KCSE 2024 REPLICA

MATHEMATICS

(PREDICTION EXAMS 1-10)

Confidential set of Possible Questions likely to be examined in the forthcoming Final Examinations. A Projection of what is likely to be tested in the much-awaited KNEC Exams scheduled for November 2024.

The following are Questions to expect in KCSE 2024 EXAMS.

CONFIDENTIAL!

For Marking Schemes
Mr Isaboke 0746 222 000 / 0742 999 000

THE KEY TO SUCCESS!

KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 1)

MATHEMATICS

121/1

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

a) *Write your name and your class in spaces provide*

b) *The paper contains **two** sections. Section **I** and Section **II***

c) *Answer all the questions in section **I** and any **five** questions from **section II**.*

d) *Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.*

e) *Marks may be given for correct working even if the answer is wrong.*

f) *Non-programmable silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.*

FOR EXAMINERS USE ONLY.

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

Question	17	18	19	20	21	22	23	24	TOTAL
Marks									

GRAND TOTAL

SECTION A (50 marks)

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

1. Without using a calculator evaluate

$$\frac{5x6 + (-76)\div 4+27\div 3}{(-5)\div 3 \times (-4)}$$ **(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)**

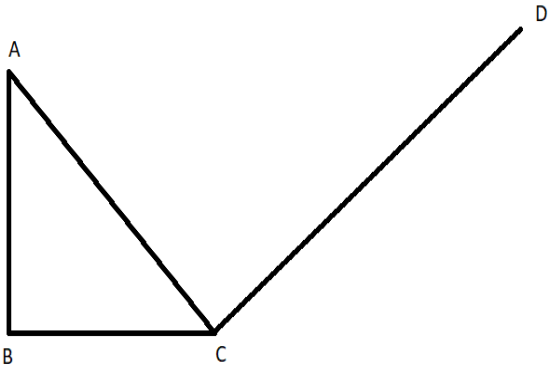
9. Use reciprocal table only to evaluate $\frac{1}{0.325}$ **(3mks)**

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^{0}E. He then changed direction and travelled a distance of 4km in the direction of 135^0 to village C.

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

(2mks)

Using scale drawing (a) above determine

a) distance between A and C **(1mk)**

b) 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

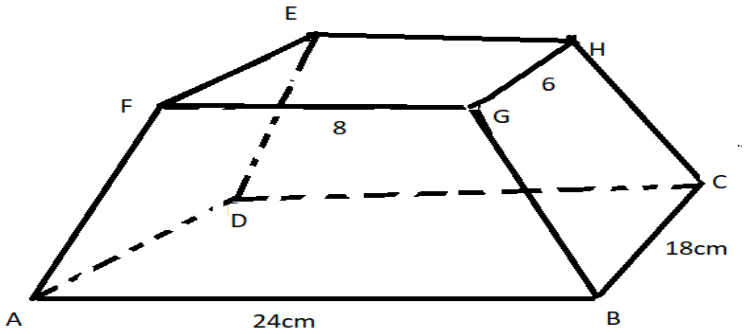
a) Determine the value of **x** **(2mk)**

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



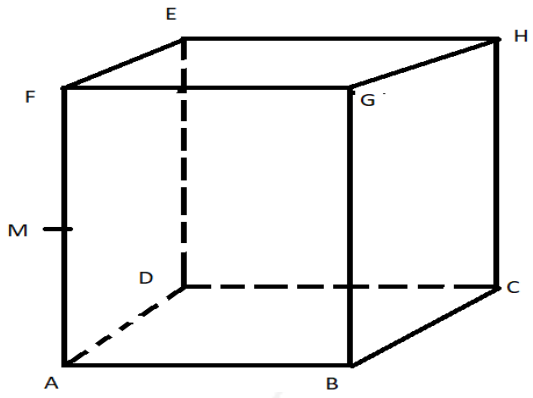
The slant height of the original pyramid is 36cm. Calculate to 1 decimal place;

i) Vertical height of the original pyramid. **(3mks)**

ii) Volume of the frustum. **(4mks)**

iii) 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 $y= 3x^2+4x+\mathbf{6}$ **(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 **A** = $\begin{pmatrix} 3 & 4 \\ 2 & 3 \end{pmatrix}$ find inverse of **A** **(1mk)**

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;

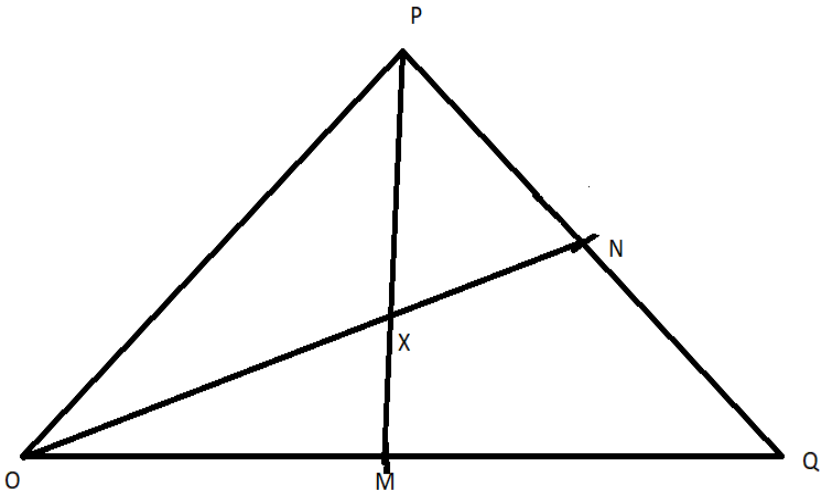
a) Distance between B and C **(2mks)**

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

1) PQ **(1mk)**

2) 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;

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

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)**

THE END

KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 1)

MATHEMATICS

121/2

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

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a) *Write your name and your class in spaces provide*

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d) *Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.*

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Marks																	

GRAND TOTAL

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Marks									

SECTION 1 (50 MARKS)

Answer **all** questions in this section

1. Use logarithm tables to evaluate to 4 significant figures

$90.35 + \left[\frac{1}{0.03506}\right]^{1/3}$ **(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

$\log_2 (2 +3x) + 3\log_2 2 = 2+\log_2 (2x+6)$ **(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. $< ARB \geq 90^0$

A ——————————————— B

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)**

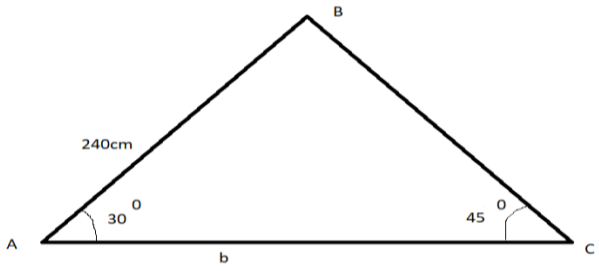
13. The following table shows income tax rates

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;

(i) The first term and common difference of the AP **(5mks)**

(ii) Common ratio of the GP **(2mks)**

(iii) 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.

i) Calculate the value of K **(3mks)**

ii) 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;

a) He will wake up late **(2mks)**

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

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

d) 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)

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)**

KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 2)

MATHEMATICS

121/1

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… SIGN……

INDEX NO…… ADM NO……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

(a) *Write your name, admission number and class in the spaces provided above.*

(b) *Sign and write the date of examination in the spaces provided above.*

(c) *This paper consists of* ***two*** *sections****; Section I*** *and* ***Section II.***

(d) *Answer* ***all*** *the questions in* ***Section I*** *and any* ***five*** *questions from* ***Section II***

(e) Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question

(f) *Marks may be given for correct working even if the answer is wrong.*

(g) *Non-programmable silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.*

For Examiner's Use Only

Section I

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

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

SECTION 1 (50 MARKS)
ANSWER ALL QUESTIONS

1. Simplify **(4mks)**

$$\frac{2\frac{1}{4} - 1\frac{2}{3} \quad - \frac{5}{8} \text{ of } 3}{\frac{1}{6} - \left(-\frac{1}{3}\right)^2}$$

2. Without using table or calculator evaluate. **(3mks)**

$$\sqrt[3]{\frac{1.90 \times 0.032 \times 0.08}{20 \times 0.0038}}$$

3. The sum of the interior angles of a regular polygon is 40 times the size of the exterior angle. Find the number of sides of the polygon. **(3mks)**

4. A farmer has a piece of land measuring 840M×396M. He divides it into square plots of equal size.Find the maximum area of one plot. **(3mks)**

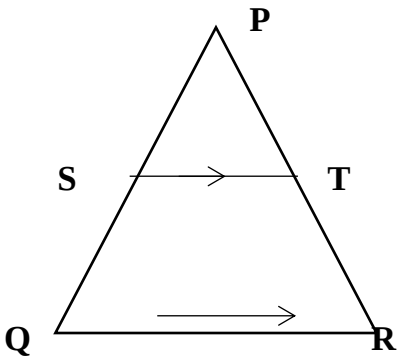
5. A Kenyan business woman bought goods from Japan worth 2,950,000 yens. On arrival in Kenya the custom duty of 20%was charged on the value of goods. If the exchange rates were as follows:
1 US dollar =118 yens
1 US dollar = Sh76
Calculate the duty paid in Kenya Shilling **(3mks)**

6. Determine the values of X that satisfy the inequalities and show the solution on a number line. $-3 - x \leq \frac{1}{3}x - 5 > \frac{2}{3}x - 6$ **(3mks)**

7. Solve for x in $27^{(x+1)} - 3^{(3x+2)} - 400 = 86$ **(3mks)**

8. A business man bought two bags of maize at the same price. On arrival at his business premises he discovered that one was of higher quality than the other. He sold the higher quality bag of maize at Sh. 1,040 and made a profit. He made a loss by selling the low quality bag of maize at Sh. 880. Given that the profit is three times the loss, calculate the buying price. **(3mks)**

9. The figure below shows triangle PQR in which PR=12cm. T is a point on PR such that TR=4cm. Line ST is parallel to QR.



If the area of triangle PQR is 336 cm^2, find the area of the quadrilateral QRTS. **(3mks)**

10. Two buses A and B leaves the same station. Bus A heads due East while bus B heads due North. The North bound bus travelled at 10km/h faster than the East bound bus. After 5 hours the two busses were 250km apart. Calculate the speed of north bound bus. **(4mks)**

11. Given that tan x = $\frac{12}{5}$, Find the value of **(3mks)**

$\frac{\text{Sin x +2 Cos x}}{1 - \sin x}$, without using a calculator or mathematical table.

12. Use reciprocal tables to find the value of $\frac{1}{0.325}$

Hence evaluate $\sqrt{\frac{0.000125}{0.325}}$ **(3mks)**

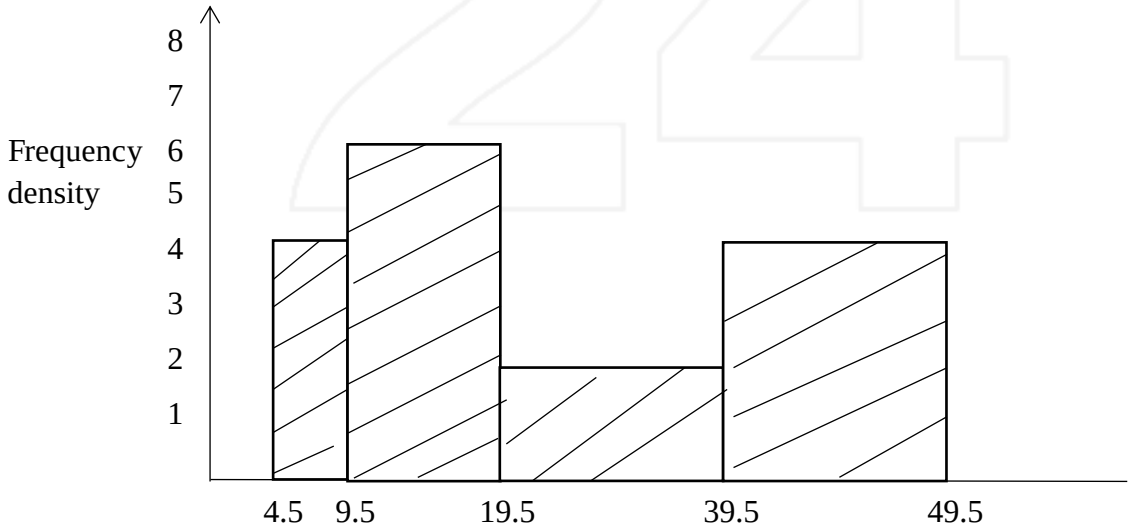
13. Simplify completely **(3mks)**

$\frac{2x^2-98}{3x^2-16x-35} \div \frac{x+7}{3x+5}$

14. Fatuma is now three times as old as her brother and four times as old as her son. Eight years from now, Fatuma age will be twelve years more than the sum of the age of the brother and the son. Find Fatuma's present age. **(3mks)**

15. Express $3.\dot{5}$ in the form of a $\frac{b}{c}$ where a, b and c are constants. **(3mks)**

16. The diagram below shows a histogram showing marks scored in a certain test.



Develop a frequency distribution table for the data if the first class has a frequency of 8. **(3mks)**

SECTION II (50 MARKS)

Answer any five questions from this section.

17. Co-ordinate's of point P and Q are (1,-2) and (3,10) respectively. Point T divides PQ in the ratio 1:1.

(a) Determine the co-ordinates of T. **(2mks)**

(b) (i) find the gradient of the perpendicular to PQ. **(1mk)**

(ii) determine the equation of the line perpendicular to PQ and passing through T. **(2mks)**

(c) Given that the line in (ii) above cuts the Y-axis at point R, calculate the distance TR correct to 4 s.f. **(3mks)**

(d) Given that point Q is the image of P under a translation, find the image of R under the same translation. **(2mks)**

18. The model of tank consists of a conical top mounted on a cylindrical part and a bottom hemispherical part. The total height of the model is 15cm, the height of the cylindrical part is 8cm and the radii of hemisphere of the cone is 3cm. (use π =3.142)

(a) Calculate the surface area of ;

(i) The conical part correct to (4 s.f) **(2mks)**

(ii) The cylindrical part correct to (2 d.p) **(2mks)**

(iii) The hemispherical bottom correct to (2 d.p) **(2mks)**

(iv) Total surface area of the model **(1mk)**

(b) The actual tank has a total height of 6M. find the total surface area of the actual tank. **(3mks)**

19. There are two sweets manufacturing factories A and B. factory A produces sweets with 60.5% sugar while factory B produces sweets with 80.5% sugar.

(a) Determine the total mass of sugar in 80 kg of sweets from A and 40kg of sweets from B.**(3mks)**

(b) 80 kg of sweets from A were crushed together with 40kg of sweets from B. find the percentage of sugar in the mixture correct to 2 d.p. **(2mks)**

(c) Type A sweets cost sh. 37 per kg while type B sweets cost sh. 55 per kg. in what ratio should they mix type A and type B in order to give a profit of 25% when sold at sh. 50 per kg. **(3mks)**

(d) Find the profit realized after selling 20kg of the mixture. **(2mks)**

20. The equation of a curve is $y=3x^3-4x^2+1$

Determine;

(a) The gradient function of the curve **(1mk)**

(b) Find the gradient of the curve when X=1 **(2mks)**

(c) The equation of the tangent to the curve at the point. (2,3) **(3mks)**

(d) The angle which the targent to the curve at (2,3) makes with X-axis correct to 1 d.p. **(1mk)**

(e) The equation of the line L which passes through the point (2,3) and is perpendicular to the targent. **(3mks)**

21. Triangle ABC with vertices A(3,4) B(1,3) and C(2,1) has the image $A^1B^1C^1$ with vertices A^1 (-4,3)B^1 (-3,1) and C^1 (-1,2) under transformation T.

(a) Draw triangle ABC and$A^1B^1C^1$ on the same axes. **(2mks)**

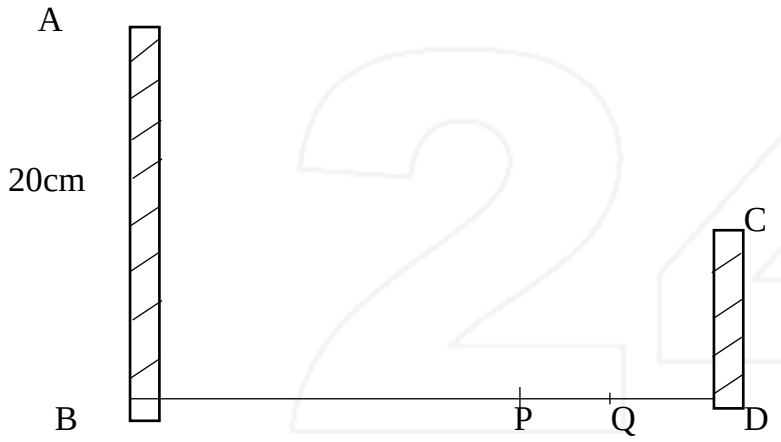
(b) Describe transformation T fully. **(2mks)**

(c) Draw triangle $A^{11}B^{11}C^{11}$ the image of $A^1B^1C^1$ under reflection in the line y=0. **(2mks)**

(d) Describe a transformation that maps ABC into $A^{11}B^{11}C^{11}$. **(2mks)**

(e) Identify two pairs of triangles which are oppositely congruent to each other. **(2mks)**

22. The diagram below shows two towers AB and CD on a level ground. P and Q are two points on a straight road BD.



(a) A car moves from B towards D. At point p, the angle of elevation of point A was 11.3°. calculate the distance BP correct to 1dp. **(2mks)**

(b) The car moving at 36km/h took 5 seconds to move from P to Q.

(i) Calculate distance PQ. **(1mk)**

(ii) Calculate the angle of elevation of point A from Q correct to 1 d.p. **(2mks)**

(c) Given that QC=50.9M and BD = 200M

(i) Find the height CD correct to 2d.p. **(2mks)**

(ii) Find the angle of elevation of A from C. **(3mks)**

23. The table below shows height of 50 students.

Height (cm)	140≤x<145	145≤x<150	150≤x<155	155≤x<160	160≤x<165
Frequency	3	15	19	X	2

(a) Find the value of x **(1mk)**

(b) State the modal class **(1mk)**

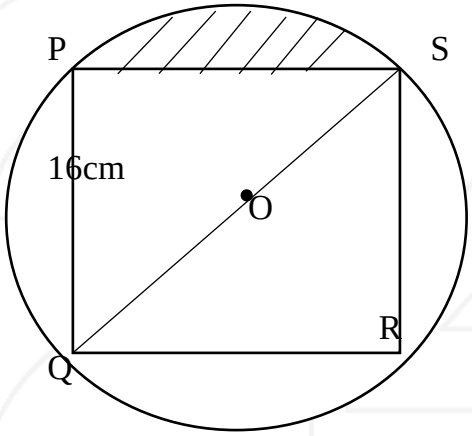
(c) State the modal frequency **(1mk)**

(d) Estimate the mean height **(3mks)**

(e) State the median class **(1mk)**

(f) Estimate the median height **(3mks)**

24. The figure below shows a circle centre O and radius 17cm. given that QS is the diameter and the rectangle PQRS is inscribed in the circle.



(a) Calculate length PS **(3mks)**

(b) Calculate angle POS correct to 1 d.p. **(3mks)**

(c) Calculate the area of the shaded part. **(4mks)**

KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 2)

MATHEMATICS

121/2

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… SIGN……

INDEX NO…… ADM NO……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

(a) *Write your name, admission number and class in the spaces provided above.*

(b) *Sign and write the date of examination in the spaces provided above.*

(c) *This paper consists of* ***two*** *sections****; Section I*** *and* ***Section II.***

(d) *Answer* ***all*** *the questions in* ***Section I*** *and any* ***five*** *questions from* ***Section II***

(e) Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question

(f) *Marks may be given for correct working even if the answer is wrong.*

(g) *Non-programmable silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.*

For Examiner's Use Only

Section I

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

Section II

17	18	19	20	21	22	23	24	Total

Grand Total	

SECTION 1 (50 MARKS)

Answer all questions in this section

1. Solve the equation $\frac{1}{3}(2x+1)+\frac{1}{4}(5x-1)=\frac{1}{2}$ **(3mks)**

2. a). Expand $(1-2x)^4$ **(1mk)**

b). Use your expansion to find the value of $(0.96)^4$ correct to 4 s.f **(2mks)**

3. The expression $1+\frac{x}{2}$ is taken as an approximation for $\sqrt{1+x}$. Find the percentage error in doing so if x = 0.44 **(3mks)**

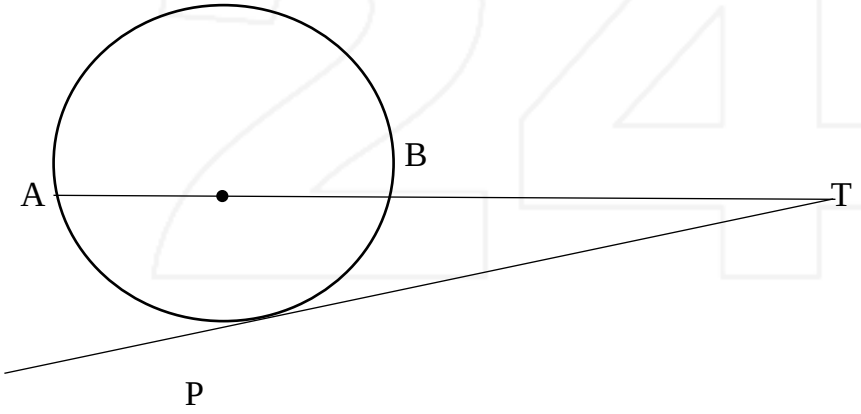
4. Solve for x in the equation $\log_8(x+6) - \log_8(x-3) = \frac{2}{3}$ **(4mks)**

5. Make p the subject if the formula **(3mks)**

$$E + x = x + \sqrt{\frac{p^2-3u}{y-3xp^2}}$$

6. An auto spare dealer sells two types of lubricants, A and B in his shop. While purchasing, type A cost sh40 per 100ml tin and type be B cost sh.60 per 100ml tin. He has Shs 15,000 to spend on both types of lubricants. Type A should not be less than 3 litres while type B should be atleast a litre . He buys x tins of type A and Y tins of type B. Write down three inequalities which represent the above information. **(3mks)**

7. In the figure below PT is a tangent to the circle at P and AT passes through the centre of the circle.



If PT =9cm and AT=12cm, find the- radius of the circle correct to 1 d.p. **(3mks)**

8. Find the radius and the centre of the circle whose equation is **(3mks)**

$3x^2 + 3y^2 - 6x + 3 + 12y = 0$

9. Without using a calculator or mathematical tables express $\frac{\sqrt{3}}{1-\cos 30^0}$ in surd form and simplify **(3mks)**

10. The table below represents the mass and volume of a liquid measured at room, temperature.

Mass (g)	8	10	20	21	30	37	52	55	70

Volume (cm^3)	10	13	20	29	35	43	60	63	70

a). By plotting the points and drawing the line of best fit, estimate the density to the liquid**. (2mks)**

b). Determine the equation of your graph. **(2mks)**

11. The population of two towns Kathwana and Siakago for three years was as follow.

	1st year	2nd year	3rd year
Kathwana	40,000	48,000	56,000
Siakago	40,000	48,000	57,600

Calculate the difference in population of the two after six years. **(3mks)**

12. Solve for $\propto$ in the equation $6\sin^2\propto - \cos\propto - 5 = 0$ **(3mks)**

For $\Theta \leq \propto \leq 300^o$

13. Arabic coffee costing sh90 per kilogram is mixed with rubusta coffee costing sh.75 per kilogram in the ration 2:3. Calculate the selling price of the mixture per kilogram if a profit of 15% if to be realized to the nearest shilling. **(3mks)**

14. The gradient of a curve at any point is given by 2x-1. Given that the curve passes through point (1,5). Find the equation of the curve. **(3mks)**

15. a). Given that AB=6cm. Construct locus of P such that <APB = 90^o. **(2mks)**

b). Hence determine the area enclosed by the locus of P. **(2mks)**

16. Given the vectors $\mathbf{a} = 3\mathbf{j} + 2\mathbf{k}$ and $\mathbf{b} = 4\mathbf{i} - 7\mathbf{k}$

Find $\mathbf{p}$ if $\mathbf{p} = 3\mathbf{a} - \mathbf{b}$ **(2mks)**

SECTION II (50 MARKS)

Answer any five questions from this section

17. Three consecutive terms of aGP are (x+2), (x-2), and (x-5). Find:-

a). The value of x. **(3mks)**

b). The common ratio **(1mk)**

c). Given that x+2 is the third term of the G.P

Find;

i). The first term giving your answer as a mixed fraction. **(3mks)**

ii). the sum of the first six terms correct to 2 d.p **(3mks)**

18. A form 1 stream at Butere mixed day secondary school has 15 boys and 25 girls. The probability of a girl reaching form 4 is $\frac{2}{5}$ and that of a boy is $\frac{3}{5}$. If a girl reaches form 4 then probability that she gets employed is $\frac{2}{3}$ while the probability that a girl gets employed without reaching form 4 is $\frac{1}{3}$. If a boy reaches form 4 the probability that he gets employed is ¾ while the probability that a boy gets employed without reaching form 4 is $\frac{1}{4}$

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

b). Using your tree diagram, determine:-

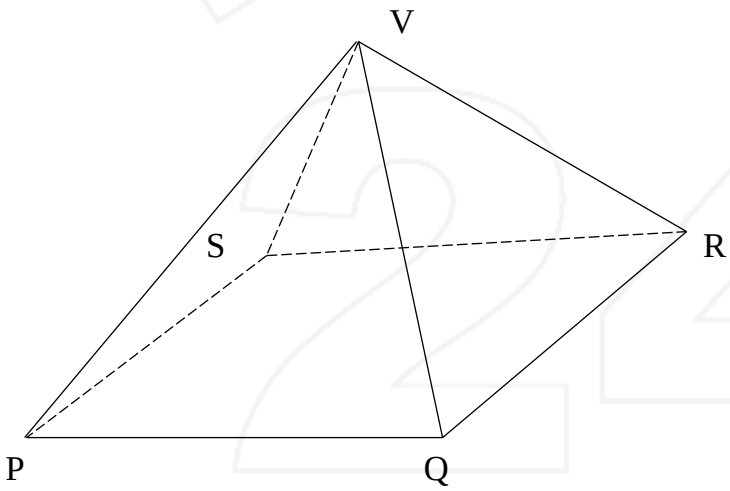
i) the probability that a girl gets employment. **(2mks)**

ii). the probability any child who has been to school gets employed. **(2mks)**

iii). the probability that a boy fails to get employment. **(2mks)**

iv). The probability that anybody who has studied upto form 4 fails to get employment. **(2mks)**

19. The diagram below shows a right pyramid VPQRS with V as the vertex and rectangular base PQRS. PQ=3cm, QR=4cm and the height of the pyramids is 6cm. M and N are the mid-points of PQ and QR respectively.



a). Calculate

i). the length PV **(3mks)**

ii). the angle between face VPQ and the base PQRS **(2mks)**

b). i). the slant height VM and VN. **(2mks)**

ii). the surface area of the pyramid. **(3mks)**

20. Two towns A and B lie on the same parallel of latitude 60^{o}N. If the longitude of A and B are 42^{o}W and 29^{o}E respectively.

a). Find the distance between A and B in nautical miles along the parallel of latitude. **(2mks)**

b). Find the local time at A if at B is 1.00.p.m. **(2mks)**

c). Find the distance between A and B in kilometre (Take $\pi = \frac{22}{7}$ and R=6370km) **(2mks)**

d). if C is another town due south of A and 1001km away from A, find the co-ordinate of C.**(4mks)**

21. The table below shows marks scored by students in a mathematics test.

Marks	30-39	40-49	50-59	60-69	70-79	80-89	90-99
No of students	2	3	8	12	15	6	4

a). Draw a cumulative frequency curve to represent the information. **(4mks)**

b). Use you graph to find:-

i). The median mark **(1mk)**

ii). The quartile deviation **(3mks)**

iii. the pass mark if 60% of the students passed. **(2mks)**

22. The initial velocity of a particle was 1m/s and it acceleration is given by (2-t) m/s^2 every second after the start.

a). i). Determine the equation representing its velocity. **(2mks)**

ii). Find the velocity of the particle during the third second. **(2mks)**

b). i). Find the equation representing its distance t seconds after the start. **(2mks)**

ii). What was the distance covered by the particle during the first three seconds. **(2mks)**

c). Determine the time when the particle was momentarily at rest. **(2mks)**

23. a). using trapezoidal rule estimate the area bounded by the curve $y=3x^2 - 2$ and the lines x = -4, x=4 and x-axis using 8 trapezia **(4mks)**

b). Find the actual area bounded by the curve $y=3x^2 -2$ and the lines x= -4, x=4 and x-axis. **(3mks)**

c). Calculate the percentage error when trapezoidal rule is used. **(3mks)**

24. The vertices of triangle PQR are P(1,1), Q(4,1) and R(5,4). A transformation represented by a matrix $T = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ maps Δ triangle PQR onto triangle $P^IQ^IR^I$.

