) of a metal rod various with increase in temperature T(^{0}c).

T(^{0}C)	0	1	2	3	4	5	6	7	8
L(cm)	4.0	4.3	4.7	4.9	5.0	5.5	5.9	6.0	6.4

Plot the values in the graph given below and draw the line of best fit.

(2 marks)



15. Evaluate the value of x in the following trigonometric equation.

$\frac{1}{2}\ sin^2 2x = +0.25$ for-$-180° \leq x \leq 180°$ (3 marks)

16. The points with co-ordinates A(13,3) and B(-3,-9) are the end of a diameter of a circle centre 0. Determine ;

(i) The coordinates of 0 (1 mark)

(ii) The equation of the circle expressing it in the form $x^2 + y^2 + ax + by + c = 0$ (2 marks)

SECTION II

17. The following are the vertices of a triangle PQR P(1,1), Q(3, 1) and R(1,4)

i) Plot the triangle on the graph given (1 mark)

ii) Triangle PQR was reflected on the line $x = 0$ to give $P^1Q^1R^1$. Draw the triangle on the graph given.

iii) The triangle $P^1Q^1R^1$ was transformed by a matrix $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$ to give $P^{11}Q^{11}R^{11}$. On the axes draw the triangle $P^{11}Q^{11}R^{11}$ on the grid. (2 marks)

iv) The triangle $P^{11}Q^{11}R^{11}$ was further transformed into a triangle $P^{111}Q^{111}$ and R^{111} using the matrix $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$. Draw the triangle and state its coordinates (3 marks)

v) Calculate the area of the triangle $P^{111}Q^{111}R^{111}$ drawn above.

(2 marks)

18. The table below shows the number of goals scored in handball matches during a tournament

Number of goals	0-10	10-20	20-30	30-40	40-50
Number of matches	2	14	24	12	8

(a) Draw a cumulative frequency curve in the space below. (3 marks)

i) Find the probability of scoring at least 20 goals using your graph.

(2 marks)

(b) Using an assumed mean of 25 calculate the standard deviation.

(3 marks)

(b) Calculate the 6th decile (2 marks)

19. Using a ruler and a pair of compasses only;

i) Construct a triangle ABC such that AB=6cm, BC=8cm and angle ABC=60^{0}. (2 marks)

ii) On the same side of BC as A construct the locus of **m** such that angle BMC=60^0.

(2 marks)

iii) Draw the locus of a point **Q** which is equidistant from B and C.

(2 marks)

iv) Draw the locus of a point R such that RC=3cm. (1 mark)

v) Draw the locus of a point P such that the area of triangle BPC=$12cm^2$.

(2 marks)

vi) Locate the region by shading such that; (2 marks)

Angle BMC $\geq 60^0$, BQ $\geq$QC, RC<3 and area of BPC> 12cm

20.

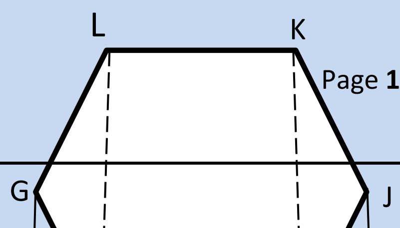
A B C D E F G H I J K L is a solid frustum which was cut two thirds way from the base of a regular hexagonal based pyramid of side 10cm. If the slant edge is 14cm. Calculate;

i) Perpendicular height of the pyramid (2 marks)

ii) Find the angle between the surface ABIH and ABCDEF (3 marks)

iii) Calculate the angle between HA and the base ABCDEF (2 marks)

iv) Calculate the angle between LK and BI (2 marks)



21. An Aeroplane moves from point A to D via B and C

(a) Give the position of B if the plane moves due north from A(30^os, 20^0W) to B covering a distance of 3600 nm. (2 marks)

(b) Calculate the distance from B to C along the parallel of latitude given that C lies on 50^0E. (2 marks)

(c) Calculate the shortest distance from C to D(30^0N, 130^0 W) if the plane moves from C to D. (3 marks)

(d) Given that the plane left A at 0700h and stopped at B for 3 minutes and at C for 45 minutes. Calculate the day and time it will arrive at D. if the speed of the plane was 300knots (3 marks)

22. Complete the table below for the function $y = x^2 - 3x - 4$ (1 mark)

X	-2	-1.5	-1.0	-0.5	0	0.5	1.0	1.5	2.0	2.5	3.0
y											

(a) Use the table and trapezoidal rule with 11 ordinate to estimate the area bounded by the curve $y = x^2 - 3x - 4, x = -2, x = 3$ and $x - axis$ (2 marks)

(b) Use the mid ordinate rule with 5 strips to estimate the area bounded by the curve $y = x^2 - 3x - 4, x = -2, x = 3$ and $x - axis$ (2 marks)

(c) Calculate the exact area above (3 marks)

(d) Find the percentage error involve in using the mid-ordinate role.

(2 marks

23. A particle moves in such a way that the velocity V at any given time is $v = 10t - \frac{1}{2}t^2 - {}^{15}/_{2}$ mls.

(a) Calculate the initial velocity (1 mark)

(b) Calculate the velocity when the time t=3 (2 marks)

(c) Find the displacement during the 5^{th} second (4 marks)

(d) Calculate the maximum velocity attained (3 marks)

24. The ministry of health made an order of both Astrazenica and Johnson and Johnson vaccines for a health centre. The total number of both vaccines should be more than 600 boxes. The number of boxes of Johnson and Johnson should be less than 500 boxes and more or equal to twice the number of Astrazenica. Letting x to represent the number of Johnson and Johnson boxes and y – to represent the number of boxes of Astrazenica.

(a) i) Form all the in equalities in x and y to represent the above information. (3 marks)

ii) Represent the inequalities on a graph (4 marks)

(b) If the cost of importing 1 box of Johnson and Johnson is sh1000 and astrazenica is shs.800. Find maximum cost of importing the vaccines. (3 marks)

MANG'U SCHOOL

PAPER 1

SECTION I: (50 MARKS)

Answer all the question in this section in the spaces provided:

1.Evaluate

$$\frac{(2\frac{1}{4}-\frac{3}{4})\times 3\frac{2}{3}\div 2\frac{1}{5}}{1\frac{4}{6}\div 1\frac{1}{4}}.$$ (3mks)

2.Use square roots, reciprocal and square tables to evaluate to 4 significant figures the expression;

$(0.06458)^{\frac{1}{2}} + \left(\frac{2}{0.4327}\right)^2$ (4mks)

3. Three similar 21 inch television sets and five similar 17 inch television cost Ksh.129,250. The difference between the cost of two 21inch television sets and four 17inch television sets is Ksh. 22,000. Calculate the price of a 21- inch television set and that of 17-inch television set. (3mks)

4.Simplify: (3 marks)

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

5. Solve for x in the equation. (3 Marks)

$9^{(2x-1)}$ x $3^{(2x+1)} = 243$

6. A classroom measures (x + 2) m by (x – 5)m. If the area of the classroom is $60m^2$.

Find its length. (3 mks)

7.A tourist exchanged X US dollars for Kenya shilling when he arrived in Kenya. He spent three days in the country and paid Ksh 45,600 for expenses. He later left the country and exchanged the remainder back to US dollars. He went back with 1200 dollars. Find the value of X to the nearest dollar.

Buying 1 US dollar = Ksh.98.36

Selling 1US dollar = Ksh.98.54 (3mks)

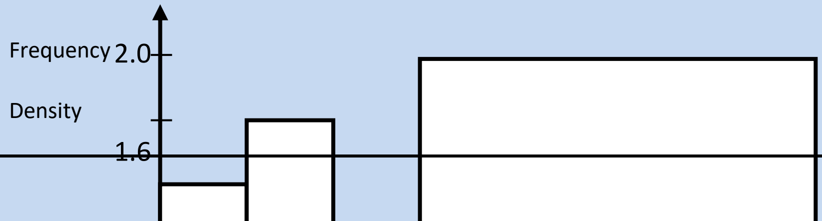
8. Three similar pieces of timber of length 240cm, 320cm and 380cm are cut into equal pieces. Find the largest possible area of a square which can be made from any of the three pieces. (3mks)

9.A regular polygon is such that its exterior angle is one eighth the size of interior angle.

Find the number of sides of the polygon. (3 mks)

10.Given that sin (2Ө + 30) = Cos (Ө - 60). Find the value of tan Ө to two decimal places. (2 mks)

11.The figure below shows a histogram.



7.5 9.5 11.5 15.5 21.5

Length in x cm

Fill in the table below the missing frequencies. (3mks)

Length in x cm	Frequency
$7.5 \le x \le 9.5$	12
$9.5 \le x \le 11.5$	
$11.5 \le x \le 15.5$	
$15.5 \le x \le 21.5$	

12. A straight line L_1 is perpendicular to another line L_2 whose equation is 3y+4x=12. If the two lines meet at point P which lies on the x-axis, find:

(i) The co-ordinate of point P (1mk)

(ii) The equation of line L1 in the form y=mx+c (3mks)

13. 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? Give your answer to 2 decimal places. (3mks)

14.Two matrices A and B are such that A= $\begin{pmatrix} k & 4 \\ 3 & 2 \end{pmatrix}$ and B = $\begin{pmatrix} 1 & 3 \\ 3 & -4 \end{pmatrix}$ Given that the determinant of AB = 10, find the value of k. (3mks)

15.1000cm^3 of milk was shared by three children, Nick, Soita and Swalleh in the ratio ¼: ½ : $^1/_5$,What volume did Soita get: (2mks)

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

SECTION II

***Answer any five questions in this section*.**

17.The distance between two towns **A** and **B** is 760 km. A minibus left town **A** at 8:15a.m and traveled towards **B** at an average speed of 90km/h. A matatu left **B** at 10:35a.m and on the same day and travelled towards **A** at an average speed of 110km/h.

(a)(i) How far from **A** did they meet? (4mks)

(ii) At what time did they meet? (2mks)

(b) A motorist starts from his home at 10:30 a.m on the same day and traveled at an average speed of 100km/h. He arrived at **B** at the same time as the minibus. Calculate the distance from **B** to his home. (4mks)

18.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, centre origin. Obtain the coordinates of the image A''' B''' C'''. (2 marks)

(e) The triangle A''' B''' C''' undergoes a rotation centre (1, -2) angle 120^0. Obtain the coordinates of the image A^{iv} B^{iv} C^{iv}. (2 marks)

(f) Which triangles are directly congruent. (1 mark)

19.The income tax rates in a certain year are as shown below.

Income (k₤ – p.a	Rate (KSh. per ₤)
1 – 4200	2
4201 – 8000	3
8001 – 12600	5
12601 – 16800	6
16801 and above	7

Omar pays Sh. 4000 as P.A.Y.E per month. He has a monthly house allowance of KSh.10800 and is entitled to a personal relief of KSh. 1,100 per month. Determine:

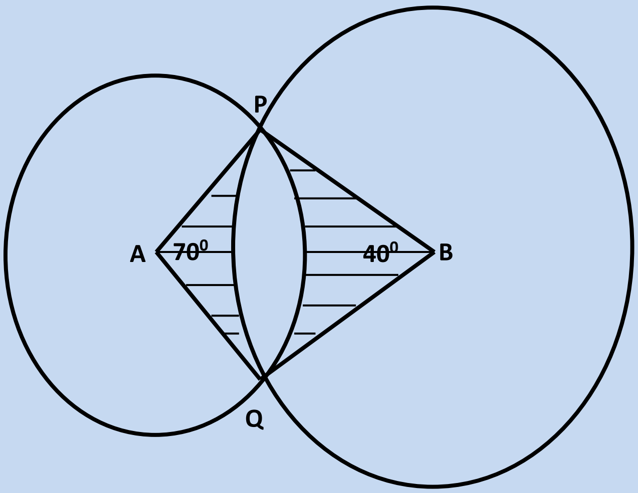
(i) his gross tax per annum in Kshs (2 Marks)

(ii) his taxable income in K₤ per annum (2 marks)

(iii) his basic salary in Ksh. per month (2marks)

(iv) his net salary per month (2 marks)

20. The diagram below shows two circles, centre A and B which intersect at points P and Q. Angle PAQ = 70^0, angle PBQ = 40^0 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 mks)

(d) Area of the minor segment of the circle whose centre is B (2mks)

(e) Area of the shaded region. (2mks)

21.Three Kenyan warships A, B and C are at sea such that ship B is 450km on a bearing of 030^0 from ship A. Ship C is 700km from ship B on a bearing of 120^0. An enemy ship D is sighted 1000km due south of ship B.

