KCSE 2024 FINAL PREDICTION

MATHEMATICS

(PREDICTIONS TRIALS 1-10)

Final series of Possible Questions expected to be examined in the forthcoming Final Exams. This provides a framework and means of illumination to guide our candidates in preparation for the KCSE Examinations scheduled for November 2024

The following are Questions to expect in KCSE 2024.

CONFIDENTIAL!

For Marking Schemes

Mr Isaboke 0746 222 000 / 0742 999 000

ALL THE BEST IN KCSE!

KCSE 2024 FINAL PREDICTION

EXPECTED EXAM 1

121/1

MATHEMATICS

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 index 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 I and II.*
d) Answer ALL questions in section I and any five from section II.
e) All answers and working must be done on the question paper in the spaces provided
f) Show all the steps in your calculations giving your answers at each stage in the spaces below each question.
g) Marks may be given for correct working even if the answer is wrong.
h) Non-programmable silent electronic calculation and KNEC Mathematical tables may be used.

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

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

$\underline{36 - 8x\ -4 - 15 \div -3}$

$3x\ -3 + -8\ (6 - (-2))$

2. Simplify $\dfrac{27^{1/3} \div 2^4}{32^{-\frac{1}{5}}}$ leaving your answer as a simple fraction **(3 mks)**

3. Solve the inequality $-3x + 2 < x + 6 \leq 17 - 2x$ and write down the integral values satisfying the inequality. **(3 mks)**

4. A triangle whose area is $16cm^2$ has its shortest side as 12cm. Find the length of the shortest side of a similar triangle whose area is $36cm^2$ **(3mks)**

5. Solve for x given that $5^{2x+2} - 20 \times 5^{2x} = 625$ **(3mks)**

6. The line $y = mx + 6$ makes an angle of $78^0\ 58^1$ with the x – axis. Find the co-ordinates of the point where the line cuts the X – axis. **(3mks)**

7. 3g of metal A of density $2.7g/cm^3$ is mixed with $1.6cm^3$ of metal B of density $3.2g/cm^3$ Determine the density of the mixture **(3mks)**

8. A two digit number is such that when the digits are reversed, the value of the number increases by 36. If the sum of the unit digit and twice the tens digit is 16, find the number**.** **(3mks)**

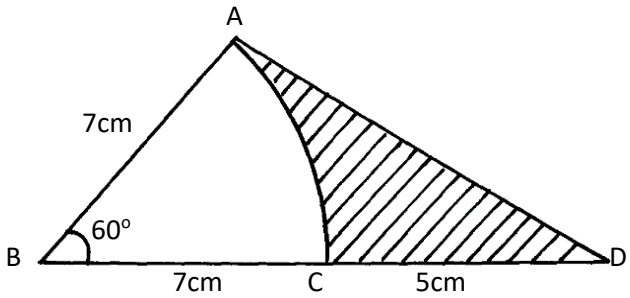
9. On Monday the currency exchange rate was

1 Euro (E) = Kshs.95.65

1 US dollar($) = Ksh.76.50

A gentle man Tourist decided to exchange half of his 2400E into Dollars.
Calculate to 2 decimal places the number of dollars he received**.** **(3 marks)**

10. In the figure given below, AC is an arc of a circle centre B. Angle ABD = 60^o, AB = BC = 7cm and CD= 5 cm.



Calculate (3 d.p)

a) The area of triangle ADB **(2mks)**

b) The area of the shaded region. **(2mks**

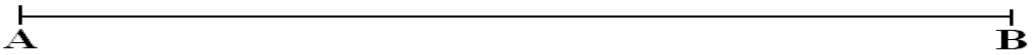
11. If cos A = $\frac{-40}{41}$ and A is obtuse, find without using tables or calculators

a) Sin A **(2mks)**

b) Tan A **(1mk)**

12. A matatu left town X at 9.37a.m. towards town Y at an average speed of 78km/h. At 9.47a.m. a Car left the same venue at an average speed of 84.5km/h. Determine the time when The car caught up with the matatu . **(3mks)**

13 Using a set square, a ruler and a pair of compasses, divide the given line into five equal parts. Measure the length of one part. **(3 marks)**



14. Simplify the expression. $\frac{x^2 + 14x + 49}{x^2 - 49}$ **(3mks)**

15. The acceleration of a particle in ms^{-2} is given by the expression Acc=3t –4

Given that t=0 sec V=3m/s and S=0 metres

Find:

(i) an expression for velocity Vms^{-1} **(2 mark)**

(ii) An expression for distance S metres from a fixed point O**.** **(2 marks)**

16. A salesman earns a basic salary of Kshs.19, 000 per month. In addition, he earns a commission of 5% for all sales above ksh.20,000. In February 2023, he sold goods worth 115,000. Calculate his total earnings that month . **(3mks)**

SECTION II (50 MARKS)

Answer only five questions

17. A triangle with A(-4, 2), B(-6, 6) and C(-6, 2) is enlarged by a scale factor -1 and centre (-2, 6) to produce triangle $A^1 B^1 C^1$. Triangle $A^1 B^1 C^1$ is then reflected in the line y = x to give triangle $A^{11} B^{11} C^{11}$

a) Draw triangle ABC, $A^1 B^1 C^1$ and $A^{11} B^{11} C^{11}$ and state the co-ordinates of $A^1 B^1 C^1$ and $A^{11} B^{11} C^{11}$ **(6mks)**

b) If triangle $A^{11} B^{11} C^{11}$ is mapped onto $A^{111} B^{111} C^{111}$ whose co-ordinates are A^{111}(0, -2), B^{111}(4, -4) and C^{111} (0, -4) by a rotation. Find the centre and angle of rotation **(4mks)**

18. A cylindrical water tank of diameter 5m and height 1.8m is supplied with water by pipe P of internal radius 2.5cm. Water flows through this pipe at the rate of 50m per minute. A drainage pipe Q can empty the full tank in 8 hours.

a) Calculate the time in hours that pipe P alone would take to fill the empty tank **(4mks)**

b) The tank is initially half full. Water flows through pipe P into the tank for 2 hours. The drainage pipe Q is then opened and both pipes left running.

Determine how long it will take to fill the tank **(6 mks)**

19. Ken and Jane cycle to school 20km away. Jane cycles at 2km/h faster than Ken and reaches there half an hour earlier. Given that the speed of Ken is **x**km/hr. Find in terms of **x**

a). The time taken by Ken**.** **(1 mk)**

b) The time taken by Jane**.** **(1 mk)**

c) Form an equation in **x**. **(1 mk)**

d) Solve the equation in (a) above and find the speed of Ken and Jane**.** **(7 mks)**

20. The table below shows some paired values of X and Y for a known curve.

X	0.0	0.2	0.4	0.6	0.8	1.0
Y	0.0	0.4	1.6	3.6	6.4	10.0

By establishing how x and y relates.

Estimate the area under the curve for the interval **0 < X< 1** using

a). The mid – ordinate rule with five mid – ordinates. **(4mks)**

b). The trapezium rule with five Trapezia. **(2mks)**

c) If the exact area is $^{10}/_{3}$ square units.

Calculate the percentage error in the two estimates. **(4mks)**

21 The following are speeds in m/s of the first 50 vehicles at a police check point.

Speed in m/s x	**No. of vehicles f**	**f(x)**
10 - 19	3	
20 – 29	1	
30 - 39	2	
40 - 49	5	
50 - 59	6	
60- 69	11	
70 – 79	9	
80 - 89	8	
90- 99	3	
100 -109	2	

a) Calculate the mean **speed** **(4mks)**

b) Draw on the same axes using this information

i) The **Histogram** **(3 mks)**

ii) The Frequency polygon **(1 mk)**

c) Calculate the median speed. **(2mks)**

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

a) Calculate

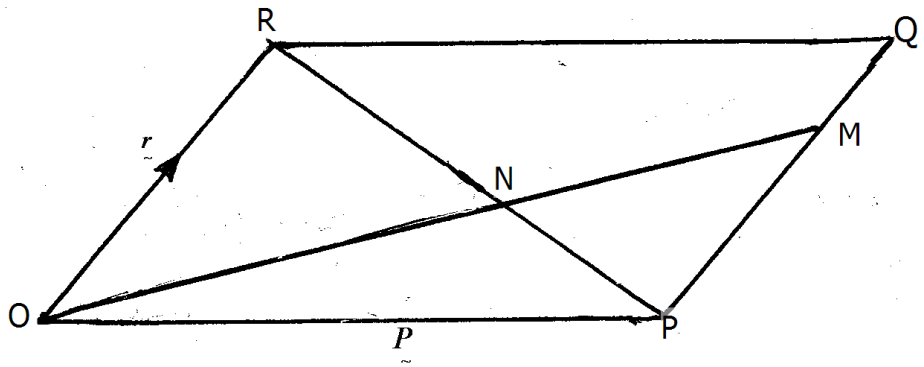
(i) The marked price of the article**.** **(2 marks)**

(ii) The price at which the trader had bought the article **(2 mks)**

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

c) To clear his stock, the trader decided to sell the remaining articles at a loss of 12.5%. Calculate the price at which he sold each article. **(3 mks)**

23. The diagram below shows a parallelogram OPQR. Point M divides line PQ in the ration 2:3 PR and OM intersect at N. Given that $\underset{\sim}{OP} = \underset{\sim}{p}$ and $\underset{\sim}{OR} = \underset{\sim}{r}$



a) Express the following vectors in terms of $\underset{\sim}{P}$ and $\underset{\sim}{r}$

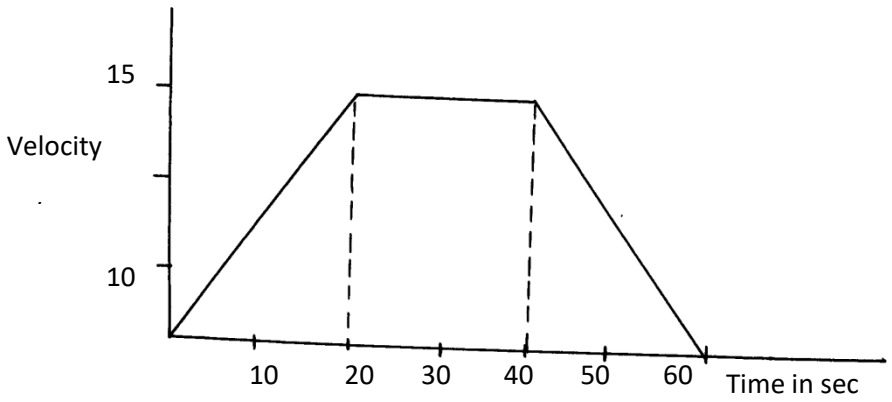
i) $\underset{\sim}{PR}$ **(1mk)**

ii) $\underset{\sim}{OM}$ **(1mk)**

b) Given that $\underset{\sim}{ON} = k\underset{\sim}{OM}$ and $\underset{\sim}{ON} = \underset{\sim}{OP} + h\underset{\sim}{PR}$

By Expressing **ON** in two different ways find the ratio in which N divides **PR.** **(8 mks)**

24. The diagram below shows the graph of a moving matatu from Nakuru to Naivasha.



a) Find the acceleration of the matatu. **(2mks)**

b) Find the deceleration of the matatu **(2mks)**

c) Calculate the distance the matatu travelled while accelerating. **(2mks)**

d) Calculate the distance the matatu covered while traveling at an acceleration of $0m/s^2$ **(2mks)**

e) Find the distance between the two Towns. **(2 mks)**

KCSE 2024 FINAL PREDICTION

EXPECTED EXAM 1

121/2

MATHEMATICS

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, class and index number*** *in the space provided.*

b) *This paper contains* ***TWO*** *sections:* ***section I*** *and* ***section II***

c) *Answer* ***ALL*** *the questions in* ***Section I*** *and only* ***five*** *questions from* ***section II.***

d) ***Show all the steps in your calculations, giving your answers at each stage in the spaces provided 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 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. Without using logarithms tables or calculator: Evaluate. **(3mks)**

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

2. Find the value of p if the expression $\boldsymbol{px^2 - 60x + 25}$ is a perfect square, given that p is a constant. **(2mks)**

3. The price of a new car is shs. 800,000. If it depreciates at a constant rate to shs. 550,000 within 4 years, find the annual rate of depreciation **to 2d.p.** **(3mks)**