A second transformation represented by $U = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ maps triangle $P^IQ^IR^I$ onto triangle $P^{II}Q^{II}R^{II}$

a). On the same axis draw the three triangles PQR, $P^IQ^IR^I$ and $P^{II}Q^{II}R^{II}$ and state the co-ordinated of triangle $P^IQ^IR^I$ and $P^{II}Q^{II}R^{II}$. **(6mks)**

b). Describe a single transformation which maps triangle PQR onto triangle $P^{II}Q^{II}R^{II}$ and find its…..matrix. **(4mks)**

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KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 3)

121/1

MATHEMATICS

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… SIGN……

INDEX NO…… ADM NO……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

(h) *Write your name, admission number and class in the spaces provided above.*

(i) *Sign and write the date of examination in the spaces provided above.*

(j) *This paper consists of* ***two*** *sections****; Section I*** *and* ***Section II.***

(k) *Answer* ***all*** *the questions in* ***Section I*** *and any* ***five*** *questions from* ***Section II***

(l) ***Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question***

(m) *Marks may be given for correct working even if the answer is wrong.*

(n) *Non-programmable silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.*

For Examiner's Use Only

Section I

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

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

SECTION I (50 MARKS)

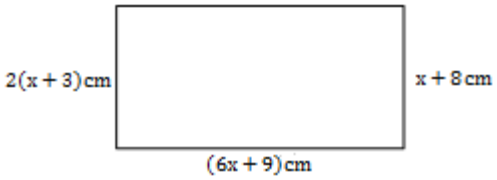
Answer ALL questions in the section in the space provided:

1. Evaluate without using a calculator 0.01% of $\left[\frac{\frac{1}{2}+0.75-\frac{3}{8}}{4.5-\frac{1}{8}-\frac{2}{5}}\right]$. **(3 marks)**

2. The sum of the ages of three brothers; Mike, Charles and Abdul is 65 years. Mike is twice as old as Abdul and one and half times as old as Charles. Determine their ages. **(3 marks)**

3. A supermarket has 18 apples, 30 oranges and 54 apples. The fruits are to be arranged in rows such that every row contains same number of fruits of one type only. Determine the least number of rows required for this arrangement to happen. **(3 marks)**

4. Find the area of the rectangle below. **(3 marks)**



5. Without using a Calculator or Mathematical Table evaluate the value of p: **(3 marks)**

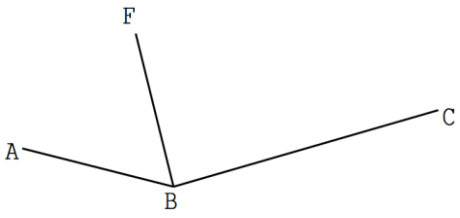
$\frac{4}{P^2} = 221^2 - 220^2$

6. Calculate the value of x given that $\mathbf{OA} = \begin{pmatrix} x \\ 4 \end{pmatrix}$, $\mathbf{OB} = \begin{pmatrix} 5 \\ 7 \end{pmatrix}$ and $|\mathbf{AB}| = 5$ units. **(3 marks)**

7. Solve for k in the equation $\frac{\sin(2k+10)^\circ}{\cos(3k-20)^\circ} = 1$. **(2 marks)**

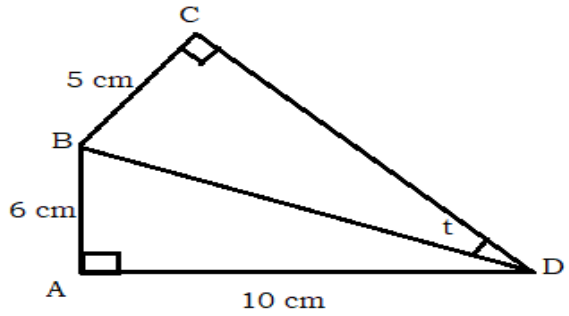
8. Solve for x in the equation $\sqrt{-2x-6} - 3 = x$. **(3 marks)**

9. In the figure below ABF is a uniform cross section of a solid. AB, BC and BF are some of the visible edges of the solid. Complete the sketch showing the hidden edges with broken lines. **(3 marks)**



10. Mr. Charles who deals in electronics sells a radio to a customer at Kshs. 1,440 after giving him a discount of 10% but finds that he still makes a 20% profit. Find the profit Mr. Charles would make if he does not give a discount. **(3marks)**

11. The figure below shows a set of two right angled triangles ABD and BCD conjoined by side BD. Sides AB, BC and AD are 6cm, 5cm and 10cm in lengths respectively.

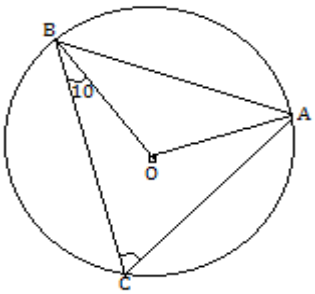


Calculate the size of angle CDB=t. **(4 marks)**

12. Given that $\log 3 = 0.4771$ and $log\ 5 = 0.6990$, find without using Mathematical table or calculator log 0.045. **(3 marks)**

13. Two towns A and B are 810km apart. A car left A at 8:00am moving towards B at an average speed of xkm/h. A bus left town B at 9:30am moving towards A at an average speed of 84km/h. Determine the average speed of the car, xkm/h, if the two vehicles met at 11.00am. **(4 marks)**

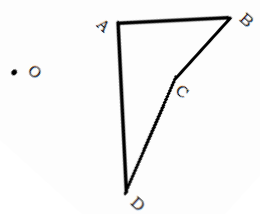
14. In the figure given below, O is the centre of circle. If $\angle BCA = 80^0$ and $\angle CB0 = 10^0$.



Determine the size of $\angle CAB$. **(3 marks)**

15. Using mid-ordinate rule with six strips estimate the area between the curve $y = 3x^2 + 4x + 10$, $x -$ axis and the lines $x = -2$ and $x = 4$. **(4 marks)**

16. Construct $A^IB^IC^ID^I$ the image of quadrilateral ABCD below. Given that it undergoes under transformation enlargement with scale factor -2 and centre O. **(3 marks)**



SECTION II (50 MARKS)

Answer ONLY FIVE questions in the section in the space provided:

17. The equation of line l_1 is $2x+3y+6=0$.

a) Find the gradient of line l_1 **(1 mark)**

b) The line l_2 is perpendicular to l_1 and passes through the point P with coordinates (7, 2), find the equation of l_2 , giving the answer in the form $y = mx + c$ where m and c are constants. **(3 marks)**

c) The line l_1 and l_2 intersect at point Q. Find the coordinates of Q. **(3 marks)**

d) The line l_3 is parallel to l_1 and passes through point P. Find the equation of l_3 giving the answer in the form $ax + by = c$, where a , b and c are constants. **(2 marks)**

e) Determine the x and y-intercepts of the line l_3. **(1 mark)**

18. The Form Two Parents of **Isaboke High School** decided to buy laboratory equipment worth Kshs.900,000 by each student contributing equal amount of money. Before they made the contribution 50 students got transferred to other institutions and this made the remaining students to pay Kshs.600 more.

a) Taking to represent the original number of students, write down an expression for:

i) The original contribution per student**.** **(1 mark)**

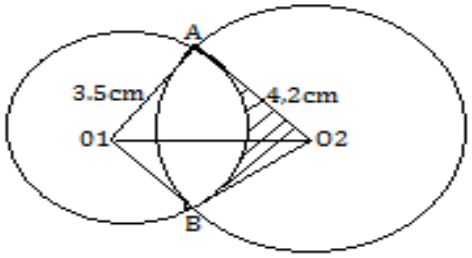
ii) The new contribution per student. **(1 mark)**

b) Find the original number of students who were to contribute. **(4 marks)**

c) Calculate the percentage change in the students' contributions. **(2 marks)**

d) If the ratio of boys to girls that remained in Form 2 was 13:12 calculate the amount contributed by the boys alone. **(2 marks)**

19. Two circles of radii 3.5 and 4.2 cm with centres O_1 and O_2 respectively intersect at points A and B as shown in the figure below. The distance between the two centres is 6 cm and the distance from O_1 to the common chord AB along O_1O_2 is x cm.



Calculate:

a) The distance x cm to 3 decimal places**.** **(3 marks)**

b) The size of ∠AO1B and ∠AO2 B (to the nearest degree**).** **(3 marks)**

c) The area of quadrilateral O_1AO_2B, correct to 2 decimal **place** **(2 marks)**

d) The shaded area correct to two significant figures. (Take. $\pi = 3.142$). **(2 marks)**

20. Three towns A, B and C are such that B is 120km on a bearing of 060^0 from A. C lies directly East of A on a bearing 165^0 from B. Using a scale of 1cm to represent 20km, a pair of compass and a ruler only, determine:

a) the relative positions of A, B and C. **(3 marks)**

b) drop a perpendicular from B to meet AC at M hence measure BM. **(2 marks)**

c) construct a circle passing through the vertices A, B and C then calculate the area covered in the circle. **(2 marks)**

d) Determine the amount of money used in ploughing the land inside the circle but outside triangle ABC at a rate of Kshs. 5000 per hectare. **(3 marks)**

21. A solid is partly a cone and partly an hemisphere of radius 7cm. The slanting length of the cone is 25cm. Determine;

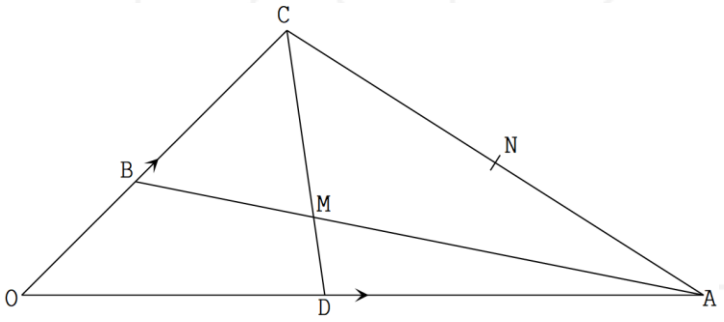
a) the height of the solid. **(2 marks)**

b) the volume of the solid **(3 marks)**

c) the surface area of the solid. **(3 marks)**

d) the mass of the solid if its density is $12.5g/cm^3$. **(2 marks)**

22. In the figure below $\vec{OB} = \underset{\sim}{b}; OC = 3\vec{OB}$ and $OA = \underset{\sim}{a}$



a) Given that $\overrightarrow{OD} = \frac{1}{3}\overrightarrow{OA}$ and $\overrightarrow{AN} = \frac{1}{2}\overrightarrow{AC}$, $\overrightarrow{CD}$ and $\overrightarrow{AB}$ meet at M. Determine in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$.

i) $\vec{AB}$ **(1 mark)**

ii) $\vec{CD}$ **(1 mark)**

b) Given that $\vec{CM} = k\vec{CD}$ and $\vec{AM} = h\vec{AB}$. Determine the values of the scalars k and h. **(5 marks)**

c) Show that O, M and N are collinear. **(3 marks)**

23. The displacement of a particle is given as $s = t^3 - 6t^2 + 9t + 50$ metres.

Determine;

a) The displacement of the particle when t = 2 seconds. **(2 marks)**

b) the velocity of the particle when $t = 4$ (**2 marks)**

c) the acceleration of the particle when $t = 5$. **(2 marks)**

d) the time when the particle is at rest. **(2 marks)**

e) the displacement during the 3rd second. **(2 marks)**

24. The height of a number of students was recorded in the table below. Each measurement is given to the nearest cm.

Height(cm)	Mid-point x	Frequency f	fx
138-142	140	3	420
143-147		8	
148-152		12	
153-157		20	
158-162	160	30	4800
163-167		14	
168-173		7	
173-177		4	
178-182	180	2	360
		$\sum f =$	$\sum fx =$

a) Complete the table. **(3 marks)**

b) Use the completed table to calculate the mean height of the students. **(2 marks)**

c) Draw a histogram to represent the information. **(2 marks)**

d) Use the histogram above to estimate the median height**.** **(3 marks)**

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KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 3)

121/2

MATHEMATICS

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES:

- *Write your **name**, **admission numbe**r and write **date** of examination in the spaces provided*
- *The paper contains **two** sections. Section I and Section II.*
- *Answer **ALL** the questions in section I and any **five** questions in section II.*
- *Answers and working **must** be written on the question paper in the spaces provided below each question.*
- *Show all steps in your calculations below each question.*
- *Marks may be given for correct working even if the answer is wrong.*
- *Non programmable silent electronic calculators and KNEC mathematical table may be used, except where stated otherwise.*

FOR EXAMINERS USE ONLY

SECTION I

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	**TOTAL**
Marks																	

SECTION II

Question	17	18	19	20	21	22	23	24	**TOTAL**
Marks									

GRAND TOTAL

SECTION I: 50 MARKS

ANSWER ALL QUESTIONS IN THIS SECTION

1. Solve for x in the equation

$2\sin^2 x - 1 = \cos^2 x + \sin x$ for $0 \leq x \leq 360$ **(3 Marks)**

2. (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)**

3. Make p the subject of the formula **(3 Marks)**

$$E + m = m + \sqrt{\frac{p - 3u}{y - 3mp}}$$

4. 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 value of **(3 Marks)**

5. 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)**

6. A circle whose equation is $(x - 1)^2 + (y - k)^2 = 10$ passes through point (2,5). Find the coordinates of the two possible centres of the circle**.** **(3marks)**

7. Juma deposited Sh. 45 000 in a bank which paid interest at 12% p.a compounded monthly. Calculate the amount of interest after 3 years **(3 Marks)**

8. (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)**

$4x + 3y = 6$

$5y + 3x - 5 = 0$

9. Given that $P=4+\sqrt{2}$ and $Q=2+\sqrt{2}$ and that $\frac{P}{Q}=a+b\sqrt{c}$, where a, b and c are constants, find the values of a, b and c. **(3 marks)**

10. Find the value of x that satisfies the equation:

$log_3(x + 24) - 2 = log_3(9 - 2x)$ **(3 marks)**

11. Under a shear with x-axis invariant the point (3,2) is mapped onto (-2,2). Find the image of point (4,4) under the same transformation. (**3marks)**

12. The data below shows the marks obtained by ten students in a test.

71, 55, 69, 45, 65, 57, 71, 82, 55, 50

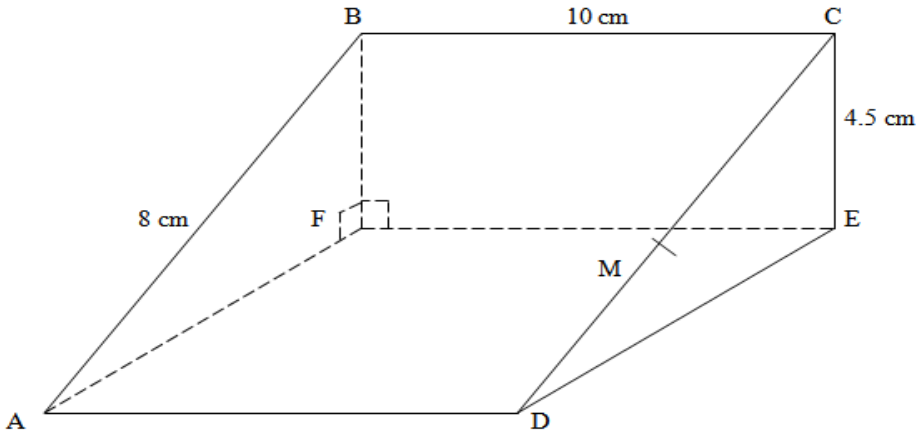
Find the quartile deviations. **(3 marks)**

13. A bag contains 4 green, 9 purple and 18 blue balls. The balls are identical except for the colour. Two balls are picked at random, one at a time without replacement, find the probability that, a blue ball and a green ball are picked. **(3 marks)**

14. Find the equation of the tangent to the curve $y = x^2 + 2x + 3$ at the point where the gradient is equal to 4. **(3 marks)**

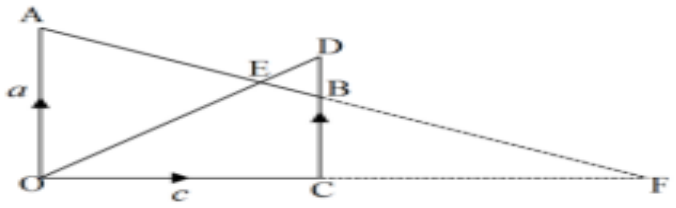
15. The radius of a spherical ball is 2.5cm correct to one decimal place. Calculate the percentage error in calculating the surface area of the ball **(3 marks)**

16. 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 mid-point of CD. AB = 8 cm, BC = 10 cm and CE = 4.5 cm. Calculate the Angle CAE makes with the plane ADEF **(3marks)**



SECTION II: 50 MARKS
ANSWER ANY 5 QUESTIONS IN THIS SECTION

17. In the figure below, $\boldsymbol{OA} = \tilde{a} and \boldsymbol{OC} = \tilde{c}$. $\boldsymbol{CB} = \frac{2}{3}\boldsymbol{OA}$ *and* $B divides\ CD\ in\ the\ ratio$ 3: 1



(a) Express the following vectors in terms of **a** and **c** only:

(i) **AB** **(1 mark)**

(ii) **OD** **(2 marks)**

(b) Given that **OE**=h**OD** and **AE**=k**AB** where h and k are scalars express OE in two different ways hence find the scalars h and k. **(5 marks)**

(c) If OC produced meets AB produced at F, find **OF** . **(3 marks)**

18. (a) The 5th term of an AP is 82 and the 12th term is 103. find:

(i) the first term and common difference. **(3marks)**

(ii) the sum of the 21 terms. **(2 marks)**

(b) A stair case was built such that each subsequent stair has a uniform difference in height. The height of the 6th stair from the horizontal floor was 85 cm and the height of the 10th stair was 145. Calculate the height of the 1st stair and the uniform difference in height of the stairs.

(3 marks)

(c) During the construction of the staircase, each step was supported by a vertical piece of timber. If the staircase has 11 stairs, calculate the total length of timber used. **(2 marks)**

19.(a) Complete the table below given that $y = -x^2 + x + 12$ for $-4 \leq x \leq 5$ **(2 marks)**

X	-4	-3	-2	-1	0	1	2	3	4	5
Y	8				12	12				

(b) On the grid provided below, draw the graph of $y = -x^2 + x + 12$ for $-4 \leq x \leq 5$

Scale: 1 cm represents 1 unit on the x – axis and 1 cm represents 2 units on the y – axis. **(4 marks)**

(c)Using your graph, to Solve the equation $\boldsymbol{x^2 - 3x - 10 = 0}$ **(2 marks)**

ii. State the range of values of x for which $-x^2 + x + 12 \geq 0$ **(1 mark)**

(d) Estimate the coordinates of the turning point of the curve $y = -x^2 + x + 12$ **(1 mark)**

20.An aircraft leaves town $P(30^\circ S, 17^\circ E)$and moves directly to town $Q(60^\circ N, 17^\circ E)$. It then moved at an average speed of 300 knots for 8 hours westwards to town R. Determine;

(a) The distance PQ in nautical miles. **(3 marks)**

(b) The position of town R. **(3 marks)**

(c) The local time at R if the local time at Q is 3:15 p.m **(2 marks)**

(d) The total distance moved from P to R in km. Take 1nm=1.853 km **(2 marks)**

21. Using a ruler and compasses only.

(i) Construct a parallelogram ABCD such that AB = 10cm, BC = 7cm and angle ABC = 105º.

(3 marks)

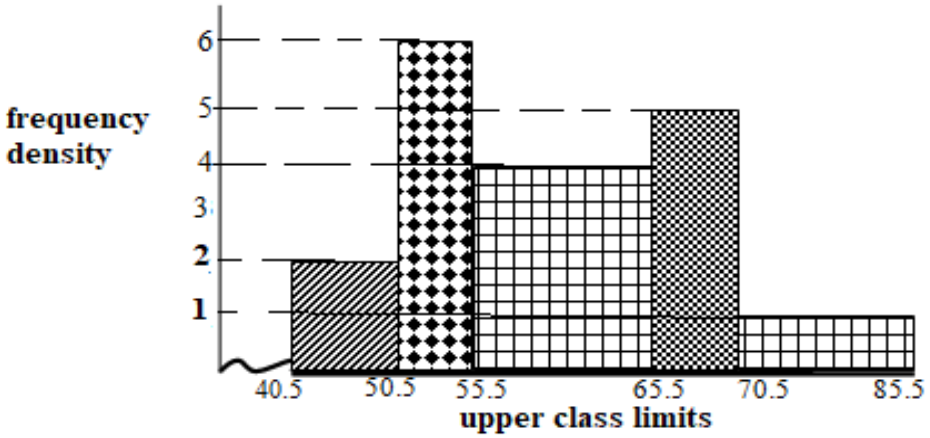
(ii) Construct the loci of P and Q within the parallelogram such that 6cm. $AP \leq 4cm$ and $BQ \leq 6cm$

(3 marks)

(iii) Calculate the area within the parallelogram but outside regions bounded by the loci of P and Q.

(4 marks)

22. Below is the histogram representing marks obtained in Mathematics test



(a) Develop a frequency distribution table for the data **(3 Marks)**

(b) Using an assumed mean of 60.5 find the mean. **(3 marks)**

(c) Calculate Standard deviation. **(4marks)**

23. (a) 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 $x - axis$ **(3 marks)**

(b) Calculate the exact area above **(5 marks)**

(c) Find the percentage error involve in using the mid-ordinate role. **(2 marks)**

24. Eldoret Airport is planning to build a fire fighting plant on a space of 250m^2. Two types of machines are to be installed, machine x which occupies a space of 5m^2 and machine Y which occupies 10m^2. The airport can have a maximum of 40 machines at a time. At most 15 machines of type Y are used at any given time.

a) Write down three inequalities other than x>0, and y>0. **(3marks)**

b) On the grid below, show the region satisfying the given conditions. **(4marks)**

c) The profit from a type x machine is Ksh 1000 and that of type y is Ksh 4000. Use the graph to obtain the number of machines of each type that should be installed to obtain maximum profit. Calculate the maximum profit**.** **(3marks)**

KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 4)

121/1

MATHEMATICS

PAPER 1

TIME: 2½ HOURS

NAME…… ADM NO; ……

CLASS…… DATE……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

(a) *Write your name and index number in the spaces provided at the top of this page.*

(b) *Write your school name, sign and write the date of the examination in the spaces provided above.*

(c) *This paper consists of **Two** sections: **Section I** and **Section II***

(d) *Answer **ALL** questions in Section I and **any five questions** from Section II*

(e) *Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.*

(f) *Marks may be given for correct working even if the answer is wrong.*

(g) *Non-Programmable silent electronic calculators and KNEC Mathematical Tables may be used.*

FOR EXAMINERS' USE ONLY

SECTION I

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

SECTION II

								Total		Grand Total	
17	18	19	20	21	22	23	24				

SECTION I (50 Marks)

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

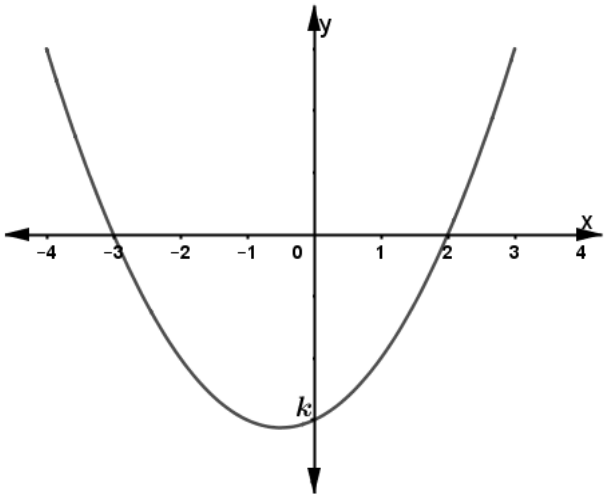
1. Without using mathematical tables or a calculator, evaluate: **(3 marks)**

$$\sqrt[3]{\frac{0.4 \times 1.28}{0.0608 + 0.0032}}$$

2. Find the exact value of $2.\dot{3}\dot{4} - 1.\dot{9}\dot{1}$ **(4 marks)**

3. The HCF and GCD of three numbers are 7920 and 12 respectively. Two of the numbers are 48 and 264. Using factor notation, find the third number if one of its factors is 3^2. **(3 marks)**

4. The graph below (not drawn to scale) is a plot for the function $y = ax^2 + bx + k$ where a, b and k are constants.



Determine the values of a, b and k. **(3 marks)**

5. Three camps, P, Q and R shared 875 bags of beans donated by a charitable organization such that the ratio of P to Q was 2: 3 and that of R to Q was 5: 4. Find the number of bags of beans received by camp Q. **(3 marks)**

6. Find the number of revolutions made by cylindrical roller of diameter 1.02 m and thickness 1.3 m if it rolls over a surface area of 291.72 m^2. Use $\pi = \frac{22}{7}$ **(3 marks)**

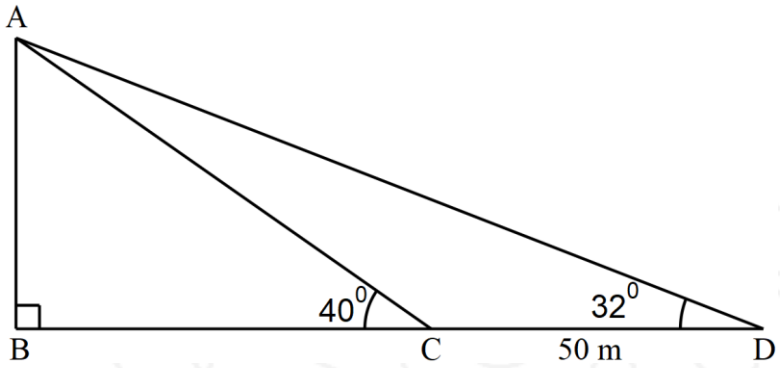
7. Dr. June needs to import a car from Japan that costs US dollars (USD) 5 000 outside Kenya. He intends to buy the car through an agent who deals in Japanese Yen (JPY). The agent charges a 20% commission on the price of the car and a further 80 325 JPY for shipping the car to Kenya. Find the amount in Kenya shillings that Dr. June will need to send to the agent to get the car given that:

(3 marks)

1 USD = Ksh 120

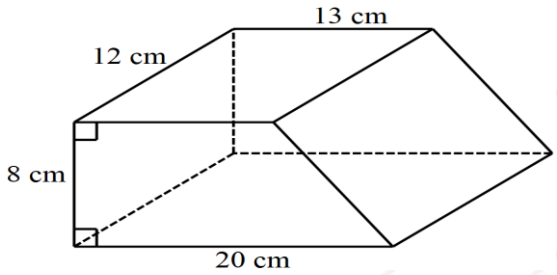
1 USD = 135 JPY

8. The figure below shows a vertical mast AB. The angles of elevation of the top of the mast from two points C and D on the level ground are 40^0 and 32^0 respectively. The distance CD is 50 metres.