(a) Taking a scale of 1cm to represent 100km locate the position of the ships A, B, C and D. (4 Marks)

(b) Find the compass bearing of:

(i) Ship A from ship D (1 Mark)

(ii) Ship D from ship C (1 Mark)

(c) Use the scale drawing to determine

(i) The distance of D from A (1 Mark)

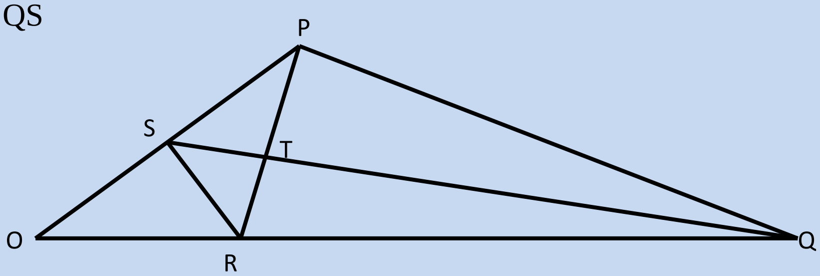
(ii) The distance of C from D (1 Mark)

(d) Find the bearing of:

(i) B from C (1 Mark)

(ii) A from C (1 Mark)

22.The figure below shows triangle OPQ in which OS = $\frac{1}{3}$ OP and OR = $\frac{1}{3}$ OQ. T is a point on QS such that QT = $\frac{3}{4}$ QS



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

(i) $\underset{\sim}{SR}$ (1 Mark)

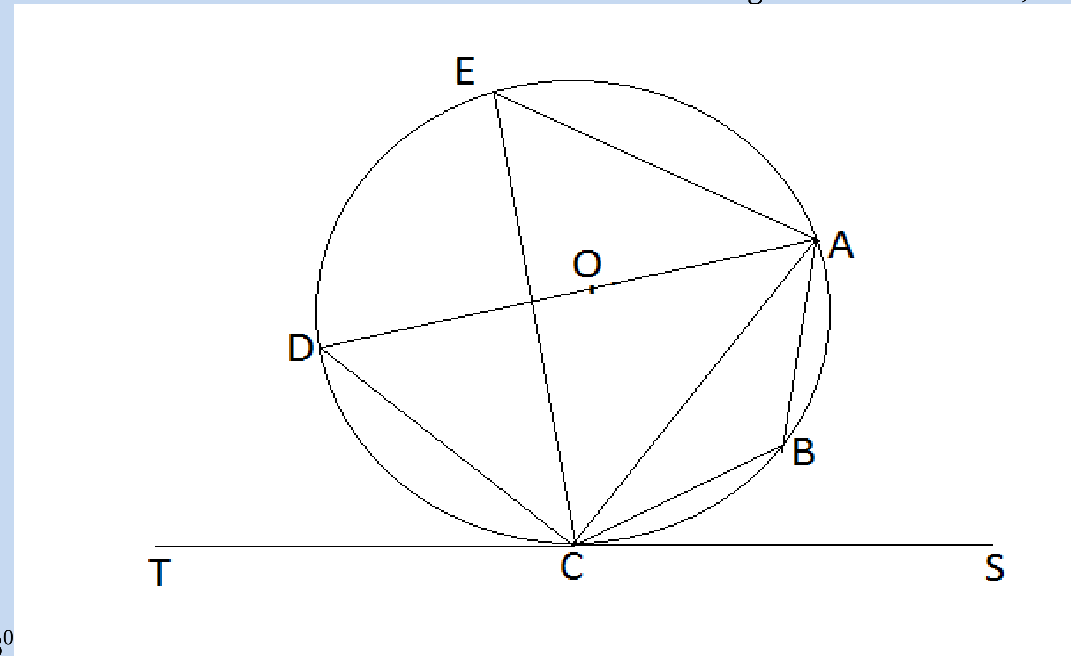
(ii) $\underset{\sim}{QS}$ (2 Marks)

(iii) $\underset{\sim}{PT}$ (2 Marks)

(iv) $\underset{\sim}{TR}$ (2 Marks)

(v) show that point PTR are collinear. (3mks)

23. 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 = 38^0

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)**

24 (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

$2x^2$	128					18				2			32
5x	-40					-15				5			20
-12	-12					-12				-12			-12
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)

PAPER 2

SECTION I (50 MARKS)
Answer ALL questions in this section.

1. Make y the subject of the formula in: $v = \frac{A\sqrt{x^2 + y^2}}{y}$ (3 marks)

2. Solve for x in the equation: $Log_8(6 - 2x) - Log_8(x - 2) = {}^{-1}/_{3}$ (3 marks)

3. Three quantities P, Q and R are such that P varies directly as the cube of Q and inversely as the square root of R. Find the percentage change in P if Q decreases by 10% and R decreases to 36%. (3 marks)

4. A circle with its centre at O (-2, 0) passes through a point (1, 4). Write down the equation of the circle in the form $x^2 + y^2 + ax + by + c = 0$ (3 marks)

5. Express: $\frac{COS\ 30^0}{\tan 45^0 + \sqrt{3}}$ in surd form and simplify by rationalizing the denominator (3 marks)

6. The position vectors of points P and Q are $\boldsymbol{p} = -2\boldsymbol{i} - \boldsymbol{j} + \boldsymbol{k}$ and $\boldsymbol{q} = 4\boldsymbol{i} - 5\boldsymbol{j} - 2\boldsymbol{k}$ and respectively. Find the magnitude of **OM** if M is a point that divides **PQ** in the ratio 1:2 correct to 4 significant figures. (3 marks)

7. a) Find the binomial expansion of $\left(1 + \frac{1}{2x}\right)^7$ up to the 4th term with increasing powers of x. (2 marks)

b) Hence estimate the value of $(1.05)^7$ correct to 4 decimal places. (2 marks)

8. A computer with a marked price of Kshs. 40000 can also be bought on hire purchase terms. Kibet bought the computer on hire purchase by making a deposit of Ksh 10000 and cleared the balance with equal 12 monthly installments of KShs. 3500 each. Determine the monthly interest rate of hire purchase to 2 significant figures. (3 marks)

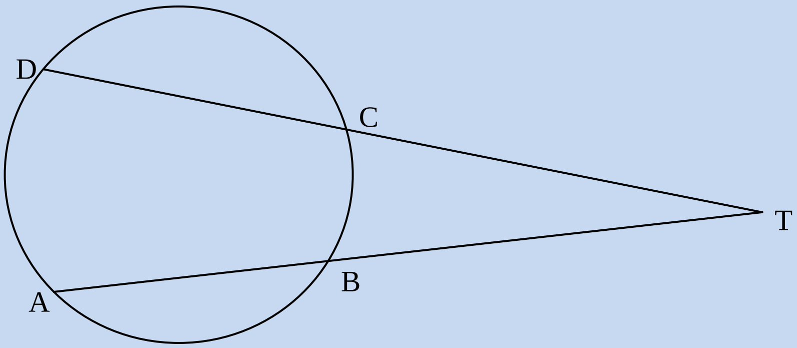
9. A dealer blends Kericho tea that costs sh 300 per 100g packet with Ketepa that costs ksh 160 per 200g packet. In what ratio must the dealer mix the two so that by selling a 100g packet of the blend for ksh 250, a profit of 25% is made? (4 marks)

10. Solve for x in the equation: $Sin\ 2\theta = -0.5$ for $0^0 \leq \theta \leq 360^0$ (3 marks)

11. Use completing of the square method to solve: $2x^2 - 6x + 4 = 0$ (3 marks)

12. A carpenter wishes to cut a 1m long piece of wood into 3 equal parts. He approximates the length of each piece to 0.33m. Calculate the percentage error due to this approximation (3 marks)

13. Calculate length DT in the figure below given AT and DT are secants that intersect at T and AB = 5 cm, BT = 4 cm and DC = 9 cm. (3 marks)



14. An arc of a circle of diameter 7 cm subtends an angle of 1.2 radians to the centre of the circle. What is the length of the arc? (2 marks)

15. Given matrix $A = \begin{pmatrix} x - 2x & x - 4 \\ x & 2 \end{pmatrix}$. Find the possible values of x if A is a singular matrix.

(3 marks)

16. Working together two taps A and B can fill a tank in 2 hours. By itself tap A can fill the tank in 6 hrs. Tap A and B are opened at the same time and after running for 1 hours, an outlet tap which can drain the full tank by itself in 12 hours is opened and Tap A is closed. Find the total time taken to fill the tank. (4 marks)

SECTION II – 50 MARKS

Answer only FIVE questions from this section.

17. In a form 4 class there are 24 girls and 30 boys. The probability that a girl participates in games is 0.4 whereas that of a boy is 0.6.

    a) A student is picked at random from the class. Find the probability that the student picked:

    i) Is a boy and will participate in games (2 marks)

    ii) Will not participate in games (2 marks)

    b) Two similar bags A and B are such that, bag A contains 3 blue balls and 7 red balls while bag B contains 4 green balls and 8 blue balls. The balls are similar in shape and size. A ball is drawn from bag A and bag B. Determine the probability that:

    i) One of the balls drawn is green. (2 marks)

    ii) The balls drawn are of the same colour. (2 marks)

    iii) None of the balls drawn is red (2 marks)

18. The table below gives the values of P and I showing the relationship between electrical power (P) and current (I) in a certain circuit.

P	1.050	1.350	1.650	1.950	2.250	2.400
I	0.995	1.697	2.700	3.698	4.403	5.196

a) Using a scale of 1 cm to represent 0.5 units on the horizontal axis and 2 cm to represent 0.5 units on the vertical axis, draw a graph of P against I on the grid provided.(4 marks)

b) What is the gradient of the graph? (2 marks)

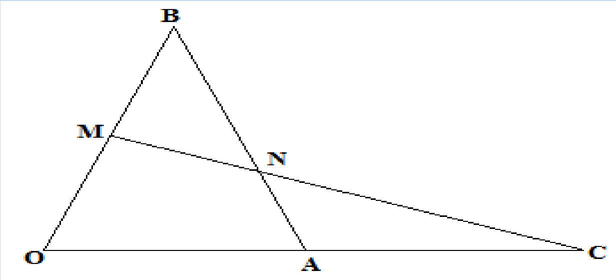
c) From the graph, find:

i) The value of P when I = 3.4 (1 mark)

ii) The value of I when P = 1.45 (1 mark)

iii) The value of P when I = 0 (2 marks)

19. In the triangle OAB below, **OA** = **a**, **OB** = **b** and 3**OA** = 2**OC**. M divided **OB** in the ratio 1:1 .



a) Express in terms of **a** and **b** only, the vectors

i) **BA** (1 mark)

ii) **OC** (1 mark)

iii) **MC** (1 mark)

b) Given further that **MN** = h**MC** and BN = k**BA**,

i) Express vector **MN** in two different ways in terms of **a**, **b**, h and k (2 marks)

ii) Find the value of h and k. (4 marks)

c) State the ratio **MN:MC** (1 mark)

20. A group of people planned to contribute equally towards buying a plot valued at Ksh 270,000. After the contribution, 2 members joined of the group. As a result, a refund of Ksh 1500 was made to the members who had already contributed..

a) Let the original number of people be x and express in terms of x:

i) The original contribution (1 mark)

ii) The new contribution (1 mark)

b) Find how much each member contributed finally (5 marks)

c) Calculate the percentage decrease in the contribution per person caused by the members who joined. (3 marks)

21. The table shows income tax rates for a certain year.

Monthly taxable pay K£	Rate of tax in Ksh. Per K£
1- 434	2
435 - 866	3
867- 1298	4
1299 - 1730	5
Over 1730	6

A company employee earns a monthly basic salary and is also given taxable allowances amounting to Ksh 10480. If the employees tax on the 5^{th} band is Ksh 3420,

a) Calculate the employee's monthly taxable income tax in K£. (2 marks)

b) The employee is entitled to a personal tax relief of Ksh. 1056 per month. Determine the net tax. (4 marks)

c) In a certain month, the employee received a 25% increment in his basic salary. Calculate his net monthly pay. (4 marks)

22. a) The nth term of a sequence is given by the relation $2n + n$

i) Write down the first 3 terms of the sequence. (1 mark)

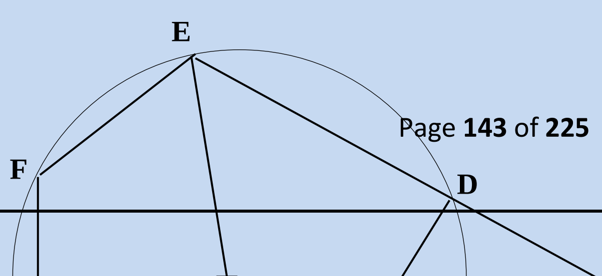
ii) Find the sum of the first 42 terms of the sequence. (3 marks)

b). Bacteria in a culture increases by 125% of every hour. The number bacteria in the culture at 0607h was 8000.

i) What will be the number of the bacteria in the culture after one hour.(2 marks)

ii) Determine the total number of bacteria in the culture at 0937h the same day (4 marks)

23. In the figure above, ABC is a tangent to the circle, centre O and BOE is a diameter. Given FG = BG and angles DBC = 48º angle GEF = 25º.