4. Mwangi truncated 7/9 to 3 decimal places. Calculate the percentage error resulting from the truncating. **(3mks)**

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

6. A quantity y varies partly as x^2 and partly as x. When y = 6, x = 1 when y = 30, x = 3. Find y when x = - 3. **(3mks**

7. The coordinates of the end points of diameter are A(2,4) and B(2,6). Find the equation of a circle in the form $\mathbf{ax^2 + by^2 + cx + dy + e = 0}$ **(3mks)**

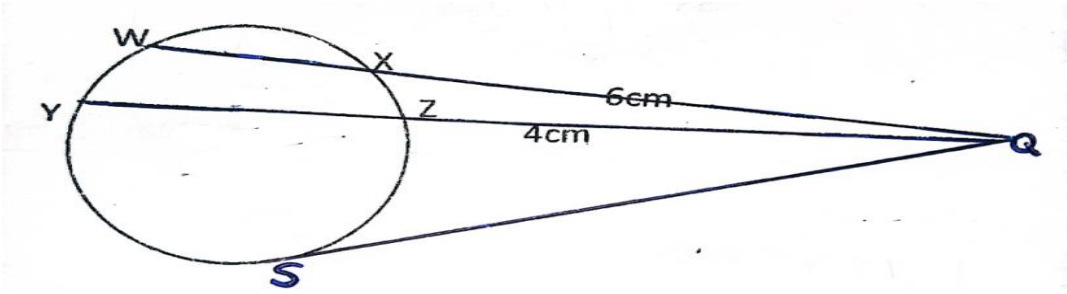
8. A bag M contains 8 balls of which 3 are red and 5 are white. Another bag N contains 7 balls of which 4 are red and 3 are white. A bag is chosen at random and two balls picked at random without replacement. **Using a tree diagram,** Find the probability that the two balls chosen are red in colour. **(4mks)**

9. Find the equation of tangent to the curve below at the indicated point

$\mathbf{y = x^3 + 3x^2 - 3}$ at **x=2** giving your answer in form of $\boldsymbol{y = mx + c}$ **(3mks)**

10. Solve the equation $\mathbf{8\sin^2 x = 7 - 2\cos x}$ for $0^0 \leq x \leq 360^0$ **(4mks**

11. Chord WX and YZ intersect externally at Q. The secant WQ= 11cm and QX= 6 cm while ZQ= 4cm.



a) Calculate the length of chord YZ. **(2mks)**

b) Using the answer in (a) above, find the length of the tangent SQ to **2 d.p**. **(2mks)**

12. Find the **possible values** of x given that $\begin{bmatrix} x-1 & x+1 \\ 3x & x \end{bmatrix}$ is a **singular** matrix. **(3mks)**

13. Determine the semi interquartile range for the following set of numbers. **(3mks)**
4, 9, 5, 4, 7, 6, 2, 1, 6, 7, 8.

14. **A** carrot patch is in the shape of trapezium. There are 13 carrot plants in the first row, 15 in the second row and 17 in the next and so on. If there are 47 plants in the last row, **how many rows** are there and **how many plants**. **(3mks)**

15. Two brands of coffee cost Kshs 120 and Kshs 144 per kilogram respectively. A wholesaler blends the two and sells the blend at Kshs 168 thereby making a profit of 20%. Find the ratio in which he blends them. **(3mks)**

16. Make x the subject of the formula **(3mks)**

$$P^2 = \sqrt{\frac{x+2W}{4x+3R}}$$

SECTION II (50 MARKS)

Answer any FIVE questions in this section.

17. (i) Complete the table below, giving the values correct to 2 **decimal places** **(2mks)**

X^0	0^0	15^0	30^0	45^0	60^0	75^0	90^0	105^0	120^0	135^0	150^0	165^0	180^0
Cos $2x^0$	1.00		0.50	0.00	-0.50		-1.00	-0.87		0.00		0.87	1.00
Sin(x^o+30^0)	0.50		0.87	0.97	1.00		0.87	0.71	0.50	0.26	0.00		-0.50

(ii) Using the grid provided draw on the same axes the graph of y=Cos $2x^0$ and y = Sin (x^o+30^0) for $0^0 \leq x \leq 180^0$ **(5mks)**

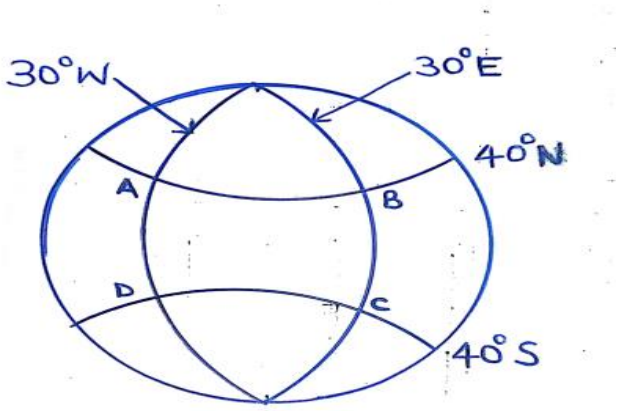
(iii) Find the period of the curve y=Cos $2x^0$ **(1mk)**

(iv) Using the graph, estimate the solutions to the following questions to the nearest degree;

a) Sin(x^o+30^0) - Cos $2x^0$= 0 **(1mks)**

b) Cos $2x^0$=0.50 **(1mk)**

18. The figure below shows points on the earth's surface.

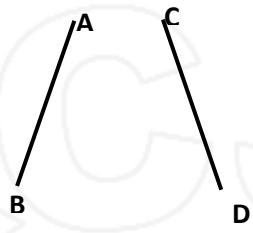


a) State the positions of A, B, C and D in coordinate form. **(2mks)**

b) An aircraft flies from A to B along latitude 40^0N, B to C along longitude 30^0E, C to D along latitude 40^0S and then flew back to A along longitude 30^0W. Calculate to **2 d.p** the total distance it covered .(**Take radius of the earth =6370 km and** $\pi = \frac{22}{7}$) **(5mks)**

c) If the aircraft leaves A at 8.00am at a speed of 720km/h to B. At what local time is it expected at B? Give your answer **to the nearest minute.** **(3mks)**

19. a) AB and CD are chords of a circle. Construct the circle with centre O and measure its radius **(4mks)**

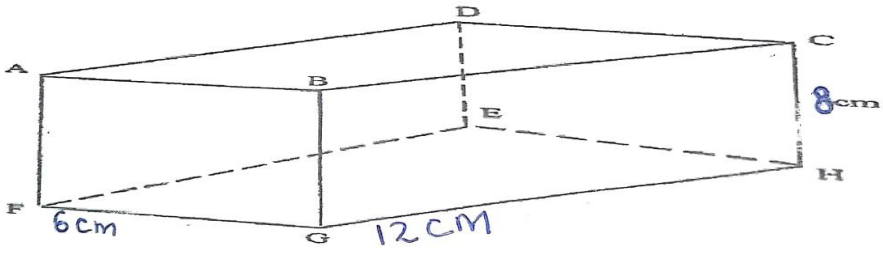


b. Construct the loci of a points x which are equidistant from line AB and CD **(1mk)**

c. Construct the loci of a points Z which are 2cm from the circumference of the circle. **(2mks)**

e. A point P moves such that CP ≥ DP, It is not more than 2cm from the circumference of the circle and its distance from line CD is not more than its distance from AB. Show the region P by shading it. **(3mks)**

20. The diagram below represents a cuboid ABCDEFGH in which FG= 6 cm, GH=12 cm and HC=8 cm



Calculate to **2 decimal places**;

a) The length of FC **(2mks)**

b) (i) The size of the angle between the lines FC and FH **(2mks)**

(ii) The size of the angle between the lines AB and FH **(2mks)**

c) The size of the angle between the planes ABHE and the plane FGHE **(2mks)**

d) The space occupied by the Cuboid. **(2mks)**

21. The points A (1,4), B(-2,0) and C (4,-2) of a triangle are mapped onto $A^1(7,4)$, $B^1(x,y)$ and C^1 (10,16) by a transformation N = $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$. Find

(i) Matrix N of the transformation **(4mks)**

(ii) Coordinates of B^1 **(2mks)**

(iii) $A^{II}B^{II}C^{II}$ are the image of $A^1B^1C^1$ under transformation represented by matrix

M = $\begin{pmatrix} 2 & -1 \\ 1 & 0 \end{pmatrix}$ Write down the co-ordinates of $A^{II}B^{II}C^{II}$ **(2mks)**

(iv) A transformation N followed by M can be represented by a single transformation K.

Determine K **(2mks)**

22. A particle moves along a straight line such that its displacement S metres, from a given point is $S = t^3 - 5t^2 + 3t + 4$. Where t is time in seconds find;

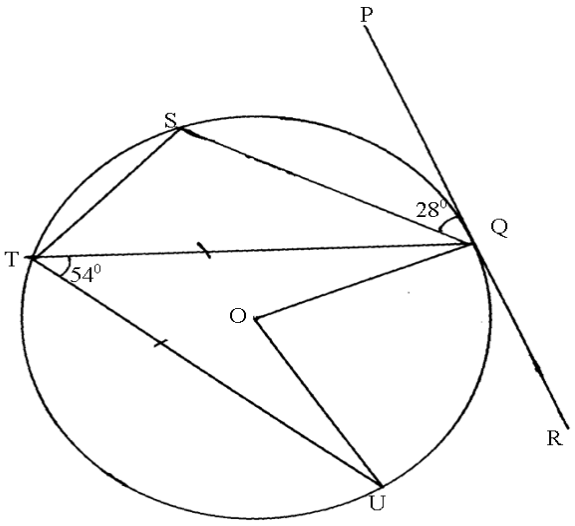
a) The displacement of the particle at t = 5 **(2mks)**

b) The velocity of the particle when t =5 **(2mks)**

c) The values of t when the particle is momentarily at rest. **(3mks)**

d) The acceleration of the particle when t = 2. **(3mks)**

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



Giving reasons, determine the size of

a) Angle STQ. **(2mks)**

b) Angle TQU. **(2mks)**

c) Angle TQS **(2mks)**

d) Reflex angle UOQ . **(2mks)**

e) Angle TQR. **(2mks)**

24. A company wishes to buy two types of squash machines; Electric and manual. A manual machine requires four attendants whereas an electric one also requires four. An electric machine fills 300 packets per hour; a manual one can fill 200 packets per hour. The numbers of packets to be filled are not more than 3000 per hour and the number of attendants should be at least 40. By letting x be the number of electric Machines and y be the number of manual Machines answer the following questions.

a) Form all the possible inequalities which will represent the above information. **(4mks)**

b) On the grid provided draw the inequalities and shade the unwanted region. **(3mks)**

c) If for every hour it is used, an electric machine brings a profit of shs.200 and a manual one shs.500, determine the number of machines of each type that should be installed in order to maximize profit per hour. Find the maximum profit **(3mks)**

KCSE 2024 FINAL PREDICTION

EXPECTED EXAM 2

MATHEMATICS

121/1

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

INSTRUCTIONS TO CANDIDATES

1. Write your name, index number and class in the spaces provided above.
2. The paper contains two sections: **Section I** and **Section II**.
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6. Negligent and slovenly work will be penalized.
7. Non-programmable silent electronic calculators and mathematical tables are allowed for use.

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 A (50 marks)

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

1. Without using a calculator evaluate

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

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

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

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. **(3marks)**

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

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

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

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. **(3marks)**

6. Without using calculator, solve for n in the equation

$1 - \left(\frac{1}{3}\right)^n = \frac{242}{243}$ **(3marks)**

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

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 marks)**

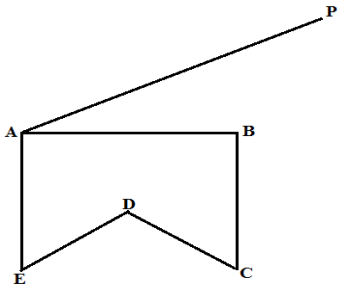
9. Use reciprocal table only to evaluate $\frac{1}{0.325}$ **(3marks)**

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. **(3marks)**

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

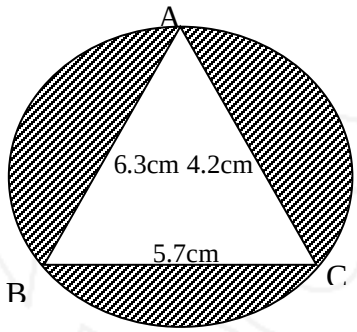
12. In the figure below ABCDE is a cross-section of a solid. The solid has a uniform cross-section. Given that AP is an edge of the solid, complete the sketch showing the hidden edges with a broken lines. **(3 marks)**



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 **(3marks)**

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. **(3marks)**

15. The circle below whose area is 18.05cm^2 circumscribes triangle ABC where AB = 6.3cm, BC = 5.7cm and AC = 4.2cm. Find the area of the shaded part. **(4 Marks)**



16. In a book store, books packed in cartons are arranged in rows such that there are 50 cartons in the first row, 48 cartons in the next row, 46 in the next and so on.