Calculate the distance BC, of the tower correct to 1 decimal place **(3 marks)**

9. The figure below shows a solid with the given dimensions.



Calculate the mass of the solid to in kilograms given that its density is 3.5 g/cm^3. **(3 marks)**

10. Solve for x in the equation **(3 marks)**

$9^{x+1} + 3^{2x} = 810$

11. A lampshade is in the shape of a frustum of a cone such that its slanting height is 30 cm while the top and bottom radii of the lampshade are 10 cm and 17.5 cm respectively. Calculate the surface area of the material used to make the lampshade. **(4 marks)**

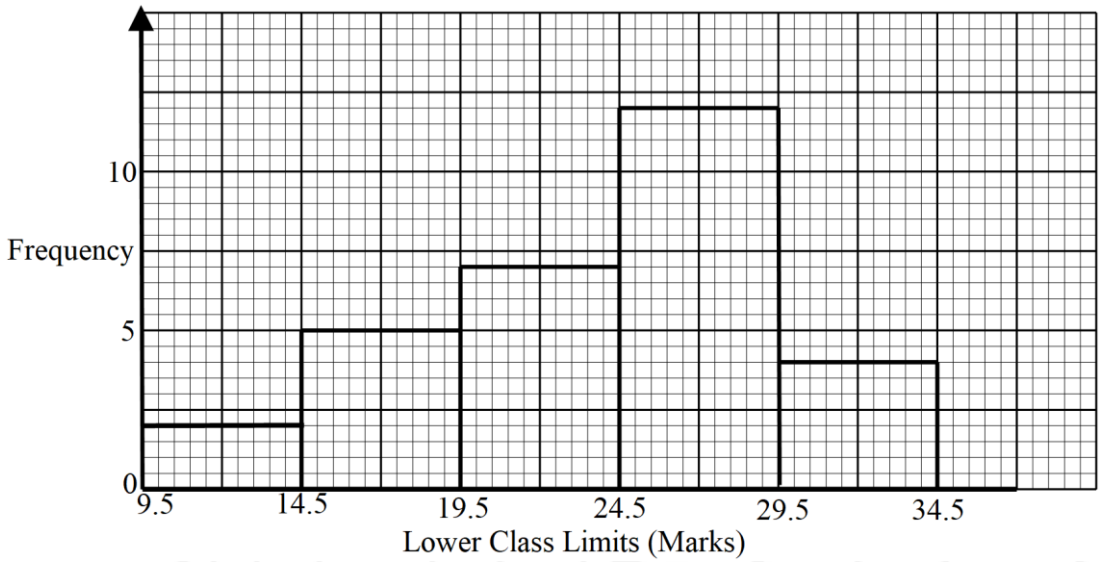
12. (a) Find the range of values of x which satisfies the following inequalities simultaneously **(2 marks)**

$4x - 9 \leq x + 6$

$4 + x \geq 8 - 3x$

(b) Represent the range of values of x in (a) above on a number line. **(1 mark)**

13. The graph below is a histogram showing the marks scored by students in a Mathematics contest.



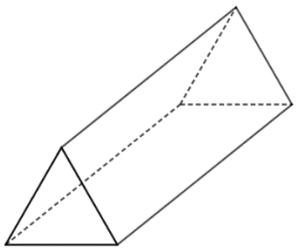
Prepare a frequency distribution table for the above data, hence determine the total number of students who did the contest. **(3 marks)**

14. Use logarithms only to evaluate **(4 marks)**

$$\left(\frac{7.089 \times 124.5}{(86.73)^2}\right)^{\frac{1}{3}}$$

15. A sales lady earns a basic salary of Ksh 12 400 per month. In addition, she gets a 2% commission on the first Ksh 80 000 worth of good and a further 3% commission on goods worth over Ksh 80 000. In a certain month, she earned a total of Ksh 20 000. Calculate the value of the goods sold that month. **(3 marks)**

16. The figure below shows a triangular prism whose cross-section is an equilateral triangle



(a) On the prism, show the positions of the lines of symmetry. **(1 mark)**

(b) Draw the net of the prism. **(1 mark)**

SECTION II (50 Marks)

Answer any five questions in this section

17. A straight line l_1 has a gradient $-\frac{1}{2}$ and passes through the point $P(-1, 3)$. Another line l_2 passes through the points $Q(1, -3)$ and $R(4, 5)$

Find:

(a) (i)The equation of $l_1$in the form $y = mx + c$, where m and c are constants **(2 marks)**

(ii) Hence find k given that $S(0, k)$ **(1 mark)**

(b) (i) The gradient of l_2 **(1 mark)**

(ii) The equation of l_2 in the form $ax + by = c$, where a, b and c are integral values.**(2 marks)**

(c) The equation of a line l_3 passing through a point $T(0, 5)$ and perpendicular to l_2.(**3 marks)**

(d) Calculate the acute angle that l_3 makes with the x-axis. **(1 mark)**

18. Water flows through a cylindrical pipe of diameter 7 cm at a rate of 15 m per minute.

(a) Calculate the capacity of water delivered by the pipe in one minute in litres. Use $\pi = \frac{22}{7}$.

(3 marks)

(b) A storage tank that has a circular base and depth 12 m is filled with water from this pipe and at the same rate of flow. Water begins flowing into the empty storage tank at 6.30 a.m. and is full at 1310 hours. Calculate the area of the cross-section of this tank in square metres. **(4 marks)**

(c) A school consumes the capacity of this tank in one month. The cost of water is Ksh. 100 for every 1 000 litres and a standing charge of Ksh 1 950. Calculate the cost of the school's water bill for one month. **(3 marks)**

19. (a) Find $\mathbf{A^{-1}}$ given that $\mathbf{A} = \begin{pmatrix} 8 & 12 \\ 9 & 15 \end{pmatrix}$ **(1 mark)**

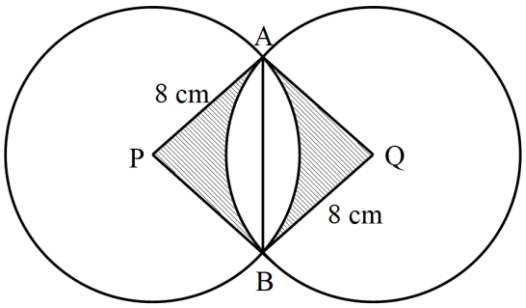
(b) An ICT firm bought 8 printers and 12 copiers for a total of Ksh 294 000. Had the firm bought 1 more printer and 3 more copiers, it would have spent Ksh 43 500 more.

(i) Form two equations to represent the information above. **(2 marks)**

(ii) Hence, using $\mathbf{A^{-1}}$ in (a) above, calculate the cost of each item. **(4 marks)**

(c) **A** two-digit number is such the that difference between tens and ones digit is 1. If the digits are reversed, the sum of the two numbers is 165. Find the original number **(3 marks)**

20. Two equal circles with centres P and Q and radius 8 cm intersect at points A and B as shown below.

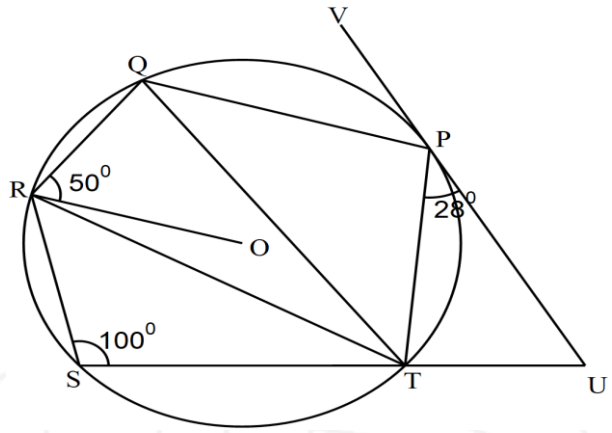


Given that the distance between their centres is 12 cm, find, correct to 4 significant figures;

(a) The length of chord AB **(2 marks)**

(b) The area of the shaded region . Use $\pi = 3.142$ **(8 marks)**

21. In the figure below, P, Q, R, S and T lie on the circumference of a circle centre O. Line UPV is a tangent to the circle at P. Chord ST of the circle is produced to intersect with the tangent at U. Angles UPT, RST and ORQ are 28^0, 100^0 and 50^0 respectively.



(a) Determine the sizes of the following angles;

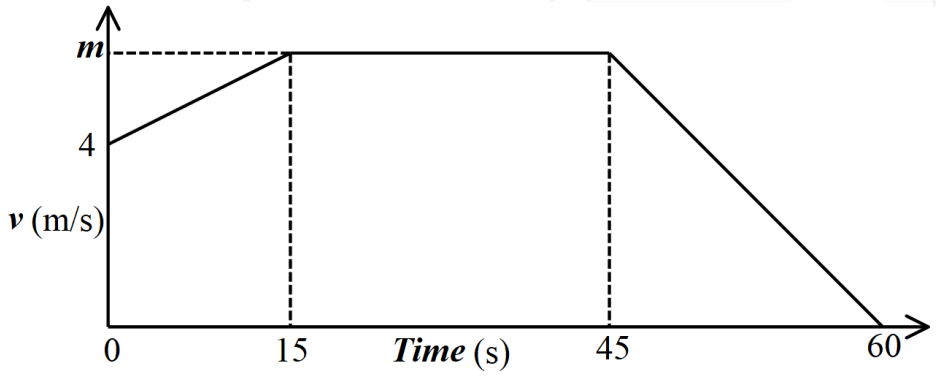
(i) RTP **(3 marks)**

(ii) QTP **(3 marks)**

(b) Given that PQ = 6 cm, calculate correct to 1 decimal place, the radius of the circle. **(4 marks)**

22. (a) Two trains, A and B are such that they are 40 m long and 160 m long respectively. Their speeds are 60 km/hr and 40 km/hr respectively. The two trains are 100 m apart and moving towards the same direction in a pair of parallel tracks. Calculate the time in seconds it takes train B to completely overtake train A. **(4 marks)**

(b) The figure below (not drawn to scale) shows a velocity time graph for a robot in a robotic challenge.



(i) If the distance covered by the robot in the first 15 seconds was 180 metres, calculate the value of m **(3 marks)**

(ii) Describe the movement of the robot between the 15^{th} and 45^{th} seconds. **(1 mark)**

(iii) Calculate the deceleration of the particle in the last 20 seconds. **(2 mark)**

23. A farmer wanted to make a trough for cows to drink water. He had a metal sheet of dimensions 240 cm by 120 cm and 1 cm thick. The density of the metal sheet is 2.5 g/cm^3. A square of sides x cm is removed from each corner of the rectangle and the remaining part folded to form an open cuboid.

(a) Sketch the sheet after removing the squares from the four corners, showing all the dimensions. **(2 marks)**

(b) Calculate

(i) the value of x, to the nearest whole number, that maximizes the volume of the cuboid **(5 marks)**

(ii) hence calculate the maximum volume of the box . **(3 marks)**

24. (a) Complete the table below for the curve $y = x^3 - 5x^2 + 2x + 9$ for $-2 \leq x \leq 5$.**(2 mks)**

x	-2	-1	0	1	2	3	4	5
y			9					

(b) On the grid provided, draw the graph of $y = x^3 - 5x^2 + 2x + 9$ for $-2 \leq x \leq 5$.**(3 marks)**

(c) Use the graph in (b) above to find the roots to the following equations:

(i) $x^3 - 5x^2 + 2x + 9 = 0$ **(2 marks)**

(ii) $x^3 - 5x^2 + 6x = -5$ **(3 marks)**

KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 4)

121/2

MATHEMATICS

PAPER 2

TIME: 2½ HOURS

NAME…… ADM NO; ……

CLASS…… DATE……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

(a) *Write your name and index number in the spaces provided at the top of this page.*

(b) *Write your school name, sign and write the date of the examination in the spaces provided above.*

(c) *This paper consists of **Two** sections: **Section I** and **Section II***

(d) *Answer **ALL** questions in Section I and **any five questions** from Section II*

(e) *Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.*

(f) *Marks may be given for correct working even if the answer is wrong.*

(g) *Non-Programmable silent electronic calculators and KNEC Mathematical Tables may be used.*

For Examiners' Use Only

SECTION I

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

SECTION II

17	18	19	20	21	22	23	24	Total

Grand Total	

SECTION I (50 Marks)

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

1. Solve for x in the equation below without using a mathematical table or calculator. **(4 marks)**

$(\log_{10} x)^2 = 3 - \log_{10} x^2$

2. The base of a right angled triangle is 4.1 cm and the height is 5.0 cm. Calculate the percentage error in the area of the triangle. **(3 marks)**

3. Given that $\tan\theta = \frac{1}{\sqrt{5}}$, θ is an acute angle, without using a calculator or mathematical tables, find $\sin(90 - \theta)$, leaving your answer in simplified surd form. **(2 marks)**

4. Find the interest on Ksh. 200,000 for 2 years at 14% per annum compounded semi-annually. **(3 marks)**

5. Make v the subject of the formula **(3 marks)**

$$S = \frac{dv}{\sqrt{cv^2 - f}}$$

6. A coffee trader buys two grades of coffee at Kshs. 80 and Kshs. 100 per packet. Find the ratio in which she should mix the two brands so that by selling the mixture at Kshs. 120 per packet, a 25% profit realized? **(3 marks)**

7. A bakery prepares cakes for sale. It has 80 eggs and 10 cups of sugar for use. It bakes two cake types: P and Q. Type P cake requires 6 eggs and 2 cups of sugar while type Q cake requires 12 eggs and three-quarters cup of sugar. By letting type P cakes to be x and type Q cakes to be y, form all the inequalities that represent the above information. **(3 marks)**

8. Find the radius and the centre of a circle whose equation is given by $3x^2 + 3y^2 + 6x - 12y - 12 = 0$. **(3 marks)**

9. The equation of a trigonometric function is $y = 2\cos(bx - 60)^0$. The period of the function is 120^0.

(a) Determine the value of b **(1 mark)**

(b) Deduce the phase angle of the function. **(1 mark)**

10. A point R is 2100 nautical miles to the east of another point Q (60^0N, 0^0), find the position of P. **(3 marks)**

11. An arithmetic progression is such that its first term is 200 and common difference 500. Given that $S_n = 80{,}100$, find the value of n **(4 marks)**

12. (a) Expand $(3 + x)^5$ in ascending powers of x up to the term in x^3. **(1 mark)**

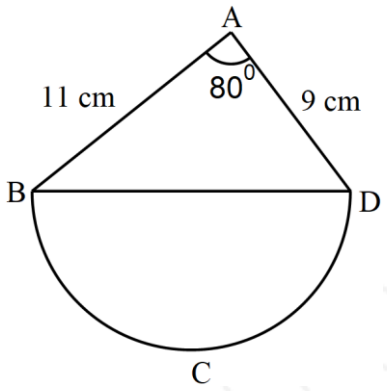
(b) Use the expansion in (a) above to approximate the value of $\left(3\frac{1}{50}\right)^5$ correct to 4 decimal places. **(2 marks)**

13. **P** varies as the cube of **Q** and inversely as the square root of **R**. If **Q** is reduced by 20% and **R** increased by 21%, find the percentage change in **P**. **(3 marks)**

14. Use tables of squares, reciprocals and square roots only to evaluate **(4 marks)**

$$\frac{1}{2.345^2} + \sqrt{0.6789}$$

15. In the figure below, AD = 9 cm, AB = 11cm and angle BAD = 80^0. BD is the diameter of the semi-circle BCD.



Calculate the area of the semi-circle, correct to 2 decimal places. Use π = 3.142 **(4 marks)**

16. Two regular polygons have sides n and $n + 3$. Given that the ratio of the sum of their interior angles is 1: 2, calculate the value of n. **(3 marks)**

SECTION II (50 Marks)

*Answer any **five** question in this section*

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

Taxable Income(Ksh per month)	Tax Rate(%)
0 – 13 450	10
13 451 – 26 350	15
26 351 – 39 250	20
39 251 – 52 150	25
52 151 and above	30

In that year, the monthly earnings for Amilo were as follows: basic salary Ksh 35 500, house allowance – Ksh 12 600 and other allowances that amount to Ksh. 5 872 were exempted from taxation.Amilo contributes 12.5% of her basic salary to a pension scheme. She is entitled to a personal tax relief of Ksh 1 845 per month.Calculate:

(a) Amilo's taxable income in Ksh per month. **(2 marks)**

(b) Amilo's P.A.Y.E that month. **(5 marks)**

(c) Amilo's net pay that month, given that the following are deducted monthly from her salary; NHIF – Ksh 1 000, Union dues – Kshs 455 and BBF – Ksh 200. **(3 marks)**

18. A mode is in the shape of a polygon with vertices A, B, C, D and E such that; AB=4.4 cm, AE=10 cm, ED=5.2 cm and BC=7.9 cm. The bearing of B from A is 030^0 and A is due east of E, while D is due north of E and angle EDC=120^0

(a) Using a ruler and a pair of compasses only,

(i) Construct the accurate plan of the model. **(4 marks)**

(ii) Measure DC. **(1 mark)**

(b) A foundation plaque is to be placed closer to CD than CB, nearer to D than to E and not more than 6 cm from A.

(i) Construct the locus of points equidistant from CB and CD. **(1 mark)**

(ii) Construct the locus of points equidistant from E and D. **(1 mark)**

(iii) Construct the locus of points 6 cm from A. **(1 mark)**

(c) Shade and label as R, the region within which the foundation plaque could be placed in the garden. **(2 marks)**

19. The probability that it rains on a certain day is 0.8. If it rains the probability that a school bus will be stuck in a traffic jam is 0.7 but otherwise it is 0.4. If the bus is stuck in the jam, the probability that students using it to school will arrive late is 0.6, otherwise the probability of students using the bus to arrive late is 0.3.

(a) Draw a tree diagram to represent this information. Use the letters R, J and L to represent the events of rain, jam and late respectively **(2 marks)**

(b) Determine:

(i) The probability that it rains, the bus isn't held in the jam but the students arrive late in school. **(1 mark)**

(ii) The probability that students arrive in school on time. **(3 marks)**

(iii) The probability that the students arrive in school late. **(2 marks)**

(iv) The probability that the bus is held in the jam. **(2 marks)**

20. The vertices of a triangle ABC are $P'(-1,1)$, $B'(-5,4)$ and $C'(-1,2)$ under a transformation whose matrix is $\begin{pmatrix} -2 & 1 \\ 1 & 0 \end{pmatrix}$

(a) Find the coordinates of ABC **(3 marks)**

(b) On the grid provided, draw triangles ABC and $A'B'C'$. **(2 marks)**

(c) Triangle $A''B''C''$ is the image of triangle $A'B'C'$ under a transformation represented by the matrix

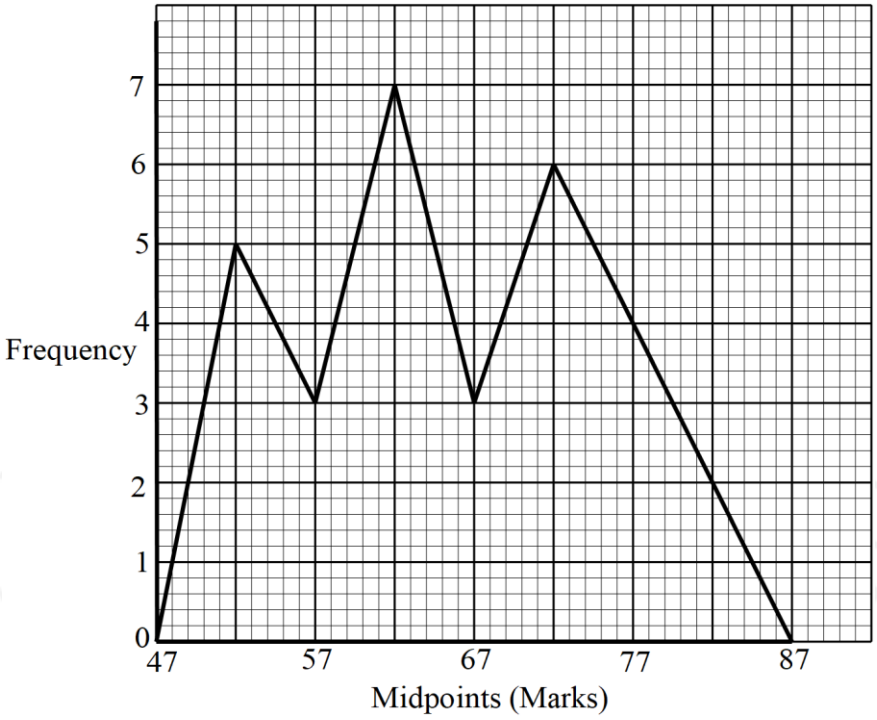
$\begin{pmatrix} -1 & 0 \\ 0 & -2 \end{pmatrix}$

(i) Determine the coordinates of $\Delta A''B''C''$. **(2 marks)**

(ii) On the same grid, draw $\Delta A''B''C''$. **(1 mark)**

(d) Another transformation $\boldsymbol{T}$ maps $\Delta A''B''C''$ on to $\Delta A'''B'''C'''$ such that $A'''(-1,-2)$, $B'''(-5,-8)$ and $C'''(-1,-4)$. Describe $\boldsymbol{T}$ fully. **(2 marks)**

21. The figure below shows a frequency polygon representing the scores of Form 4 Green students in a History contest.



(a) Generate the frequency distribution table for the data under the headings given in the table below. **(5 marks)**

x	f	$d = \frac{x - 67}{5}$	fd	fd^2
	$\Sigma f =$		$\Sigma fd =$	$\Sigma fd^2 =$

(b) Calculate the standard deviation of the marks. **(3 marks)**

(c) The mean weight of 11 babies in a clinic is 4.5 kg. If one more baby comes to the clinic, the total mass of the babies becomes 60 kg. Find the mass of the additional baby. **(2 marks)**

22. In a triangle OAB, $\boldsymbol{OA} = 12\boldsymbol{a}$, and $\boldsymbol{OB} = 12\boldsymbol{b}$. P and Q are points on OA and OB respectively such that $\boldsymbol{3OP} = \boldsymbol{OA}$ and $\boldsymbol{OQ} = \frac{1}{3}\boldsymbol{OB}$. M is the midpoint of AB.

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

(i) $\boldsymbol{OM}$ **(1 mark)**

(ii) $\boldsymbol{PM}$ **(1 mark)**

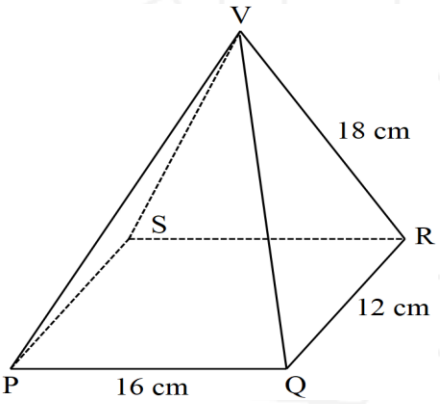
(b) $\boldsymbol{OM}$ and $\boldsymbol{BP}$ intersect at R such that $\boldsymbol{PR} = k\boldsymbol{PB}$ and $\boldsymbol{OR} = h\boldsymbol{OM}$.

(i) Express $\boldsymbol{PR}$ in two ways **(2 marks)**

(ii) Hence find the values of h and k (**3 marks)**

(c) Show that A, R and Q are collinear. **(3 marks)**

23. The figure below represents a right pyramid with a vertex V and a rectangular base PQRS. VP=VQ=VR=VS=18 cm. PQ=16 cm and QR=12 cm. M and O are the midpoints of QR and PR respectively.