Giving reasons, find the size of angles:

i) BFE (2 marks)

ii) BGD (2 marks)

iii) DFE (2 marks)

iv) Reflex DOE (2 marks)

v) BGF (2 marks)

24. a) Complete the table below for $y = -2\ sin\ x$ and $y = 3\ cos\ x$. (2 marks)

b) Draw the graph $y = -2\ Sin\ x$ and $y = 3\ cos\ x$ using 1 cm to represent 30° horizontal axis and 2 cm to represent 1 unit on the vertical axis.

x	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
-2 Sin x	0.00		-1.73			-1.00	0.00			2.00	1.73		
3 Cos x	3.00		1.50			-2.60	-3.00			0.00	1.50		

(5 marks)

c) Use the graph to solve:

i) 3 Cos x + 2sin x = 0 (1 mark)

ii) 1 - 2sin x = 2 (2 marks)

KABARAK HIGH AND SACHO SCHOOL

PAPER 1

SECTION A

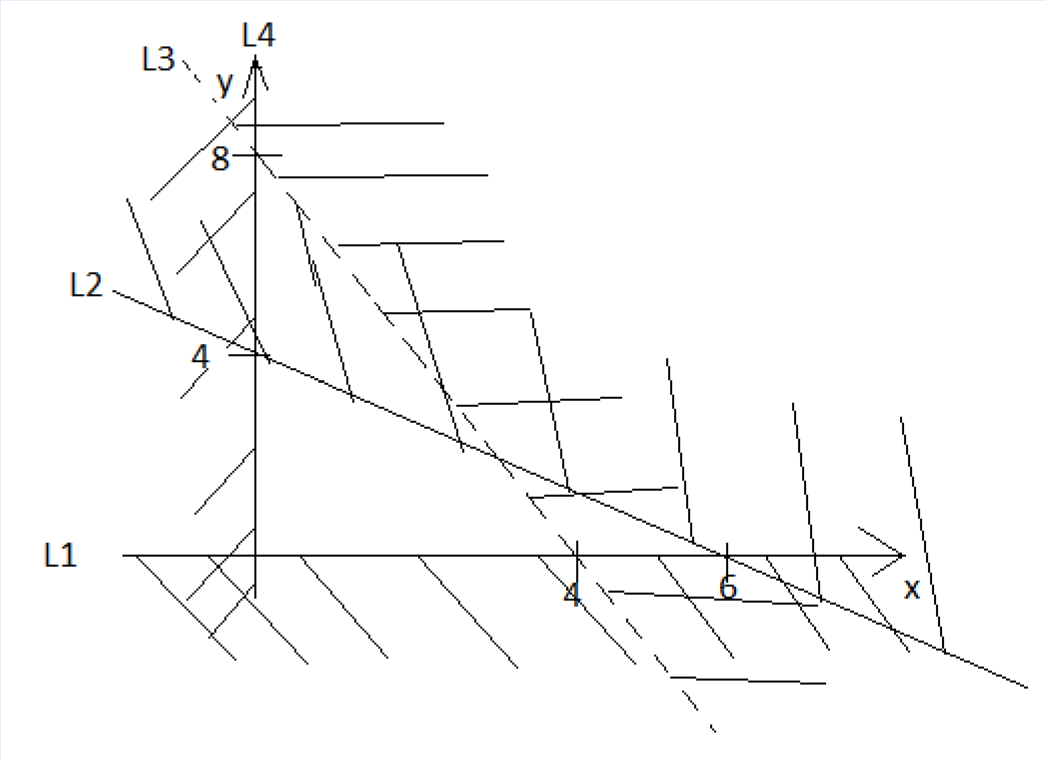
*Answer **all** questions in this section in the spaces provided*

1. The sum of two numbers exceeds their product by one. Their difference is equal to their product less five. Find the two numbers. **(3 marks)**

2. Musa has twenty shillings more than Aisha. After he spends a quarter of his money and Aisha ⅕ of hers, they find that Aisha has 10 shillings more than Musa. How much money did both have? **(4 marks)**

3. The number 2942m08 is divisible by 11. Find the least value of m and the square of m. **(3 marks)**

4. Give the inequalities which define the region R in the diagram shown below. **(3 marks)**



5. Given P = $\begin{pmatrix} 2 & 0 \\ -2 & 1 \end{pmatrix}$, Q = $\begin{pmatrix} 4 & -1 \\ 3 & 2 \end{pmatrix}$ and R = $\begin{pmatrix} 2 & -1 \\ -4 & 5 \end{pmatrix}$, find PQ + R.

(3 marks)

6. A Kenyan businessman bought goods from Japan worth 2,900,000 Japanese Yen. On arrival in Kenya, custom duty 10% was charged on the value of the goods. If the exchange rates were as follows:
1 US dollar = 118 Japanese Yen
1 US dollar = 78 Kenyan Shillings.

Calculate the duty paid in Kenya Shillings. **(3 marks)**

7. Solve the equation; **(3 marks)**

$4^x + 2^{2x+1} = 36$

8. Line AB is perpendicular to a line whose equation is $y - 2x + 7 = 0$ and passes through point $(-4, 5)$. Determine the equation of AB in the form y = mx + c.

(3 marks)

9. Simplify the following expression. **(3 marks)** $\frac{cos^2\theta - 1}{\sin\theta}$

10. Without using a calculator evaluate using squares, square roots and reciprocal tables the following:-

(3 marks)

$\frac{2}{30.16^2} + \frac{10}{\sqrt{588.3}}$

11. Two of the exterior angles of an irregular polygon are 63^0 each. The remaining exterior angles are each 26^0. Determine the number of sides of the polygon.

(3 marks)

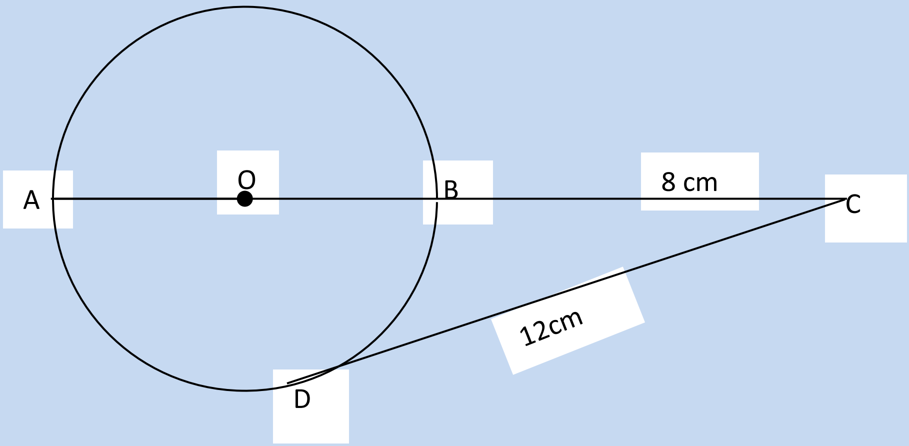
12. A number when divided by 10, 15 and 18, the reminders are 7, 12 and 15 respectively. Find the lowest number.

(3 marks)

13. The figure below shows part of a circle. Complete the circle and determine the radius and the centre of the circle.

(3 marks)

14. In the figure below, DC is a tangent to the circle centre O at D. AOBC is a straight line meeting DC at C. DC = 12 and BC = 8. Find the radius of the circle. **(3 marks)**



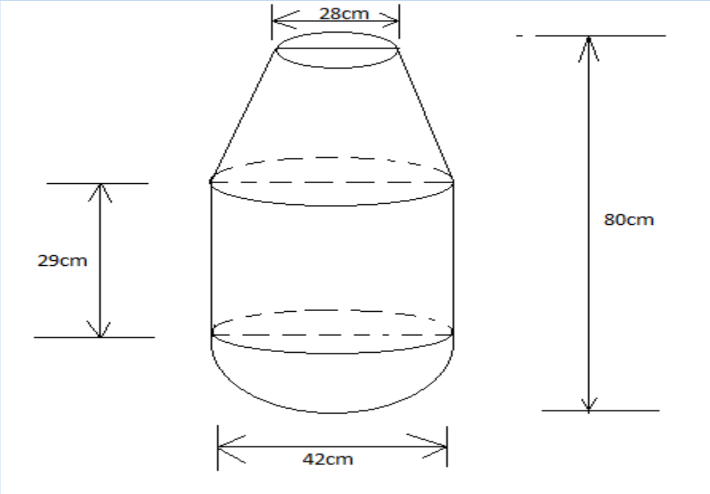
15. x varies directly as the cube of y and inversely as the square root of z. When x=24, y=2 and z=16. Find z in terms of x and y. **(3 marks)**

16. Evaluate; $\int_{-1}^{2}(-x^3 + 5x - 2)\,dx$ **(4 marks)**

SECTION B

*Answer any **five** questions in this section*

17. The figure below is a model representing an open storage container. The model whose total height is 80 cm is made up of a frustum top, a hemispherical bottom and the middle part is cylindrical. The diameter of the top of the frustum is 28 cm, the base of the frustum diameter of the cylindrical and hemispherical part is 42 cm. The height of the cylindrical part is 29 cm.



(a) Calculate the surface area of the solid above **(5 marks)**

(b) The actual height of the container is 8 metres. Calculate the capacity of the container to the nearest litre. **(5 marks)**

18. The table below shows marks scored by 40 students in a Mathematics test.

Marks	**30-39**	**40-49**	**50-59**	**60-69**	**70-79**
No. of Students	2	10	13	8	7

(a) Using and assumed mean of 54.5, calculate the mean mark. **(5 marks)**

(b) Calculate the variance. **(3 marks)**

(c) Calculate the standard deviation. **(2 marks)**

19. Two policemen were together at a road junction. Each had a walkie talkie. The maximum distance at which one could communicate with the other was 2.5km. One of the policemen walked due East at 3.2km/h while the other walked due North at 2.4km/h. The policeman who headed east travelled for x km while the one who headed North travelled for y km before they were unable to communicate.

(a) Draw a sketch to represent the relative positions of the policemen. **(1 mark)**

(b) (i) From the information above form two simultaneous equations in form of x and y. **(2 marks)**

x	-3	-2	-1	0	1	2	3
$-2x^2$	-18			0	-2		
1	1	1	1	1	1	1	1
y	-20	-9			0		

(ii) Find the value of x and y. (**5 marks)**

(iii) Calculate the time taken before the police were unable to communicate. **(2 marks)**

20. Complete the table of the functions $y = 1+x-2x^2$ (2marks)

b) Draw the graph of the function $y = 1+x -2x^2$ on the graph paper provided (3marks)

c) Use your graph to find the value for x in the equations $1 + x - 2x^2 = 0$ (1 mark)

d) By drawing a suitable line graph on the same graph find the value for **x** which satisfies the equation $5 + 2x - 2x^2 = 0$ (3marks)

e) State the maximum point of the function $y = 1 + x - 2x^2$ (1mark)

21. (a) The position vectors of points A and B are **a** and **b** respectively. C is another point with position vectors $\boldsymbol{c} = \frac{6}{4}\boldsymbol{b} - \frac{2}{4}\boldsymbol{a}$. Express in terms of $\boldsymbol{a}$ and $\boldsymbol{b}$ vectors.

(i) $\overrightarrow{AB}$ **(1 mark)**

(ii) $\overrightarrow{CB}$ **(1 mark)**

(iii) $\overrightarrow{CA}$ **(1 mark)**

(iv) Show that A, B and C are collinear. **(3 marks)**

(v) Determine the ratio AB:BC **(1 mark)**

(b) Given that $\overrightarrow{OP} = 3i + 8j - 3k \; and \; \overrightarrow{OP} = 3i + 2j + 2k$. Find $|PQ|$ correct to 2dp. **(3 marks)**

22. (a) Given a curve $y = 10 + 3x - x^2$, use the trapezoidal rule with 5 trapezia to estimate the area bounded by the curve from $x = -1 \; to \; x = 4$. **(4 marks)**

(b) Find the actual area under the curve by integration method from $x = -1\ to\ x = 4$.
(4 marks)

(c) Find the percentage error introduced by the approximation. **(2 marks)**

23. (a) A man standing 20m away from a building notices that the angles of elevation of the top and bottom of a flagpole mounted at the top of the building are 64^0 and62^0 respectively. Calculate the height of the flagpole.
(4 marks)

(b) The angles of elevation of the top of a tree from P and Q which are 30m apart are 22^0 and 32^0 respectively. Given that the two points are on the same side of the tree and on a straight line, determine the height of the tree. **(6 marks)**

24. The displacement s metres after t seconds is given as $s = -t^3 + 3t^2 + 4$.

(a) Find its initial acceleration. **(3 marks)**

(b) Calculate;

(i) The time when the particle was momentarily at rest. **(3 marks)**

(ii) The acceleration in m/s^2 $when\ t = 3s$ **(2 marks)**

(c) Find the maximum velocity attained by the particle. **(2 marks)**

PAPER 2

<u>SECTION 1:(50 MARKS.) ANSWER ALL THE QUESTIONS</u>

(vi) Use logarithms to evaluate. **(4mks)**

$$\frac{\mathbf{4.497 \times \sqrt{0.3673}}}{\mathbf{1 - \mathit{cos} 81.53°}}$$

2. Calculate the percentage error in the volume of a cone whose radius is 9.0cm and slant length 15.0cm. **(3mks)**

3. Make **y** the subject of the formula. **(3mks)**

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

4. Solve for **x**: **$\tan^2 x - 2\tan x = 3$** for the interval **$0 \leq x \leq 180^{\circ}$** **(3 mks)**

5. Solve the equations **(4mks)**

$$x + 3y = 13$$
$$x^2 + 3y^2 = 43$$

6. Simplify $\frac{3+\sqrt{5}}{\sqrt{5}-2}$ give the answer in the form $a+b\sqrt{c}$ where a, b and c are integers. **(3mks)**

7. Kiprono buys tea costing sh 112 per kilogram and sh.132 per kilogram and mixes them, then sells the mixture at sh.150 per kilogram .If he is making a profit of 25% in each kilogram of the mixture, determine the ratio in which he mixes the tea. **(4mks)**

8. Find the value of x given that. **(3mks)**

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

9. The tangent to the curve $y = ax^2 + bx + c$ is parallel to the line $y - 4x=0$ at the point where $x = 2$. If the curve has a minimum value of -3 where $x = 1$, find the values of a, b and c. **(3 mks)**

10. The points **A, B and C** lie on a straight line. The position vectors of **A** and **C** are 2**i** + 3**j** + 9**k** and 5**i** – 3**j** + 4**k** respectively; B divides AC internally in the ratio 2:1. Find the

(a) Position vector of **B**. **(2 mks)**

(b) Distance of B from the origin. **(1 mk)**

11.(a) Find the inverse of the matrix $\begin{pmatrix} 4 & 3 \\ 3 & 5 \end{pmatrix}$ **(1 mk)**