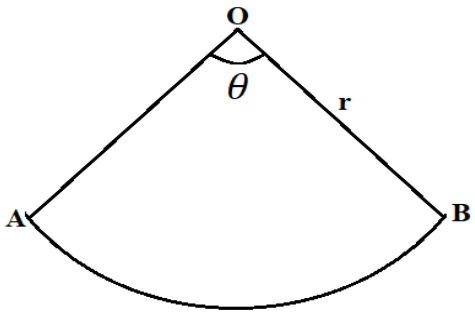
(a) How many cartons will there be in the 8th row? **(2 Marks)**

(b) If there are 20 rows in total, find the total number of cartons in the book store**.** **(2 Marks)**

SECTION II (50 Marks)

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

17. The figure below represents a sector of a circle radius r units. The area of the sector is 61.6 cm^2 and the length of the arc AB is one tenth of the circumference of the circle from which the sector was obtained. (Take $\pi = \frac{22}{7}$)



a) Calculate;

i) the angle θ subtended by the sector at the centre**.** **(2 marks)**

ii) The radius r of the circle**.** **(3 marks)**

b) If the sector above is folded to form a cone;

i) Calculate the base radius of the cone. **(2 marks)**

ii) The volume of the cone. **(3 marks)**

18. Two factories A and B produce both chocolate bars and eclairs. In factory A, it costs Kshs x and Kshs y to produce 1 kg of chocolate bars and 1 kg of eclares respectively. The cost of producing 1

kg of chocolate bars and 1 kg of eclairs in factory B increases by the ratio 6:5 and reduce by the ratio 4:5 respectively.

a) Given that it costs Kshs 460 000 to produce 1 tonne of chocolate bars and 800kg of eclares in factory A and Kshs 534 000 to produce the same quantities in factory B, form two simplified simultaneous equations representing this information**.** **(3 marks)**

b) Use matrix method to find the cost of producing 1 kg of chocolate bars and 1 kg of eclaires in factory A. **(5 marks)**

c) Find the cost of producing 100 kg of chocolate bars and 50 kg of eclaires in factory B. **(2 marks)**

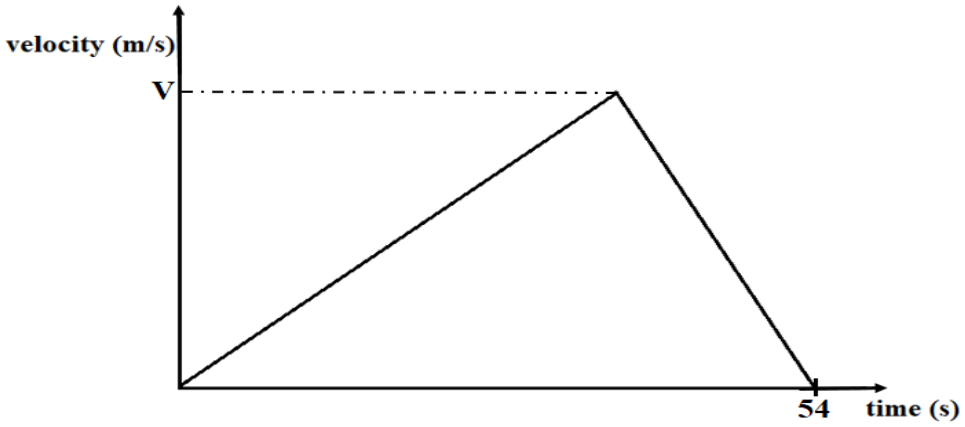
19. The following measurements were recorded in a field book of a farm in metres (xy = 400m)

	Y	
	400	
C60	340	
	300	120D
	240	100E
	220	160F
B100	140	
A120	80	
	x	

(a) Using a scale of 1cm representing 4000cm, draw an accurate map of the farm**.(3 Marks)**

(b) If the farm is on sale at Kshs. 80,000.00 per hectare, find how much it costs**.(7 Marks)**

20. The figure below shows a velocity-time graph of an object a which accelerates from rest to a velocity of V ms^{-1} then decelerated to rest in a total time of 54 seconds.



a) If it covered a distance of 810 metres;

i) Find the value of V. **(2 marks)**

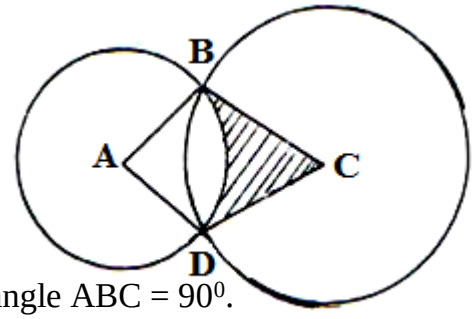
ii) Calculate its deceleration, given that its initial acceleration was $1\frac{2}{3}ms^{-2}$ **(2 marks)**

b) A bus left town X at 10.45 am and travelled toward town Y at an average speed of 60 km/h. A car left town X at 11.45 am on the same day and travelled along the same road toward Y at an average speed of 100km/h. The distance between town X and town Y is 500km.

i) Determine the time of the day when the car overtook the bus**.** **(3 marks)**

ii) Both vehicles continued towards town Y at their original speeds. Find how long the car had to wait in town Y before the bus arrived**.** **(3 marks)**

21. In the diagram below, two circles, centres A and C and radii 7cm and 24cm respectively intersect at B and D. AC = 25cm.



(a) Show that angle ABC = 90^0. **(3 Marks)**

(b) Calculate

(i) the size of obtuse angle BAD **(3 Marks)**

(ii) the area of the shaded part **(4 Marks)**

22. (a) a straight line L_1 whose equation is $9y - 6x = -6$ meets the x-axis at Z. Determine the coordinates of Z. **(2 marks)**

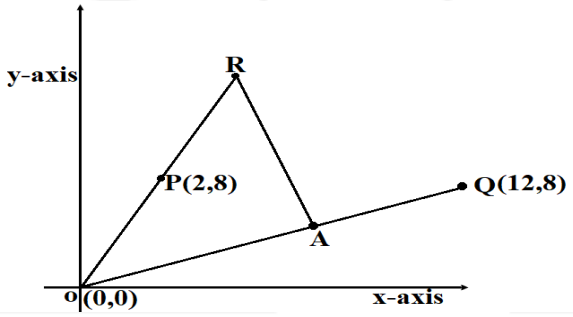
(b) A second line L_2 is perpendicular to L_1 at Z. Find the equation of L_2 in the form $ax + by = c$, where ,b and c are integers. **(3 marks)**

(c) a third line L_3 passes through the point (2,5) and is parallel to L_1. Find:

i) The equation of L_3 in the form $ax + by = c$, where a, b and c are integers. **(2 marks)**

ii) The coordinate of point R at which L_2 intersects L_3**.** **(3marks)**

23. In the diagram below, the coordinates of points O, P and Q are (0,0), (2,8) and (12,8) respectively. A is a point on **OQ** such that 4**OA**=3**OQ**. Line **OP** produced to R is such as **OR**=5**OP**.



a) Find vector **RA.** **(3 marks)**

b) Given that point L is on **PQ** such that **PL**: **LQ**=12:5, find vector **RL**. **(4 marks)**

c) Show that R, L and A are collinear. **(2 marks)**

d) Find the ratio of **RL**:**LA.** **(1 marks)**

24. Five points, P, Q, R, V and T lie on the same plane. Point Q is 53km on the bearing of 055^0 of P. Point R lies 162^0 of Q at a distance of 58km. Given that point T is west of P and 114km from R and V is directly south of P and S40^0E from T.

a) Using a scale of 1:1,000,000, show the above information in a scale drawing. **(3 marks)**

b) From the scale drawing determine:

i) The distance in km of point V from R. **(2 marks)**

ii) The bearing of V from Q. **(2 marks)**

iii) Calculate the area enclosed by the points PQRVT in squares kilometers. **(3 marks)**

KCSE 2024 FINAL PREDICTION

EXPECTED EXAM 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, index number and class in the spaces provided above.
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) All working and answers must be written on the question paper in the spaces provided below each question.
e) Marks may be awarded for correct working even if the answer is wrong.
f) Negligent and slovenly work will be penalized.
g) Non-programmable silent electronic calculators and mathematical tables are allowed for use.

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*

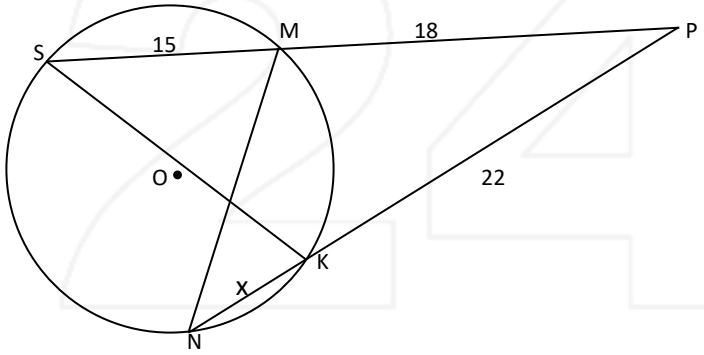
1. Find matrix **X** given that $\boldsymbol{AX - X} = \begin{pmatrix} \mathbf{-4} \\ \mathbf{-10} \end{pmatrix}$ where $A = \begin{pmatrix} 2 & 3 \\ -2 & 4 \end{pmatrix}$ **(3 marks)**

2. The cost of providing a commodity consists of transport, labour and raw material in the ratio $8:4:12$ respectively. If the transport cost increases by $12\ \%$ labour cost $18\ \%$ and raw materials by $40\ \%$, find the percentage increase of producing the new commodity **(3 marks)**

3. Find the number of terms in the series $\frac{8}{81} - \frac{4}{27} + \frac{2}{9} - \ldots\ldots\ldots\ldots\ldots - 1\frac{11}{16}$ **(3marks)**

4. Using binomial expansion simplify $\frac{\left(2+\sqrt{3}\right)^4}{\left(2-\sqrt{3}\right)^4}$ leaving your answer in the form $\mathbf{a + b\sqrt{c}}$ where a, b and c are rational numbers **(3marks)**

5. The figure below shows external intersection of two chords SM and NK which are produced to meet at P. Given that SOK is the diameter of the circle and that SM=15cm, MP=18cm and PK=22cm



a). Calculate the value of x representing length of chord NK. **(1 marks)**

b). Calculate the radius of the circle **(2marks)**

6. Determine the equation of a circle if the coordinates of the end points of its diameter are **A(−4,4) and B(6,−12)** leaving your answer in the form of $\mathbf{ax^2 + by^2 + cx + dy + e = 0}$ where a, b, c, d and e are integers. **(3 marks)**

7. Make 'c' the subject of the formula if $v^2 = \frac{r}{3} + \sqrt{\frac{1+c^2}{r^2}}$ **(3marks)**

8. Find the area enclosed by the curve$y = 81 - x^2$ and the x −axis using mid-ordinate rule with 9 strips. **(4marks)**

9. Without using a calculator or tables, find the value of x in **(3marks)**

$$\log_{2.5}\left(\frac{1}{x}\right)-1-\log_{2.5}(x)=3\log_{2.5}\left(\frac{1}{x}\right)-\log_{0.5}2$$

10. Solve for ϑ in the equation $6cos^2\vartheta - sin\vartheta - 4 = 0$in the range $-180^0 \leq \vartheta \leq 180^0$ **(3 marks).**

11. Wambua deposited 6,400 in an investment account which pays 30% interest rate per annum compounded semi – annually for 3 years. Muinde invested one and a half times that of Wambua at $12\frac{1}{2}\%$ per annum simple interest for 6 years. Find whose investment earned more interest and by how much give your answer to the nearest shilling. **(3marks)**

12. (a) Expand and simplify the binomial expression. **(2 Marks)**

$$\left(2-\frac{1}{2}y\right)^5$$

(b) Use the first four terms of the simplified expression in (a) above to evaluate to 5 significant figures. (1.98)5. **(2 Marks)**