Calculate, correct to 2 decimal places;

(a) The length of the projection of the line VP on the plane PQRS **(2 marks)**

(b) The angle between the lines VP and the plane PQRS. **(2 marks)**

(c) the angle between planes VQR and VPS. **(4 marks)**

(d) The angle between the planes VQR and PQRS **(2 marks)**

24. Two functions, $x + y = 4$ and $y = x^2 + 2$, intersec at C and D

(a) Determine the coordinates of C and D **(4 marks)**

(b) Using the trapezium rule with 6 trapezia, estimate the area bound by $y = x^2 + 2$, the x-axis and the vertical lines through C and D. **(4 marks)**

(c) Find the exact area in (b) above. **(2 marks)**

KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 5)

MATHEMATICS

121/1

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… SIGN……

INDEX NO…… ADM NO……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

a) *Write your name, index number and date in the spaces provided at the top of this page.*
b) *Write name, admission number and class in the spaces provided above.*
c) *This paper contains **TWO** sections: **section I** and **section II***
d) *Answer **ALL** the questions in **Section I** and only **five** questions from **section II.***
e) ***Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.***
f) *Marks may be given for correct working even if the answer is wrong.*
g) ***Non-programmable** silent electronic scientific calculators and KNEC mathematical tables may be used except where stated otherwise.*

FOR EXAMINER'S USE ONLY:

Section I

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

Section II

17	18	19	20	21	22	23	24	TOTAL

GRAND TOTAL

SECTION 1 (*50 marks*)

Answer all the questions in this section in the space provided

1. Evaluated: **(3mks)**

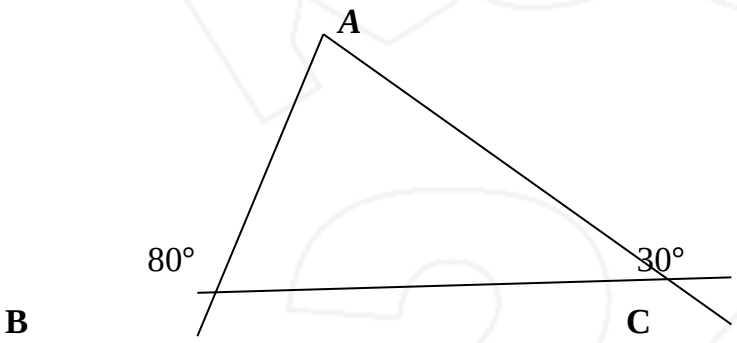
$$\frac{2\frac{1}{2}\ of\ 1\frac{3}{4} - 5\frac{1}{4}}{1\frac{2}{5} + 2(1\frac{1}{4} - 2\frac{3}{4})}$$

2. Use logarithms to evaluate the following to 4 significant figures to: **(4mks)**

$$\left(\frac{95.75\ X\ 0.85}{4.524 + 1.234}\right)^{\frac{2}{3}}$$

3. An electrician made a loss of 30% by selling a multi plug at sh.1400.what percentage profit would he has made if he sold the multi plug at sh. 2300. **(3mks)**

4. In the triangle ABC below, BC=9cm, angle ABC=80°.and angle ACB=30°.



Calculate, correct to 4 significant figures, the area of the triangle. **(3mks)**

5.) Given that the exterior angle of a regular hexagon is 2x. Find the value of x . Hence find the size of each interior angle of the hexagon. **(3mks)**

6. Two numbers *t* and *s* are such that $t^4 x\ s^2 = 5625$. Find *t* and *s* **(3mks)**

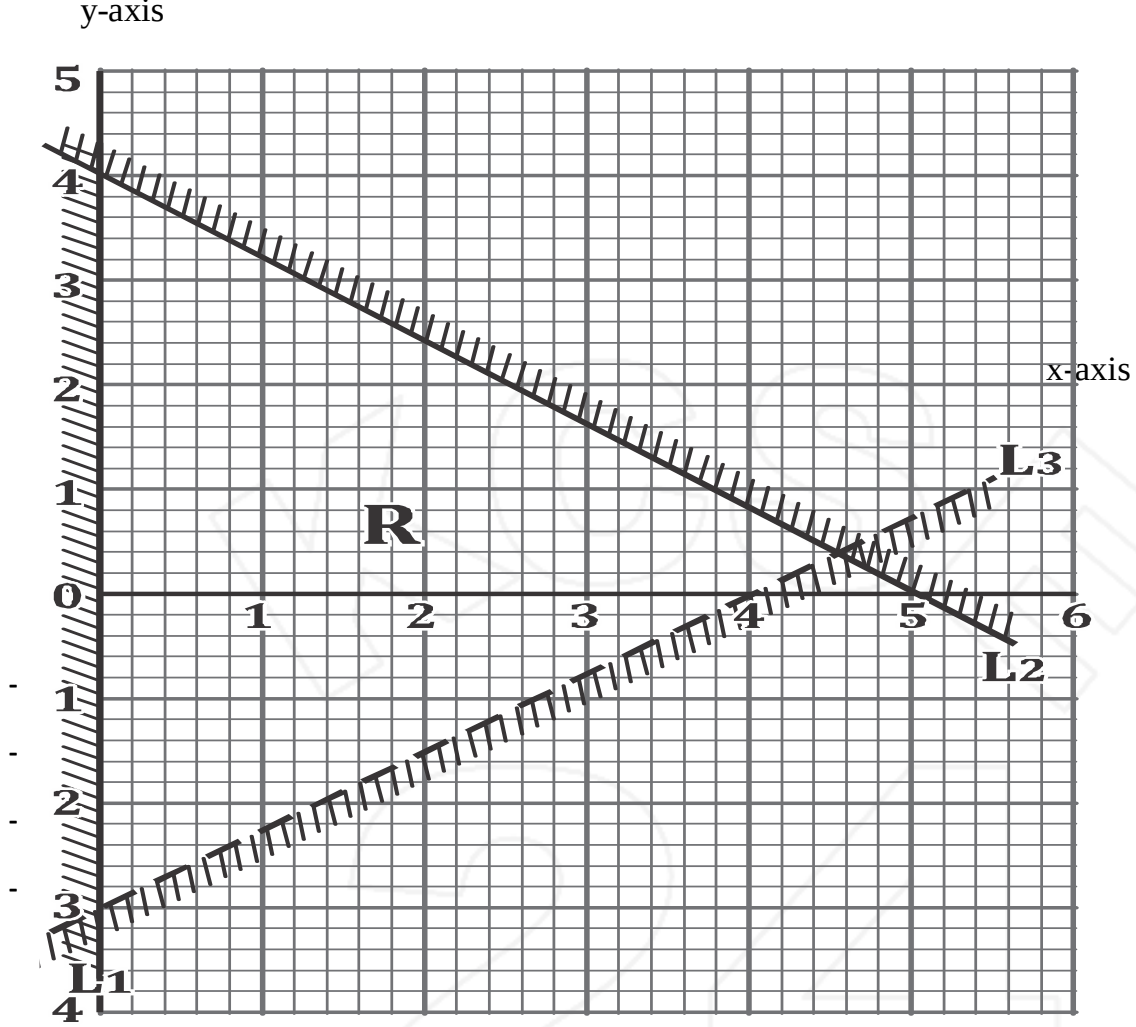
7. Find the obtuse angle the line with equation 2y+5x+2=0 makes with the x-axis. **(3mks)**

8. Simplify the expression **(3mks)**

$$\frac{12x^2 + ax - 6a^2}{9x^2 - 4a^2}$$

9. A plot is in the shape of a right angled triangle. The length of the shorter side is 15m and the area is 456.8m^2. Calculate the length of the longest side of the garden. **(3mks)**

10.) The diagram below shows a region R bounded by three lines L_1, L_2 and L_3. Form the three inequalities that satisfies the given region R **(3mks)**



11. A bus travelled at an average speed of 63km/h left the station at 9.15 am. A car later left the same station at 10.00am and caught up with bus at 11.45 am. Find the average speed of the car. **(3mks)**

12. A tourist came in Kenya and exchanged 1250 US dollars into Kenyan shillings at the rate shown below.

	Buying (Kshs)	selling (Kshs)
1US dollar	105.5	110.8

He spent Ksh. 85400 after which he converted the remaining balance to US dollars. How much US dollars did he get back to the nearest dollar. **(3mks)**

13.a) Complete the table below for $y= x^2+5$ **(1mk)**

X	0	1	2	3	4	5	6
$Y=x^2+5$	5						

b) Use the trapezoidal rule with7 ordinates to estimate the area bounded by the curve $y=x^2+5$, x – axis , y-axis and x=6 **(2mks)**

14. Given that $\mathbf{a} = \begin{pmatrix} 6 \\ 2 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} -2 \\ -4 \end{pmatrix}$ and $3\mathbf{a}-2\mathbf{b}+2\mathbf{c} = \begin{pmatrix} 32 \\ 20 \end{pmatrix}$, find $\mathbf{c}$ **(3mks)**

15). A triangle T with vertices A(2,4), B(6,2)and C(4,8) is mapped onto triangle T' with vertices A'(10,0) ,B'(8,-4) and C'(14,-2) by a rotation .

a) on the grid provided draw triangle T and its image T' **(2mks)**

b) Determine the centre and the angle of rotation that maps T onto T' **(2mks)**

16. A small cone of height 8cm is cut off from a bigger cone leaving a frustum of height the 16cm. If the volume of the smaller cone is $160cm^3$, find the volume of the frustum. **(3mks)**

Section II (50MKS)

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

17. Three businessmen, Hassan, Mutua and Wanyonyi decided to start a business. The initial capital which was needed was Ksh. 4,000,000 of which they were able to raise 30% by making contributions in the ratio 3:3:2 respectively. The rest of the amount was obtained from a bank and was to be paid back within one year with an interest of 25% in the same ratio 3:3:2. The three men were to share the profit of the business in the ratio of their contribution. During the year, the business realized a profit of ksh.4, 800,000.

a) How much of the initial amount did Wanyonyi raise? **(3mks)**

b) How much did Hassan pay to the bank at the end of the year? **(4mks)**

C) After paying the bank at the end of the year, how much was Mutua left with? **(3mks)**

18. The marks scored by 50 students in a geography examination are as follows:

60	54	40	67	53	73	37	55	62	43
44	69	39	32	45	58	48	67	39	51
46	59	40	52	61	48	23	60	59	47
65	58	74	47	40	59	68	51	50	50
71	51	26	30	38	70	46	40	51	42

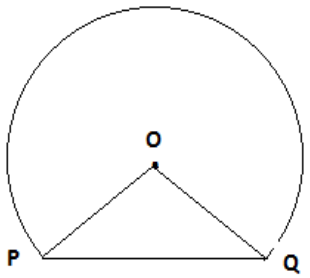
a) Prepare a frequency distribution table using a class interval of 10 starting from 21-30 **(3mks)**

b) Draw a histogram to represent the distribution **(4mks)**

c) Use your histogram to estimate the modal class **(1mk)**

d) Using the histogram estimate the mean of the distribution of the data. **(2mk**

19. A petrol tanker has a cross-section in the shape shown below. It is used to transport petrol. Its internal length is 7m while its internal radius is 3.5 m. Obtuse angle POQ = 144^0.On one of its trips, it was filled to capacity. Taking $\pi = {}^{22}/_{7}$



(a) Calculate the volume of petrol in the tanker in

(i) m^3 **(2 marks)**

(ii) litres **(1mark)**

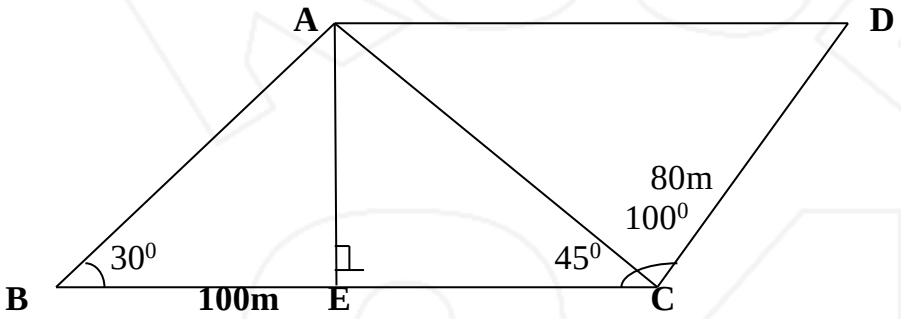
(b) In the parking lot at night, a third of the petrol was stolen.

i) How many litres of petrol was the owner left with? **(2 marks)**

ii) What was the mass of the remaining petrol given that one cubic metre of petrol has a mass of 700kg? **(3 marks)**

(iii) At the weigh bridge, any vehicle carrying excess of 50,000 Kg was charged Sh. 12.50 for every extra kilogram. How much fine did the owner of the tanker pay? **(2 marks)**

20. The figure below represents a quadrilateral piece of land ABCD divided into three triangular plots. The lengths BE and CD are 100m and 80m respectively. Angle ABE = 30^0, ACE = 45^0 and ACD = 100^0.



(a) Find to four significant figures:

(i) The length of AE. **(2mks)**

(ii) The length of AD. **(2mks)**

(iii) The perimeter of the piece of land. **(3mks)**

(b) The plots are to be fenced with five strands of barbed wire leaving an entrance of 2.8m wide to each plot. The type of barbed wire to be used is sold in rolls of lengths 480m. Calculate the number of rolls of barbed wire that must be bought to complete the fencing of the plots. **(3mks)**

21. A straight line $\mathbf{L_1}$ has a gradient **-½** and passes through point **P (-1, 3).** Another line $\mathbf{L_2}$passes through the points **Q (1,-3)** and **R (4, 5)**.

Find:

(a) The equation of $\mathbf{L_1}$ **(2 marks)**

(b) The equation of $\mathbf{L_2}$ in the form ax + by + c = 0 . **(3 marks)**

(c) The equation of a line passing through a point **S (0, 5)** and is perpendicular to $\mathbf{L_2}$. **(3 marks)**

(d) The equation of a line through **R** parallel to $\mathbf{L_1}$. **(2 marks)**

22. a) A port B is on a bearing 080° from a port A and a distance of 95 km. A Submarine is stationed at a port D, which is on a bearing of 200° from A, and a distance of 124 km from B. A ship leaves B and moves directly Southwards to an Island P, which is on a bearing of 140° from A. The Submarine at D on realizing that the ship was heading to the Island P, decides to head straight for the Island to intercept the ship. Using a scale of 1 cm to represent 10 km, make a scale drawing showing the relative positions of A, B, D and P. **(4 marks)**

Hence find:

b) The distance from A to D. **(2 marks)**

c) The bearing of the Submarine from the ship when the ship was setting off from B. **(1 mark)**

d) The bearing of the Island P from D. **(1 mark)**

e) The distance the Submarine had to cover to reach the Island P. **(2 marks)**

23. (a) Find the inverse of the matrix: **(1mk)**

$A=\begin{pmatrix}4 & 3\\ 3 & 2\end{pmatrix}$

b) Amina bought 20 bags of oranges and 15 bags of mangoes for a total of sh. 9,500. Nafula bought 30 bags of oranges and 20 bags of mangoes for a total of sh. 13,500. If he price of a bag of oranges is X and that of mangoes is y:

i) Form two equations to represent the information above. **(2mks)**

ii) Hence use the matrix A^{-1} above to find the price of one bag of each item. **(4mks)**

(c) The price of each bag of oranges was increased by 10% and that of mangoes reduced by 10%. The businesswomen (Amina and Nafula) bought as many oranges and as many mangoes as they bought earlier. Find the total cost of oranges and mangoes that each businesswomen bought after the percentage change. **(3mks)**

24. The displacement, s metres, of a moving particle from a point O, after t seconds is given by, s = $t^3 - 5t^2 + 3t + 10$

a) Find s when t=2 **(2mks)**

b) Determine:

i) the velocity of the particle when t=5 seconds; **(3mks)**

ii) the value of t when the particle is momentarily at rest **(3mks)**

c) find the time , when the velocity of the particle is maximum **(2mks)**

KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 5)

MATHEMATICS

121/2

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… SIGN……

INDEX NO…… ADM NO……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

a) *Write your name, index number and date in the spaces provided at the top of this page.*
b) *Write name, admission number and class in the spaces provided above.*
c) *This paper contains **TWO** sections: **section I** and **section II***
d) *Answer **ALL** the questions in **Section I** and only **five** questions from **section II.***
e) ***Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.***
f) *Marks may be given for correct working even if the answer is wrong.*
g) ***Non-programmable** silent electronic scientific calculators and KNEC mathematical tables may be used except where stated otherwise.*

FOR EXAMINER'S USE ONLY:

Section I

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

Section II

17	18	19	20	21	22	23	24	**TOTAL**

GRAND TOTAL

SECTION I (50mks)

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

1. Simplify without using mathematical tables or calculator. **(4mks)**

$$\frac{2(\log_{10} 2.5 + \log_{10} 40)}{3\log_{10}0.05 + 2\log_{10}2 - \log_{10}0.5}$$

2. Simplify $\frac{2}{2+\sqrt{5}} - \frac{2\sqrt{5}}{2-\sqrt{5}}$ and express your answer in the form $a+b\sqrt{c}$ where a, b and c are constants**.** **(3mks)**

3. A wedding committee did a budget for a wedding ceremony as follows:

Food: Ksh. 58,205

Chairs:Ksh. 11,950

Entertainment: 8,453

The sum of the budget was done by first rounding each figure to 3 significant figures.

a) Determine the sum of the **budget** **(2mks)**

b) Determine the percentage error in this sum of the budget **(2mks)**

4. Solve the equation $4\sin^2 x + 4\cos x = 5$ for $0^0 \leq x \leq \mathbf{360^0}$ **(3mks)**

5. a) Expand $(1-x)^4$ using the binomial **expansion** **(1mk)**

b). Use the first three terms of the expansion in (a) above to find the value of $(0.998)^4$

Correct to the nearest hundredth **(3mks)**

6. Make w the subject of the formula **(3mks)**

$$P=\sqrt{\frac{vw^2}{V^2-W^2}}$$

7. Given that $y = 3\sin(\frac{1}{2}x + 60)^0$ find, amplitude, period and the phase angle of the function. **(3mks)**

8. A ship sails due North from latitude 20^0 S for a distance of 1440nm. Find the latitude of the point it **reaches** **(2mks)**

9. The equation of a circle is given by $3x^2+3y^2+3x+42y+30=0$. Determine the radius and the coordinates of the centre circle. **(3mks)**

10. a) i) Draw a straight line MN such that MN=7cm **(1mk)**

ii) Construct the locus P such that $< MPN=90^0$ **(1mk)**

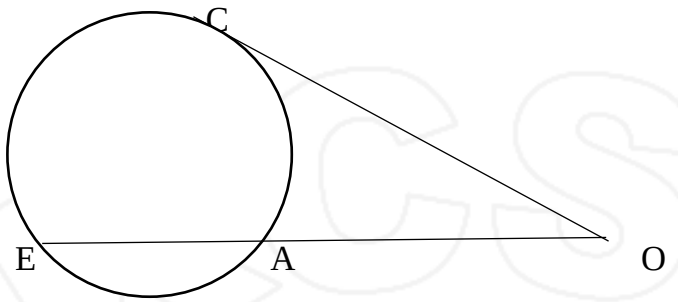
b) On the locus of P in (a) above, mark point T such that T is equidistant from M and N. **(2mks)**

11. The table below shows tax table for monthly income

Monthly taxable income in Ksh.	**Tax rate % in each shilling**
0- 9680	10
9681- 18800	15
18801-27920	20

In a certain month, Kamau's tax was sh. 3336. Determine his income during that month. **(3mks)**

12. In the figure below OC is the tangent to the circle. If OE=8cm and OC=6cm, find EA. **(2mks)**



13. Evaluate $\int_1^4 (3x^2 + 1)dx$ **(3mks)**

14. Liquid P contains 30% of water while liquid Q contains 48% of water. In what ratio should P and Q be mixed so that the mixture contains 42% of water**?** **(3mks)**

15. The probability that it is rainy in the morning is 0.6. The probability that John carries an umbrella while going to work is 0.4. Find the probability that

i) It is not rainy and John does not carry an umbrella**.** **(2mks)**

ii) It is rainy and John carries an umbrella **(1mk)**

16. Solve the simultaneous equations

x-2y=1, x^2+y^2=29 **(3mks)**

SECTION II (50 MARKS)

(Answer five questions in this section)

17. The first three consecutive terms of a geometric progression are 3^{2x+1}, 9^x and 81 respectively

a) Calculate the value of ***x*** **(3mks)**

b) Find the common ratio of the **series** **(2mks)**

c) Calculate the sum of the first ten terms of this **series** **(2mks)**

d) Given that the fifth and the seventh terms of this Geometrical Progression form the first two consecutive terms of an arithmetic sequence calculate the sum of the first 20 terms of the arithmetic sequence. **(3mks)**

18. In an experiment, the length of 100 rats were measured to the nearest 0.1cm and the frequency tabulated as follows:

Length in *(cm)*	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Frequency	1	4	x	20	25	26	7	1	1

a) Find the value of x **(2mks)**

b) Calculate the mean length using assumed mean of 42 **(4mks)**

c) Calculate the standard **deviation** **(4mks)**

19. Complete the table below for the function

$y=x^3+6x^2+\mathbf{8x}$ **(2mks)**

X	-5	-4	-3	-2	-1	0	1
x^3	-125	-64		-8	-1	0	1
$6x^2$		96	54		6	0	6
$8x$	-40		-24	-16		0	8
Y			3	0	-3	0	15

a) Draw the graph of the function $y=x^3+6x^2+8x$ for $-5\leq x\leq 1$ **(3mks)**

(Use a scale of 2 big squares to represent 1 unit on the x-axis and 1big square to represent 2 units on the y-axis)

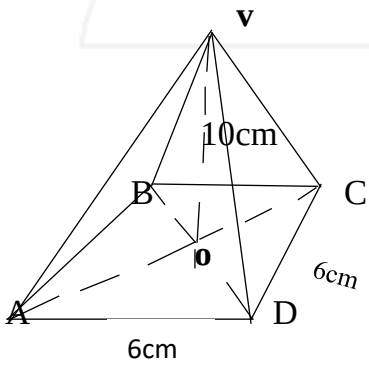
b) Use your graph to estimate the roots of the equations

i. $x^3+6x^2+8x=0$ **(1mk)**

ii. $x^3+5x^2+4x=-x^2-3x-1$ **(2mks)**

c) Find the values of x which will satisfy the inequality $x^3+6x^2+8x>1$ **(2mks)**

20. The figure below is a square based pyramid ABCDV with AD=DC=6cm. VO=10cm



a) State the projection of VA on the base ABCD **(1mk)**

b) Find:

i. The length of VA **(3mks)**

ii. The angle between the planes VA and ABCD **(2mks)**

iii. The angle between the planes VDC and ABCD **(2mks)**

iv. The volume of the pyramid **(2mks)**

21. The points A (0,0), B (-3,1), C (1,3) and (4,2) are the vertices of a parallelogram ABCD.

a) $A^{/}B^{/}C^{/}D^{/}$ is the image of ABCD under the matrix of transformation $\begin{bmatrix} -2 & 0 \\ 0 & -2 \end{bmatrix}$

Draw ABCD and $A^{/}B^{/}C^{/}D^{/}$ on the grid. Write down the coordinates of $A^{/}B^{/}C^{/}D^{/}$ **(3mks)**

b) The points $A^{//}(0,0)$ $B^{//}(-6,2)$ $C^{//}(2,6)$ and $D^{//}(8,4)$ are the vertices of $A^{//}B^{//}C^{//}D^{//}$ the image of ABCD under a certain transformation. Draw $A^{//}B^{//}C^{//}D^{//}$ on the same grid as ABCD. Describe this transformation fully. **(3mks)**

c) A single transformation T maps $A^{/}B^{/}C^{/}D^{/}$ on to $A^{//}B^{//}C^{//}D^{//}$. Determine the matrix of T **(4mks)**

22. A sum of money is deposited in a bank that pays simple interest at a rate r. After 3 years the total amount of money in the account is Ksh. 358,400. The interest earned each year is Ksh. 12,800.

a) Calculate: i) The amount of money which was deposited. **(2mks)**

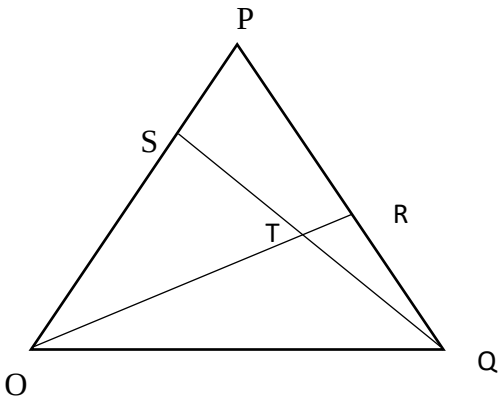
ii) The rate of interest r**.** **(2mks)**

b) A computer whose marked price is Ksh. 40,000 is sold at ksh. 56,000 on hire purchase terms.

i) James bought the computer on hire purchase terms. He paid a deposit of 25% of the hire purchase price and cleared the balance by equal monthly instalments of ksh. 2625. Calculate the number of instalments. **(3mks)**

ii) Had James bought the computer on cash price he would have been allowed a discount of 12.5% on the marked price. Calculate the difference between the cash price and the hire purchase price and express it as a percentage of the cash price. **(3mks)**

23. In the figure below OPQ is a triangle in which $OS = \frac{3}{4}\overrightarrow{OP}$ and $\overrightarrow{PR} : \overrightarrow{RQ} = 2:1$. Lines OR and SQ meet at T.



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

i. $\overrightarrow{PQ}$ **(1mk)**

ii. $\overrightarrow{OR}$ **(2mks)**

iii. $\overrightarrow{SQ}$ **(2mks)**

b) Given that $\overrightarrow{ST} = m\overrightarrow{SQ}$ and $\overrightarrow{OT} = n\overrightarrow{OR}$ where m and n are consonants, determine the values of m and n **(4mks)**

c) Find the ratio of ST:**TQ** **(1mk)**

24. During installation of electricity bulbs in street lighting a dealer is required to supply two types of bulbs A and B. The total number of bulbs should not be more than 400. He must supply more of type A than of type B and type A should not be more than 300 and type B should not be less than 80.

a) By letting the number of type A bulbs to be *x* and the number of type B bulbs to be *y*, write all the inequalities representing the above information**.** **(3mks)**

b) On the grid provided draw all the **inequalities** **(4mks)**

c) If type A bulbs cost sh.450 per piece and type B cost sh.350 per piece and that the higher the cost the higher the profit:

i. Use your graph to determine the number in each type of bulb that he should supply to maximize the profit. **(1mk)**

ii. Calculate the maximum cost of lighting the **street** **(2mks)**

KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 6)

MATHEMATICS

121/1

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… SIGN……

INDEX NO…… ADM NO……

Kenya Certificate of Secondary Education.

INSTRUCTION TO CANDIDATES

a) Write your name and Admission number in the spaces provided above.

b Sign and write the date of examination in the spaces provided above.

*c)The paper consists of **two** sections. **Section I** and **Section II.***

*d)Answer **ALL** the questions in Section I and any **FIVE** questions in Section II.*

e) Show all the steps in your calculations, giving your answer at each stage in the spaces provided below each question.

f) Marks may be given for correct working even if the answer is wrong.

g)Non-programmable silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.

h)Candidates should answer the questions in English.