(b) Hence solve the simultaneous equation using the matrix method. **(2 mks)**

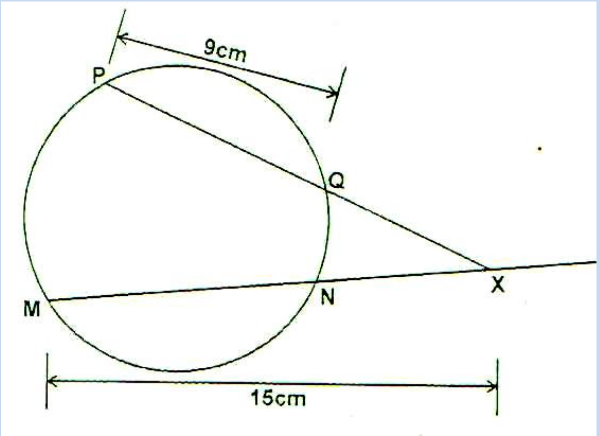
$$4x + 3y = 6$$
$$3x + 5y = 5$$

12. Find the radius and the centre of a circle whose equation is. **(3mks)**

$$3x^2 + 3y^2 + 18y - 12x - 9 = 0$$

13. A model of the globe representing the earth has a radius of 0.2m. Point A and B are located at (60˚ N,140˚ E) and (60˚ N,120˚ W),respectively. If O is the centre of the latitude 60 N, find the area of the minor sector OBA, in square metres. **(3 mks).**

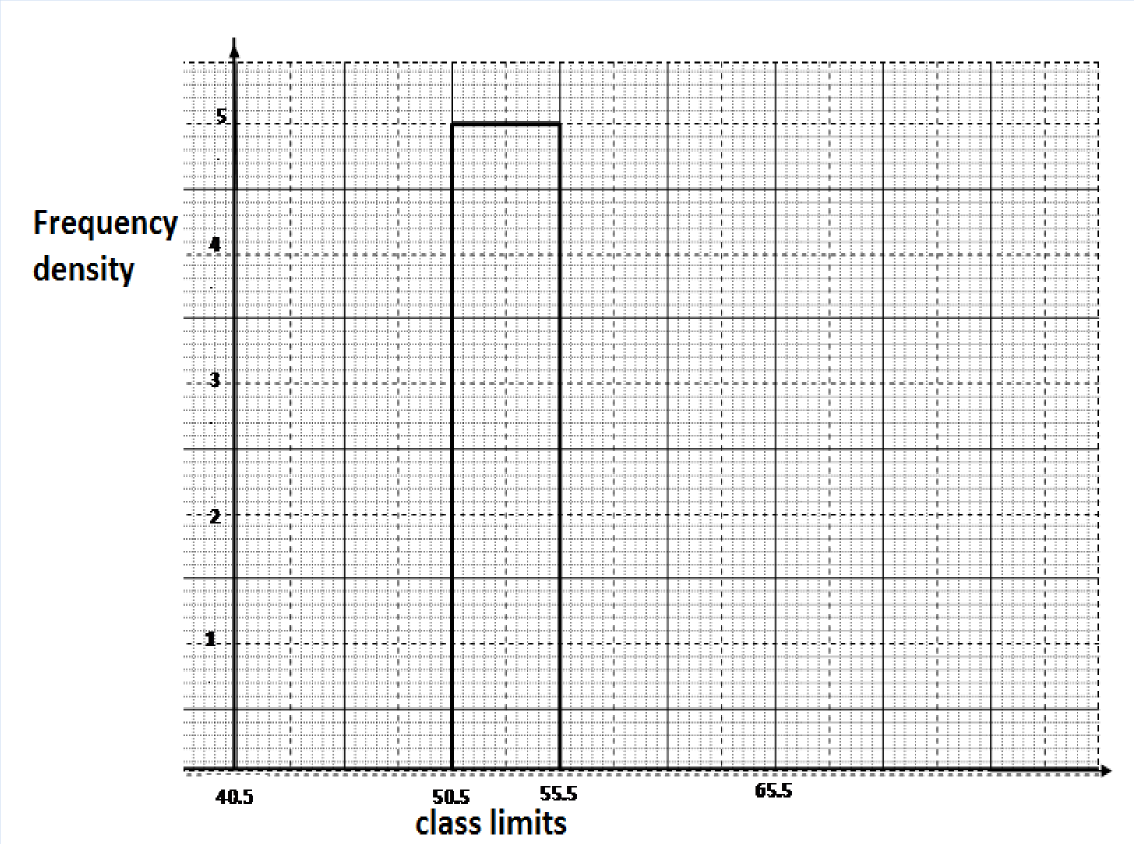
14.Find the length NX in the figure below that PQ = 9cm, PX = 12cm and MX = 15cm.
(2 mks)



15. A colony of insects was found to have 250 insects at the beginning. Thereafter, the number of insects doubled every two days. Find the number of insects after 16 days.
(3 mks)

16. The following data was obtained from the mass of a certain animal. Complete the table and the histogram below. **(3 mks)**

Mass(kg)	frequency
41-50	20
51-55	
56-65	40



SECTION II (50 MARKS)

Answer ONLY FIVE questions in this section

17.The table below shows the rate at which income tax is charged for all income earned in a month in 2015.

Taxable Income p.m (Kenya pound)	Rate in % per Kenya pound
1 -236	10%
237 -472	15%
473 -708	20%
709 – 944	25%
945 and over	30%

Mrs.mumanyi earns a basic salary of 18000.She is entitled to a house allowance of Ksh. 6,000 a person relief of Ksh. 1064 month

. Every month she pays the following.

a) Electricity bill shs.580

b) Water bill shs. 360

c) Co-operative shares shs. 800

d) Loan repayment Ksh. 3000

(a) Calculate her taxable income in k£ p.m. **(2 mks)**

(b)Calculate her P.A.Y.E **(6 mks)**

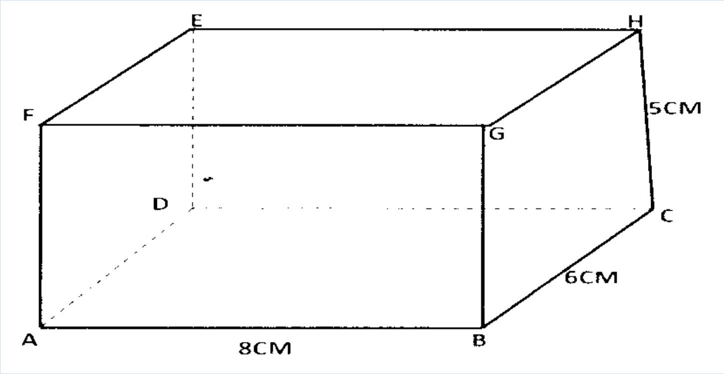
(c) Calculate her net salary. **(2 mks)**

18 (.a) Use the trapezium rule with six trapezia to calculate the areas bounded by the curve $Y=2x^2+ 3x +1$, the axis and the ordinate x=0 and x=3**. (5mks)**

b) Calculate the exact axed in **(a) above by integration. (3mks)**

c) Assuming they are calculated in (a) above is an estimate, calculate the percentage error made when the trapezium rule is used leaving your answer to 2 decimal places. **(2mks)**

19. The figure below shows a cuboid.



Calculate

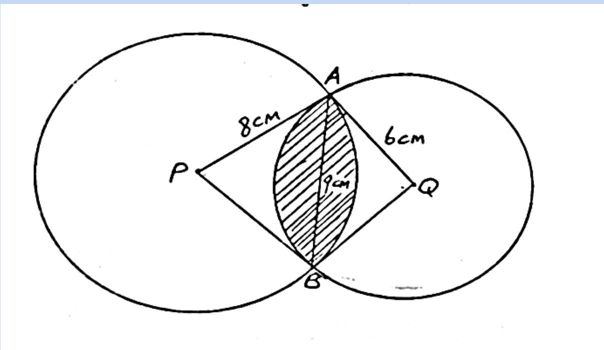
(a) The length **BE.** (2 mks)

b) The angle between BE and plane ABCD. **(3 mks)**

c) The angle between FH and BC. **(2mks)**

d) The angle between place AGHD and plane ABCD. **(3 mks)**

20. The figure below shows two intersecting circles radii 8cm and 6cm respectively. The common chord AB = 9cm and P and Q are the centres as shown.



a. Calculate the size of angle

i. APB **(1mk)**

ii. AQB **(1mk)**

b. Calculate the area of

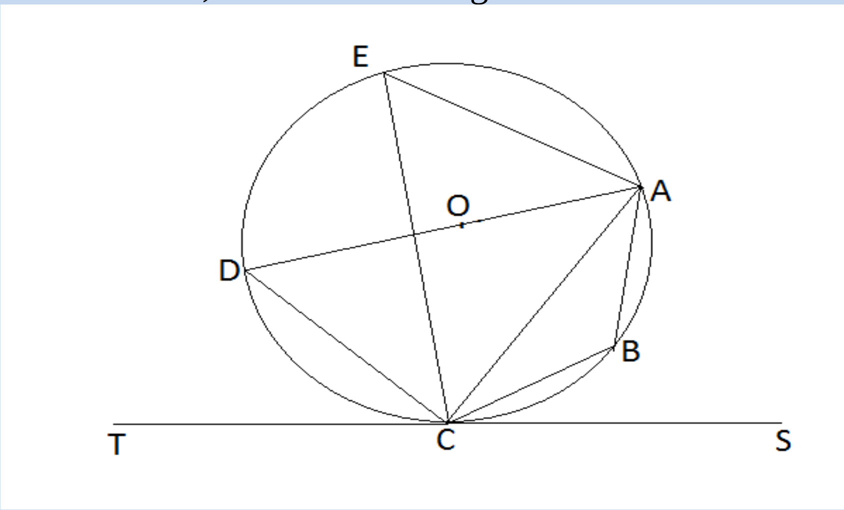
i. Minor segment of the circle centre P. **(2mks)**

ii. Minor segment of the circle centre Q **(2mks)**

iii. The quadrilateral APBQ **(2mks)**

iv. The shaded region **(2mks)**

21. 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 = 38^0



Giving reasons, determine the following angles:

(a) $\angle DCT$ **(2 mks)**

(b) $\angle DEA$ **(2 mks)**

(c) $\angle ACB$ **(2 mks)**

(d) $\angle BDC$ **(2 mks)**

(e) $\angle BOA$ **(2 mks)**

22. A flower garden is in the shape of a triangle ABC such that AB = 9M, AC=7.5M and angle ACB=75˚. Using a rule and a pair of compass only.

a) Construct △BC **(3mks)**

b) Construct a locus of P such that AP = PC. **(2mks)**

c) Construct locus of Q such that it is equal distance from AB and BC and locus of R which is 2m from AC. **(2mks)**

d) Flowers are to be planted such that they are nearer AC than AB and less than 5m from a shade the portion with flowers. **(3mks)**

23. Three variables p, q and r are such that p varies directly as q and inversely as the square of **r.**

   a. When **p = 9, q = 12** and **r = 2** find **p** when **q = 15** and **r = 5** **(4mks)**

b. Express **q** in terms of **p** and **r** **(1mk)**

c. If p is increased by 20% and r is reduced by 10% find,

i. A simplified expression for the change in q in terms of **q** and **r.** **(3mks)**

ii. The percentage change in **q.** **(2mks)**

24. The table below shows some values of the curve **y = 2cos x** and **y= 3 sin x.**

(iv) Complete the table for values **y=2cosx** and **y=3 sin x**, correct to 1 decimal places. **(3mks)**

X	**0**	**30^0**	**60^0**	**90^0**	**120^0**	**150^o**	**180^0**	**210^0**	**240^0**	**270^0**	**300^0**	**330^0**	**360^0**
y=2cos x	2		1	0			-1.7	-1.7	-1		1	1.7	2
y=3sin x	0	1.5		3	2.6				-2.6			-1.5	0

On the grid provided draw the graphs of **y=2cos x** and **y=3sin x** for **$0^0 \leq x \leq 360^0$** on the same axis. **(5mks)**

i. Use the graph to find the values of x when **2cos x- 3sin x=0. (2mks)**

ii. Use the graph to find the values of y when 2 cos x = 3sin x. **(1mk)**

NAIROBI SCHOOL

PAPER 1

SECTION I (50 MARKS)

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

1. (a) Evaluate 94344 – 36425 ÷ 5 $[1mark]$

(b) Write the total value of the digit in the thousands place of the result obtained in (a) above $[1mark]$

2. In a game park $\frac{1}{5}$ of the animals are rhinos and ¾ of them are zebras. $\frac{2}{3}$ of the remaining animals are lions and the rest are warthogs. Find the fraction of warthogs in the game park. $[3marks]$

3. The volume of a cube is $2744cm^3$. Calculate the length of the diagonal of a face of the cube giving your answer in surd form. $[3marks]$

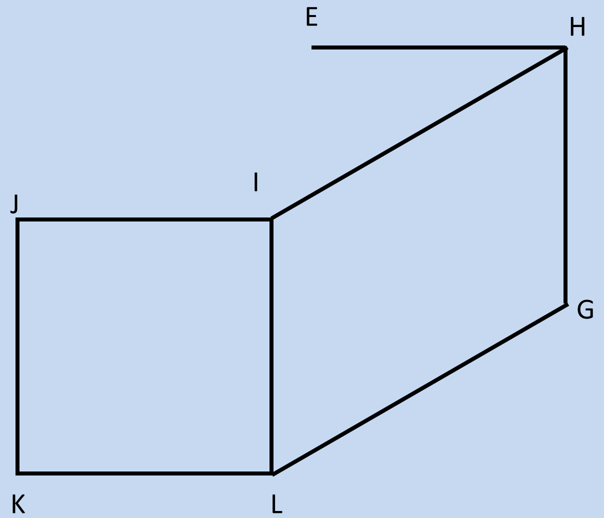
4. Without using mathematical tables or a calculator, evaluate

$$27^{\frac{2}{3}} \times \left(\frac{81}{16}\right)^{-\frac{3}{4}}$$ $[3marks]$

5. Using ruler and a pair of compasses only, construct triangle ABC in which AB = 6cm and angle ABC = 105^0 and angle BAC = 45^0. Measure length of BC. $[3marks]$

6. An empty specimen bottle has a capacity of $300ml$ and a mass of $280g$. Calculate the mass of the bottle when it is full of a liquid whose density is $1.2g/cm^3$. $[3marks]$