13. Use logarithms to evaluate $\sqrt[3]{\frac{5.27\times\cos^2 82.48}{\log 6.7}}$ **(3marks)**

14. Form the quadratic equation whose roots are **x = -5/3** and **x = 1** **(2 marks)**

15. A biased coin is weighted such that its tail is twice as likely to appear as the head. Find the probability that that a tail and a head appear when the coin is tossed twice. **(3marks)**

16. Line BC below is a side of a triangle ABC and also side of a parallelogram BCDE.



Using a ruler and a pair of compasses only construct:

(i) The triangle ABC given that $\angle ABC = 120^0$ and AB = 6 cm. **(1 mark)**

(ii) The parallelogram BCDE whose area is equal to that of the triangle ABC and point E is on line AB. **(3 marks)**

SECTION II (50 marks)

*Answer **only five** questions from this section*

17. ABCD is a quadrilateral with coordinates $A\ (2,1), B\ (3,2), C\ (3,4)$ and $D\ (0,3)$. ABCD is mapped onto A'B'C'D' under transformation **T** given by a shear with x – axis invariant such that A' (4, 1).

a) Determine the $2\ x\ 2$ transformation matrix representing **T** and hence determine the coordinates of B', C' and D'. **(2 marks)**

b) A'B'C'D' is transformed to A"B"C"D" under a transformation **H** such that A" $(-6,-9)$ and D" $(-12,-15)$ Determine the $2x2$ matrix representing **H** and hence determine the coordinates of B" and C" **(3 marks)**

c) A"B"C"D" mapped onto A"'B"'C"'D"' under a transformation **V** representing a reflection in the line $\mathbf{y=-x}$. Determine the $2x2$ matrix representing **V** and hence determine the coordinates of A"'B"'C"'D" **(3 marks)**

18. The following table shows heights of 200 seedlings of the same species measured to the nearest cm.

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

a) Calculate the:-

i) Quartile deviation **3marks**

b) Standard deviation using a working mean of 102 **3marks**

c) Draw an ogive curve representing the above information and use it to determine the percentage number of seedling whose height ranges between $85 \leq H \leq 93$. **(4marks)**

19. In order to ensure optimal health a lab technician needs to feed the rabbits on a daily diet containing a minimum of 24grams of fat, 36grams of carbohydrates and 4grams of protein. Rather than order rabbit food that is custom blended it is cheaper to order food X and food Y and blend them for an optimal use. One packet of food X contains 6grams of fat ,12 grams of carbohydrates ,2 grams of proteins and costs Sh 50.While one packet of food Y contains 12grams of fat,12 grams of carbohydrates,1 gram of proteins and it costs Sh 60

a). Form all the inequalities to represent the information above**.** **(4 marks).**

b). Graph all the inequalities **(4marks)**

c). Determine the number of packets of type X and Y feed that should be used for optimal health at minimum cost. **(2marks)**

20. Mr Kibet's PAYE per month is ksh 29,522. The ratio of his basic salary to taxable allowances is 13: 9. He is housed by his employer and pays a norminal rent of ksh 9000. His taxable pay is his gross pay plus 15% of his gross pay less the norminal rent. He is entitled to a personal relief of ksh 1056 per month.The following tax rates are used in the tax computation.

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

Calculate:

a) His basic salary per month **7marks.**

b) The percentage change in his PAYE if his taxable pay increases by 10% **3marks**

21. A group of students wish to build up a pile of toy bricks so as to have 2 bricks in the top row,4 bricks in the second row, and 6 bricks in the third row and so on. If they have 3000 bricks

a) How many rows can they complete and how many bricks are they left with? **(4marks)**

b) Calculate the least number of bricks they should add to have all bricks used with no remainder? **(2marks)**

c) Counting from the top, the 3rd row, 9th row, 27th row and so on form a geometric progression. If rows forming this progression are to be summed up, calculate the total number of bricks forming this arrangement after the number of bricks in (b) above have been included**.** **(4marks)**

22. P and Q are two pints on latitude $60°S$.Their longitudes are $30°E$ and $150°W$ respectively. Find to one decimal place :(Take the radius of the earth = $6370km$ and $\pi = \frac{22}{7}$)

a) The distance in km between P and Q along the parallel of latitudes**.** **(2marks)**

b) The shortest distance along the earth's surface between P and Q. **(3marks)**

c) A weather forecaster reports that the center of a cyclone at (30°S 120°W) is moving due south at 24 knots. How long will it take to reach a point (45°S, 120°W**).** **(2marks)**

d) A plane leaves P at $1400hrs$ to Q at a speed of $900\ knots$ along the shortest route. Determine the time at Q when the plane arrived. **(3marks)**

23. A curve is represented by the following function; $y = x^3 - 4x^2 + 5x - 2$. Use the curve to answer the following questions;

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

b). (i). Determine the values of the stationery points of the curve. **(4marks)**

(ii). Determine the nature of each stationery point on the curve **(2 marks)**

c). In the space provided, sketch the curve of $y = x^3 - 4x^2 + 5x - 2$ **(3 marks)**

24. Three quantities A,B and C are such that A varies directly as the square root of B and inversely as the square of C.

a). Given that $A = 4$ when $B = 64$ and $c = 5$, find

i). The law connecting A, B and C **(4 marks)**

ii). A when $B = 16$ and $C = 10$ **(2 marks)**

b). If B is increased by 44% and C decreased by 20%, find the percentage change in A. (**4 marks)**

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KCSE 2024 FINAL PREDICTION

EXPECTED EXAM 3

121/1

MATHEMATICS

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Instructions to candidates

1. *Write your name, index number, school and stream in the spaces provided above.*
2. *This paper contains two sections:* ***Section I*** *and* ***Section II****. Attempt* ***all*** *the questions in* ***section I*** *and* ***strictly any five*** *questions* ***from Section II.***
3. *All answers and working must be written on the question paper in the spaces provided below each question.*
4. *Show all the steps in your calculations, giving your answers at each stage in the spaces below eachquestion.*
5. *Marks may be given for correct working even if the answer is wrong.*
6. *Non-programmable silent electronic calculators and* ***KNEC*** *mathematical tables may be used, exceptwhere stated otherwise.*
7. *Answer the questions in English*

FOR OFFICIAL 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

For Marking Schemes Contact 0746 222 000 / 0742 999 000

SECTION I: (50 MARKS)

Attempt all questions in the spaces provided

1. An irregular 6 sided polygon has two of its interior angles equal to 2x each, three angles equal to x each and one side equal to 20^o

Calculate the value of x **(3marks)**

2. The diagonals of a parallelogram are 20cm and 28.8cm. The acute angle between the diagonals is 62^o. Calculate the area of the parallelogram. **(3marks)**

3. A mobile phone seller gets a commission of shs 250 on every mobile phone that he sells. In a given month he got 33,000 shillings.

a. How many phones did he sell that month **(1mark)**

b. If this commission is 2% what is the sale price of each mobile phone. **(2marks)**

4. Given that Sin x=3/4, without using tables or calculators, find.

a. Cos x^o **(2marks)**

b. Tan $(90-x)^o$ **(1mark)**

5. Solve the simultaneous equation

$2\log y = \log 2 + \log t$

$2^y = 4^t$ **(4marks)**

6. Evaluate without using tables or a calculator

$100^{-1.5} \times 32^{0.2}$ **(3marks)**

7. The angle subtended by the major arc at the center of the circle O is twice the angle substended by the minor arc at the center. If the radius of the circle is 3.5cm. Find the length of the minor arc.

(3marks)

8. Two trains T_1 and T_2 travelling in the opposite directions on a parallel tracks are just beginning to pass one another. Train T_1 is 72m long and is travelling at 108km/hr. Train T_2 is 78m long and is travelling at 72km/hr. Find the time in seconds the two trains take to completely pass one another

(3marks)

9. The angle of depression of a chick from the hawk on top of a vertical tree 8m tall is 28^o. On seeing the hawk, the chick moves directly towards the base of the tree to a point P such that the angle of elevation of the hawk from P is 32^o. Calculate the distance moved by the chick.

(4marks)

10. Find a 2 x 2 matrix m such that **(3marks)**

$$\begin{pmatrix} 1 & 3 \\ 2 & -1 \end{pmatrix} m + \begin{pmatrix} 4 & -6 \\ 2 & 0 \end{pmatrix} = \begin{pmatrix} 1 & 7 \\ 3 & -2 \end{pmatrix}$$

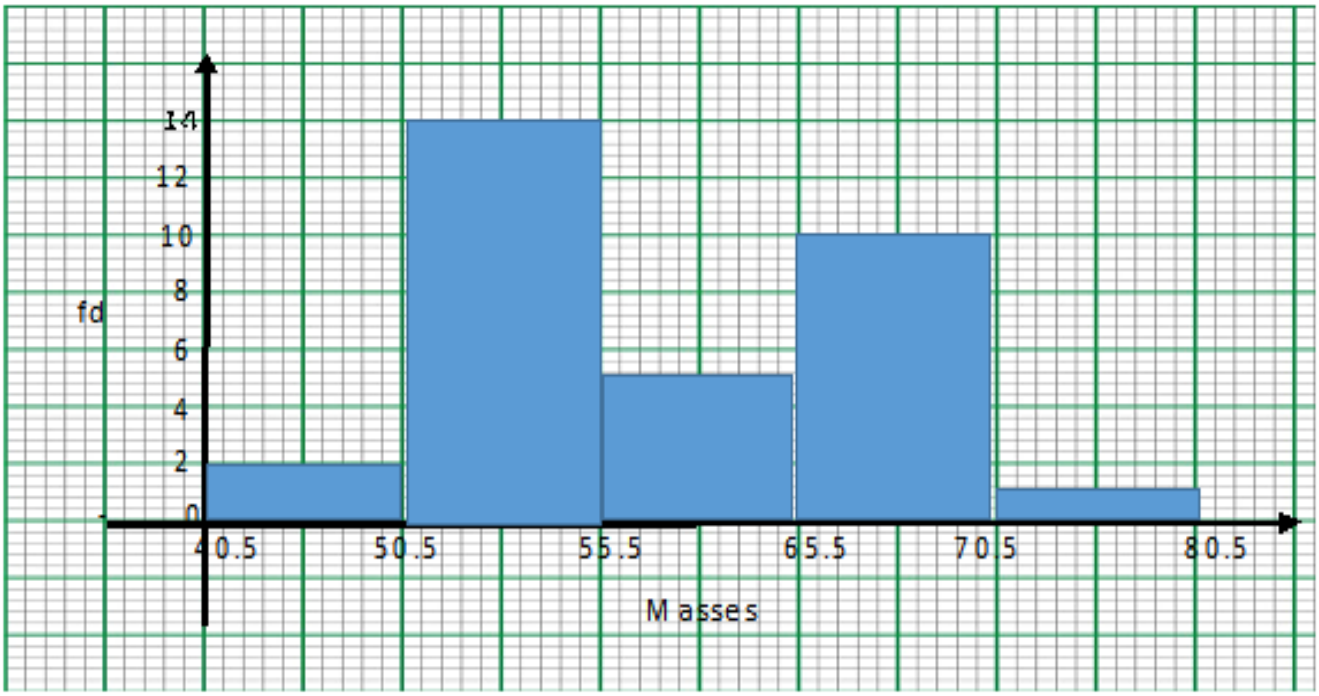
11. Given that a=1.2, b =0.02 and c =0.2 Express ac +b in the form $^m/_n$ where m and n are integers **(3mark)**

12. The line passing through the point P(-1,3w) and Q(w,3) is parallel to another line whose equation is 2y -3x =9 .

Write down the co-ordinates of P and Q **(3marks)**

13. A certain volume of solution has a mass of 2.2kg with density of 0.8g/cm^3. Calculate the volume of the solution in liters **(3marks)**

14. The graph below shows frequency densities for the masses of same 200 students selected from a class. Use it to answer the questions that follows.