FOR EXAMINER'S USE

SECTION I

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

SECTION II

17	18	19	20	21	22	23	24	**Total**

Grand Tota

SECTION I:(50MKS)

Attempt All The Questions From This Section

1. Without using a calculator or a mathematical table evaluate **(3mks)**

$$\frac{\frac{6}{7}of\ \frac{14}{3}\div 8\times\frac{-2}{3}}{-2\times 3+(14\div 7)\times -3}$$

2. In a disco hall, four lights signals are programmed at intervals of 8 seconds, 10 seconds, 12 seconds and 15 seconds. What is the earliest time they will give out light signals simultaneously if the last time they did this 1915 Hrs. **(3mks)**

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

4. The number of sides of two regular polygons differ by one. If the sum of the interior angles of these polygons is in the ratio 3:2 calculate the number of sides of each polygon and name them. **(4mks)**

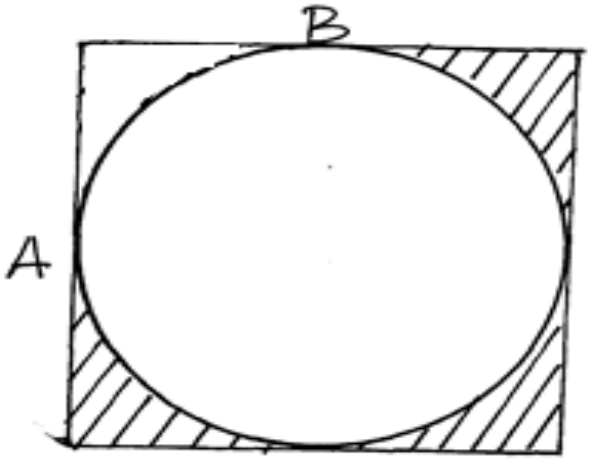
5. Under an enlargement scale factor -4 the image of point A(4,3) is A^1(-4,-5). Calculate the coordinates of the centre of enlargement. **(3mks)**

6. Given that $A+\begin{pmatrix}2 & 0\\ 1 & 3\end{pmatrix}=\begin{pmatrix}2 & 3\\ 0 & 1\end{pmatrix}$ find A^T the transpose of matrix A. **(2 mks)**

7. If $\frac{x^h}{y^{\frac{2}{3}}}\div\frac{y^k}{yx^3}=x^3y^{-4}$, find h +k **(3mks)**

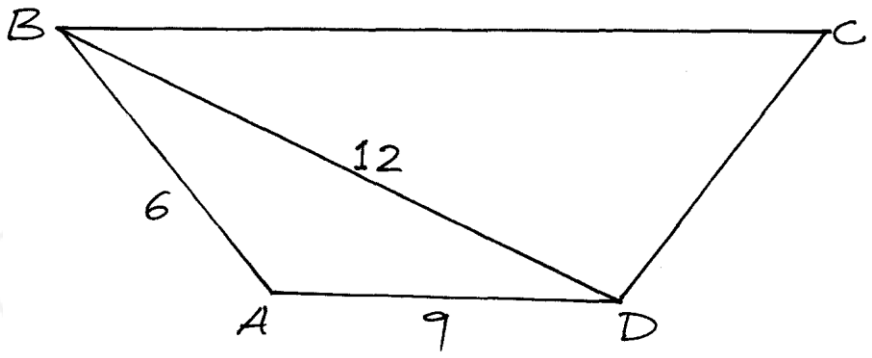
8. The figure below shows a circle inscribed in a square. The length of the arc AB is $\frac{44}{7}\sqrt{7}$ cm.

Calculate the area of the shaded region. $\left(\pi=\frac{22}{7}\right)$. **(4mks)**



9. Two students Paul and Omondi standing 10m apart on the same side of a tall building on a horizontal ground. Paul who is closer to the building sees the roof top at an angle of 70^0, while Omondi at an angle of 46.8^0, if the building, Paul and Omondi lies on a straight line, calculate the height of the building correct to 3 s.f. **(4 mks)**

10.A trapezium was created by joining two similar triangles. What is the perimeter of the quadrilateral? **(3mks)**



11. Mr Wajakoya purchased animal feeds for his 10 cows which would last for 7 days. After feeding his cows for 4 days, he sold 4 cows. How many more days will the feeds last the remaining cows. **(3mks)**

12. Use the tables of logarithms to evaluate. **(4mks)**

$$\left(\frac{6.79\times 0.391}{\log 5}\right)^{\frac{-3}{4}}$$

13.A pentagonal prism has each of its sides as 5cm and length 10cm. Find the volume of the prism. **(3 mks)**

14. Solve the following inequalities and state the integral solutions. **(3mks)**

$$\frac{1}{2}(24-4x) > 6(3x-\frac{4}{3}) \geq -\frac{2}{3}(42+3x)$$

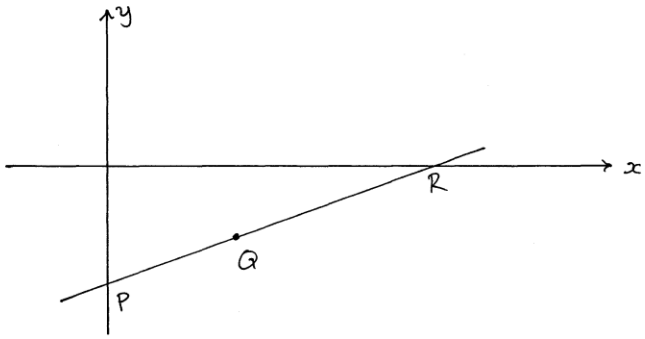
15. When a shirt is sold at sh 126 a loss of x% is made. If the same shirt is sold at sh 154, a profit of x% is realized. Find the buying price of the shirt. **(3mks)**

16. Without using calculator or mathematical tables, find the value of x in $\sin 60^0 = \cos (3x-45)^0$ given that $0^0 \leq x \leq \frac{\pi^C}{2}$ **(2mks)**

SECTION II

Answer Any Five Questions

17. The figure below shows a line that passes through points P, Q and R. Given that its equation is $\frac{-7y}{30}+\frac{x}{10}=1$ and that point Q is equidistant from x and y-axis

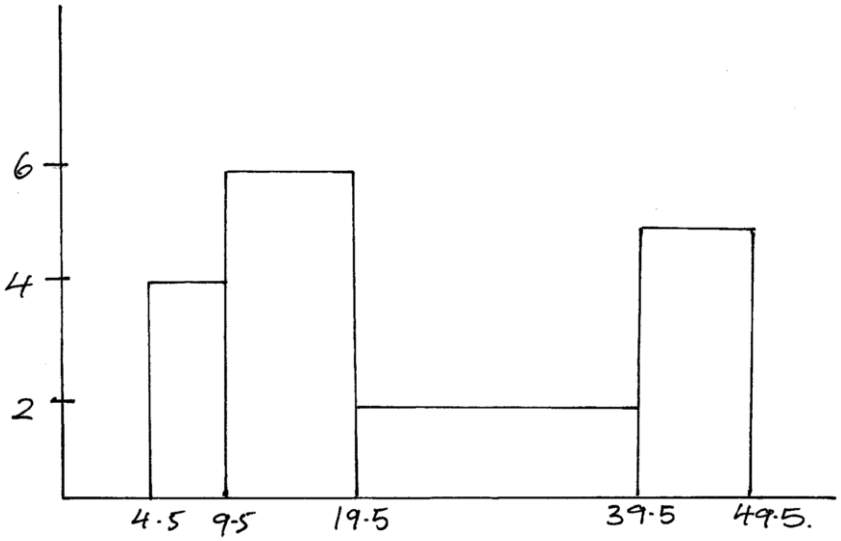


(a) Calculate the co-ordinates of points Q. **(4mks)**

(b) Calculate the size of angle formed by the line and y-axis. **(3mks)**

(c) Find the equation of the perpendicular to the line through Q in the form of $\frac{x}{a}+\frac{y}{b}=1$ **(3 mks)**

18. The figure below shows a histogram of a certain data.



(a) Given that the frequency of the last class is 30, prepare frequency distribution table for the data. **(3mks)**

(b) **(i)**State the modal class. **(1 mk)**

(ii) Estimate the mean height **(3mks)**

(c) Using a vertical line show where the median lies and state the median. **(3mks)**

19. Towns A and B are 420km apart. Two Lorries departed from A at the same time travelling towards B. Lorry X travelled at an average speed of 15km/h less than Y and reached 1 hour and 24 minutes later.

(a) Calculate the average speed of lorry Y. **(5mks)**

(b) How far was X from A when Y reached B. **(2mks)**

(c) A van left town B heading towards A at the time lorries X and Y left A. If the van travelled at an average speed of 90km/h, how far from A did it meet Lorry Y. **(3mks)**

20. The vertices of a triangle PQR are P(0,0), Q(6,0) and R(2,4).

(a) Draw triangle PQR on the grid provided. **(1mk)**

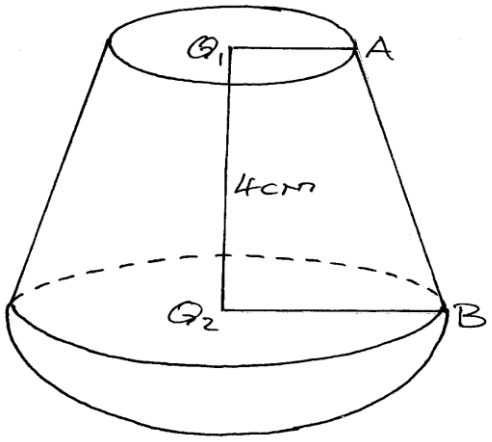
(b) Triangle $P^1Q^1R^1$ is the image of triangle PQR under an enlargement scale factor $\frac{1}{2}$ and centre (2,2), write down the co-ordinates of $P^1Q^1R^1$ and plot on the same grid. **(3mks)**

(c) Draw triangle $P^{11}Q^{11}R^{11}$ the image of triangle $P^1Q^1R^1$ under a positive quarter turn about point (1,1). State the co-ordinates of $P^{11}Q^{11}R^{11}$. **(3mks)**

(d) Draw triangle $P^{111}Q^{111}R^{111}$ the image of $P^{11}Q^{11}R^{11}$ under a reflection in the line y=1. **(2mks)**

(e) State the type of congruence between triangle $P^1Q^1R^1$ and $P^{111}Q^{111}R^{111}$. **(1mk)**

21. The diagram below represents a solid consisting of a hemispherical bottom and a conical frustum at the top. O_1O_2 =4cm, O_2B=R=4.9cm and O_1A=r=2.1cm.



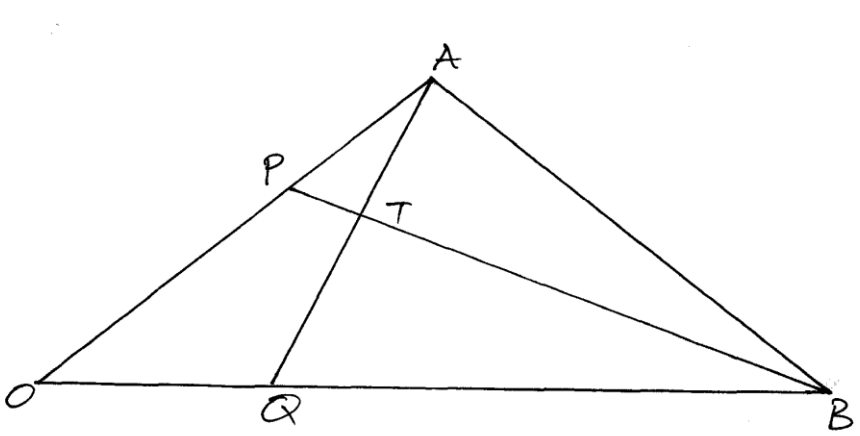
Calculate to 1 d.p,

(a) The height of the chopped off cone and hence the height of the bigger cone**. (2mks)**

(b) The surface area of the solid. **(4mks)**

(c) Calculate the volume of the solid. **(4mks)**

22. In the triangle below P and Q are points on OA and OB respectively such that OP:PA=3:2 and OQ:QB =1:2 AQ and PQ intersect at T. Given that OA= $\underset{\sim}{a}$ and OB= $\underset{\sim}{b}$



(a) **Express AQ** and **PQ** in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$ **(2mks)**

(b) Taking **BT**=k**BP** and **AT**=h**AQ** where h and k are real numbers.

(i) Find two expressions for **OT** in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$ **(2mks)**

(ii) Use the expressions in b(i) above to find the values of h and k. **(3mks)**

(c) Show that B, T and P are collinear. **(3mks)**

23.A ship leaves port M and sails on a bearing of 050^0 heading towards island L. Two navy destroyers ships sail from a naval base N to intercept the ship. Destroyer A sails such that it covers the shortest distance possible. Destroyer B sails on a bearing of 010^0 to L. The bearing of N from M is 100^0 and distance NM=300km. Using a scale of 1cm represents 50km, determine;

(i) The position of M, N and L. **(5 mks)**

(ii) The distance travelled by destroyer A. **(2mks)**

(iii) The distance travelled by destroyer B. **(2mks)**

(iv) The bearing of N from L. **(1mks)**

24.(a) Determine the x and y-intercepts of the curve $y=(x-1)(x+3)^2$ **(3mks)**

(b) Find the stationary points of the curve above and state their nature. **(4mks)**

(c) Sketch the curve. **(3mks)**

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KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 6)

MATHEMATICS

121/2

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… SIGN……

INDEX NO…… ADM NO……

Kenya Certificate of Secondary Education.

INSTRUCTION TO CANDIDATES

a) Write your name and Admission number in the spaces provided above.

b) Sign and write the date of examination in the spaces provided above.

*c) The paper consists of **two** sections. **Section I** and **Section II.***

*d) Answer **ALL** the questions in Section I and any **FIVE** questions in Section II.*

e) Show all the steps in your calculations, giving your answer at each stage in the spaces provided below each question.

f) Marks may be given for correct working even if the answer is wrong.

g) Non-programmable silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.

h)Candidates should answer the questions in English.

FOR EXAMINER'S USE

SECTION I

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

SECTION II

17	18	19	20	21	22	23	24	**Total**

Grand Total

SECTION I: (50MKS)

Attempt All The Questions From This Section

1. Find the percentage error in the area of a circle whose radius is 3.5cm measured to 1decimal place. **(3mks)**

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

$$q = \frac{1+rh}{l-ht}$$

3. Simplify $\frac{2}{2\sqrt{3}+\sqrt{2}} - \frac{2}{2\sqrt{3}-\sqrt{2}}$ and express your answer in the form $a\sqrt{b}$. State the values of a and b. (Express a and b in the simplest form) **(3mks)**

4. Given that $a^2x^2+6ax+k$ is a perfect square find K. **(3mks)**

5. Vector q has a magnitude of 7 and is parallel to vector P. Given that $P = 3\underset{\sim}{i} - \underset{\sim}{j} + 1\frac{1}{2}\underset{\sim}{k}$, Express vector q in terms of I, j and k. **(3mks)**

6. Given that three number x, y and z are in the ratio 6:4:5. Find the value of **(3mks)**

$$\frac{3x-y}{4y-z}$$

7. Determine the equation of the normal to the curve $y=x^2 -3x+1$ at a point (-2, 3) giving your answer in the form ax+by=c. **(3mks)**

8. (a) Expand and simplify $(1-3x)^5$ upto the term in x^3. **(1 mks)**

(b)Hence use your expansion to estimate $(0.97)^5$ correct to 4 decimal places. **(2mks)**

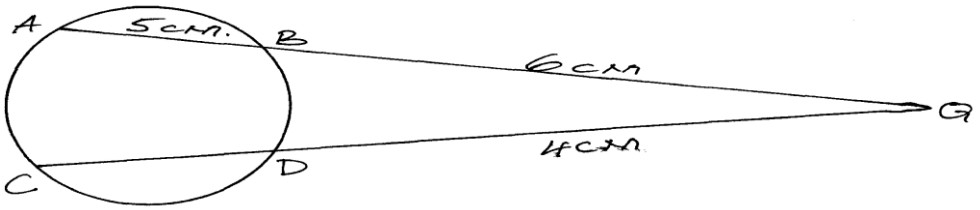
9. Two lines x+2y=1 and 2x+3y=3 intersect at T. Find the equation of circle centre T and radius 5 units giving your answer in form of $x^2 + y^2 +ax+by+c=0$ **(4 mks)**

10.A quantity P varies jointly as the square of Q and inversely as S. P=3 when Q=5 and S=2. Find the value of P when Q=2 and S=3. **(3mks)**

11. Solve for x if $\sin\frac{3x}{2} = 0.85$ for the range $0 \le x \le 360^0$ **(3mks)**

12.A rectangle ABCD is such that AB=6 and BC=5cm. A variable point P moves inside the rectangle such that $AP \le PB$ and AP>2.5cm. Show the region where P lies. **(3mks)**

13. Chords AB and CD intersects externally at Q. If AB=5cm, BQ=6cm and DQ =4cm. Find the length CQ. **(3mks)**



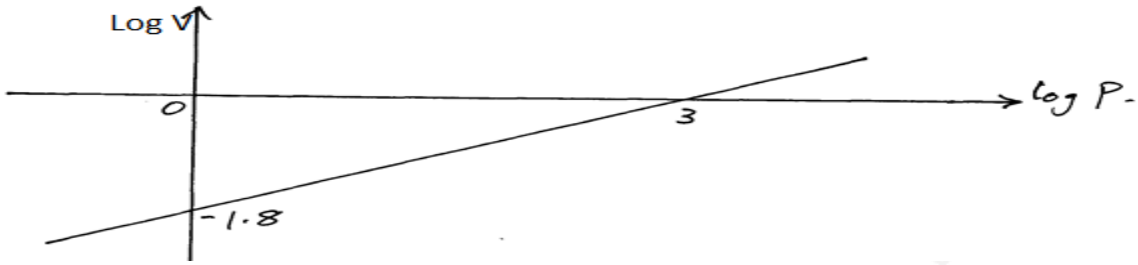
14. Find the value of k for which the matrix below is singular . **(3mks)**

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

15. Solve for x in the equation **(3mks)**

$$\log_8(x+5) - \log_8(x-3) = \frac{2}{3}$$

16. The graph below is part of the straight line graph obtained from the initial equation $V = ap^n$.



(a) Write down the equation of the straight line in form y=mx+c. **(1mk)**

(b) Use the graph to calculate the values of a and n. **(3 mks)**

SECTION II;*Answer Only Five Questions From This Section*

17. The table below shows income tax rates.

Monthly taxable pay in K£	Rate of tax Ksh in 1 K£
1-435	2
436-870	3
871-1305	4
1306-1740	5
Excess over 1740	6

A company employee earn a monthly basic salary of Ksh 30,000 and is also given allowances amounting to Ksh 10 480.

(a) Calculate the total income tax. **(5mks)**

(b) The employee is entitled to a personal tax relief of Ksh 800 per month. Determine the net tax. **(1mk)**

(c) If the employee received a 50% increase in his total income, calculate the corresponding percentage increase on the income tax. **(4 mks)**

18. John and James were employed together in a certain year. Their annual salaries in shillings progressed as follows.

	1st year	2nd year	3rd year
JOHN	480,000	528,000	576000
JAMES	480,000	528,000	580800

(a) Calculate John's annual salary increment and hence write down an expression for his annual salary in his n^{th} year of employment. **(2mks)**

(b) Calculate James' annual percentage rate of salary increment and hence write down an expression for his annual salary in his n^{th} year of employment. **(3 mks)**

(c) Calculate their total earnings after 10 years of employment to the nearest Kshs. **(5mks)**

19. The number x is chosen at random from the set (0,3,6,9) and the number y is chosen at random from set (0,2,4,6,8). Calculate the probability of each of the following separate events.

(i) $x > 6$ **(1mk)**

(ii) $x+y=11$ **(2mks)**

(iii) $x>y$ **(2mks)**

(iv) $xy=0$ **(2mks)**

(v) $10x+y<34$ **(2mks)**

20. On the surface of the earth A(50^0N, 80^0E) and B(50^0N, 120^0 E) are two separate places that seem to enjoy trade connected by airlines, taking the radius of the earth as 6370km.

(a) If the local time at B is 12.15pm. Find the time at A. **(2mks)**

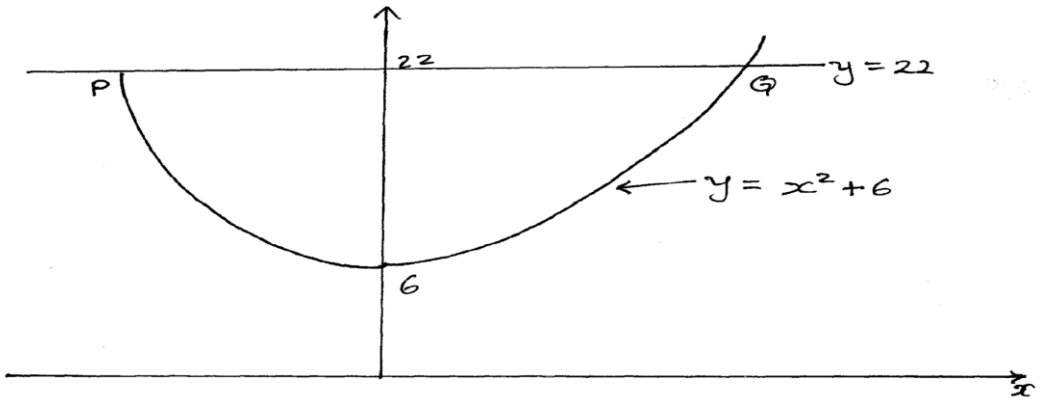
(b) Calculate the shortest distance between A and B along

(i) Parallel of latitude in nm. **(3mks)**

(ii) A great circle in nm. **(3mks)**

(c) There is a third place C($0,80^0$E) that is also enjoying some relationship with town A. Calculate the distance between A and C in km. **(2mks)**

21. The diagram shows a sketch of the graph of $y=x^2+6$ and $y=22$, intersecting at point P and Q.



(a) Find the co-ordinates of P and Q. **(2mks)**

(b) Estimate the area bounded by line PQ and the curve using the trapezium rule with 8 intervals. **(3mks)**

(c) Calculate the actual area of the enclosed region. **(3mks)**

(d) Calculate the percentage error introduced. (Give your answer to 4 d.p) **(2mks)**

22. Mr Mark Opito wishes to take students from wonderful mixed secondary school for a tour. The total number of pupils to be taken should not exceed 60. Each girl must contribute sh 10,000 and

each boy shs 15000 and money to be contributed must not exceed sh 120,000. If the trip is to be successful the number of boys must conditionally be greater than girls.

(a) Write down inequalities to represent this information taking the number of boys and girls to be x and y respectively. **(3mks)**

(b) Represent the above information on the graph paper provided **(4 mks)**

(c) What is the optimum number of boys and girls to be taken in order to minimize cost and hence determine the cost. (**3mks)**

23. Complete the table below. **(2mks)**

x	0	15	30	45	60	75	90	105	120	135	150	165	180
sinx	0.00	0.26		0.71			1.00	0.97		0.71			0.00
2cos x	2.00	1.93		1.41			0.00	-0.52		-1.41			-2.00
y=sinx+2cosx	2.00	2.19		2.23			1.00	0.45		-0.70			-2.00

(b) Draw the graph of y=sin x+2 cos x for $0 \le x \le 180$ on the grid provided. **(3mks)**

(c) Use the graph to solve

(i) sin x+2cosx=0 **(1mk)**

(ii) 2(sinx +2cos x) =3 **(2mks)**

(iii) tan x+2= $\frac{1}{\cos x}$ **(2mks)**

24. The following Distribution shows the marks obtained by 72 students in a mathematical test.

Marks	20-29	30-39	40-49	50-59	60-69	70-79	80-89
Frequency	3	13	13	13	14	12	4

(a) Use the information above to draw a cumulative frequency (Ogive) curve on the grid provided.

(b) Use your graph to estimate

(i) Median **(1mk)**

(ii) Lower quartile and upper quartile **(3mks)**

(iii) Quartile deviation. **(1mk)**

(c) The percentage of candidates passing if the pass mark is 42 marks. **(3mks)**

KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 7)

MATHEMATICS

121/1

PAPER 1

TIME: 2½ HRS

NAME……

SCHOOL…… SIGN……

INDEX NO…… ADM NO……

Kenya Certificate of Secondary Education.