7. The figure below shows a sketch of a solid cuboid EFGHIJKL. Complete the sketch. $[2marks]$



8. Find the rate per annum at which a certain amount doubles after being invested for a period of 5 years compounded semi-annually

$[3marks]$

9. The sum of the interior angles of a regular polygon is 40 times the size of the exterior angle.

(a) Find the number of sides of the polygon. [$3marks$]

(b) Name the polygon [$1mark$]

10. The data below shows the number of pupils in Nairutia Primary School

42	43	48	40	46	42	44	48	39	40	42
41	47	46	45	49	45	42	40	38	39	40
46	47	42	40	41	43	44	45	46	48	

(a) Using a class size of 2 organize the data in a grouped frequency table. [$2marks$]

(b) Determine the mean of the data. [$2marks$]

11. Given that $\underset{\sim}{q} = 5\underset{\sim}{t} - 3\underset{\sim}{f}$ where $\underset{\sim}{t} = \begin{pmatrix} -2 \\ -3 \end{pmatrix}$ and $\underset{\sim}{f} = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$ find:

(a) the column vector $\underset{\sim}{q}$ [$2marks$]

(b) Given that T^I (3,2) is the image of T (0,-2) under a translation, find the translation. [1*mark*]

12. Given that a = -5 b = 3 and c = $-\frac{1}{3}$, evaluate: $\frac{5a^2-2b-4c}{\frac{1}{3}(b^2+2a)}$ [3*marks*]

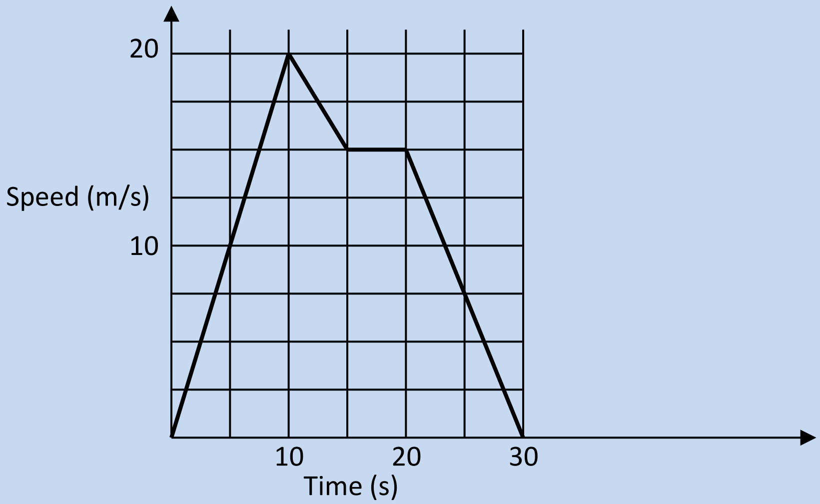
13. Find the value of x in the equation $\cos(3x-180^o)=\frac{\sqrt{3}}{2}$ in the range listed below.

$0^o \le x \le 180^o$ [3*marks*]

14. Simplify the expression

$$\frac{4t^2-25a^2}{6t^2+9at-15a^2}$$ [3*marks*]

15. The figure below represents the speed-time graph of a tuktuk. Use it to answer the questions (a) and (b)



(a) Calculate the acceleration of the tuktuk. [2*marks*]

(b) Find the total distance travelled for the whole journey [$2marks$]

16. 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. [$3marks$]

SECTION (50 MARKS)

Answer any five questions in this section in the spaces provided.

17. In the year 2001 the price of a sofa set in a shop was KSh. 12,000

(a) Calculate the amount received from the sales of 240 sofa sets that year. [$2marks$]

(b) In the year 2002 the price of each sofa set increased by 25% while the number of sets sold decreased by 10%.

(i) Calculate the percentage increase in the amount received from the sales [$3marks$]

(ii) If at the end of the year 2002, the price of each sofa set changed in the ratio 16:15. Calculate the price of each sofa set in the year 2003. [$2marks$]

c) The number of sofa sets sold in the year 2003 was p% less than the number sold in the year 2002. Calculate the value of P given that the amount received from the sales in the year were equal
$[3marks]$

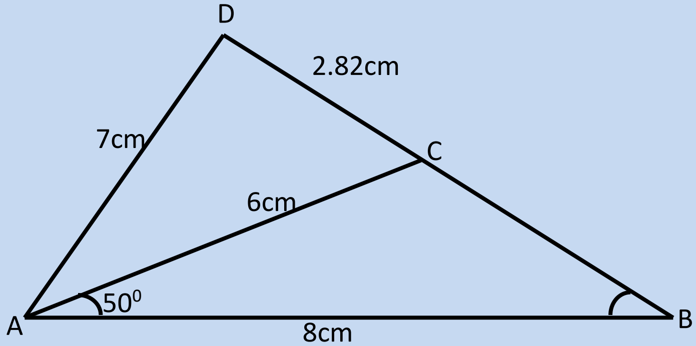
18. A line L passes through points (-2,3) and (-1,6) and is perpendicular to a line P at (-1,6)
(a) Find the equation of L. $[2marks]$

(b) Find the equation P in the form ax + by = c where a, b and c are constants. $[2marks]$

(c) Given that another line Q is parallel to L and passes through point (1,2), find the x and y - intercepts of Q.
$[3marks]$

(d) Find the point of intersection of lines P and Q. $[3marks]$

19. In the figure below (not drawn to scale) AB = 8cm, AC = 6cm, AD = 7cm, CD = 2.82cm and angle CAB = 50^0.



Calculate to 2 decimal places

(a) the length BC [$3marks$]

(b) the size of angle ABC [$2marks$]

(c) the size of angle CAD [$3marks$]

(d) the area of triangle ACD [$2marks$]

20. The coordinates of a triangle ABC are A(1, 1) B(3, 1) and C (1, 3).

(a) Plot the triangle ABC. [$\mathbf{1\ mark}$]

(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'. [$\mathbf{2\ marks}$]

(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. [$\mathbf{2\ marks}$]

(d) The triangle A" B" C" , undergoes an enlargement scale factor -1, centre origin. Obtain the coordinates of the image A''' B''' C'''. [$\mathbf{2\ marks}$]

(e) The triangle A''' B''' C''' undergoes a rotation centre (1, -2) angle 120^0. Obtain the coordinates of the image A^{iv} B^{iv} C^{iv}. [$\mathbf{2\ marks}$]

(f) Which triangles are directly congruent. [$\mathbf{1\ mark}$]

21. Three warships $P, Q\ and\ R$ leave port X at 9:00am, ship P sails at a steady speed on a bearing of 070º, 100km from port X, while ship Q sails on a bearing of 320º, 80km from X. Ship R is on a bearing of 150º from port X and due south of ship P.

   a) Use scale drawing to show the position of $P, Q, R\ and\ X$ [$4marks$]

   b) Use the scale drawing to determine
      i) The distance and bearing of ship P from ship Q [$2marks$]

      ii) The distance of ship R from port X [$2marks$]

      iii) The distance of ship R from ship P [$2marks$]

22. A rectangular tank whose internal dimensions are $2.04m\ by\ 1.68m\ by\ 26.4\ m$ is $\frac{7}{8}$ full of milk

a) If the tank is made of metal of thickness $3mm$. Calculate the external volume of the tank in m^3 when closed.

[$3marks$]

b) Calculate the volume of milk in the tank in cubic metres. [$2marks$]

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 $13.6\ cm$. Full packets obtained are sold at $kshs. 35$ per packet. Calculate;

i) The volume of milk, in cubic centimeters contained in each packet to 4 significance figures. Hence find the number of full packets. [$3marks$]

ii)The exact amount that will be realized from the sale of all the packets of milk. [$2marks$]

23. (a) Find the inverse of the matrix [$2marks$]

$$\begin{bmatrix} 2 & 5 \\ 4 & 3 \end{bmatrix}$$

(b) A transport company has two types of vehicles for hire: Lorries and buses. The vehicles are hired per day. The cost of hiring two lorries and five buses is Sh. 156,000 and that of hiring 4 lorries and three buses is Sh. 137,000.

(i) Form two equations to represent the above information. [2 *marks*]

(ii) Use matrix method to determine the cost of hiring a lorry and that of hiring a bus. [3 *marks*]

(c) Find the value of x given that $\begin{bmatrix} 2x-1 & 1 \\ x^2 & 1 \end{bmatrix}$ is a singular matrix [3 *marks*]

24. a) (i) Find the co-ordinates of the stationary points of the curve $y = x^3 - 3x + 2$. [4 *marks*]

(ii) For each stationary point determine its nature [2 *marks*]

(b) Determine the y-intercept [2 *marks*]

(c) In the space provided sketch the graph of the function $y = x^3 - 3x + 2$ [2 *marks*]

PAPER 2

SECTION I (50 MARKS)

Answer ALL the questions in this section.

1. Use logarithms to evaluate:

$\sqrt[3]{\frac{45.3 \times 0.00697}{0.534}}$ (4 marks)

2. a) Expand $\left(1 - \frac{1}{2}x\right)^6$ up to fourth term. (2 marks)

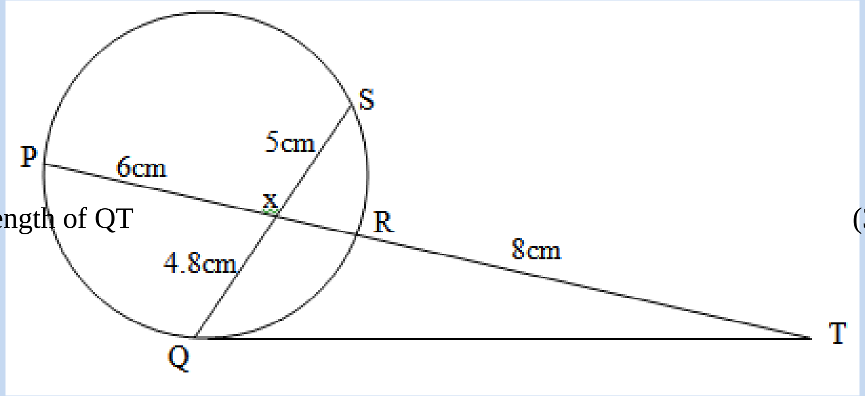
b) Use the expansion above to evaluate $(0.98)^6$ (2 marks)

3. The data below represents the ages in months at which 11 babies started walking:
9,15 , 12, 9, 8, 13, 7, 11, 13, 14 and 10.
Calculate the interquartile range of the above data (3 marks)

4. 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)

5. If $\frac{\sqrt{3}-2\sqrt{2}}{3\sqrt{2}+\sqrt{3}} = a\sqrt{b} + c$ Find the values of a, b and c. (3 marks)

6. 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.



Find the length of QT (3 marks)

7. Solve for x in the equation below:
Log 3(x + 3) = 3 log 3 + 2 (3 marks)

8. Pipe A can fill a tank in 2 hours, Pipe B and C can empty the tank in 5 hours and 6 hours respectively. How long would it take:

a) To fill the tank if A and B are left open and C is closed. (2 marks)

b) To fill the tank with all pipes open. (2 marks)

9. A transformation is represented by the matrix $\begin{bmatrix} 1 & 3 \\ 4 & 2 \end{bmatrix}$. This transformation maps a triangle ABC of the area $12.5cm^2$ onto another triangle A′B′C′. Find the area of triangle A′B′C′.

(3marks)

10. Make P the subject of the formula $XY^P = Q^{PX}$ (3 marks)

11. The coordinates of the end points of diameter are A(2,4) B(–2,6). Find the equation of a circle in the form $ax^2 + by^2 + cx + dy + e = 0$ (3 marks)

12. A bag contains 10 balls of which 3 are red, 5 are white and 2 green. Another bag contains 12 balls of which 4 are red, 3 are white and 5 are green. A bag is chosen at random and a ball picked at random. Find the probability the ball so chosen is red. (3 marks)

13. Use the trapezium rule with seven ordinates to find the area bounded by the curve $y = x^2 + 1$ lines x = -2, x = 4 and x – axis (3 marks)

14. 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)

15. 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)

16. The gradient function of a curve is given $\frac{dy}{dx} = 3x^2 - 8x + 2$. If the curve passes through the point, (2, –2), find its equation. (3 marks)

SECTION II (50 MARKS)

Answer five questions only from this section

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. a) Complete the table below for y=sin 2x and y=sin (2x + 30) giving values to 2d.p

X	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

(2 marks)

b) Draw the graphs of y=sin 2x and y = sin (2x + 30) on the axis. (4 marks)

c) Use the graph to solve $sin\ (\ 2x\ +\ 30) - sin\ 2x\ =\ 0$ (1 mark)

d) Determine the transformation which maps $sin\ 2x\ onto\ sin\ (2x\ +\ 30)$ (1 mark)

e) State the period and amplitude of $y\ =\ sin\ (\ 2x\ +\ 30)$ (2 marks)

19. A plane S flies from a point P (40^0N, 45^0W) to a point Q (35^0N, 45^0W) and then to another point T (35^0N, 135^0E).

a) Given that the radius of the earth is 6370km find the distance from P to Q in Km.
(Take $\pi = \frac{22}{7}$) (2 marks)

b) Find in nm
(i) The shortest distance between Q and T. (2 marks)

(ii) The longest distance between Q and T (to the nearest tens) (2 marks)

c) Find the difference in time taken when S flies along the shortest and longest routes if its speed is 420 knots (4 marks)