(a) Complete the frequency distribution table below. **(2 marks)**

Mass in kg					
frequency					

(b) State the modal frequency **(1mark)**

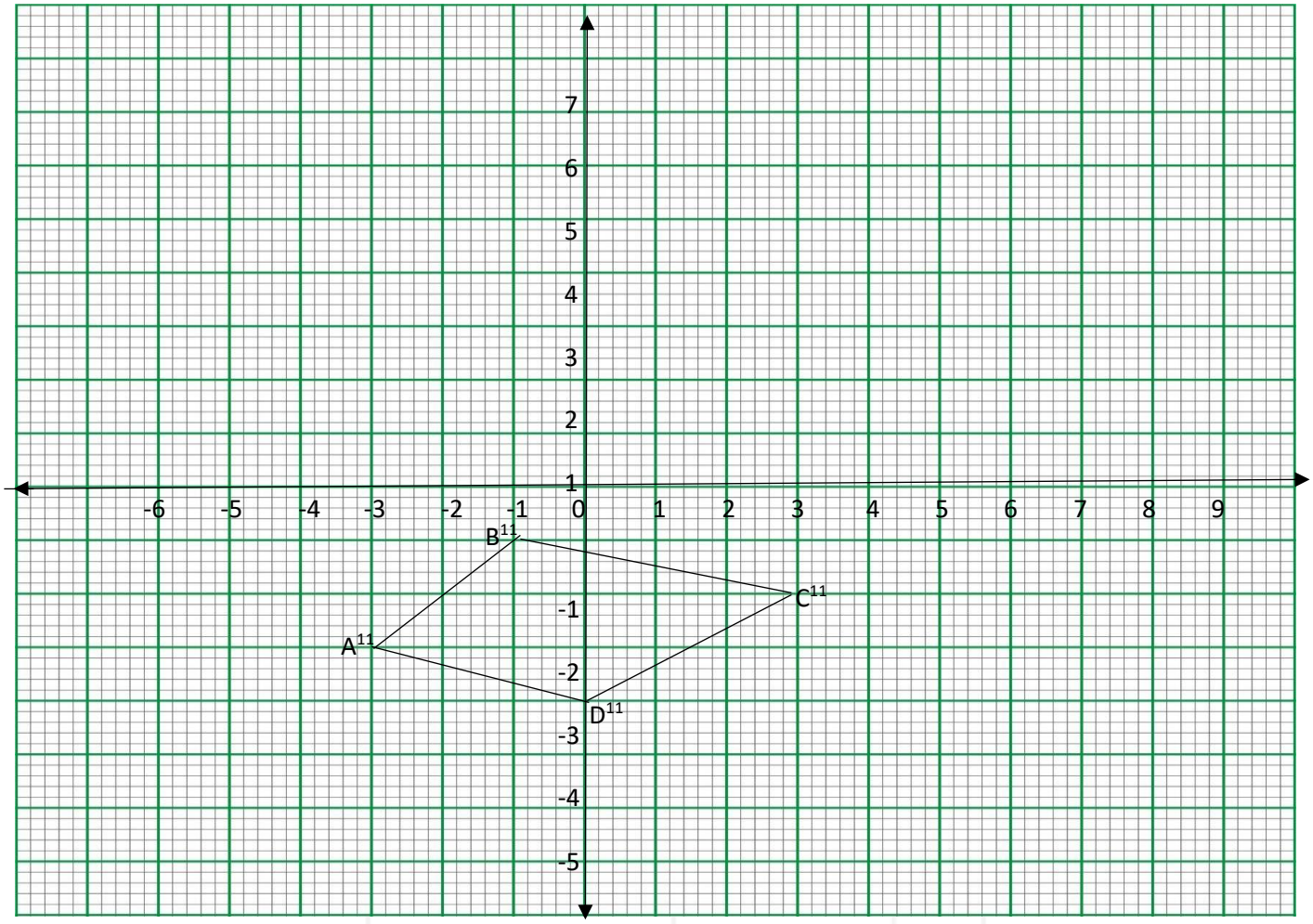
15. Calculate the area bounded by the curve y=x^2, the line y= -1 and the lines x=0 and x=3 using trapezoidal rule with 7 ordinates (correct to 3 d p) **(3marks)**

16. Mutai imports rice from United States at the initial cost of 500 US dollars per tonnes. He then pays 20% of this amount as shopping costs and 10% of the same amount as custom duty. When the rice reaches Mombasa he has to pay 6% of the initial cost to transport it to Nairobi. Given that on the day of this transaction the exchange rate was 1 us dollar =kshs 76.60. calculate the total cost of importing one tonne of rice up to Nairobi in Kenya shillings. **(3mks)**

SECTION II (50 MARKS)

Answer only 5 questions from this section.

17. (a) On the Cartesian plane given below, draw the quadrilateral ABCD with vertices A(6,6),



B(2,2) C(4,-6) and D(8,0). **(1mrk)**

a. Draw the image $A^1B^1C^1D^1$ of ABCD under an enlargement scale factor ½, center origin. State the coordinates of $A^1B^1C^1D^1$ **(3mrks)**

b. Describe the transformation that maps $A^1B^1C^1D^1$ onto the given image $A^{11}B^{11}C^{11}D^{11}$ **(2mark)**

c. Rotate $A^{11}B^{11}C^{11}D^{11}$ about center (-2,-1) through a positive quarter turn to get $A^{111}B^{111}C^{111}$ D^{111}. State the co-ordinates of $\mathbf{A^{111}B^{111}C^{111}D^{111}}$ **(3marks)**

d. State a pair of quadrilaterals that are oppositely congruent. **(1mark)**

18. On a certain day, Mwema bought plates worth Kshs 1200. On another day, Mrs. Mwema spent the same amount of money but bought the plates at a discount of 20% per plate.

a. If Mwema bought a plate at Kshs x, write down a simplified expression for the total number of plates bought by the two people **(3marks)**

b. If Mrs. Mwema bought 6 plates more that her husband, find how much each spent on a plate. **(5marks)**

c. Find the total number of plates bought by the family **(2marks)**

19. (a) Using a ruler and a pair of compasses only, construct triangle ABC such that lines AB=5.5cm, BC=4.8cm and AC =6.8cm, Construct circle passing through vertices A, B and C **(6 marks)**

a. Measure the radius of the circle **(1mark)**

b. Measure the angle substended at the center of the circle by chord AC **(1mark)**

c. Hence calculate the area of the triangle AOC **(2marks)**

20. A particle P moves in a straight line such that t seconds after passing a fixed point Q , its velocity is given by the equation $2t^2 - 10t + 12$

Find

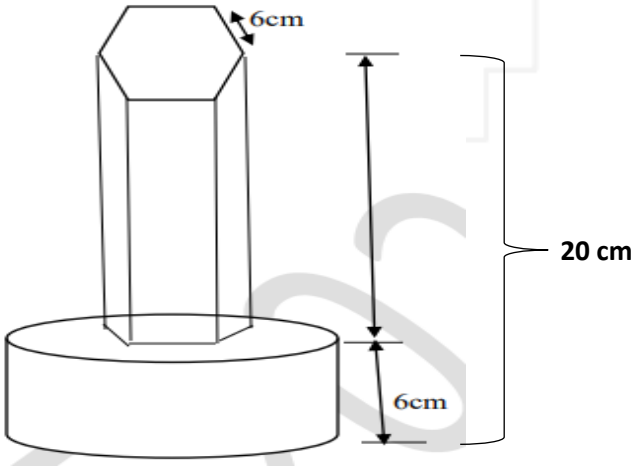
a. The values of t when P is instantaneously at rest. **(2marks)**

b. An expression for the distance moved by P after t seconds. **(2marks)**

c. The total distance travelled by P in the first 3 seconds after passing point Q **(2marks)**

d. The distance of P from Q when acceleration is zero. **(4marks)**

21. The figure below shows a model of a pillar to be constructed at the Canterbury. The model consists of a circular base of diameter 21cm and a uniform hexagon stand of sides 6cm and height 20cm.

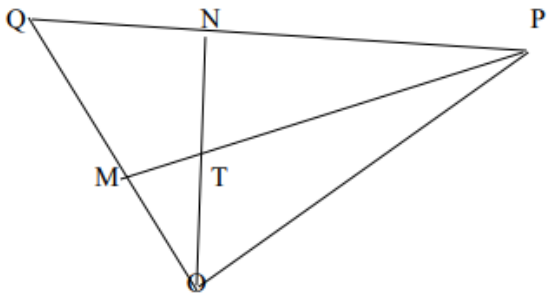


a. Calculate the cross-sectional area of the hexagon to 2dp. **(3marks)**

b. Calculate the total volume of the model to 2dp. **(3marks)**

c. If the height of the red pillar is 52m and the constructor uses two bags of cement for every $500m^3$ of the construction. Calculate the least number of bags of cement required **(4marks)**

22. The diagram below shows a triangle OPQ in which QN: NP=1:2, OT: TN=3:2 and M is the mid-point of OQ.



(a) Given that OP=**P** and OQ =**q**. Express the following vectors inters of **p** and **q**

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

(ii) ON **(2marks)**

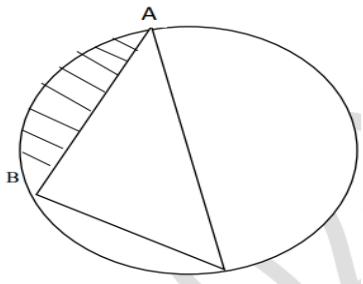
(iii) PT **(2marks)**

(iv) PM **(1mark)**

(b) (i) Show that points P,T and M are collinear **(3marks)**

(ii) Determine the ratio MT ; TP **(1mark)**

23. The diagram below shows a triangle ABC Circumscribed in a circle with AB=12cm BC=12cm, BC=15cm and AC=14cm



Calculate to 4 significant figures

(a) The angle ACB **(3marks)**

(b) The radius of the circle **(3marks)**

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

24. If Nick gives a quarter of the money he owns to Tom, Tom will have twice as much as Nick. If Tom gives q shillings to Nick, then Nick will have thrice as much as Tom. Taking the initial amount owned by Nick and Tom to be x and y respectively;

a. Express y and q in terms of x **(7marks)**

b. Given that Nick's initial amount was Kshs 40,000. calculate the value of q **(1mark)**

c. The initial amount owned by Tom **(2marks)**

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KCSE 2024 FINAL PREDICTION

EXPECTED EXAM 3

121/2

MATHEMATICS

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

INSTRUCTION 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) 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

For Marking Schemes Contact 0746 222 000 / 0742 999 000

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)**

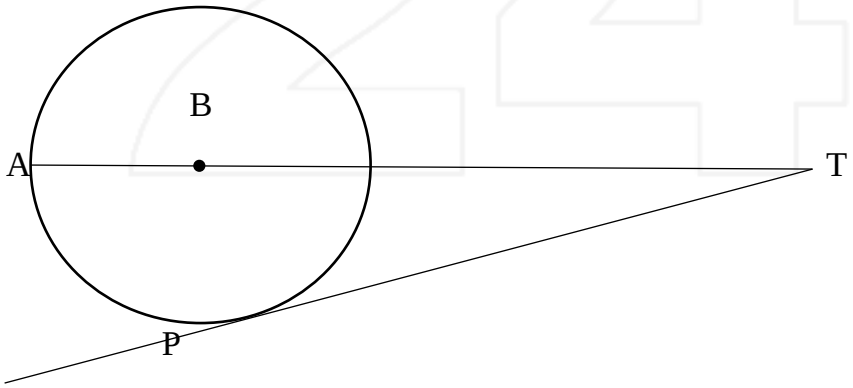
4. Solve for x in the equation $\log_8(x+6) - \log_8(x-3) = \frac{2}{3}$ **(4mks)**

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

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

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:-

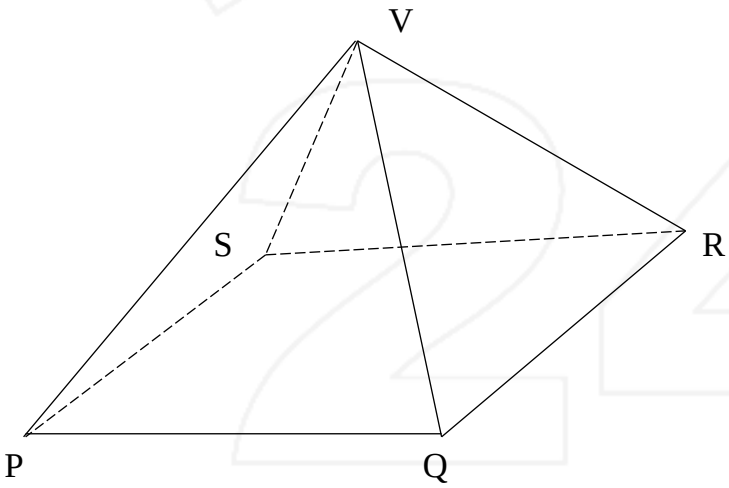
i) the probability that a girl gets employment. **(2mks)**