INSTRUCTIONS:

1. *Write your name, Index number in the space provided at the top of the page.*
2. *Sign and write the date of examination in the spaces provided above.*
3. *This paper consists of **Two** sections 1 and II.*
4. *Answer all the questions in section **1** and only **five** questions from section II*
5. *All answers and working must be written on the question paper in the spaces provided below each question.*
6. *Show all the steps in your calculation, giving your answers at each stage in the space provided.*
7. *Marks may be given for correct working even if the answer is wrong.*
8. *Non programmable silent electronic calculator and KNEC Mathematical table may be used, except when stated otherwise.*

FOR EXAMINER'S USE ONLY

SECTION 1

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

SECTION 2

17	18	19	20	21	22	23	24	Total

SECTION 1 (50 MARKS) COMPULSORY

1. Without using calculators evaluate: **(3 marks)**

$$\frac{\frac{1}{2} + 2\frac{4}{5} \text{ of } 8 \div 6(2 \times 4\frac{2}{5})}{\frac{1}{2} \text{ of } 6(8 \div 7\frac{1}{3})}$$

2. Simplify the expression **(3 marks)**

$$\frac{y^4 - x^4}{y^3 - yx^2}$$

3. Solve for x in the equation **(3 marks)**

$$2^{(2x-1)} \times \frac{1}{8}^{(1+x)} = 4^{(3x+1)}$$

4. The marked price of a modern camera is Ksh. 24,000. A trader sold it to a customer at a 10% discount. If the trader still made a profit of 20% on the cost price, what was its cost price. **(3 mks)**

5. A two – digit number is such that the sum of the digit is 12. If the digits are interchanged the value of the new number formed is fifteen more than twice the value of the original number. Find the original number? **(4 marks)**

6. Using reciprocal and square – root tables only. Evaluate. **(3 marks)**

$$9.452^2 + \frac{1}{63.37}$$

7. Two similar container hold $2000cm^3$ and 6.75 litres respectively. If the smaller container has a diameter of 15.50cm. What is the radius of the larger container correct to 1 decimal place? **(3 mks)**

8. Given that **OA** = i + 3j - 4k and **OB** = 3i - j - k. **(3 marks)**
Find /AB/

9. Three schools A, B, and C are such that B is 12km due south of A and C is 15km from A. C is on a bearing of $N30^0W$ from B. Calculate the bearing of C from A. **(3 marks)**

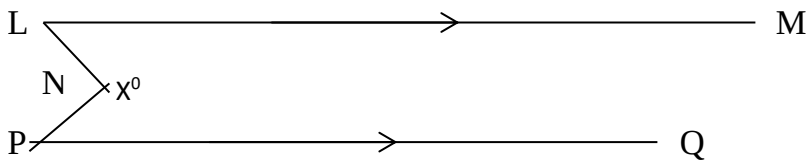
10. Solve the inequality

$$3 - 2x < x \leq \frac{2x + 5}{3}$$

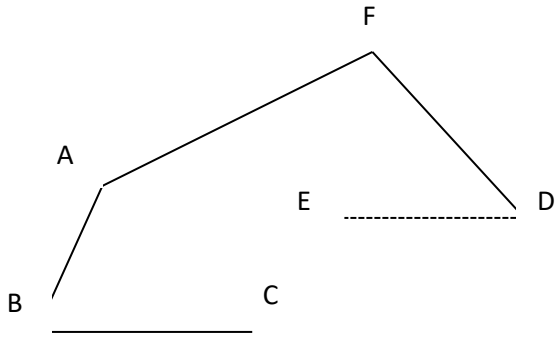
State the integral values which satisfy these inequalities **(3 marks)**

11. The gradient of a line L through A (2x, 4) and B (-1, x) is $^1/_7$. Find the equation of line perpendicular to L through B. **(3 marks)**

12. On the figure below LM is parallel to PQ. Angle MLN = 30^0 and Angle NPQ = 70^0. Find the value of X^0 **(3 marks)**



13. Complete the sketch below for the prism, ABCDEF **(3 marks)**



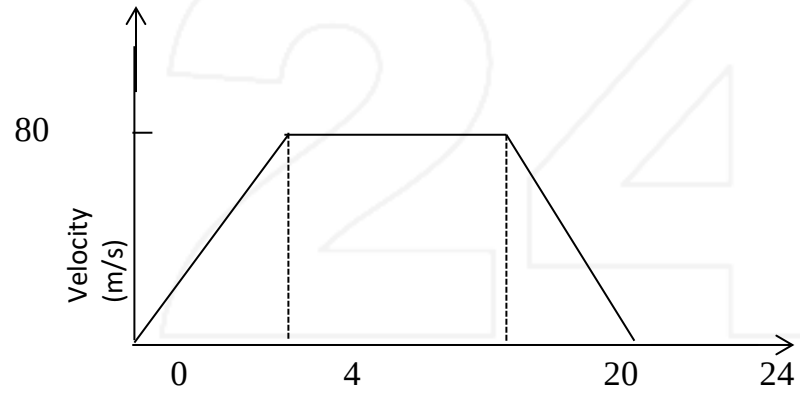
14. A Jua Kali artisan has 63000g of metal of density 7g/cm^3. He intends to use it to make a rectangular pipe with external dimensions 120mm by 150mm and internal dimensions of 100mm by 120mm. Calculate the length of the pipe in metres. **(3 marks)**

15. Jane and Mary started a business whereby contributed Ksh. 25000 and 20000 respectively. At the end of the year a profit of Ksh. 8100 was realized. From the profit funds for development, dividends and reserves were set aside in the ration 4:5:6 respectively. If the dividends were shared in the ration of their contribution, determine:

(a) The amount set aside for development **(2 marks)**

(b) The dividends Mary received **(2 marks)**

16. The figure below is a velocity time - graph for car



Time in seconds

(a) Find total distance traveled by the car **(2 marks)**

(b) Calculate the deceleration of the car. **(1 mark)**

SECTION II (50 MARKS)

Answer any five questions in this section

17. Five members of a self-supporting enterprise Peter, John, Esther, Brian and Caro were given a certain amount of money to share amongst themselves. Peter got 3/8 of the total amount while John got 2/5 of the remainder. The remaining amount was shared equally among Esther, Brian and Caro each of which received Ksh. 6,000;

(a) How much was shared among the five business women? **(3 marks)**

(b) How much did John get? **(2 marks)**

(c) Peter, John and Caro invested their money and earned a profit of Ksh. 12,000. A third of the profit was left to maintain the business and the rest was shared according to their investments. Find how much each got. **(5 marks)**

18. (a) On the grid provided draw the square whose vertices are A(6, -2), B(7, -2), C(7, -1) and D(6, -1) **(1 mark)**

(b) On the same grid draw

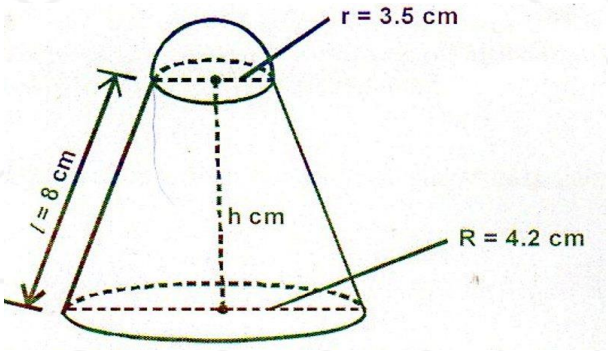
(i) $A^1B^1C^1D^1$ the image of ABCD, under an enlargement scale factor 3, Centre (9, -4) **(3 marks)**

(ii) $A^{11}B^{11}C^{11}D^{11}$, the image $A^1B^1C^1D^1$ under a reflection in the line x = 0 **(2 marks)**

(iii) $A^{111}B^{111}C^{111}D^{111}$, the image of $A^{11}B^{11}C^{11}D^{11}$ under a rotation of $+90^0$ about the origin. **(2 marks)**

(c) Describe a single transformation that maps $A^1B^1C^1D^1$ onto $A^{111}B^{111}C^{111}D^{111}$. **(2 marks)**

19. The figure below shows a solid made up of a conical frustum and a hemispherical top. The dimensions are as indicated.



The top radius r = 3.5cm, bottom radius R = 4.2cm, slant height l = 8cm and the height of the frustum part is h cm.

(a) Find the surface area of the solid (Take $\pi = {}^{22}/_{7}$) **(5 marks)**

(b) If a similar solid has a total surface area of $81.51cm^2$, determine the radius of its base, to the nearest whole number **(1 mark)**

(c) (i) Find the height h of the frustum. **(1 mark)**

(ii) Hence determine the volume of the solid **(3 marks)**

20. Two towns A and B are 80km apart. Juma started cycling from town A to town B at 10.00am at an average speed of 40km/h. Mutuku started his journey from town B to town A at 10.30am and traveled by car at an average speed of 60km/h

Calculate:

(i) The distance from town A when Juma and Mutuku met **(5 marks)**

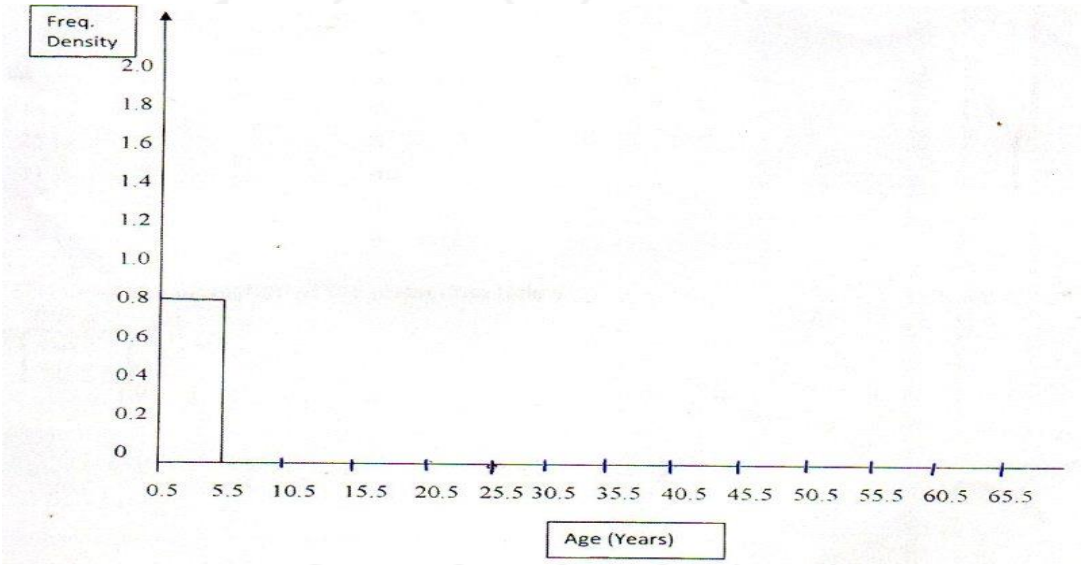
(ii) The time of the day when the two met **(2 marks)**

(b) Kamau started cycling from town A to town B at 10.20am. He met Mutuku at the same time as Juma did. Determine Kamau's average speed. **(3 marks)**

21. The following data shows the sample of age distribution of the people who reside in a certain village in years, in Nandi County

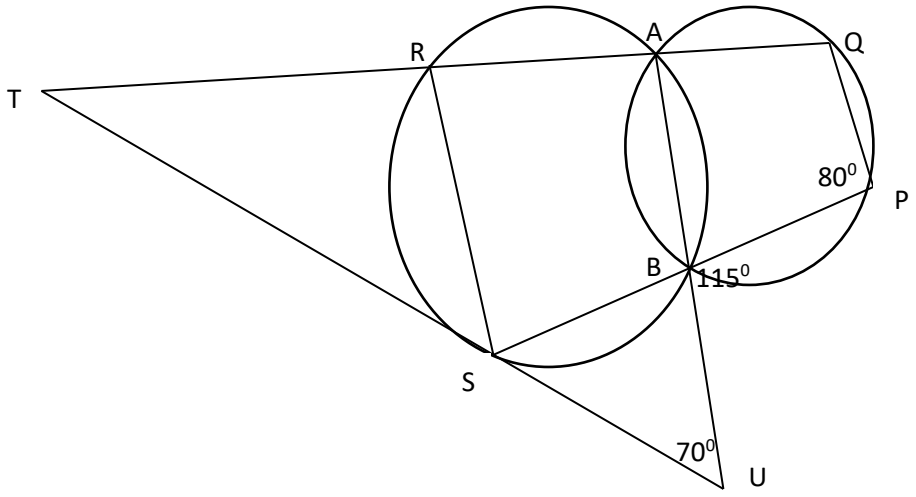
Age group	Frequency
1 …….5	4
6 ……10	8
11 …… .20	8
21 …….30	6
31 …….50	40
51 …….55	3
56 …….65	3

(a) Complete the histogram of the given data below **(6 marks)**



(b) Calculate the mean age of the given sample in the village **(4 marks)**

22. The figure below shows two circles ABPQ and ABSR intersecting at A and B. PBS, QART and ABU are straight lines. The line UST is a tangent to the circle ABSR at S. Angle BPQ = 80^0, angle PBU = 115^0 and angle BUS = 70^0



Find the values of the following angles, stating your reasons in each case.

(a) <BAR **(2 marks)**

(b) <STR **(2 marks)**

(c) <BSU **(2 marks)**

(d) <BRS **(2 marks)**

(e) <SBU **(2 marks)**

23. Using a pair of compasses and ruler only,

(a) Construct triangle XYZ such that XY = 8cm, YZ = 6cm and angle XYZ = 30^0 **(3 marks)**

(b) Measure the length of XZ **(1 mark)**

(c) Draw a circle that touches the vertices X, Y and Z. **(2 marks)**

(d) Measure the radius of the circle **(1 mark)**

(e) Calculate the area of the circle outside the trangle to 2 d.p. **(3 marks)**

24. The function $y = x^3 + x^2 – 3x + 2$ represents a curve.

a) Find the gradient function of the curve **(1 mark)**

b) Find the turning points of the curve and distinguish between them. **(6 marks)**

c) Hence sketch the curve $y = x^3 + x^2 – 3x + 2$ **(3 marks)**

KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 7)

MATHEMATICS

121/2

PAPER 2

TIME: 2½ HRS

NAME……

SCHOOL…… SIGN……

INDEX NO…… ADM NO……

Kenya Certificate of Secondary Education.

INSTRUCTIONS:

a) *Write your name, Index number in the space provided at the top of the page.*
b) *Sign and write the date of examination in the spaces provided above.*
c) *This paper consists of* ***Two*** *sections 1 and II.*
d) *Answer all the questions in section* ***1*** *and only* ***five*** *questions from section II*
e) *All answers and working must be written on the question paper in the spaces provided below each question.*
f) *Show all the steps in your calculation, giving your answers at each stage in the space provided.*
g) *Marks may be given for correct working even if the answer is wrong.*
h) *Non programmable silent electronic calculator and KNEC Mathematical table may be used, except when stated otherwise.*

FOR EXAMINER'S USE ONLY

SECTION 1

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

SECTION 2

17	18	19	20	21	22	23	24	Total

SECTION 1 (50 MARKS) COMPULSORY

SECTION I (50 Marks)

1. A quadratic equation has roots as $x = -4$ and $x = \frac{2}{3}$. Write the equation in the form $ax^2 + bx + c = 0$, where a, b and c are integers. **(3 marks)**

2. Given that $2 \leq p \leq 8$ and $3 \leq q \leq 10$, find the maximum value of: **(2 marks)**

$$\frac{p-q}{q+p}$$

3. Without using a mathematical table or a calculator, write the expression below in the form $a\sqrt{3} + c$, where a and c are constants **(3 marks)**

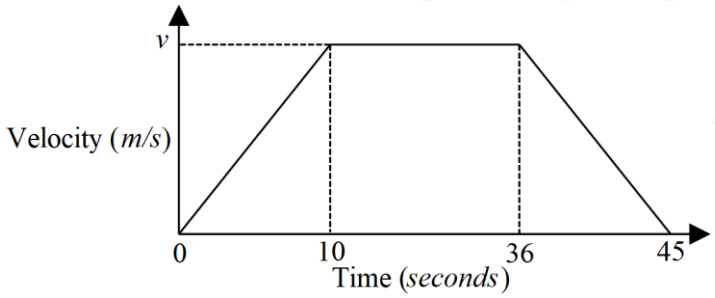
$$\frac{2}{\sin 90^0 + \tan 60^0}$$

4. Solve for x in the equation $\log_2(x-3) + 2 = \log_2(8-x)$ **(3 marks)**

5. A truck is bought at Kshs. 1,800,000. It depreciates by 10% per annum in the first 2 years, thereafter its annual depreciation rate is 15%. Find the value of the truck after 5 years. **(4 marks)**

6. The position vectors of points A and B are $4\boldsymbol{i} - 5\boldsymbol{j} + 6\boldsymbol{k}$ and $-2\boldsymbol{i} + 3\boldsymbol{j} + 8\boldsymbol{k}$ respectively. Calculate the magnitude of $\boldsymbol{AB}$ correct to 3 decimal places. **(3 marks)**

7. The figure below shows the velocity-time graph of a particle that moves for 60 seconds and covered a distance of 852 metres.



Calculate the value of v **(2 marks)**

8. Make x the subject of the formula: **(3 marks)**

$$px = \sqrt{x^2 + \frac{m}{Q}}$$

9. The equation of a circle is $x^2 + y^2 + 6x - 10y - 2 = 0$. Determine the co-ordinates of the centre and the area of the circle in terms of π **(3 marks)**

10. (a) Expand $(1 + 3x)^6$ in ascending powers of x up to the term in x^3 **(1 mark)**

(b) Use your expansion to evaluate $(0.997)^6$ correct to 5 decimal places. **(2 marks)**

11. (a) Complete the table below for the function $y = x^2 - 4x + 5$ for $1 \leq x \leq 5$ **(1 mark)**

y	1	1.5	2	2.5	3	3.5	4	4.5	5
x	2				2		5		

(b) Use the mid-ordinate rule with 4 strips to find the area bound by the function, the x-axis and the lines $x = 1$ and $x = 5$. **(2 marks)**

12. A town T lies on latitude 37^0N and longitude 50^0E. An airport is located on another town R whose longitude is 10^0W on the same latitude as T. An aeroplane leaves town T and flies westwards to R. Calculate the distance covered by the plane in km. (Take R = 6370km and $\pi = \frac{22}{7}$) **(3 marks)**

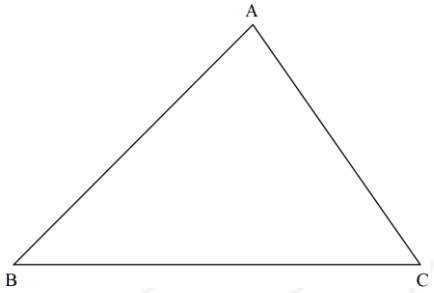
13. The diagram below shows a plot of land. Shade the region R enclosed under the following conditions:

(i) $CR \geq 1.5$ cm

(ii) R is more than 2 cm from line AB

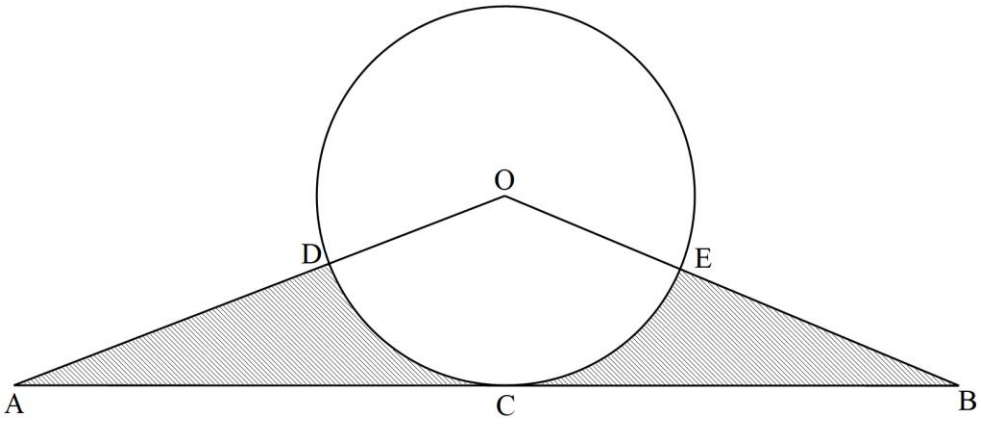
(iii) $\angle CRA \geq \angle CRB$

(iv) R is nearer to CB than CA



By construction and using a scale of 1 cm to represent 10 metres, shade the region where the borehole lies. **(5 marks)**

14. In the figure below, O is the centre of the circle. AB is a tangent to the circle at C. AD=17cm and AO=24cm



Calculate the shaded area correct to 4 significant figures. **(4 marks)**

15. A trader makes two types of chairs; ordinary and special. The cost of each ordinary chair is Kshs. 300 while the cost of a special chair is Kshs. 700. He is prepared to spend not more than Kshs. 21, 000. It is not viable for him to make less than 20 chairs. Ordinary chairs must be less than twice the special chairs but more than 15. By taking the number of ordinary chairs as x and the special chairs as y; Write down all the inequalities representing the above information. **(4 marks)**

16. A construction firm has two tractors; P and Q. tractor P completes a job in 4 days while tractor Q completes the work in 6 days. The two tractors start working together and after 2 days, tractor P breaks down. How long does it take Q to complete the remaining work? **(3 marks)**

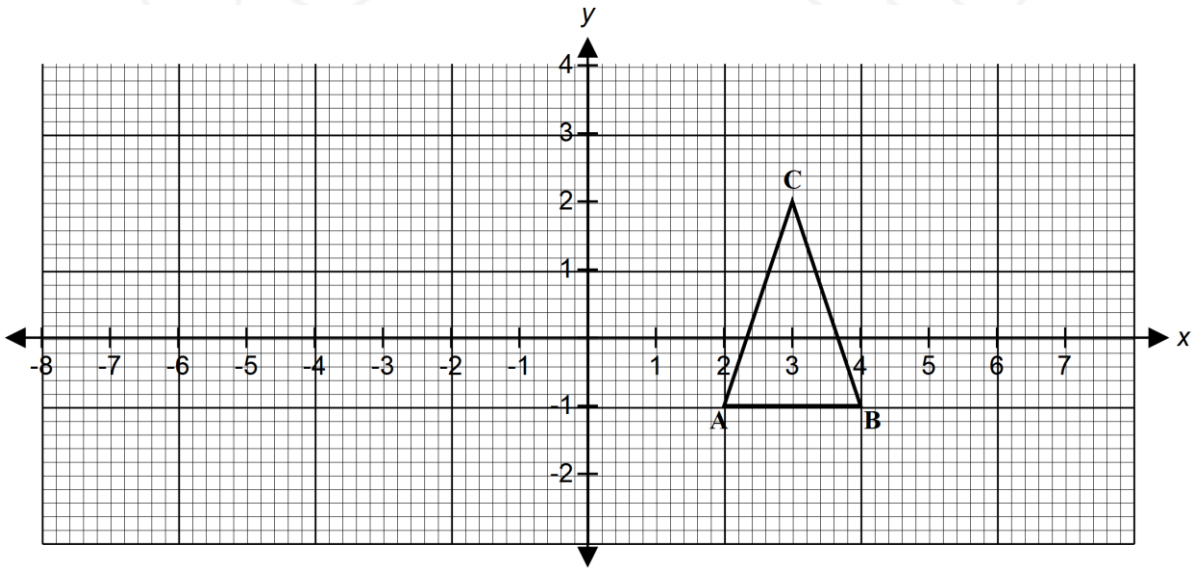
SECTION II (50 marks)

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

17. The graph below shows a triangle ABC with vertices $A(2,-1), B(4,-1)$ and $C(3,2)$

(a) $\Delta A'B'C'$ is the image of ΔABC under a transformation given by the matrix $\begin{pmatrix}1 & 2\\ 0 & 1\end{pmatrix}$. Determine the coordinates of A', B' and C' **(2 marks)**

(b) On the grid provided draw $\Delta A'B'C'$ and describe the transformation fully **(3 marks)**



(c) $\Delta A''B''C''$ is the image of $\Delta A'B'C'$ under a reflection along the line $y = 0$. Draw $\Delta A''B''C''$ on the same pair of axes and state its coordinates **(2 marks)**

(d) Determine the matrix representing a single transformation that maps ΔABC onto $\Delta\ A''B''C''$ **(3 marks)**

18. (a) Write down the first three terms of the sequence whose n[th] term is given by $T_n = 5n - 2$ **(1 mark)**

(b) The third and the sixth terms of a geometric sequence are 18 and 486 respectively. Find the first term and the common ratio of the sequence. **(3 marks)**

(c) The first and the last terms of an arithmetic progression are 8 and -190 respectively. If the sum of the first n terms of this arithmetic progression is -3094, find the number of terms in the progression **(2 marks)**

(d) The second, fourth and seventh terms of an arithmetic progression are the first three terms of a geometric progression. Find the common ratio of the geometric progression if the first term of the arithmetic progression is 2 **(4 marks)**

19. (a) Three variables P, Q and R are such that P varies partly as the square of Q and partly inversely as the square root of R. Determine:

(i) The relationship between P, Q and R given that when $P = 11\frac{1}{3}, Q = 2$ and $R = 9$ and also when $P = 14.75$, $Q = 5$ and $R = 64$ **(4 marks)**

(ii) Q when $P = 145\frac{11}{18}$ and $R = 1.44$ **(2 marks)**

(b) Four quantities A, B, C and D are such that A varies jointly with B, the square root of C and inversely as the square of D. Find the percentage change in A if B increases by 21%, C decreases by 36% and D increases by 10% **(4 marks)**

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

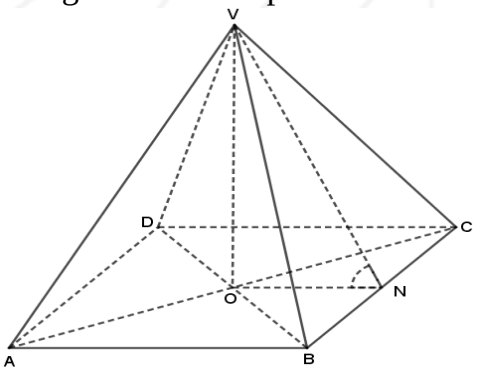
(a) The displacement of the particle at $t = 5$ **(2 marks)**

(b) The velocity of the particle when $t = 5$ **(3 marks)**

(c) The values of t when the particle is momentarily at rest **(3 marks)**

(d) The acceleration of the particle $t = 2$ **(2 marks)**

21. The figure below shows a right pyramid standing on a rectangular base ABCD. AB=8 cm, BC=15 cm and each slant edge is 12 cm long. N is the midpoint of BC



Calculate to two decimal places

(a) The vertical height of the pyramid **(3 marks)**

(b) The volume of the pyramid. **(1 mark)**

(c) The obtuse angle between the planes VBC and VAD of the pyramid **(4 marks)**

(d) The angle between line VD and the base **(2 marks)**

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

x	0^0	30	60	90	120^0	150	180^0	210^0	240	270	300^0	330	360
$y = \sin(x + 30^0)$	0.50			0.87		0.00		-0.87			-0.50		0.50
$y = 2\cos(x + 30^0)$	1.73		0.00		-1.73		-1.73		0.00			2.00	1.73

(b) On the same set of axes, draw the graphs of $y = \sin(x + 30^0)$ and $y = 2\cos(x + 30^0)$ for $0^0 \leq x \leq 360^0$.

Use the scales *x*-axis; 1 cm to represent 30^0 and *y*-axis; 2 cm to represent 1 unit. **(5 marks)**

(a) Use you graphs to solve the equation $2\cos(x + 30^0) - \sin(x + 30^0) = 0$ **(2 marks)**

(b) State the amplitude of $y = 2\cos(x + 30^0)$ **(1 mark)**

23. A triangle OPQ, R and S are points on $\boldsymbol{OP}$ and $\boldsymbol{OQ}$ respectively, such that $\boldsymbol{OR}$: $\boldsymbol{RP} = 2:3$ and $\boldsymbol{OS}$: $\boldsymbol{SQ} = 2:1$. $\boldsymbol{PS}$ and $\boldsymbol{QR}$ intersect at T. Given that $\boldsymbol{OP} = \boldsymbol{p}$ and $\boldsymbol{OQ} = \boldsymbol{q}$.