20. The following table shows the distribution of marks obtained by 50 students.

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

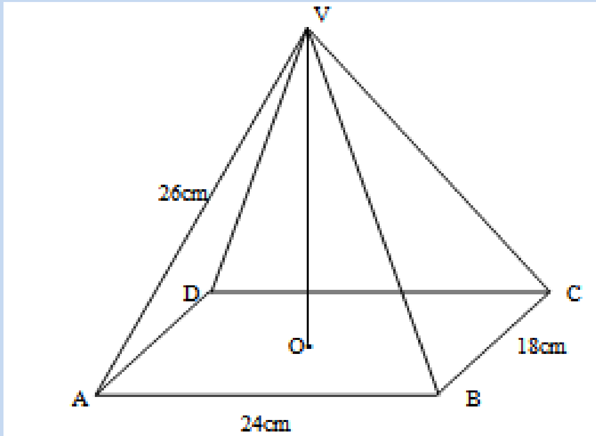
By using an assumed mean of 62, calculate

a) the mean (5 marks)

b) the variance (3 marks)

c) the standard deviation (2 marks)

21. The diagram below represents a pyramid standing on rectangular base ABCO. V is the vertex of the pyramid and $\mathrm{VA} = \mathrm{VB} = \mathrm{VC} = \mathrm{VD} = 26$ cm. M is the midpoints of BC and AC respectively. $AB = 24\ cm$ and $BC = 18\ cm.$



Calculate:-

a) The length of the projection of line VA on plane ABCD (2marks)

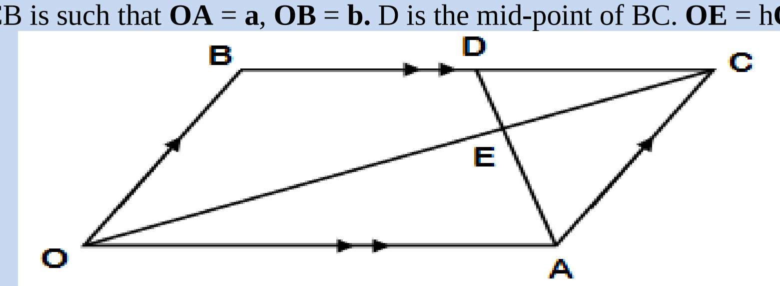
b) The angle between line VA and the plane ABCD. (2marks)

c) The size of the angle between the planes VBC and ABCD. (2marks)

d) The vertical height of the pyramid. (2marks)

e) The volume of the pyramid (2marks)

22. A parallelogram OACB is such that **OA** = **a**, **OB** = **b.** D is the mid-point of BC. **OE** = h**OC** and **AE** = k**AD**.



(a) Express the following in terms of **a**, **b**, h and k.

(i) **OC** (1 mark)

(ii) OE (1 mark)

(iii) **AD** (1 mark)

(iv) **AE** (1 mark)

(b) Find the values of h and k. (4 marks)

(c) Determine the ratios:

(i) AE : ED (1 mark)

(ii) OE : OC (1 mark)

23. A uniform distributor is required to supply two sizes of skirts to a school: medium and large sizes. She was given the following conditions by the school.

(i) The total number of skirts must not exceed 600.

(ii) The number of medium size skirts must be more than the number of large size skirts.

(iii) The number of medium size skirts must not be more than 350 and the number of large size skirts must not be less than 150. If the distributor supplied χ medium size and y large size skirts.

(a) Write down, in terms of χ and y, all the linear inequalities representing the conditions above. (4mks)

(b) On the grid provided, represent the inequalities in (a) above by shading the unwanted regions. (4mks)

The distributor made the following profits per skirt.: Medium size = Sh.300., Large size = Sh.250. Determine the maximum profit. (3mks)

24. (a) On the same diagram construct:-

i) Triangle PQR such that PQ = 9cm, PR = 7cm and triangle RPQ = 60^0 (2 marks)

ii) The locus of a point M such that M is equidistant from P and Q. (1mark)

iii) The locus of a point N such that RN ≤ 3.5cm. (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 ≥ QM. (2marks)

ii) Find the area of the shaded region in (i) above (4marks)

FRIENDS SCHOOL KAMUSINGA

PAPER 1

1. Evaluate without using a calculator (2 Marks)

$$\frac{23.4 - 2(5.2 + 5.3)}{3.2\ x\ 1.2}$$

2. In Blessed Church choir, the ratio of males to females is 2:3. On one Sunday service, ten male members were absent and six new female members joined the choir as guests for the day. If on this day the ratio of males to females was 1:3, how many regular members does the choir have? (3 Marks)

3. A Kenyan bank buys and sells foreign currency as shown below.

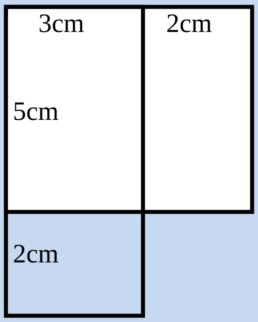
	Buying Kenya shillings	Selling Kenya shillings
1 Euro	84.15	84.26
1 US Dollar	80.12	80.43

A tourist travelling from Britain arrives in Kenya with 5000 Euros. He converts all the Euros to Kenya shillings at the bank. While in Kenya he spends a total of KSh. 289,850 and then converts the remaining Kenya shillings to US dollars at the bank. Calculate (to nearest dollar) the amount he receives? (3 Marks)

4. Simplify the expression. (3 Marks)

$$\frac{4x^2 - 16y^2}{6x^2 - 8xy - 8y^2}$$

5. Complete the figure below so as to make the net of a cuboid. Hence determine the surface area of the cuboid. (4 Marks)



6. The sum of the interior angles of a regular polygon is 1080^0. Calculate

(a) The number of sides of the polygon (2 Marks)

(b) The sizes of the exterior and interior angles of the polygon. (2 Marks)

7. If $3^{(2x)} - 4(3^x) + 3 = 0$. Find the possible values of x (3 Marks)

8. Three similar pieces of timber of length 240cm, 320cm and 380cm are cut into equal pieces. Find the largest possible area of a square which can be made from any of the three pieces. (3 Marks)

9. The sum of digits formed in a two digit number is 16. When the number is subtracted from the number formed by reversing the digits, the difference is 18. Find the number (3 Marks)

10. Solve for x given that (3 Marks)

Log_{10}(x – 1) + 1 = Log_{10}(x – 4)

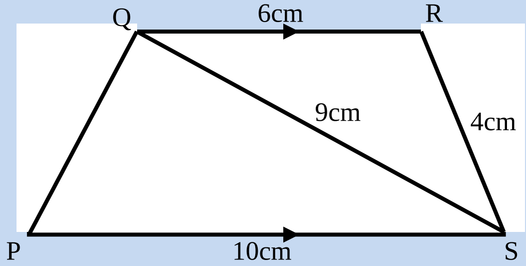
11. Three pens and four exercise books cost Sh. 87. Two pens and five exercise books cost Sh. 93. Find the cost of one pen and one exercise book. (4 Marks)

12. A farmer has enough feed to last 45 cows for 30 days. If he buys 5 more cows, how long will the feed last? (2 Marks)

13. Find the equation of the line perpendicular to $3x - 7y - 20 = 0$, and passes through the point (5,2) (3 Marks)

14. Wanza sold a bag of potatoes for Sh. 420 and made a profit. If she sold it at Sh. 320, she could have made a loss. Given that the profit is thrice the loss, how much did she pay for the bag of potatoes? (3 Marks)

15. In the figure below PQRS is a trapezium with QR parallel to PS. QR = 6cm, RS = 4cm, QS = 9cm and PS = 10cm.



Calculate

(a) The size of angle SQR (2 Marks)

(b) The area of triangle PQS (2 Marks)

16. Given that Cos $(x - 20)^0$ = Sin $(2x + 32)^0$ and x is an acute angle, Find tan $(x - 4)^0$ (3 Marks)

SECTION II (50 MARKS)

Answer Only Five Questions In This Section

17. An expedition has 5 sections AB, BC, CD, DE and EA. B is 200m on a bearing of 050^0 from A. C is 500m from B. The bearing of B from C is 300^0. D is 400m on a bearing 230^0 from C. E is 250m on a bearing 025^0 from D.

    (a) Sketch the route (1 Mark)

    (b) Use the scale of 1cm to 50m to draw the accurate diagram representing the route. (5 Marks)

    (c) Use your diagram to determine

    (i) Distance in metres of A from E (2 Marks)

    (ii) Bearing of E from A

18. A business lady bought 100 quails and 80 rabbits for Sh. 25,600. If she had bought twice as many rabbits and half as many quails she would have paid Sh. 7,400 less. She sold each quail at a profit of 10% and each rabbit at a profit of 20%.

    (a) Form two equations to show how much she bought the quails and the rabbits (2 Marks)

    (b) Find the cost of each (3 Marks)

    (c) Calculate the profit she made from the sale of the 100 quails and 80 rabbits (3 Marks)

(d) What percentage profit did she make from the sale of the 100 quails and 80 rabbits (2 Marks)

19. The table below shows the length of 40 seedlings.

Length in (mm)	Frequency
118-126	3
127 – 135	4
136 – 144	10
145 – 153	12
154 – 162	5
163 – 171	4
172-180	2

Determine

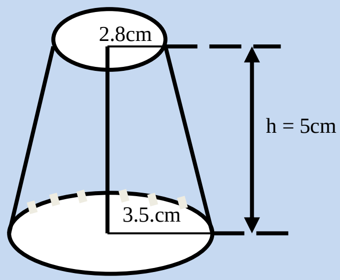
(a) (i) The modal class (1 Mark)

(ii) The median class (2 Marks)

(b) (i) The mean of the seedlings (4 Marks)

(ii) The median of the seedlings (3 Marks)

20. Find



(a) The surface area of the frustrum (5 Marks)

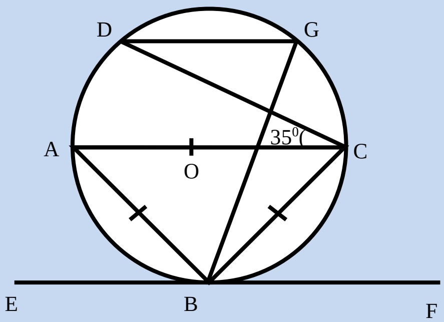
(b) The volume of frustrum shown. (5 Marks)

21. Triangle ABC vertices A (-2, 6), B (2, 3) and C (-2, 3) is reflected in the line x = -3 to give the image $A_1B_1C_1$. $A_1B_1C_1$ is translated by the vector $\begin{pmatrix} 10 \\ 2 \end{pmatrix}$ to give image $A_2B_2C_2$. $A_3B_3C_3$ with coordinates A_3 (6,-6) B_3 (2,-3) and C_3 (6,-3) is the image of $A_2B_2C_2$ after transformation.
Plot all the triangles in the grid provided and determine

(i) The transformation that maps $A_2B_2C_2$ onto $A3B_3C_3$ (2 Marks)

(ii) The simple transformation that maps ABC onto $A_3B_3C_3$ (2 Marks)

22. In the figure below AOC is a diameter of the circle centre O; AB = BC and ∠ACD = 35^0. EBF is a tangent to the circle at B. G is a point on the minor arc CD.



Giving reason

(a) Calculate the size of

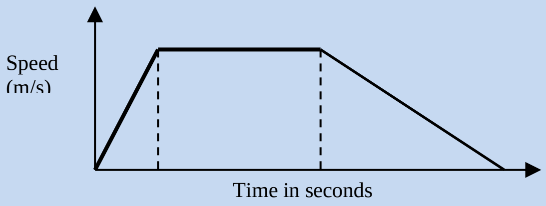
(i) ∠BAD (3 Marks)

(ii) The obtuse ∠BOD (2 Marks)

(iii) ∠BGD (2 Marks)

(b) Show that ∠ABE = ∠CBF (3 Marks)

23. The diagram below shows the speed-time graph for a bus travelling between two stations. The bus begins from rest and accelerates uniformly for 30 seconds. It then travels at a constant speed for 60 seconds and finally decelerates uniformly for 40 seconds.



Given that the distance between the two stations in 2090m. Calculate

(a) The maximum speed, in km/h the bus attained (3 Marks)

(b) The acceleration (2 Marks)

(c) The distance travelled during the last 20 seconds (2 Marks)

(d) The time the bus takes to travel the first half of the journey (3 Marks)

24. The members of a photograph club decided to buy a camera worth Shs. 4000 by each contributing the same amount of money. Fifteen member failed to pay their contribution due to various reasons. As a result each of the remaining members had to contribute Sh. 60 more.