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°N. If the longitude of A and B are 42°W and 29°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 $\triangle$ 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 FINAL PREDICTION

EXPECTED EXAM 4

121/1 Mathematics Paper 1

Time: 2½ Hours

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

Instructions to Candidates

(a) Write your name, Adm. Number and stream in the spaces provided at the top of this page.
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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.*

1. A normal year has 365 days while a leap year has 366 days. Find the number of days from the beginning of 1900 to end of 2000. **(2 marks)**

2. Find the exact value $2.\dot{2} + 3.2\dot{4}$ in its simplest form. **(3 marks)**

3. A mirror line maps point (4,3) onto (-2,7). Find the equation of the mirror line in double intercept form. **(4 marks)**

4. The average lap time of 3 cars in a racing competition is 36 seconds, 40 seconds and 48 seconds respectively. If they all start the race at the same time, find the number of times the slowest car will have been overlapped by the fastest at the time they all cross the starting point together again. **(4 marks)**

5. The table below shows patients who attend a clinic in one week and were grouped by age as shown in the table below.

Age x years	$0 \leq x < 5$	$5 \leq x < 15$	$15 \leq x < 25$	$25 \leq x < 45$	$45 \leq x < 75$
Number of patients	14	41	59	70	15

On the grid provided draw a histogram to represent the distribution**.** **(3 marks)**

6. Three farmers, Formula-One, Method-Two and Way-Three are to share a grazing field. Formula-One has 5 cows, Method-Two has 7 cows and Way-Three has 4 cows. The three grazed for 3 days, 2 days and 4 days respectively. The owner of the field charged them ksh. 9000 which they were to share proportionately. How much money did Formula-One contribute? **(3 marks)**

7. a) Simplify the expression $\frac{3x+5}{2x} - \frac{2x+8}{3x}$. **(1 mark)**

b) Hence solve $\frac{3x+5}{2x} - \frac{2x+8}{3x} = \frac{4}{5}$ **(2 marks)**

8. A solid in the shape of a regular nonagon with distance from the centre to any vertex as 10cm and length 3.5m has a density of $3.2gcm^{-1}$. Calculate to 3 significant figures the mass of the solid in kilograms. **(4 marks)**

9. Find the exact value of $\frac{3^{n+1}-3\times3^{n-1}}{4\times3^{n+2}}$ **(3 marks)**

10. Use tables of natural tangents and square roots to find

a) $tan72.63^0$ **(2 marks)**

b) $\sqrt{0.5479}$ **(1 mark)**

c) Hence evaluate $tan72.63^0 + \sqrt{0.5479}$ **(1 mark)**

11. Given the column vectors $a = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$, $b = \begin{pmatrix} -3 \\ -9 \end{pmatrix}$ and $c = \begin{pmatrix} 5 \\ -7 \end{pmatrix}$ and that $p = 2a - \frac{1}{3}b + c$. Find the magnitude of ***p*** to 3 significant figures. **(3 marks)**

12. Using the grid below, solve the simultaneous equations below **(3 marks)**

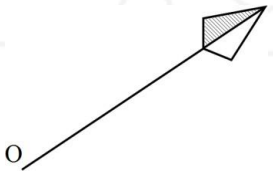
$$x + 3y = 9 \; and \; 3x + 2y = 13$$

13. Under an enlargement with scale factor +2, point $P(2,9)$ is mapped onto $P'(-5,3)$. Determine the co-ordinates of the centre of enlargement. **(3 marks)**

14. A businessman sells two types of mobile phones Samsung and Nokia. The price of one Samsung and one Nokia is ksh. 2000 and ksh. 1600 respectively. He wishes to have at least 20 mobile phones. The number of Samsung phones, should be less or equal to the number of Nokia phones. He has ksh. 96 000 to spend.

15. If he buys **x** Samsung phone and **y** Nokia phones, write down the inequalities for the above situation. **(3 marks)**

16. Complete the figure below to show a rotational symmetry of order 3 about point O. **(3 marks)**



17. Solve for α in $2sin(2\alpha + 20) - 2cos(-\alpha - 30) = 0$ **(2 marks)**

SECTION II (50 MARKS)

(Answer ANY FIVE questions in the spaces provided)

18. The distance between Kipsigis Girls and Mbita School is 240km. During the Champions Jet 1 result release at Kipsigis Girls, Mbita School ferried their students using two buses, Scania and Isuzu. The Scania bus travelled 20km/h faster than the Isuzu bus whose speed was xkm/h.

a) Write an expression in terms of x for the time taken to cover the distance by;

i. Isuzu bus **(1 mark)**

ii. Scania bus **(1 mark)**

b) The Isuzu bus left Mbita at 7.00 am. and 36 minutes later, the Scania bus left Mbita for Kipsigis. The two vehicles reached Kipsigis Girls at the same time. Form an equation in x hence find the speed of Scania bus. **(5 marks)**

c) During the return journey, the two buses left Kipsigis at the same time and maintained their original speeds. The Scania bus developed a puncture after covering 100km which took 20 minutes to mend. If the two buses arrived at Mbita at the same time, find the average speed of Scania bus from the point where the tire was mended. **(3 marks)**

19. Sol is a sales lady with a company that pays her a basic salary of sh. 30,000 per month. She is also given commission on goods sold as follows,

0% for the first sh. 100,000

3% on the sales above sh. 100,000 up to sh. 300,000

7.5% of sales above sh. 300,000

a) During the month of May, she sold 400 calculators at sh. 1250 per calculator. Calculate:

i. How much she collected from the sale of calculators. **(2 marks)**

ii. Her total earnings for the month of May. **(3 marks)**

b) During the month of June, each calculator was sold at a discount of 16.8%. If Sol received a total of sh. 52,500 as her earnings, find the total number of calculators sold during the month of June.

(5 marks)

20. Two quadratic curves intersect at points $(-2,0)$ and $(4,0)$.

a) Determine the equations of the curves in the form $y = ax^2 + bx + c$. **(4 marks)**

b) Using trapezium rule with 6 strips, estimate the area bounded by the curves. **(4 marks)**

c) Estimate the area in (b) above using mid-ordinate rule with 3 trapezia. **(2 marks)**

21. A, B, C, D and E are such that B is 88 km on a bearing of 062^0 from A. C is 120 km on a bearing of 142^0 from B. D is $S38^0W$ of C at a distance of 90km. E lies directly South of A and directly west of D. Using a scale of $1:2{,}000{,}000$;

a) Determine the relative positions of A, B, C, D and E. **(4 marks)**

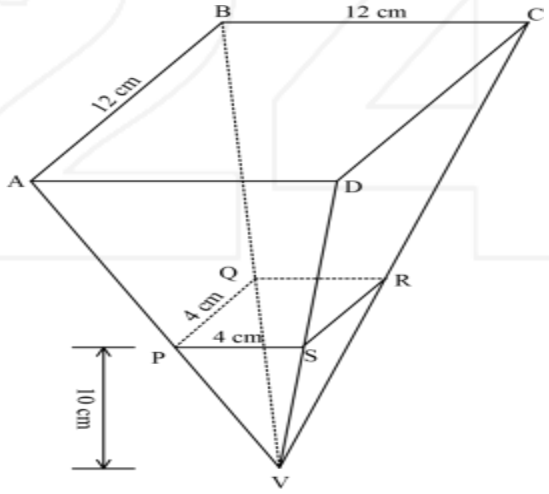
b) Find the bearing and distance of **(4 marks)**

i. E from C

ii. D from A

c) Find the area covered by A, B,C D and E in square kilometers. **(2 marks)**

22. The diagram below represents square based pyramid standing vertically. AB = 12 cm,PQ = 4 cm and the height of the pyramid PQSV is 10 cm.



(a) If PQRSV is a solid, find the volume of material used to make it.

(b) Find the;

(i) Height of the frustum ABCDPQRS.

(ii) Volume of the frustum.

(c) The liquid from a hemisphere is poured into ABCDPQRS. Find the radius correct to 4significant figures of the hemisphere if the liquid from hemisphere filled the solid completely.($\pi = 3.142$)

23. The equation of a curve is given as $y = x^3 - 6x^2 + 9x + 20$.

a) Find ;

i. the $y - intercept$ of the curve. **(2 marks)**

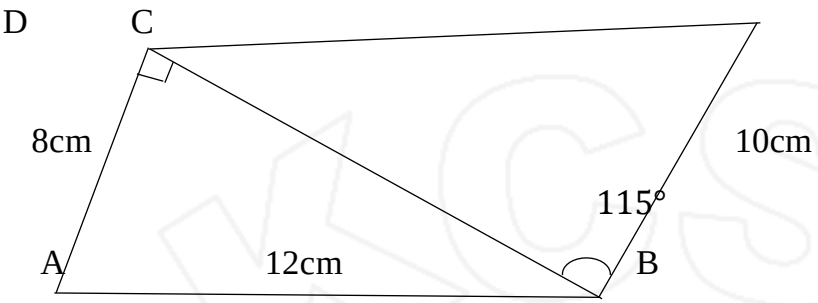
ii. the stationary points of the curve. **(3 marks)**

b) For each stationary point in (a) (ii) above, determine its nature. **(2 marks)**

c) Sketch the curve. **(2 marks)**

23. The figure below shows a quadrilateral ABCD. ABD is a right angled triangle. Given that

$AB = 12cm, BC = 10cm, AD = 8cm,$ and angle $DBC = 115°$.



Calculate to one decimal place:

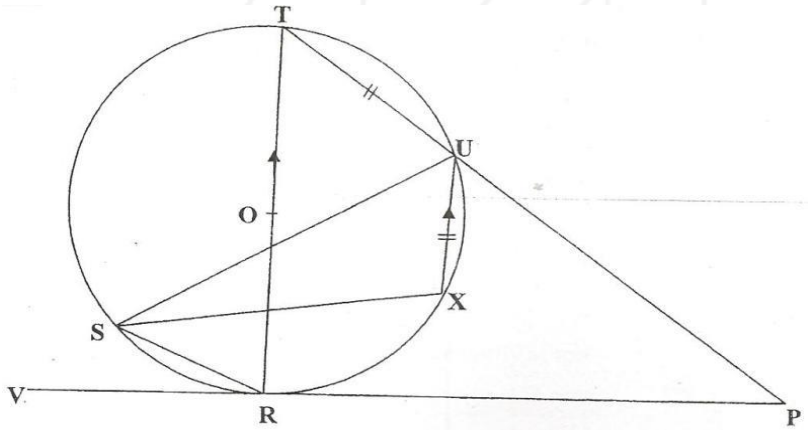
a) The length BD **(2marks)**

b) The length CD **(3marks)**

c) The angle BCD **(2marks)**

d) The area of the quadrilateral ABCD **(3marks)**

24. In the figure below, O is the centre of the circle TOR is the diameter and PRV is tangent to the circle at R.



Given that <SUR = 25^0, <URP = 60^0, TU = UX is parallel to the diameter; giving reasons calculate;

a) <TOU **(2 marks)**

b) <XUP **(2 marks)**

c) <STR **(2 marks)**

d) Reflex <SXU **(2 marks)**

e) <RPU **(2 marks)**

KCSE 2024 FINAL PREDICTION

EXPECTED EXAM 4

121/2 Mathematics Paper 2

Time: 2½ Hours

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

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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 from this section

1. Solve the equation: $1 + 2\cos\left(\frac{2}{3}x + 30^0\right) = 0 \quad \text{for } 0^0 \leq x \leq 360^0$ **(3 marks)**

2. A rectangular block has a square base whose side is exactly 8 cm. Its height is measured to the nearest millimetre as 3.1 cm. Find the percentage error in calculating its volume. **(3 marks)**

3. If $a = \sqrt{7} + \sqrt{5}$ and $b = \sqrt{7} - \sqrt{5}$ find;

(a) The product ab **(1 mark)**

(b) $a^2 - b^2$ **(2 mrks)**

4. Draw line $AB = 3\ cm$, P is a variable point such that $< APB = 60^0$. Draw the possible location of point P. **(3 marks)**

5. Use the first four terms of the expansion $(1 - x)^8$ to evaluate $(0.95)^8$ correct to 3 decimal places**.** **(3 marks)**

6. Make y the subject of the formula $x = \left(\frac{x^2y-2}{4y-3}\right)^{\frac{1}{4}}$ **(3 marks)**

7. Tap A can fill a bath in 5 minutes. Tap B can empty a full bath in 10 minutes. Both taps are opened at the same time. After 5 minutes, tap B is closed. How long will it take tap A to fill the bath completely from then. **(3 marks)**