(a) Express in terms $\boldsymbol{p}$ and $\boldsymbol{q}$

(i) $\boldsymbol{QR}$ **(1 mark)**

(ii) $\boldsymbol{PS}$ **(1 mark)**

(b) Given that $\boldsymbol{QT} = h\boldsymbol{QR}$ and $\boldsymbol{PT} = k\boldsymbol{PS}$, express $\boldsymbol{OT}$ in terms of

(i) $h, \boldsymbol{p}$ and $\boldsymbol{q}$ **(2 marks)**

(ii) $k, \boldsymbol{p}$ and $\boldsymbol{q}$ **(2 marks)**

(c) Find the values of h and k **(4 marks)**

24. The test scores obtained by 40 students were recorded as shown in the table below

Marks	No. of Students
61 – 65	4
66 – 70	5
71 – 75	9
76 – 80	8
81 – 85	8
86 – 90	6

(a) Using a working mean of 73, calculate

(i) the mean mark **(4 marks)**

(ii) the standard deviation **(3 marks)**

(b) (i) On the grid provided, draw an ogive to represent the information in the table **(3 marks)**

(ii) Us the ogive to estimate the marks scored by the 25^{th} student. **(1 mark)**

KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 8)

MATHEMATICS

121/1

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… SIGN……

INDEX NO…… ADM NO……

INSTRUCTIONS TO CANDIDATES:

- *Write your **name**, **admission numbe**r and write **date** of examination in the spaces provided*
- *The paper contains **two** sections. Section I and Section II.*
- *Answer **ALL** the questions in section I and any **five** questions in section II.*
- *Answers and working **must** be written on the question paper in the spaces provided below each question.*
- *Show all steps in your calculations below each question.*
- *Marks may be given for correct working even if the answer is wrong.*
- *Non programmable silent electronic calculators and KNEC mathematical table may be used, except where stated otherwise.*

FOR EXAMINERS USE ONLY

SECTION I

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	**TOTAL**
Marks																	

SECTION II

Question	17	18	19	20	21	22	23	24	**TOTAL**
Marks									

GRAND TOTAL

SECTION I (50MARKS)

Answer ALL Questions in this Section

1. Evaluate the following; **(3 marks)**

$$\frac{\frac{2}{3} - 1\frac{1}{4} + \frac{5}{6}}{\frac{2}{7} + 3\frac{1}{5}\ of\ \frac{7}{8} \div \frac{6}{11} - \left[5\frac{1}{3} + \frac{9}{10}\right]}$$

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

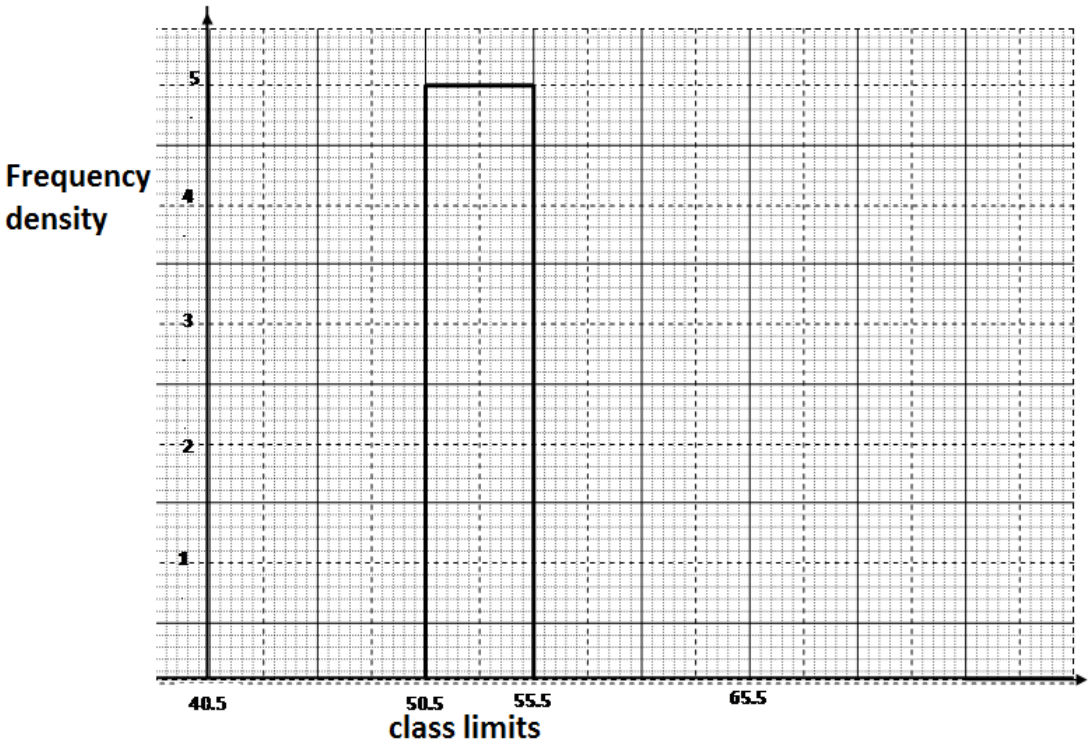
$(0.06458)^{\frac{1}{2}} + \left(\frac{2}{0.4327}\right)^2$ **(3 marks)**

3. Solve for x in the equation $\frac{1}{2}\log_2 81 + \log_2(x^2 - \frac{x}{3}) = 1$ **(3marks)**

4. 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. **(3 marks)**

5. The following data was obtained from the mass of a certain animal. Complete the tableand the histogram below. **(3 marks)**

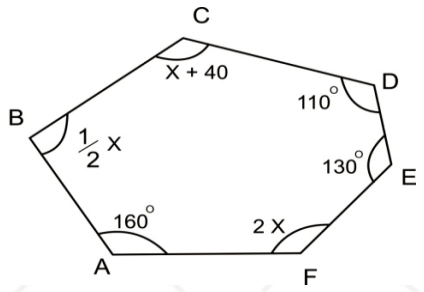
Mass(kg)	frequency
41-50	20
51-55	
56-65	40



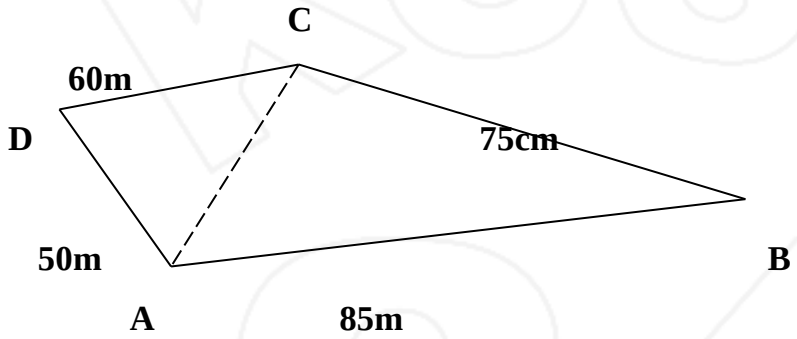
6. Solve the following inequalities and state the integral values **(3 marks)**

$2x - 2 \leq 3x + 1 < x + 11$

7. The figure below shows a regular polygon A B C D E F with the interior angles indicated. Find the value of the smallest angle in the polygon. **(3 marks)**



8. The figure below represents a plot of land ABCD such that AB=85m, BC=75m, CD=60m, DA=50m and angle ACB = 90^0. (Not drawn to scale).



Determine the area of the plot, in hectares, correct to two decimal places. **(3marks)**

9. A rectangular tank has a hole in it such that $11cm^3$ of water leaks out every 5 seconds. Using π as 3.142. Calculate:-

(i) The capacity of the water lost from the tank every hour. **(2marks)**

(ii) The time it takes to fill a cylindrical tank of radius 30cm and height 30cm into which the leaking water drains; in hours to 4 significant figures. **(2marks)**

10. Find the value of x if. **(3 marks)**

$$\left(\frac{27}{8}\right)^{x+7} = \left(\frac{4}{9}\right)^{-3x}$$

11. The image of a point K(1,2) after translation is K^1 (-1,2). What is the coordinate of the point R whose image is R^1 (-3,3) after undergoing the same translation. **(3 marks)**

12. Mugo, a fruit vendor obtained a total of Kshs. 6144 from her sales of oranges on Monday at Kshs. 8.00 each. She had bought 560 more oranges to add to what had remained on Sunday where she had sold 240 more oranges than on Saturday. She had sold 750 oranges on Saturday. Calculate the total number of oranges Mugo had bought on Saturday. **(4 marks)**

13. Simplify the following expression by reducing it to a single fraction. **(3 marks)**

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

14. Water and ethanol are mixed such that the ratio of the volume of water to that of ethanol is 3: 1. Taking the density of water as 1 g/cm^3 and that of ethanol as 1.2g/cm^3, find the mass in grams of 2.5 litres of the mixture. **(3 marks)**

15. A Kenyan bureau buys and sells foreign currencies as shown below

	Buying (In Kenya shillings)	Selling (In Kenya Shillings)
1 Hong Kong dollar	9.74	9.77
100 Japanese Yen	75.08	75.12

A tourists arrived in Kenya with 105 000 Hong Kong dollars and changed the whole amount to Kenyan shillings.While in Kenya, she pent Kshs 403 897 and changed the balance to Japanese Yen before leaving for Tokyo. Calculate the amount, in Japanese Yen that she received. **(3 marks)**

16. Draw triangle ABC such that AB=4.4cm, BC=4cm and angle ABC=120^0, construct an orthocenter of the triangle ABC and mark it X. **(3 marks)**

SECTION II (50 MARKS)

Answer FIVE questions ONLY from this section

17. A line L_1 passes through the points $(-2, 3)$ and $(-1, 6)$ and is perpendicular to L_2at $(-1, 6)$.

a) Find the equation of L_1. **(2 marks)**

b) Find the equation of L_2 in the form $ax + by - c = 0$ where a, b and c are constants. **(2 marks)**

c) Given that another line L_3 is parallel to L_1 and passes through point $(1,2)$, find the x and y intercepts of L_3 . **(3 marks)**

d) Find the point of intersection of $L_2$and L_3. **(3 marks)**

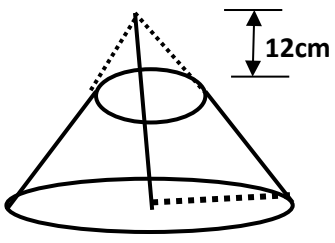
18. A sector of angle 108^0 is cut from a circle of radius 20 cm. It is folded to form a cone. Calculate to 1 decimal place**: (use $\pi = \frac{22}{7}$)**

(a) The curved surface area of the cone. **(2 marks)**

(b) The base radius of the cone. **(3 marks)**

(c) The vertical height of the cone. **(2 marks)**

(d) If 12 cm of the cone is chopped off to form a frustum as shown below.



Calculate the volume of the frustum formed. **(3 marks)**

19. A village Q is 7 km from village P on a bearing of 045^0. Village R is 5 km from village Q on abearing of 120^0 and village S is 4 km from village R on a bearing of 270^0.

a) Taking a scale of 1 m to represent 1 Km, locate the three villages. **(3 marks)**

b) Use the scale drawing to find the:

i. Distance and bearing of the village R from village P. **(2 marks)**

ii. Distance and bearing of village P from village S. **(2 marks)**

c) Calculate the area enclosed by the three villages **(3 marks)**

20. 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 **(2marks)**

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. **(5marks)**

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. **(3marks)**

21. a)Given that the matrix $A = \begin{pmatrix} 2 & 3 \\ 3 & 4 \end{pmatrix}$, find A^{-1}, the inverse of A. **(2 marks)**

b) Kariuki bought 400 goats and 600 sheep for a total of Kshs 1,700,000. Maina bought 180 goats and 240 sheep for a total of Kshs 720,000. If the price of a goat is sh. X and that of a sheep is shs y,

i) Form two equations to represent the above information. **(2 marks)**

ii) Use the matrix A^{-1} to find the price of one goat and one sheep. **(3 marks)**

c) John bought 450 goats and 720 sheep. He was given a total discount of shs 66,600.

If the discount on the price of a goat was 2%, calculate the percentage discount on the price of a goat.

(3 marks)

22. The distance between two towns A and B is 460 km. a minibus left town A at 8.45 am and travelled towards Bat an average speed of 65km/hr. A matatu left B at 10.55 am on the same day and travelled towards A at an average speed of 80km/hr.

(a) How far from town B did they meet? **(4 marks)**

(b) At what time did the two vehicles meet? **(2 marks)**

(c) A motorist started from his home at 9.15am on the same day and travelled to B at an average speed of 120km/hr. he arrived at the same time as the minibus. Calculate the distance from B to his home. **(4 marks)**

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

(a) Calculate their net profit per day. **(2 marks)**

(b) The matatu works for 25 days per month and is serviced every month at a cost of KSh.10,000. Calculate their monthly profit in June. **(1 mark)**

(c) The three partners agreed to save 40% of the profit, 24% is shared equally and the rest to be shared in the ratioof their contribution. Calculate Muthoka's share in the month of June.

(4 marks)

(d) The matatu developed mechanical problems and they decided to sell it through an agent who charged a commission of 5% on selling price. Each partner received KSh. 475,000 from the agent after he had taken his commission. Determine the price at which the agent sold the matatu.

(3 marks)

24. The displacement S metres of a body moving along a straight line after t seconds is given by $S = -2t^3 + \frac{3}{2}t^2 + 3t$

(a) Find its initial acceleration. **(3 marks)**

(b) Calculate:-

(i) The time when the body was momentarily at rest. **(3 marks)**

(ii) Its displacement by the time it comes to rest momentarily **(2 marks)**

(c) Calculate the maximum velocity attained **(2 marks)**

KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 8)

MATHEMATICS

121/2

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… SIGN……

INDEX NO…… ADM NO……

INSTRUCTIONS TO CANDIDATES:

- *Write your **name**, **admission numbe**r and write **date** of examination in the spaces provided*
- *The paper contains **two** sections. Section I and Section II.*
- *Answer **ALL** the questions in section I and any **five** questions in section II.*
- *Answers and working **must** be written on the question paper in the spaces provided below each question.*
- *Show all steps in your calculations below each question.*
- *Marks may be given for correct working even if the answer is wrong.*
- *Non programmable silent electronic calculators and KNEC mathematical table may be used, except where stated otherwise.*

FOR EXAMINERS USE ONLY

SECTION I

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	**TOTAL**
Marks																	

SECTION II

Question	17	18	19	20	21	22	23	24	**TOTAL**
Marks									

GRAND TOTAL

SECTION I (50MARKS)

Answer ALL Questions in this Section

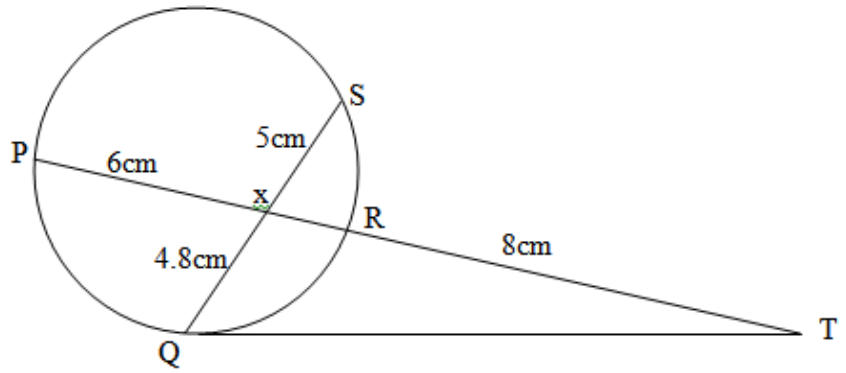
1. Use Logarithms correct to four significant figures to evaluate. **(4marks)**

$$\sqrt[3]{\frac{24.36 \times 0.066547}{1.48^2}}$$

2. Find the value of x given that the matrix $\begin{bmatrix} x+7 & 4 \\ -3 & x \end{bmatrix}$ is singular **(3 marks)**

3. 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)**

4. 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)**

5. Given that $x = \sqrt{\frac{tp}{2\,m+p}}$ make p the subject of the formula **(3 marks)**

6. (a) Construct triangle PQR such that PQ = 7cm, QR = 5cm and $< PQR = 30°$ **(2 marks)**

(b) Construct the focus L_1 of points equidistant from P and Q to meet the locus L2 of points equidistant from Q and R **(2 marks)**

7. The points (5, 5) and (-3, -1) are ends of a diameter of a circle centre A. Determine:

a) The coordinates of A. **(1 mark)**

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

8. 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)**

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. **i)** Expand and simplify $(1-3x)^5$ upto the term in x^3 **(2 marks)**

ii) Hence use your expansion to estimate $(0.97)^5$ correct to 4d.p. **(2 marks)**

11. Solve for x in the equation:

$2cos4x = -1$ for $0^0 \leq x \leq 180^0$ **(3 marks)**

12. 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)**

13. 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)**

14. Simplify the following surds leaving your answer in the form $a + b\sqrt{c}$ **(3marks)**

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

15. The sum of two numbers is 24. The difference of their squares is 144. What are the two numbers? **(3marks)**

16. The data below represents the marks scored by 9 form 4 students in an exam:

40, 37, 39, 40,41,43,44, 37,44

Calculate the interquartile range of the above data **(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 the year 2021

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

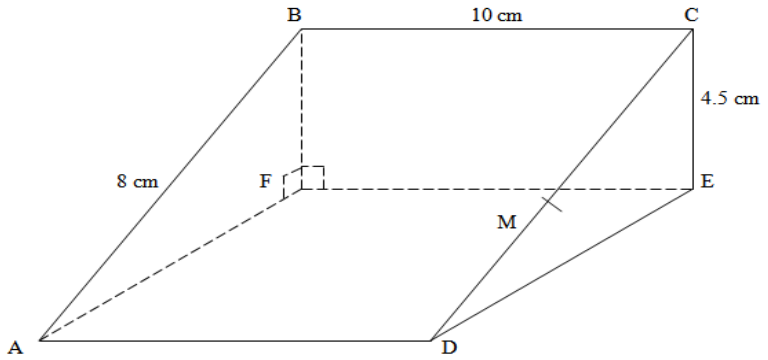
Maina earns a basic salary of Ksh.42000 and a monthly house allowance of sh.13000. He contributes 7.5 % of his basic salary to pension scheme. This contribution is exempted from taxation. He is entitled to a personal relief of sh.2400 per month. Calculate:

a) His monthly Taxable income **(2 marks)**

b) Calculate his net monthly tax **(6 marks)**

c) Maina's monthly salary **(2 marks)**

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 mid-point of CD. AB = 8 cm, BC = 10 cm and CE = 4.5 cm.

(a) Calculate the size of angle CDE **(2 marks)**

(b) Calculate the

(i) Length of AC **(2 marks)**

(ii) Angle AC makes with the plane ADEF **(2 marks)**

(c) Find the:

(i) Length of MB **(2 marks)**

(ii) Angle CBM **(2 marks)**

19. An aeroplane left town $P(65^oN, 15^oE)$ to another town $Q(65^oN, 165^oW)$ at a speed of 200 knots using the shortest route. $(Take\ \pi = \frac{22}{7}, R = 6370km)$

a) Find

i) The shortest distance travelled in nautical miles. **(3 marks)**

ii) The time taken from P to Q in hours. **(2 marks)**

b) Another plane left P at 1.30 p.m local time and travelled to T (65^0N, 60 ^{0}E) along the parallel of latitude. Find

i) The distance between P and Q to the nearest kilometres. **(3 marks)**

ii) The local time of arrival at T if the plane flew at 470km/hr. **(2 marks)**

20. The probability that a student goes to school by a boda-boda is $\frac{2}{3}$ and by a matatu is $\frac{1}{4}$. If he uses a boda-boda the probability that he is late is $\frac{2}{5}$ and if he uses matatu the probability of being late is $\frac{3}{10}$. If he uses other means of transport the probability of being late is $\frac{3}{20}$.

a) Draw a tree diagram to represent this information. **(3marks)**

b) Find the probability that he will be late for school. **(3marks)**

c) Find the probability that he will be late for school if he does not use a matatu **(2marks)**

d) What is the probability that he will not be late to school? **(2marks)**

21. A farmer has 50 acres of land. He has a capital Shs. 2,400 to grow carrots and potatoes as cash crops. The cost of growing carrots is Shs.40 per acre and that of growing potatoes is Shs.60 per acre. He estimates that the respective profits per acre are Shs.30 (on carrots) and Shs. 40 (on potatoes). By letting x and y to represent the acres of carrots and potatoes respectively:-

a) Form suitable inequalities to represent this information. **(4marks)**

b) By representing this information on a graph, determine on how many acres he should grow each crop for maximum profit **(4marks)**

c) Find the maximum profit. **(2marks)**

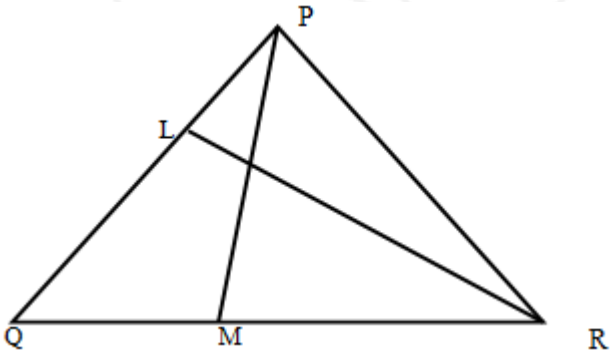
22. The 2^{nd} and 5^{th} terms of an arithmetic progression are 8 and 17 respectively. The 2^{nd}, 10^{th} and 42^{nd} terms of the A.P. form the first three terms of a geometric progression. Find

(a) the 1^{st} term and the common difference. **(3marks)**

(b) the first three terms of the G.P and the 10^{th} term of the G.P. **(4marks)**

(c) The sum of the first 10 terms of the G.P. **(3marks)**

23. In the triangle PQR below L and M are points on PQ and QR respectively such that PL:LQ=1:3 and QM:MR=1:2, PM and RL intersect at X, given that **PQ** = **b** and **PR** = **c**



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

(i) **QR** **(1mark)**

(ii) **PM** **(1mark)**

(iii) **RL** **(1mark)**

(b) By taking PX = h**PM** and RX = k**RL** where h and k are constants find two expressions of PX in terms of h, k, **b** and **c**. Hence determine the values of the constant h and k. **(6marks)**

(c) Determine the ratio LX:XR **(1mark)**

24. Given that $y = 2\sin 2x$ and $y = 3\cos(x + 45)^o$

a) Complete the table below. **(2mks)**

X	0^0	20^0	40^0	60^0	80^0	100^0	120^0	140^0	160^0	180^0
$2\sin 2x$	0		1.97		0.68	-0.68	-1.73		-1.29	0.00
$3\cos(x+45^0)$	2.12	1.27		-0.78		-2.46			-2.72	-2.12

b) Use the data to draw the graphs of $y = 2\sin 2x$ and $y = 3\cos(x + 45^o)$ for $0^o \leq x \leq 180^o$ onthe same axes. **(4marks)**

a. State the amplitude and period of each curve. **(2marks)**

b. Use the graph to solve the equation $2\sin 2x - 3\cos(x + 45^0) = 0$ for $0^0 \leq x \leq 180^0$ **(2marks)**

KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 9)

MATHEMATICS

121/1

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… SIGN……

INDEX NO…… ADM NO……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

(a) *Write your name and admission number in the spaces provided above.*
(b) *Sign and write the date of examination in the spaces provided.*
(c) *This paper consists of two sections:* ***Section I*** *and* ***Section II****.*
(d) *Answer all questions in* ***section I*** *and* ***only five*** *questions from section* ***II****.*
(e) ***Show all the steps in your calculations, giving the answers at each stage in the spaces provided below each question.***
(f) *Marks may be given for correct working even if the answer is wrong.*
(g) ***Non-programmable*** *silent electronic calculators and KNEC mathematical tables may be used, except where stated otherwise.*

For Examiner's Use Only

SECTION I

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

SECTION II

17	18	19	20	21	22	23	24	**Total**

Grand Total

SECTION I (50 MARKS)

*(Answer **all** questions in this section in the spaces provided below each question)*

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

2. Paul bought a refrigerator on hire purchase by paying monthly instalments of Ksh. 2000 per month for 40 months and a deposit of Ksh. 12,000. If this amounted to an increase of 25% of the original cost of the refrigerator, what was the cash price of the refrigerator? **(3 marks)**

3. Without using calculator, evaluate

$\left(\frac{7}{3}\left[\frac{2}{5}of1\frac{2}{3}-\frac{1}{2}\left(\frac{1\frac{2}{3}-2\frac{1}{2}}{\frac{1}{3}-\frac{19}{27}}\right)^{\frac{1}{2}}+\frac{2}{3}\right]\right)^{\frac{1}{2}}$ leaving the answer as a mixed fraction**.** **(4 marks)**

4. During a certain month, the exchange rates in a bank were as follows;

	Buying (Ksh.)	Selling (Ksh.)
1 US $	91.65	91.80
1 Euro	103.75	103.93

A tourist left Kenya to the United States with Ksh.1 000,000.On the air port he exchanged all the money to dollars and spent 190 dollars on air ticket. While in US he spent 4500 dollars for upkeep and proceeded to Europe. While in Europe he spent a total of 2000 Euros. How many Euros did he remain with? **(3marks)**

5. A regular *n*-sided polygon has its interior angle equal to 4 times its exterior. Find *n.* **(3 marks)**

6. The ratio of the lengths of the corresponding sides of two similar rectangular petrol tanks is 3:5.The volume of the smaller tank is 8:1m^3.Calculate the volume of the larger tank.**(3 marks)**

7. A man walks directly from point A towards the foot of a tall building 240m away. After covering 180m, he observes that the angle of elevation of the top of the building is 45^0.Determine the angle of elevation of the top of the building from A. **(3 marks)**

8. The G.C.D. and L.C.M. of three numbers are 3 and 1008 respectively. If two of the numbers are 48 and 72, find the least possible value of the third number. **(3 marks)**

9. Solve for x in the equation below without introducing logarithms

$5^{2x-1} = 60^{2x-1}$ **(3 marks)**

10. The table below shows masses of fifty students in a form one class.

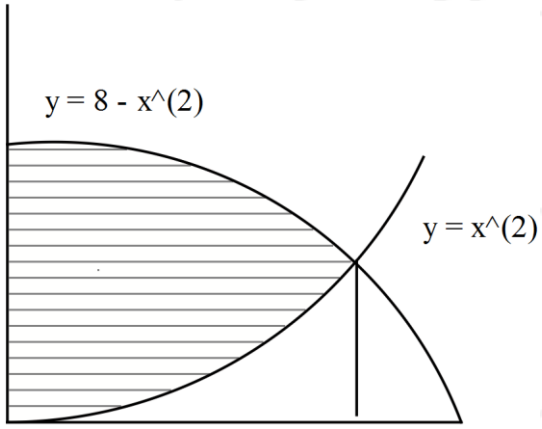
Mass (kg)	Frequency
25-30	6
30-35	10
35-40	24
40-45	7
45-50	4

a) State the modal class. **(1mark)**

b) Calculate to 3 d.p the median mass. **(2 marks)**

11. Given that the position vectors of points P and Q are $\boldsymbol{p} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$ **and** $\boldsymbol{q} = \begin{pmatrix} 5 \\ 4 \end{pmatrix}$. M is a point on PQ such that PM:MQ = 2:1. Find the coordinates of M. **(3 marks)**

12. Calculate the area of the shaded region. **(3 marks)**



2

13. Solve the simultaneous equations. **(4 marks)**

$\frac{p}{q+1} = \frac{1}{4}, \frac{p-3}{p+q} = \frac{2}{3}$

14. The ratio of boys to girls in a school is 4:5. One day $\frac{1}{3}$ of the boys and $\frac{1}{5}$of the girls were absent. If 8 less pupils had been absent, $\frac{3}{4}$ of the school would have been present. Calculate the number of pupils in the school on that day. **(3 marks)**

15. Tap A can fill a tank in 10 minutes; tap B can fill the same tank in 20 minutes. Tap C can empty the tank in 30 minutes. The three taps are left open for 5 minutes, after which tap A is closed. How long does it take to fill the remaining part of the tank**?** **(3 marks)**

16. A solid in a shape of a right pyramid on a square base of side 8cm and height 15cm is cut at 6cm height from the base. Find the volume of the frustrum formed. **(3 marks)**

SECTION II (50 MARKS)

(Answer ANY FIVE questions in the spaces provided)

17. The points $A^IB^IC^I$ are the images of $A(4,1), B(0,2) and\ C(-2,4)$ respectively under a transformation represented by the matrix $M = \begin{pmatrix} 1 & 1 \\ 1 & 3 \end{pmatrix}$.