(a) Find the number of members in the club (7 Marks)

(b) What was the percentage increase in the contribution per month? (3 Marks)

PAPER 2

SECTION I (50 MARKS)

*Answer **all** the questions from this section*

1. Use logarithms to evaluate (4 Marks)

$$\frac{0.5249^2 \times 83.58}{\sqrt[3]{0.3563}}$$

2. Make n the subject of the formula $\frac{r}{p} = \sqrt{\frac{m}{n^2-1}}$ (3 Marks)

3. Solve for x in the equation $2\ sin^2 x - 1 = cos^2 x + sinx\ for\ 0^\circ \le x \le 360^\circ$ (4 Marks)

4. The image of a scalene triangle under the transformation given by the matrix $\begin{bmatrix} x+1 & 1 \\ 2 & x \end{bmatrix}$ is a straight line, find the possible value of x (3 Marks)

5. Evaluate without using tables or a calculator $\frac{1+Sin60^\circ}{1-Cos30^\circ} + \frac{1-Sin\ 60^\circ}{1+Cos30^\circ}$

6. The equation of a circle is $x^2 + 4x + y^2 - 2y - 4 = 0$. Determine the centre and radius of the circle (3 Marks)

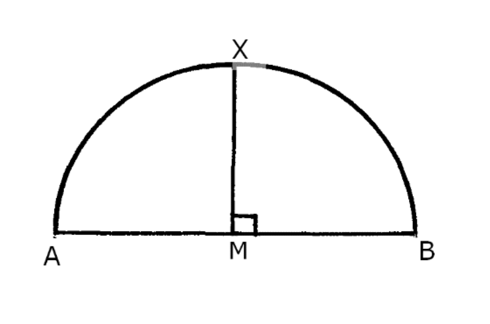
7. Use the expansion of $(x - y)^5$ to evaluate $(9.8)^5$ correct to 1 decimal place (3 Marks)

8. If $\int_1^a 3(x+1)^2 dx = a^3 + 11$ find the possible values of a (4 Marks)

9. The measurement of the radius and height of a cylinder are given as 8cm and 9.5cm respectively. Calculate the percentage error in volume of a cylinder (Take π=3.142) (3 Marks)

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

11. The figure below is a segment of a circle cut-off by chord AB. Line MX is perpendicular Bisector of chord AB.



If AB is 20cm and MX is 6cm. Calculate the radius of the circle from which the chord was cut. (2 Marks)

12. a) Find the inverse of the matrix (1 Marks)

$$\begin{pmatrix} 4 & 3 \\ 3 & 5 \end{pmatrix}$$

b) hence solve the following simultaneous equation using matrix method (2 Marks)
$4x + 3y = 6$
$3x + 5y = 5$

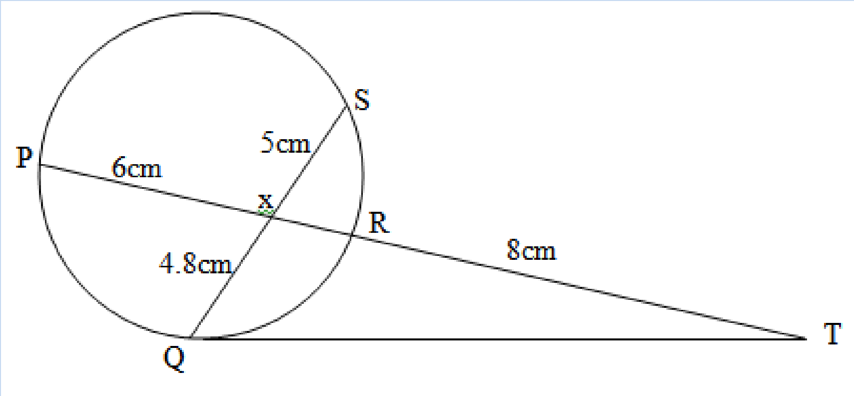
13. Point A is at (10°S, 20°E); when it is 1p.m in A, it is 9 p.m at B. Find the position of point B if both points lie in the same latitude. (2 Marks)

14. A soda manufacturing company supplies two types of drinks, fanta and coke the total number of crates must not be more than 400. The company must supply more crates of fanta than coke. However, the number of crates of fanta must not be more than 300 and the number of crates of coke must be less than 80 let x represent fanta and y coke.

Write down all the inequalities representing the given instructions (4 Mark)

15. A student at a certain college has 60% chance of passing an examination at the first attempt. Each time a student fails and repeats the examination his chances of passing are increased by 15%. Calculate the probability that a student in the college passes an examination at the third attempt. (2 Marks)

16. 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.

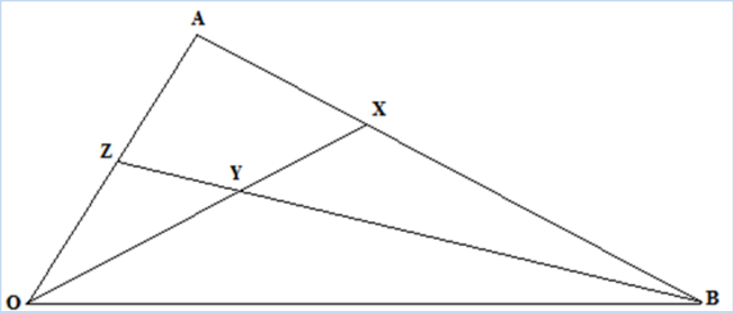


Find the length of QT (3 Marks)

SECTION II (50 MARKS)

*Answer **FIVE** questions **ONLY** from this section*

17.



In the figure above O is the origin. **OA** = **a**, **OB** = **b**. The point x is on AB such that 2**AX** = **XB** and Y is the mid point of OX.

a) Find in terms of **a** and **b**, the vectors.

i) **OX** (2 Marks)

ii) **BY** (2 Marks)

b) BY produced meets OA at Z. Given that **OZ** = h**a** and **BZ** = k**BY** where h and k are constants, find the values of h and k. (4 Marks)

c) Find the position vector, **OZ** and obtain the ratio **OZ**: **ZA**. (2 Marks)

18. The second, third and fourteenth terms of Arithmetic progression are the three consecutive terms of a geometric progression. The 10^{th} term of the arithmetic progression is 18. Find;

a) The first term and the common difference of the progression. (5 Marks)

b) The sum of the first 10 terms of the progression. (3 Marks)

c) The sixth term of the A.P (2 Marks)

19. Fifty candidates sat for an exam. The following results were obtained

Marks	0-9	10-19	20-29	30-39	40-49	50-59	60-69
No. of candidates	4	6	8	12	9	7	4

Draw a cumulative frequency curve (4 Marks)

b) use your graph to estimate

i) Median (1 Mark)

ii) Upper Quartile (1 Mark)

i) Lower Quartile (1 Mark)

b) The pass mark if 30% of the candidates passed (3 Marks)

20. Alice and Cate can dig a shamba in 12 and 15 days respectively. Alice did the work for three days alone and she was joined by Cate on the 4th day and both of them worked for the next two days. Find
   a) The proportion of the work Alice had done before she was joined by Cate. (2 Marks)

   b) The work done in the first 5 days (3 Marks)

   c) The work remaining by the end of the first five days (1 Mark)

   d) After five days they were joined by John who can dig the shamba a lone in 10 days. How long will the three take to clear the remaining portion of the work (4 Marks)

21. The table below shows income tax for a certain year

Monthly Income in Kenya Shillings (Ksh)	Tax Rate
0 - 10164	10%
10165 - 19740	15%
19741 - 29316	20%
29317 - 38892	25%
Over 38892	30%

A tax relief of Ksh 1162 per month was allowed. In a certain month of the year, an employee's taxable income in the fifth band was Ksh.2108.

a) Calculate
   i) Employees total taxable income in that month (2 Marks)

   ii) The tax payable by the employee in that month (5 Marks)

b) The employee's income include a house allowance of Ksh 15,000 per month. The employee contributed of the 5% basic salary to a co-operative society. Calculate the employee's net pay for that month (3 Marks)

22. a) complete the table below for the functions y=Sin x and y=2Sin(x+30◦) for 0◦≤ x≤360◦ (2 Marks)

x◦	0	30	60	90	120	150	180	210	240	270	300	330	360
Sin x	0	0.5	0.87		0.87	0.5	0		-0.87	-1		-0.5	0
2Sin(x+30◦)	1		2	1.73		0	-1	-1.73		-1.73	-1	0	1

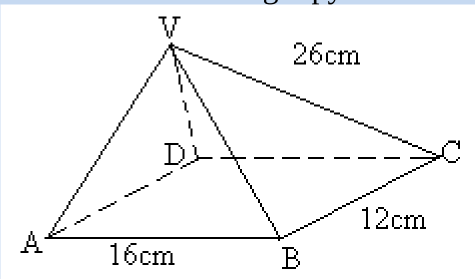
On the same axis, draw the graphs of y=Sin x and y=2Sin (x +30◦) for 0◦≤x≤360◦ (4 Marks)

c) i) State the amplitude of the graph y= 2Sin(x+30) (1 Mark)

ii)State the period of the graph y = Sin x (1 Mark)

d) use your graph to solve the equation Sin x – 2Sin (x +30◦) = 0 (2 Marks)

23. The figure below shows a right pyramid ABCDV with a rectangle base.



Given that AB = 16cm, BC = 12cm and VA = VB = VC = VD = 26cm.

Find

a) The height of the pyramid. (3 Marks)

b) The angle between line DV and the base ABCD. (2 Marks)

c) The angle between plane VBC and the base ABCD. (2 Marks)

d) The angle between planes AVB and CVD. (3 Marks)

24. Construct triangle PQR such that PQ = 7cm, QR = 6cm and RP = 5cm. (1 Mark)

(a) Construct the locus of point X which is equidistant from Q and R. (1 Mark)

(b) Construct the locus of M which is equidistant from PR and QR.
Mark with letter M the point where this locus meets PQ. Measure QM. (3 Marks)

(c) Construct the locus of Y such that PY = 4cm. (1 Mark)

(d) Shade the region in which T lies given that $QT \geq TR$ and $\angle PRT \geq \angle QRT$ and $PT \leq 4cm$
(4 Marks)

MOI GIRLS ELDORET

PAPER 1

SECTION 1: (50 MARKS)

Attempt ALL Questions in this section

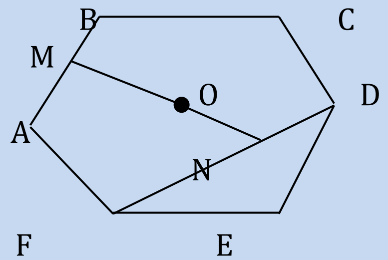
1. Evaluate: (3marks)

$$\frac{8 \times \frac{1}{3} \text{ of } 9 \div 2}{(12+2\times3) - \frac{2}{3} \text{ of } 144 \div 12}$$

2. Given that Cos $(x - 20)^0$ = Sin $(2x + 32)^0$ and x is an acute angle, Find tan $(x - 4)^0$ (3 Marks)

3. A rhombus A B C D with its side 15cm and diagonal AC = 24cm. Find the length of the other diagonal BD. (2marks)

4. The figure below is a regular hexagon. O is the centre and M is the mid point of AB.



Find angle: (i) EFD (1mark)

(ii) MNF (2marks)

5. Simplify the expression: (4marks)

$$\frac{4x^2 - xy - 3y^2}{32x^2 - 18y^2}$$

6. A man invests KSh. 24,000 in an account which pays 16% interest p.a. The interest is compounded quarterly. Find the amount in the account after 1 ½ years. (3 Marks)

7. Solve for x given that (3 Marks)
$Log_{10}(x - 1) + 1 = Log_{10}(x - 4)$

8. A seven sided polygon has three of its angles equal to θ and the other angles are (2θ - 30), (θ + 28), 3(θ - 4) and (126 - θ).Calculate the value of θ (3 marks)

9. Pipe A can fill a tank in 2 hours, pipes B and C can empty the tank in 5 hours and 6 hours respectively. How long would it take
(a) To fill the tank if A and B are left open and C closed (2 Marks)

(b) To fill the tank with all the pipes open (2 Marks)

10. The travel timetable below shows the departure and arrival time for a bus plying between two towns M and R, 300 kilometres apart.

TOWN	**ARRIVAL**	**DEPARTURE**
M		0830h
N	1000h	1020h
P	1310h	1340h
Q	1510h	1520h
R	1600h	

Calculate the average speed for the whole journey. (3marks)

11. Simplify the following expression without using tables or calculator: (3marks)

$$\frac{4\cos 60^0 + 16\cos^2 45 + 2\sin 30}{\text{Sin}^2 45}$$

12. Given that PQ = $\begin{pmatrix} 9 \\ 2 \end{pmatrix}$ and OQ = $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$, determine:

OP and find the magnitude of OP giving your answer in surd form. (3marks)

13. A tourist arrived from USA and changed his US $1500 TO Ksh. He spent Ksh. 3000 per night in a hotel for 20 nights and a further Ksh. 9000 daily for the entire period. He left for South Africa having changed the balance to South African Rand.

Calculate the amount of South African Rands he left with, if the bank buys and sells currencies using the table below.

Currency	Buying	Selling
1 US Dollar ($)	78.4133	78.4744
1 Sterling Pound (£)	114.1616	114.3043
1 South African Rand	7.8842	7.9141

14. Two similar containers can hold 1000ml and 8 litres of water respectively. The larger has a surface area of 800cm^2. Find the surface area of the smaller container. (3marks)

15. Use squares square roots and reciprocal tables to evaluate (3marks)

$$3.045^2 + \frac{1}{\sqrt{49.24}}$$

16. The sum of digits formed in a two digit number is 16. When the number is subtracted from the number formed by reversing the digits, the difference is 18. Find the number (3 Marks)

SECTION II (50 MARKS)

Answer any five questions in this section

17. A group of choir members decided to raise 3600/= to buy a guitar. Each member was to contribute equal amount. In the preparation process five members transferred to another church, which meant the remaining contributors had to pay more to achieve the target.