8. Kola bought a television set on hire-purchase by paying a down payment of ksh. 5000 and monthly instalments of ksh. 1250 for 2 years. If interest rate charged was 12% p.a, what is the carrying charge to the nearest hundreds? **(3 marks)**

9. Use matrix method to for x and y in the following sets of equation.

$2y - 3x = -4\ and\ 2y = 5x$ **(3 marks)**

10. Solve for x given that $\log(5x - 10) - \log\left(\frac{x}{15}\right) = \log 40 - \log\left(\frac{x}{20}\right)\ where\ x \neq 0$ **(3 marks)**

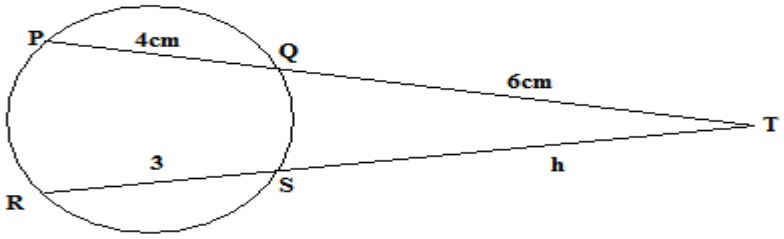
11. Nine men have heights of $185, 179, 181, 181, 173, 182, 184, 178\ and\ 176$ all in cm. Using an assumed mean of 180, calculate the variance to 4 significant figures. **(3 marks)**

12. Given that $\boldsymbol{a = 10i + 6j - 7k}$ and $\boldsymbol{b = 2i + 8j + 4k}$, find $\left|2\boldsymbol{a} + \frac{1}{2}\boldsymbol{b}\right|$ **(3 marks)**

13. A farmer has 1000 m of fencing wire to fence a rectangular enclosure. Find the greatest possible area this farmer can fence. **(3 marks)**

14. The acceleration of a particle a m/s^2 is $2t - 3$ m/s^2. Given that the particle has a velocity of 2 m/s after 1 second. Find its displacement in the fourth second**.** **(4 marks)**

15. In the figure below, chords PQ and RS intersect externally at T.



Given that PQ = 4cm, QT = 6cm and RS = 3cm, find RT. **(3 marks)**

16. In a shooting practice three soldiers A, B and C aim at a target. The probabilities of A, B and C hitting the target are $^1/_3$, $^1/_4$ and $^1/_2$ respectively. The three soldiers shot at the target only once; one after the other. What is the probability that the target was hit only once**?** **(4 marks)**

Section II (50 Marks)

Answer any five questions from this section.

17. A ship sends a radio signal saying she is in distress and giving her position as $(60^0N, 45^0W)$. The signal is picked up by a ship A at $(60^0N, 30^0W)$ and a ship B at $(60^030'N, 45^0W)$. Both ships move at a speed of 25 $knots$.

(a) Calculate the length of time that each captain should indicate that it will take to come to the rescue, assuming that A sails due West and B sails due south. **(6 marks)**

(b) If the distressed ship is drifting due East at 5 $knots$. Find the new position she should radio call 16 hours later**.** **(2 marks)**

(c) Find the local time and day at $X(60^0N, 30^0W)$ when the local time at $Y(0^0, 30^0E)$ is 0045H on Monday. **(2 marks)**

18. Two hundred people were asked how much water they drink per day. The table below shows the results.

Amount of water (X litres)	No. of people	Cumulative frequency
$0 < x \leq 0.5$	8	
$0.5 < x \leq 1$	27	
$1 < x \leq 1.5$	45	
$1.5 < x \leq 2$	50	
$2 < x \leq 2.5$	39	
$2.5 < x \leq 3$	21	
$3 < x \leq 3.5$	7	
$3.5 < x \leq 4$	3	

(a) Develop a cumulative frequency **column** **(1 mark)**

(b) On the grid provided below, draw a cumulative frequency curve using a scale of 2 cm for one litre on the x – axis and 1 cm for 20 people in the y- axis**.** **(3 marks)**

(c) Using your graph;

(i) Find the median **(1 mark)**

(ii) The quartile deviation **(2 marks)**

(iii) Find the number of people who consumed at least 2.6 litres per day. **(1 mark)**

(iv) Find the percentage number of people who did not drink enough water given that the doctor recommends at least 1.8 litres per day. **(2 marks)**

19. Triangle ABC with vertices $A(2,4), B(2,9)\ and\ C(6,2)$ undergoes a transformation T denoted by the matrix $\begin{pmatrix} -0.6 & 0.8 \\ 0.8 & 0.6 \end{pmatrix}$ to obtain triangle $A_1B_1C_1$.

(a) Draw triangle ABC and its image under T on the same axes. **(4 marks)**

(b) Describe the transformation T fully. **(1 mark)**

(c) Under another transformation M, triangle $A_1B_1C_1$ is mapped on to triangle $A_2B_2C_2$ with $A_2(-2,-4), B_2(-6,-7) and\ C_2(2,-6)$. Find the matrix of transformation M **(4 marks)**

(d) Describe the single transformation that maps triangle $A_2B_2C_2$ onto triangle ABC **(1 mark)**

20. A relief organization has to transport at least 80 people and at least 18 tonnes of supplies to a site. There are two types of vehicles available; type A and type B. type A can carry 900 kg of supplies and 6 people while type B can carry 1350 kg of supplies and 5 people. There are at most 12 vehicles of each type available. By taking x to represent the number of vehicles of type A and y to represent the number of vehicles of type B.

(a) Write down all the four inequalities to represent the above information**.** **(4 marks)**

(b) On the grid provided, draw all the inequalities in (a) above. **(4 marks)**

(c) Use the graph in (b) above to determine the least number of vehicles of each type required at the site**.** **(2 marks)**

21. An arithmetic progression has the first term (a) and common difference (d).

(a) Write down the third, the ninth and twenty fifth terms of the AP. **(1 mark)**

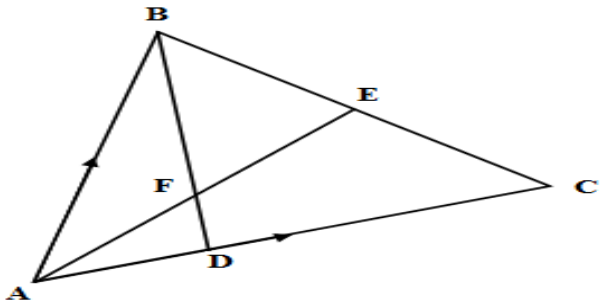
(b) The AP is increasing and the 3rd, 9th, and 25th terms form the first three consecutive terms of the GP. If the sum of the seventh term and twice the sixth terms of the AP is 78, calculate:

(i) The first term and the common difference of the A.P. **(4 marks)**

(ii) The common ratio of the GP **(2 marks)**

(iii) The sum of the first nine terms of the A.P. **(3 marks)**

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



a) If AB = **b** and AC = **c,** find:

i) BD **(2 marks)**

ii) AE **(2 marks)**

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

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

23. The table below shows income tax rates

Monthly taxable pay (k£)	Rate of tax ksh per £
1- 435	2
436 – 870	3
871 – 1305	4
1306 – 1740	5
Excess over 1740	6

A company employee earns a monthly basic salary of Ksh 28,000. He is also entitled to the following monthly allowances: house allowance of Ksh 9000, a medical allowance of sh 2000 and a commuter allowance of shs 1480.

(a) Calculate his total income tax. **(5 marks)**

(b) He is entitled to a personal tax relief of Ksh 1056 per month. Determine the net tax.**(1 mark)**

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

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

a) Determine the coordinates of the turning points of the curve, correct to 1 decimal place and state their nature **(4 marks)**

b) Use the equation of the curve to complete the table below. **(1 mark)**

x	-4	-3	-2	-1	0	1
y	-2		6	1		

c) i) On the grid provided, use the solutions in part (a) and the values in the table in part (b) to draw the curve for $-4 \leq x \leq 1$. **(3 marks)**

ii) Use the graph to solve the equation $x^3 + 4x^2 - 2 = 0$ **(2 marks)**

KCSE 2024 FINAL PREDICTION

EXPECTED EXAM 5

121/1 **Mathematics** Paper 1

Time: 2½ Hours

NAME.....

SCHOOL..... **SIGN**.....

INDEX NO..... **ADM NO**.....

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO DANDIDATES

1. *Write your name, index number and class.*
2. *The paper contains two sections: Section I and II*
3. *Answer ALL questions in section I and ONLY FIVE questions from section II.*
4. *All working and answers must be written on the question paper in the spaces provided below each question.*
5. *Marks may be awarded for correct working even if the answer is wrong.*

FOR EXAMINER'S USE ONLY

SECTION 1

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

GRAND TOTAL

SECTION II

17	18	19	20	21	22	23	24	25	TOTAL

For Marking Schemes Contact 0746 222 000 / 0742 999 000

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

$\left(\frac{7}{3}\left[\frac{2}{5}of\,1\frac{2}{3}-\frac{1}{2}\left(\frac{1\frac{2}{3}-2\frac{1}{2}}{\frac{1}{3}-\frac{19}{27}}\right)^{\frac{1}{2}}+\frac{2}{3}\right]\right)^{\frac{1}{2}}$ 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.

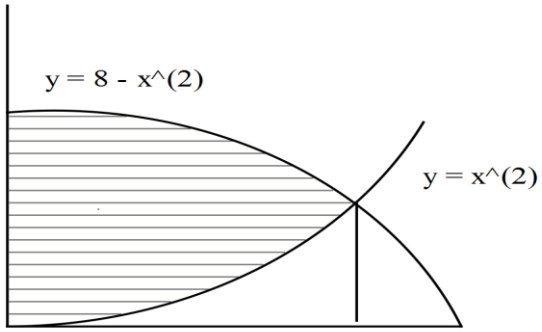
Mass (kg)	Frequency
25-30	6
30-35	10
35-40	24
40-45	7
45-50	4

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)**



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 $A^{I}B^{I}C^{I}$ are the images of $A(4,1), B(0,2) and\ C(-2,4)$ respectively under a transformation represented by the matrix $M = \begin{pmatrix} 1 & 1 \\ 1 & 3 \end{pmatrix}$.

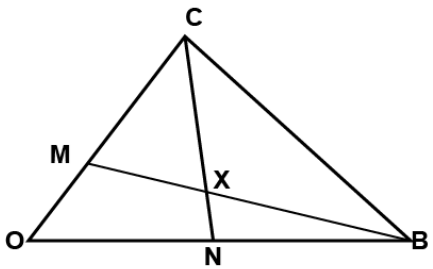
(a) Write down the coordinates of $A^{I}B^{I}C^{I}$ **(3 marks)**

(b) $A^{II}B^{II}C^{II}$ are the images of $A^{I}B^{I}C^{I}$ 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 $\underline{a}$ and $\underline{b}$ 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.

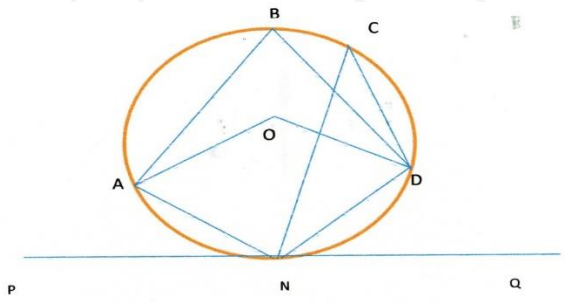
Express OX in terms of:

i. $\underline{a}$, $\underline{b}$ and k. **(2 marks)**

ii. $\underline{a}$, $\underline{b}$ 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 FINAL PREDICTION

EXPECTED EXAM 5

121/2 **Mathematics** Paper 2

Time: 2½ Hours

NAME.....

SCHOOL..... **SIGN**.....

INDEX NO..... **ADM NO**.....