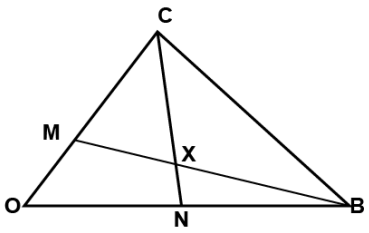
(a) Write down the coordinates of $A^IB^IC^I$ **(3 marks)**

(b) $A^{II}B^{II}C^{II}$ are the images of $A^IB^IC^I$ under another transformation whose matrix is $N = \begin{pmatrix} 2 & -1 \\ 1 & 2 \end{pmatrix}$. Write down the co – ordinates of $A^{II}B^{II}C^{II}$ **(3 marks)**

(c) Transformation M followed by N can be replaced by a single transformation P. determine the matrix for P. **(2 marks)**

(d) Hence determine the inverse of matrix P. **(2 marks)**

18. The figure below shows a triangle OAB with O as the origin. ***OA=<u>a</u> OB = <u>b</u>, OM 2/5<u>a</u> and ON = 2/3<u>b</u>.***



a) Express in terms of <u>a</u> and <u>b</u> the vectors

(i) BM **(1 mark)**

(ii) AN **(1 mark)**

b) Vector OX can be expressed in two ways: OB + KBM or OA + hAN, where K and h are constants.

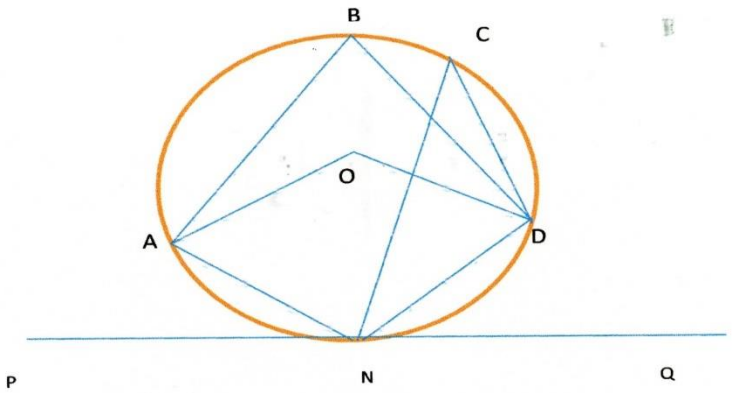
Express OX in terms of:

i. <u>a</u>, <u>b</u> and k. **(2 marks)**

ii. <u>a</u>, <u>b</u> and h. **(2 marks)**

c) Find the values of k and h. **(4 marks)**

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



Giving reasons find;

a) Angle DON **(2marks)**

b) Angle DNQ **(2marks)**

c) Angle DBA **(2marks)**

d) Angle ONA **(2marks)**

e) Angle ODN**.** **(2marks)**

20. The displacement h metres of a particle moving along a straight line after t seconds is given by

$$h=-2t^3+\frac{3}{2}t^2+3t.$$

a) Find its initial acceleration **(3 marks)**

b) Calculate;

i) The time when the object was momentarily at rest **(3 marks)**

ii) Its displacement by the time it comes to rest **(2 marks)**

c) Calculate the maximum speed attained **(2 marks)**

21. A metal R is an alloy of two metals X and Y. Metal X has a mass of 70g and a density of $16g/cm^3$. Metal Y has a mass of 19g and a density of $4g/cm^3$.

(a) Calculate the density of the metal R. **(4 marks)**

(b) If metal R is divided into two equal parts and each half reinforced by adding metal X to get to initial volume. Find the density of the new alloy. **(4 marks)**

(c) The two metals are mixed in a ratio of 4:1 respectively. What is the density of the alloy?

(2 marks)

22. A trailer moving at a speed of 80km/h is being overtaken by a car moving at 100km/h in a clear section of a road. Given that the bus is 21m long and the car is 4m long.

a) How much time (in seconds) will elapse before the car can completely overtake the bus?

(3 marks)

b) How much distance (in metres) will the car travel before it can completely overtake the bus?

(2 marks)

c) Given that as soon as the car completed overtaking the trailer, a bus heading towards the trailer and the car and moving at a speed of 90km/h became visible to the car driver. It took exactly 18 seconds for the car and the bus to completely by pass each other from the moment they first saw each other.

i. How far was the tail of the bus from the tail of the car at the instance they first saw each other given that the bus is 12 metres long? **(3 marks)**

ii. How far a part was the trailer and the bus just immediately after the car and the bus had passed each other? **(2 marks)**

23. Every Sunday Alex drives a distance of 80km on a bearing of 074^0 to pick up his brother John to go to church. The church is 75km from John's house on a bearing of **S**50^0**E**. After church they drive a distance of 100km on a bearing of 260^0 to check on their father before Alex drives to John's home to drop him off then proceeds to his house.

(a) Using a scale of 1cm to represent 10km, show the relative positions of these places.

(4 marks)

(b) Use your diagram to determine:

(i) the true bearing of Alex's home from their father's house. **(1 mark)**

(ii) the compass bearing of the father's home from John's home**.** **(1 mark)**

(iii) the distance between John's home and the father's home. **(2 marks)**

(iv) the total distance Alex travels every Sunday. **(2 marks)**

24. P and **Q** are two points on a geographical globe of diameter 50 cm. They both lie on a parallel latitude 50^o North. **P** has longitude 90^o West and Q has longitude 90^o East. A string **AB** has one end at point **P** and another at point **Q** when it is stretched over the North pole. Taking $\pi = 3.142$;

(a) Calculate the length of the string. **(3 marks)**

(b) If instead the string is laid along the parallel of latitude 50^oN with **A** at point **P**, calculate the longitude of point **B.** **(3 marks)**

(c) State the position of **B** if the string is stretched along a great circle of **P** towards the South pole if point **A** is static at **P**. **(4 marks)**

KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 9)

MATHEMATICS

121/2

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… SIGN……

INDEX NO…… ADM NO……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

(a) *Write your name and admission number in the spaces provided above.*
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(d) *Answer all questions in* ***section I*** *and* ***only five*** *questions from section* ***II****.*
(e) ***Show all the steps in your calculations, giving the answers at each stage in the spaces provided below each question.***
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(g) ***Non-programmable*** *silent electronic calculators and KNEC mathematical tables may be used, except where stated otherwise.*

For Examiner's Use Only

SECTION I

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

SECTION II

17	18	19	20	21	22	23	24	**Total**

Grand Total

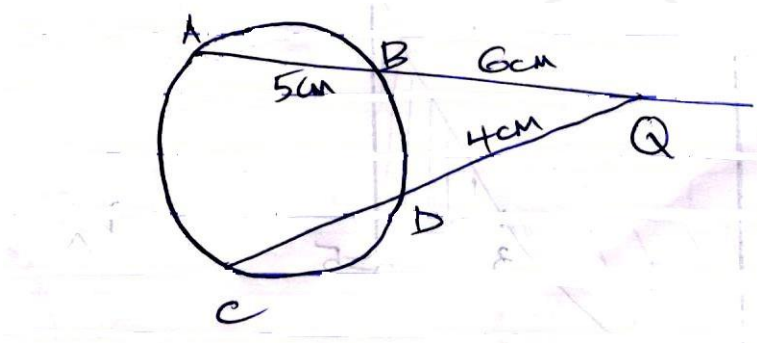
SECTION I (50 MARKS)

1. 1kg of brown sugar cost sh.150 while that of white sugar cost sh180. In what ratio by mass should be mixed so as to realize a profit of 20% by selling 1kg of the mixture at sh.210. **(3 marks)**

2. Simplify $\frac{\sqrt{15}}{\sqrt{5}-\sqrt{3}} - \frac{\sqrt{15}}{\sqrt{5}+\sqrt{3}}$ **(3 marks)**

3. Find the compound interest on Sh.200,000 for 2 years at 14% p.a. compounded semi-annually **(3 marks)**

4. Chord AB and CD in the figure below intersect externally at Q. If AB = 5cm and BQ =6cm and DQ=4cm, Calculate the length chord CD. **(2 marks)**



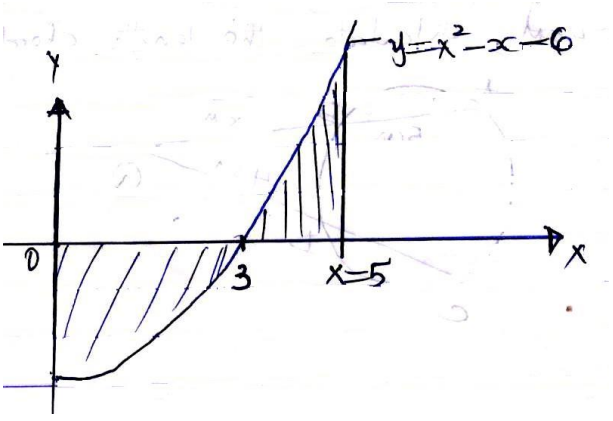
5. The ratio of 12th to 10th term in geometric series is 9:1. Find the common ratio **(2 marks)**

6. Make q the subject of the formula. **(3 marks)**

$P = \frac{\sqrt{nq-M}}{q}$

7. **P** varies as the cube of **Q** and inversely as the square root of **R**. If **Q** is increased by 20% and **R** decreased by 36%, find percentage change in **P.** **(3 marks)**

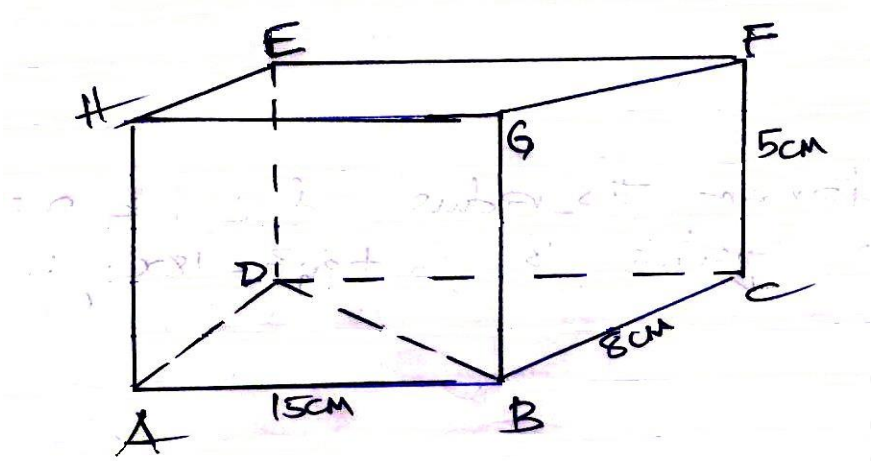
8. The Sketch below represents the graph of $y = x^2 - x - 6$. Find the area bounded by the curve, X-axis and the line X=5 **(3 marks)**



9. Expand upto the term X^3 (i) $(2 - \frac{1}{4}x)^5$ **(2 marks)**

(ii) Use your expansion to find the value of $(1.96)^5$ correct to 3 decimal places. **(2 marks).**

10. The figure below shows a cuboid labeled ABCDEFGH point O is the mid-point of BD, AB=15cm, BC = 8cm and CF = 5cm.



Calculate the angle between the lines BD and EF **(3 marks)**

11. Find the value of X in log (X - 2) + log (X + 1) = 1 + log 4 **(3 marks)**

12. Given that $2 \leq A \leq 4$ and $0.1 \leq B \leq 0.2$. Find the minimum value of $\frac{AB}{A-B}$ **(3 marks)**

13. Solve the equation: 2 sin (3x+60) = 1 for $0° \leq x \leq 180°$ **(3 marks)**

14. Determine the radius and centre of a circle whose equation is $3x^2 + 3y^2 - 18x + 12y - 9 = 0$ **(3 marks)**

15. The position vector of A and B are given as $\mathbf{a} = 2\mathbf{i} - 3\mathbf{j} + 4\mathbf{k}$ and $\mathbf{b} = -2\mathbf{i} - j + 2\mathbf{k}$ respectively. Find to two decimal places the length of **AB** **(3 marks).**

16. In a transformation, an object with area $9cm^2$ is mapped onto an image whose area is $54cm^2$. Given that the matrix of transformation is $\begin{pmatrix} x & x-1 \\ 2 & 4 \end{pmatrix}$ Find the value of X **(3 marks)**

SECTION II (50MARKS)

*Choose **Five** Questions in this Section*

17. The Points A (1, 4), B (-2, 0) and C (4,-2) of a triangle are mapped onto A^1 (7, 4), B1(X, Y) and C^1 (10, 16) by a transformation N = $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$

Find;

(i) Matrix N of the transformation. **(4 marks)**

(ii) Co-ordinates of B^1 **(2 marks)**

(iii) A"B"C" are the image of A^1 B^1 C^1 under transformation represented by matrix M = $\begin{pmatrix} 2 & -1 \\ 1 & 0 \end{pmatrix}$ write down the coordinate of A"B"C" **(2 marks)**

(iv) A transformation N followed by M can be represented by a single transformation K. Determine K. **(2 marks)**

18. The table below shows a sample of 100 bulbs, the time taken for each bulb to burn was recorded. The table below shows the results of the measurement.

Time in Hrs	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74
Number of Bulbs	6	10	9	5	7	11	15	13	8	7	5	4

a) Using an assumed mean of 42, Calculate;

(i) The actual mean of distribution. **(4 marks)**

(ii) The Standard deviation of the distribution **(3 marks)**

b) Calculate the quartile deviation. **(3 marks)**

19. (a) Complete the table below by filling in the blank spaces. **(2 marks)**

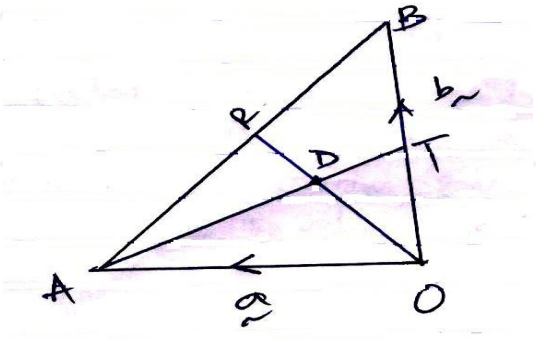
X	0	30	60	90	120	150	180	210	240	270	300	330	360
y = cos x	1.00	0.87		0.00		-0.87		-0.87				0.87	
y = 3 sin x	0.00			3.00								-1.50	0.00

b) Using the scale 1cm to represent 30° on the X-axis and 2cm to represent 1 unit on the vertical axis, draw on the graph y = cos x and y = 3 sin x **(5 marks)**

c) Use your graph to solve the equation cosx - 3 sin x = 0 **(2 marks)**

d) What is the difference in the value of y = cox x and y = 3 sin x at x=120° **(1 mark)**

20. The figure below is a triangle OAB, where **OA** = **a** and**OB**=**b**. A point R divides **AB** in the ratio 2:5 and a point T divides 0B in the ratio 1:3. **OR** and **AT** intersect at D.



a) Find in terms of **a** and **b**

(i) **BT** **(1 mark)**

(ii) **OR** **(1 mark)**

(iii) **AT** **(1 mark)**

b) Given that AD =kAT and RD = hRO where k and h are scalars.

(i) Find the values of h and k. **(4 marks)**

(ii) Hence AD in terms of **a** and **b** **(1 mark)**

21. (a) Two towns on latitude 30°N are 3000km apart. Find the longitude difference of the two towns (Take $\pi = {}^{22}/_{7}$, and radius of earth to be 6370km) **(2 marks)**

b) The position of airport P and Q are P(60°N, 45°W) and Q (60°N, k°E). It takes a plane 5 hours to travel due East from P to Q at average speed of 600 knots.

(i) Calculate the value of k **(3 marks)**

(ii) The Local time at P is 10:45am when it is the local time at Q when the plane reached there? **(3 marks)**

c) Calculate the shortest distance between A(30°S, 36°E) and B (30°S, 144°W) **(2 marks)**

22. A bag contains 3 red, 5 white and 4 blue balls. Two balls are picked without replacement. Determine the probability of picking.

(a) 2 red balls **(2 marks)**

(b) Only one red ball **(2 marks)**

(c) At least a white ball **(2 marks)**

(d) Balls of same colour. **(2 marks)**

(e) Two white balls **(2 marks)**

23. The ministry of health made an order of both Astrazenica and Johnson and Johnsons 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 inequalities 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)**

24. A particle moves in such a way that its velocity V at any given time is $v = 10t - \frac{1}{2}t^2 - 15$ m/s.

a) Calculate its initial velocity **(1 mark)**

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

c) Find the displacement during the 5th second **(4 marks)**

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

KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 10)

121/1

MATHEMATICS

PAPER 1

TIME: 2½ HOURS

NAME…… ADM NO; ……

CLASS…… DATE……

SIGN: ……

Kenya Certificate of Secondary Education.

Instructions to candidates

(a) *Write your name and index number in the spaces provided above.*
(b) *Sign and write the date of examination in the spaces provided above.*
(c) *This paper consists of **TWO** sections: **Section I** and **Section II.***
(d) *Answer **ALL** the questions in **Section I** and **only five** questions from **Section II.***
(e) ***Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.***
(f) *Marks may be given for correct working even if the answer is wrong.*
(g) ***Non-programmable** silent electronic calculators **and** KNEC Mathematical tables may be used, except where stated otherwise.*

For examiner's use only

Section I

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

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

SECTION I (50 MARKS)

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

1. (a) Evaluate 94344 – 36425 ÷ 5 [**1*mark***]

(b) Write the total value of the digit in the thousands place of the result obtained in (a) above [**1*mark***]

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. [**3*marks***]

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. [**3*marks***]

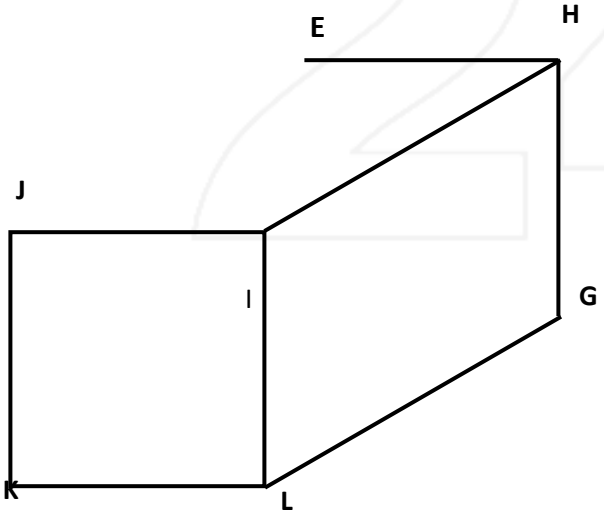
4. Without using mathematical tables or a calculator, evaluate

$27^{\frac{2}{3}} \times \left(\frac{81}{16}\right)^{-\frac{3}{4}}$ [**3*marks***]

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. [**3*marks***]

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 $1.2g/cm^3$. [**3*marks***]

7. The figure below shows a sketch of a solid cuboid EFGHIJKL. Complete the sketch. [**2*marks***]



8. Find the rate per annum at which a certain amount doubles after being invested for a period of 5 years compounded semi-annually [**3*marks***]

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. [**3*marks***]

(b) Name the polygon [**1*mark***]

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. [**2*marks***]

(b) Determine the mean of the data. [**2*marks***]

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 $\underset{\sim}{q}$ [**2*marks***]

(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***]

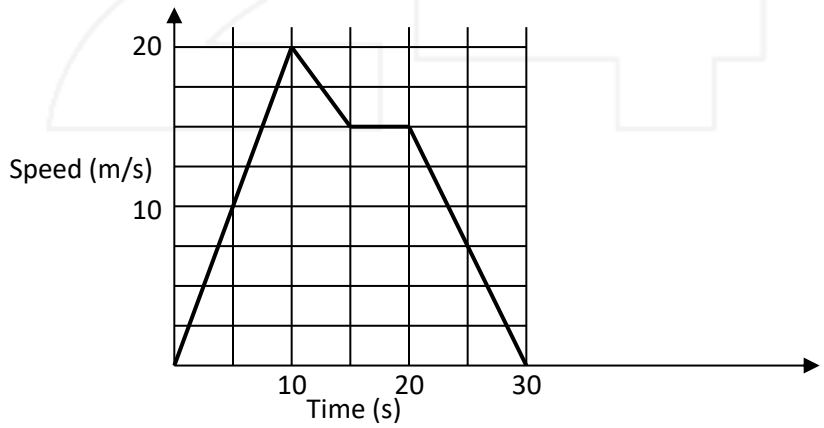
13. Find the value of x in the equation $\cos(3x-180^o) = \frac{\sqrt{3}}{2}$ in the range listed below.

$0^o \le x \le 180^o$ [**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 [**2*marks***]

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. [**3*marks***]

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. [**2*marks***]

(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 [**3*marks***]

(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. [**2*marks***]

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 [**3*marks***]

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

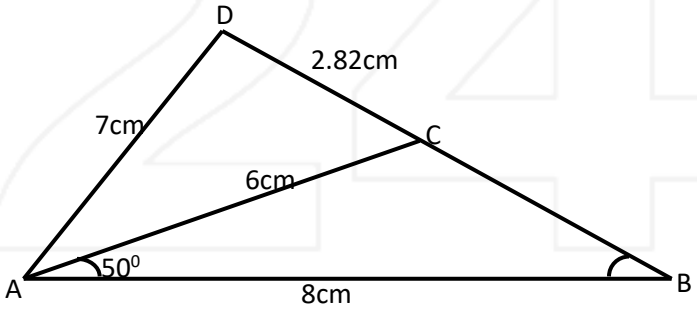
(a) Find the equation of L. [**2*marks***]

(b) Find the equation P in the form ax + by = c where a, b and c are constants. [**2*marks***]

(c) Given that another line Q is parallel to L and passes through point (1,2), find the x and y - intercepts of Q. [**3*marks***]

(d) Find the point of intersection of lines P and Q. [**3*marks***]

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 [**3*marks***]

(b) the size of angle ABC [**2*marks***]

(c) the size of angle CAD [**3*marks***]

(d) the area of triangle ACD [**2*marks***]

20. 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**]

21. Three warships $P, Q \text{ and } R$ 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 $P, Q, R \text{ and } X$ [**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 $2.04m \text{ by } 1.68m \text{ by } 26.4\ m$ 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. [**2marks**]

(ii) Use matrix method to determine the cost of hiring a lorry and that of hiring a bus. [**3marks**]

(c) Find the value of x given that $\begin{bmatrix} 2x-1 & 1 \\ x^2 & 1 \end{bmatrix}$ is a singular matrix [**3marks**]

24. a) (i) Find the co-ordinates of the stationary points of the curve $y = x^3 - 3x + 2$. [**4marks**]

(ii) For each stationary point determine its nature [**2marks**]

(b) Determine the y-intercept [**2marks**]

(c) In the space provided sketch the graph of the function $y = x^3 - 3x + 2$ [**2marks**]

KCSE 2024 REPLICA PREDICTION

(POSSIBLE TRIAL 10)

121/2

MATHEMATICS

PAPER 2

TIME: 2½ HOURS

NAME…… ADM NO; ……

CLASS…… DATE……

SIGN: ……

Kenya Certificate of Secondary Education.

Instructions to candidates

(a) *Write your name and index number in the spaces provided above.*

(b) *Sign and write the date of examination in the spaces provided above.*

(c) *This paper consists of **TWO** sections: **Section I** and **Section II.***

(d) *Answer **ALL** the questions in **Section I** and **only five** questions from **Section II.***

(e) ***Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.***

(f) *Marks may be given for correct working even if the answer is wrong.*

(g) ***Non-programmable** silent electronic calculators **and** KNEC Mathematical tables may be used, except where stated otherwise.*

For examiner's use only

Section I

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

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

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)**

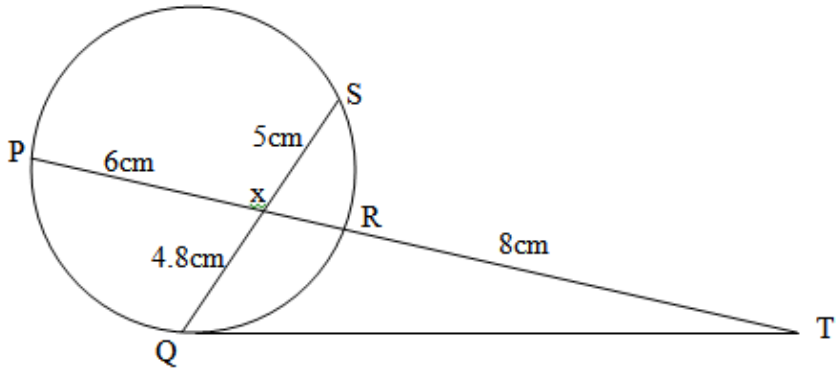
4. The fifth term of an arithmetic progression is 11 and the twenty fifth term is 51.

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

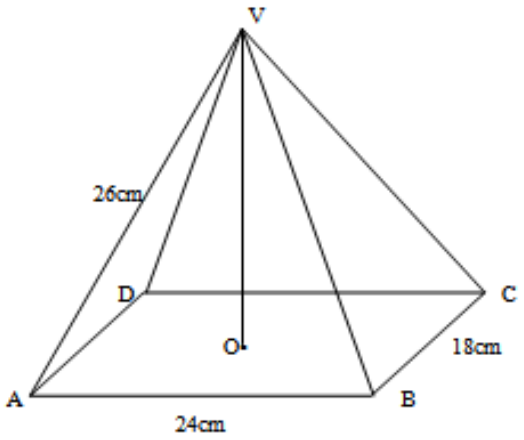
By using an assumed mean of 62, calculate

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 VA = VB = VC = 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)**

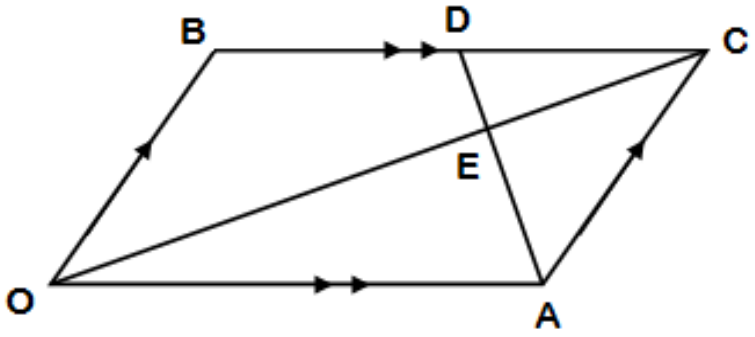
b) The angle between line VA and the plane ABCD. **(2marks)**

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 $\leq$ 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 $\geq$ QM. **(2marks)**

ii) Find the area of the shaded region in (i) above **(4marks)**