(a) i) find an expression in terms of n for the original contribution (1mk)

ii) find an expression in terms of n for the new contribution by the remaining members. (1mk)

iii) Show that the increase in the contribution per member was:

Sh. $\frac{18,000}{n(n-5)}$ if n is the initial number of members. (3mks)

(b) If the increase in the contribution per member was sh. 24, what was the original contribution before the other members left? (3mks)

(c) Calculate the percentage increase in the contribution before the others left. (2mks)

18. The table below shows the marks scored by form four students in a mathematical test.

Marks	$5\leq X\leq 14$	$5\leq X\leq 24$	$5\leq X\leq 34$	$5\leq X\leq 54$	$5\leq X\leq 64$	$5\leq X\leq 84$	$5\leq X\leq 94$
Frequency	3	10	22	72	87	98	100

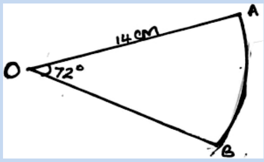
(a) State the modal class. (1mark)

(b) Calculate the mean mark. (3marks)

(c) Calculate the 70th percentile mark. (3marks)

(d) Draw a histogram to represent this information. (3marks)

19. The figure below shows a sector of a circle. If the radius OA = 14cm and the angle AOB = 72^0.



(a) Calculate the area of the sector. (2marks)

(b) The sector is folded to form a cone. Calculate:-

(i) The radius of the cone formed. (2marks)

(ii) The volume of the solid formed. (3marks)

(c) A solid cone of same size in (b) above is melted down and casted into circular washers. Each washer has an external diameter of 4cm, internal diameter of 1½ cm and 0.3cm thick. Calculate number of washers made. (3marks)

20. A bus left Kisumu for Nairobi at an average speed of 60km/hr. After 1½ hours another car left Kisumu for Nairobi along the same route at an average speed of 100km/h. If the distance between Kisumu and Nairobi is 500km, determine:-

(a) (i) The distance of the bus from Nairobi when the car took off. (2marks)

(ii) The distance the car travelled to catch up with the bus. (4marks)

(b) Immediately the car caught up with the bus, the car stopped for 25 minutes. Find the new average speed of which the car travelled in order to reach Nairobi at the same time as the bus. (to the nearest whole number). (4marks)

21. Three variables P, Q and R are such that P varies directly as the cube of Q and inversely as the square of R.

(a) Given that $P = 16$ when $Q = 2$ and $R = 3$. Determine the value of R when $P = 288$ and $Q = 4$. (5marks)

(b) Q decreases by 30% while R increases by 40%. Find the percentage decrease or increase in P. (5marks)

22. A triangle with A (-4, 2), B (-6,6) and C (-6,2) is enlarged by a scale factor -1 and centre (-2,6) to produce triangle $A^IB^IC^I$. Triangle $A^IB^IC^I$ is then reflected in the line y = x to give triangle $A^{II}B^{II}C^{II}$.

(a) Draw triangle ABC, $A^IB^IC^I$ and $A^{II}B^{II}C^{II}$ and state the coordinates of $A^IB^IC^I$ and $A^{II}B^{II}C^{II}$. (6marks)

(b) If triangle $A^{II}B^{II}C^{II}$ is mapped onto $A^{III}B^{III}C^{III}$ whose co-ordinates are A^{III} (0,-2) B^{III} (4,4) and C^{III} (0, -4) by a rotation. Find the centre and angle of rotation. (4marks)

23. 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)

24. (a) Draw a regular pentagon PQRST of sides 7cm. On it draw a line AR such that it is a line of symmetry to the figure. (4marks)

(b) Locate a point M on AR such that M is equidistant from P and Q, hence measure the shortest distance of M from TS. (2marks)

(c) Shade the region within the figure such that a variable X must lie, given that X satisfies the following conditions: (4marks)

(i) X is nearer to PT than to PQ.

(ii) RX is not more than 7.5cm.

Angle PXT is greater than 90^0

PAPER 2

SECTION I: ***Answer all questions from this section***

1. Use logarithm tables to evaluate (4 Marks)

$$\sqrt[3]{\frac{45.3 \times 0.00697}{0.534}}$$

2. Solve for x in the equation $2Sin^2x - 1 = Cos^2x + Sinx$ for $0^0 \leq x \leq 360^0$ (3 Marks)

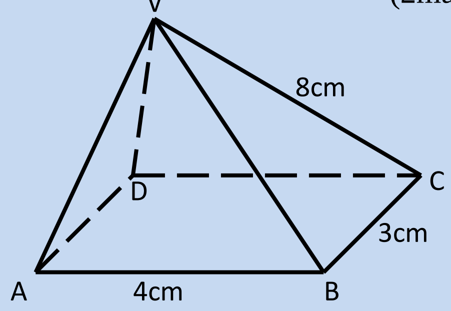
3. (a) Expand $\left(1+\frac{3}{x}\right)^5$ upto the fifth term (2 Marks)

   (b)Hence use your expansion to evaluate the value of $(2.5)^5$ to 3 d.p. (2 Marks)

4. Make p the subject of the formula (3 Marks)

$$E = \sqrt{\frac{p-3u}{y-3xp}}$$

5. The figure below shows a rectangular based right pyramid. Find the angle between the planes ABCD and ABV. (2marks)



6. A object A of area $10cm^2$ is mapped onto its image B of area $60cm^2$ by a transformation whose matrix is given by $P=\begin{Bmatrix} x & 4 \\ 3 & x+3 \end{Bmatrix}$. Find the possible values of x (3 Marks)

7. The position vectors of A and B are $\underset{\sim}{a}$ = 4i + 4j – 6k and $\underset{\sim}{b}$ = 10i + 4j + 12k. D is a point on AB such that AD:DB is 2:1. Find the co-ordinates of D (3 Marks)

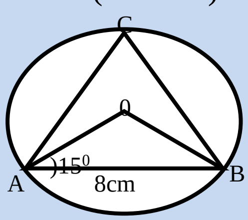
8. A dealer has two types of grades of tea, A and B. Grade A costs Sh. 140 per kg. Grade B costs Sh. 160 per kg. If the dealer mixes A and B in the ratio 3:5 to make a brand of tea which he sells at Sh. 180 per kg, calculate the percentage profit that he makes (3 marks)

9. A variable Z varies directly as the square of X and inversely as the square root of Y. Find the percentage change in Z if X increased by 20% and Y decreased by 19% (3 Marks)

10. By rounding each number to the nearest tens, approximate the value of $\frac{2454 \, x \, 396}{66}$ Hence calculate the percentage error arising from this approximation to 4 significant figures (3 Marks)

11. Find the centre and radius of the circle whose equation is $2x^2 + 2y^2 – 8x + 12y – 2 = 0$ (3 Marks)

12. In the figure below AB = 8cm and O is the centre of the circle. Determine the area of the circle if angle OAB= 15^0 (3 Marks)



13. Pipe A can fill a tank in 2 hours; pipes B and C can empty the tank in 5 hours and 6 hours respectively. How long would it take:
    (a) To fill the tank if A and B are left open and C closed (2 Marks)

(b) To fill the tank with all the pipes open (2 Marks)

14. (a) Find the inverse of the matrix $\begin{pmatrix} 4 & 3 \\ 3 & 5 \end{pmatrix}$ (1 Mark)

(b)Hence solve the simultaneous equation below using matrix method (3 Marks)

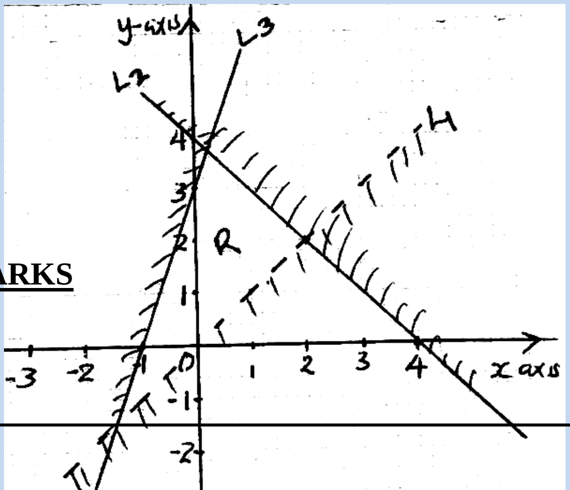
$4x + 3y = 6$

$5y + 3x – 5 = 0$

15. Evaluate by rationalizing the denominator and leaving your answer in surd form.(2 Marks)

$$\frac{\sqrt{8}}{1+Cos\ 45^0}$$

16. Form the three inequalities that satisfy the given region R (3 Marks)



SECTION II – 50 MARKS

Answer any FIVE questions from this section

17. (a)P, Q and R are three quantities such that P varies directly as the square of Q and inversely as the square root of R.

i) Given that P = 12 when Q = 24 and R = 36, find P when Q =27 and R = 121. (3 Marks)

ii) If Q increases by 10% and R decreases by 25%, find the percentage increase in P. (4 marks)

b) If Q is inversely proportional to the square root of P and P = 4 when Q = 3. Calculate the value of P when Q = 8. (3 marks)

18. (a) complete the table for the curves y = 3sin (2x + 30^0) and y = Cos2x ,use the range $0 \leq x \leq 180^0$

x	0	15	30	45	60	75	90	105	120	135	150	165	180
y=3sin (2x+30)	1.5		3		1.5		-1.5			-2.60	-1.00		1.5
y=Cos 2x	1			0		-0.866		-0.866	-0.5			0.866	1

(b) Using the scale Horizontal axis 1cm represent 30^0, vertical axis 1cm represent 1 unit, draw the graphs of y = 3 Sin (2x + 30) and y = Cos 2x (4 Marks)

(c)Use your graph to solve the equation 3Sin (2x + 30) = Cos 2x (1 Mark)

(d)Determine the following from your graph

(i) Amplitude of y = 3Sin (2x + 30) (1 Mark)

(ii) Period of y = 3 Sin (2x + 30) (1 Mark)

(iii) Period of y = Cos 2x (1 Mark)

19. The 2nd and 5th terms of an arithmetic progression are 8 and 17 respectively. The 2nd, 10th and 42nd terms of the A.P. form the first three terms of a geometric progression. Find:

(a) The 1st term and the common difference. (3 Marks)

b) The first three terms of the G.P and the 10th term of the G.P. (4 Marks)

(c)The sum of the first 10 terms of the G.P. (3Marks)

20. The probability of passing KCSE depends on the performance in the KCPE. If the candidate passes the KCPE, the probability of passing KCSE is $\frac{4}{5}$. If the candidate fails in the KCPE, the probability of passing KCSE is $\frac{3}{5}$. If a candidate passes KCSE the probability that he/she will get employed is $\frac{5}{8}$. If he/she fails KCSE the probability of getting employed is $\frac{1}{3}$. The probability of passing KCPE is $\frac{2}{3}$.

(a) Draw a well labelled tree diagram to represent the above information. (2 Marks)

(b) Using the tree diagram, find the probability that a candidate:-

(i) Passes the KCSE (2 Marks)

(ii) Gets employed (2 Marks)

(iii) Passes KCSE and get employed (2 Marks)

(iv) Passes KCPE and does not get employed (2 Marks)

21. The heights of 100 maize plants were measured to the nearest centimeter and the results recorded in the table shown below.

Height x (cm)	Frequency	d	d^2	fd	fd^2	cf
25 – 29	5			-15		5
30 – 34	12			-24		17
35 – 39	18	-1	1	-18		35
40 – 44	30	0	0	0		65
45 – 49	17	1	1			
50 – 54	11	2				
55 – 59	7	3				

(a) Complete the table (2 Marks)

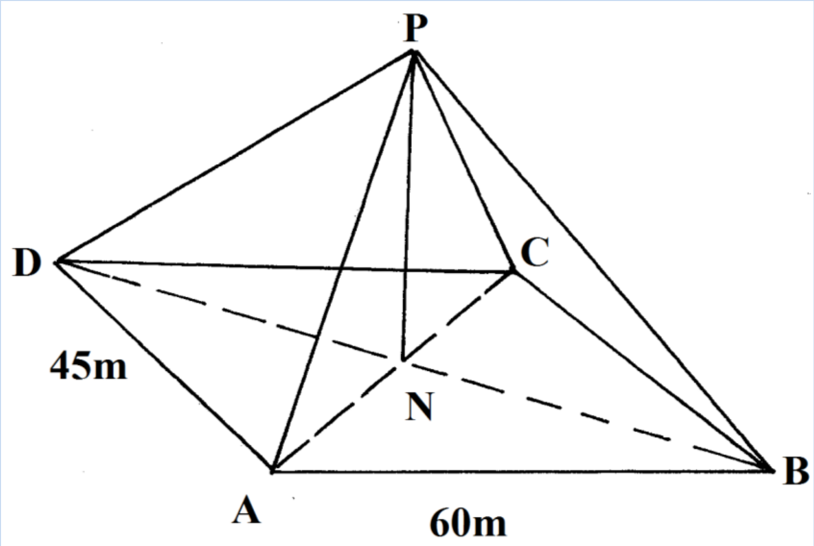
(b) Calculate to 2 d.p.

(i) The mean (2 Marks)

(ii) The standard deviation (2 Marks)

(c)Using the data above plot an ogive and use it to find the quartile deviation (4 Marks)

22. The figure below shows rectangular plot ABCD with AB =60m and BC=45m. PN is a vertical pole of length 30m to which four taut wire PB_1, PC1,PD and PA are attached



Calculate

a) length of the projection of PCon the plane ABCD (2mrks)

b) the angle PC made with the base ABCD (3mks)

c) The angle between the planes PBC and ABCD (3Mrks)

d) If point A is to be the North of point C. calculate the bearing of B from A (2mks)

23. (a) Construct a parallelogram ABCD in which AB = 9cm, AD = 5cm and angle BAD = 60^0. Measure the length AC (3 Marks)

(a) Show the locus of point P which moves so that it is equidistant from A and C.(1 Mark)

(b) Show the locus of point Q which moves such that angle BQD = 90^0.(2 Marks)

(d) The position of point X such that AX ≥ XC and angle BXD = 90^0(2 Marks)

(c) Shade the region inside the parallelogram such that AX≥XC and angle BXD ≥90^0 (2 Marks)

24. a) Draw ΔPQR whose vertices are P(1,1), Q(-3,2) and R(0,3) on the grid provided (1 Mark)

b) Find and draw the image P'Q'R', image of ΔPQR under the transformation whose matrix is $\begin{pmatrix} 3 & 0 \\ 1 & 1 \end{pmatrix}$

(3 Marks)

c) P'Q'R' is then transformed into P"Q" R" by the transformation of $\begin{pmatrix} -1 & 0 \\ 1 & 3 \end{pmatrix}$ matrix
Find the co-ordinates of P"Q" R" and draw the image (3 Marks)

d) Describe fully the single transformation which maps PQR onto P"Q" R"· Find the matrix of this transformation (3 Marks)