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO DANDIDATES

1. *Write your name, index number and class.*
2. *The paper contains two sections: Section I and II*
3. *Answer ALL questions in section I and ONLY FIVE questions from section II.*
4. *All working and answers must be written on the question paper in the spaces provided below each question.*
5. *Marks may be awarded for correct working even if the answer is wrong.*

FOR EXAMINER'S USE ONLY

SECTION 1

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

GRAND TOTAL

SECTION II

17	18	19	20	21	22	23	24	25	TOTAL

SECTION A (50 MARKS)

Answer all questions in this section in the spaces provided

1. A piece of wire 10cm long is to be cut into two parts. If the parts are bent to form a square and a circle respectively, find the length each of the two parts, and hence find the radius of the circle formed, if the sum of their areas is minimum. **(4 marks)**

2. In 2023, the cost of processing a bag of wheat was Ksh 250, and this was divided between electricity costs and labour in the ratio 2:3. In the year 2024, the cost of electricity doubled, while the cost of labour increased by x%. Calculate the value of x given that the cost of processing a bag of wheat in 2024 is 425. **(2 marks)**

3. A triangle PQR is such that the equation of line PQ is 3y-2x - 11 =0, while that of line QR is 2y - 3 = -3x. Find the coordinates of the point of intersection of the two lines. **(3 marks)**

4. Three quantities **b, n** and **m** are such that **b** varies directly as the product of **m** and **n**, and inversely as the square root of the difference of $\mathbf{n^2}$ and **m**. Form an equation connecting b, n and m. Express **n** in terms of **b**, **m** and **k,** where k is the constant of proportionality**. (3 marks)**

5. The locus of points 3 cm away from a point (m,m) passes through the point (2,5). Find the value of m. **(3 marks)**

6. Using a ruler and pair of compasses only, construct triangle MNP in which MN = 5cm, NP = 4.4cm and angle PNM = 45^0. Draw a circle passing through all the vertices of the triangle and measure its radius. **(3 marks)**

7. The deviations from the mean of a set of data are given as -4, -1, x^2, 1, x, and -2. Find the value of x, hence find the standard deviation of the data, given that x is positive. **(3 marks)**

8. Two parallel chords of length 4.6cm and 6.8cm are on the same side of a circle of radius r cm. calculate the radius of the circle, correct to four significant figures, given that distance between the two chords is 2cm. **(3 marks)**

9. A piece of land is in the shape of a quadrilateral ABCD such that side AB=AD=50m, < DAB= 100^0, < ABC = 87^0 and < ADC = 79^0Determine the length of barbed wire that would go around the land to the nearest metre. **(4 marks).**

10. OABC is parallelogram in which **OA** =**a** and **OC** =**c**. Y is the mid-point of **OC**, and **AY** meets **OB** at X. X divides line **OB** and **AY** in the ratio 3:4 and 1:2 respectively. Find **OB** in terms of **a** and **c.** **(3 marks)**

11. Simplify without using tables or calculators: **(3 marks)**

$$\frac{\sin 480^0 - \cos 765^0}{\tan 225^0 - \cos(-330^0)}$$

12. Use the first four terms of the expansion $(2a + b)^8$ to find the value of 2.05^8 correct to 4 significant figures. **(3 marks)**

13. Bazu owns a total more than 10 buses and matatus combined. There are four more matatus than buses, and the buses are not more than 8 in number. By taking x to represent the number of buses, write down all the inequalities for the information and hence state all possible solutions of x. **(3 marks)**

14. Two similar metallic cylinders have masses of 64g and 125g respectively. The smaller cylinder has a volume of 21.56cm^3. The larger cylinder is molded into a sphere of radius r. Find the value of r correct to 3 decimal places. **(3marks)**

15. A ship is observed from the top of a cliff 200 m high in a direction N18^{0}E at an angle of depression of 15^0. Thirty minutes later, the same ship is observed in a direction S72^{0}E at an angle of depression of 10^0. Find the distance travelled in the 30 minutes assuming that the ship travelled along a straight line. **(4 marks)**

16. A right pyramid VABCD has its vertex at V and a rectangular base ABCD. AB= 8cm, BC=6cm and all the slant edges of the pyramid are 10cm. Find the angle between plane VBC and plane VAD correct to two decimal places. **(3 marks)**

SECTION B (50 MARKS)

Answer only FIVE questions in this section in the spaces provided

17. The table below shows the income tax rate for a certain year

Income in Ksh. p.m	Tax rate(%)
1 – 11180	10
11181 – 21714	15
21715 – 32248	20
32249 – 42781	25
42782 and above	30

In a certain month, Mr Zakayo paid a net tax of Ksh 26416. He was entitled to a monthly personal relief of Ksh 1648. He also paid insurance premiums amounting to 18200 and was entitled to an insurance relief at 15% of premiums paid, subject to a maximum of Ksh 2000 per month. He also lived in a company house for which he paid a nominal rent of 5200 per month. Other taxable allowances amounted to sh. 22400.

a) Calculate Mr Zakayo's monthly gross tax **(2 marks)**

b) Calculate Mr Zakayo's total taxable income in that month **(4 marks)**

c) Calculate Mr Zakayo's net monthly income. **(4 marks)**

18. The equation of a curve is given as $y = \frac{x(x-2)}{(x-1)^{-1}}$.

a) Sketch the curve. **(7 marks)**

b) Determine the exact area bounded by the curve and the x-axis. **(3 marks)**

19. Water flows through a cylindrical pipe of diameter 2.8cm at a speed of 25m/min.

a) Calculate the volume of water delivered by the pipe per minute in litres. **(3 marks)**

b) A cylindrical storage tank of depth 2.5m is filled by water from this pipe and at the same rate of flow. Water begins flowing into the empty storage tank at 8:00am and is full at 2:00pm. Calculate the area of the cross section of this tank in m^2. **(4 marks)**

c) A family consumes the capacity of this tank in one month. The cost of water is sh. 150 per 1000 litres plus a fixed maintenance charge of sh. 200. Calculate this family's water bill for a month. **(3 marks)**

20. The second, 4^{th} and 7^{th} terms of an AP form the first three consecutive terms of a GP.

a) Find the common ratio of the G.P **(5 marks)**

b) The first term of the GP if the common difference of the AP is 3 **(2 marks)**

c) The seventh and the fifth terms of the G.P form the first two consecutive terms of an AP. Find the sum of the first 20 terms of the AP formed. **(3 marks)**

21. Use a ruler and a pair of compasses only for all constructions in this question.

(a) Construct parallelogram ABCD such that $<ABC = 67.5^0$, BA = 7.8cm and CB = 5.6cm. **(3 marks)**

(b) Construct a perpendicular from A to meet DC at E. Measure AE, hence find the area of the parallelogram. **(2 marks)**

(c)On the same side of AB as C and D, construct the locus of points P such that $< APB = 45^0$ **(2 marks)**

(d) Identify by shading the unwanted region, the locus of points R such that AR > 2.8 cm, AR≤ RB and $<ARB \geq 45^0$. **(3 marks)**

22. In a form 4 chemistry classes consisting of both boys and girls, $^2/_5$ of the students are girls. $^2/_3$ of the boys and $^7/_{10}$ of the girls are right handed. The probability that a right-handed student breaks a conical flask in any practical session is $^3/_7$ and the corresponding probability of a left-handed student is $^4/_9$, independent of the student's gender.

a) Draw a tree diagram to represent the above information **(2 marks)**

b) Determine the probability that a student chosen at random from the class is left handed and does not break a conical flask during a practical session in simplest form. **(3 marks)**

c) Determine the probability that a conical flask is broken in any chemistry practical session in simplest form. **(3 marks)**

d) Determine the probability that a conical flask is not broken by a right-handed student in the simplest form. **(2 marks)**

23. A farmer wishes to grow two crops, maize and beans. He has 70 acres of land available for this purpose. He has 240 man-days of labour available to work out the land and he can spend up to sh. 180,000. The requirements of the crops are as follows:

	Maize	Beans
Minimum number of acres to be sown	10	20
Man – day per acre	2	4
Cost per acre in sh.	3,000	2,000
Profit per acre in sh.	15,000	10,000

a) If x and y represent the number of acres to be used for maize and beans respectively, write down in their simplest form, all the inequalities which x and y must satisfy. **(2 marks)**

b) Represent the inequalities on the grid provided **(5 marks)**

c) Profit per acre of maize and beans is sh. 15,000 and 10,000 respectively. Draw a suitable search line on the graph and use it to find the number of acres to be used for maize and beans so as to give maximum profit. **(2 marks)**

d) Find the maximum profit. **(1 mark)**

24. The table below gives values of P with corresponding values of G.

P	90.1	223.3	371.2	693.3	4450.1	11000
G	60	105	147	226	780	1500

a) Using the data from the table above, draw a suitable straight line graph given that P and G are connected by the equation $\log P = n\log G + \log K$ **(5 marks)**

b) Use the graph to determine:

i) The values of k and n **(3 marks)**

ii) The value of P when G is 113 **(1 mark)**

iii) The value of G when P is 400 **(1 mark)**

KCSE 2024 FINAL PREDICTION

EXPECTED EXAM 6

101/1

MATHEMATICS

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Instructions to candidates

*(a) Write your **name**, **admission** number and **school** in the spaces provided above.*
(b) Sign and write the date of the examination in the spaces provided above.
*(c) The 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) 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 calculations, giving your answers at each stage in the spaces below each question.***
(g) Marks may be given for correct working even if the answer is wrong.
*(h) **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

For Marking Schemes Contact 0746 222 000 / 0742 999 000

SECTION I (50 marks)

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

1. Express $3.\dot{7}\dot{5}$ in the form $a\frac{b}{c}$ hence find the absolute value in $\frac{b}{c}-a$. **(3 marks)**

2. Find the values of p and q

$P^2 \times q^3 = 3087$ **(2 marks)**

3. A *forex* bureau in Nairobi buys and sells selected foreign currencies at the rates given in the table below.

Currency	**Buying (Ksh)**	**Selling (Ksh)**
1 *South African Rand*	7.00	7.70
1 *United Arab Emirates Dirham*	36.14	37.50

A tourist arrived in Kenya from South Africa with 8546000 South African Rand. He converted the whole amount to Kenya shillings through an agent at a commission 2%. While in Kenya, he spent $\frac{1}{4}$ of this money and changed the balance to UAE Dirham. Calculate the amount of UAE Dirham that he received. **(4 marks)**

4. A rectangular garage measures 13.2 m long by 6 m wide. The garage is to be covered by square concrete slabs leaving a margin of $\frac{1}{5}$ m. Calculate the minimum number of square slabs required to cover the garage. **(4 marks)**

5. Use logarithms correct to 4 decimal place to evaluate

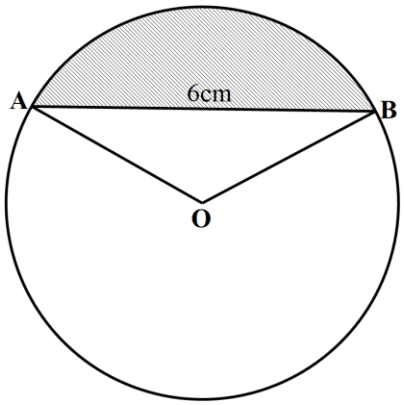
$\sqrt[3]{\frac{68.37\sin 53.4^0}{39.4^2}}$ **(4 marks)**

6. Given that $\frac{\sin(2a+20)^0}{\cos\left(\frac{1}{2}a-60\right)^0} = \tan 45^0$, find the value of a **(3 marks)**

7. The position vector of **P** and **Q** are $\mathbf{OP} = -5\mathbf{i} + 4.5\mathbf{j}$ and $\mathbf{OQ} = 3\mathbf{i} - 1.5\mathbf{j}$.

Evaluate $|\overrightarrow{\mathbf{PQ}}|$ **(3 marks)**

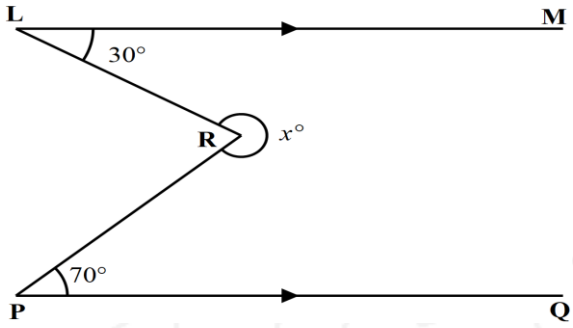
8. The figure below shows a circle centre O radius $3\sqrt{2}$ cm. Given that the length of chord $AB = 6$ cm, calculate the area of the shade region leaving your answer in terms of π. **(4 marks)**



9. Expand and simplify:

$(3p-2q)^2-(3p+2q)^2$ **(2 marks)**

10. On the figure below (**not drawn to scale**), LM is parallel to PQ. Angle $MLR = 30^0$ and angle $RPQ = 70^0$. Find the value of x. **(2 marks)**

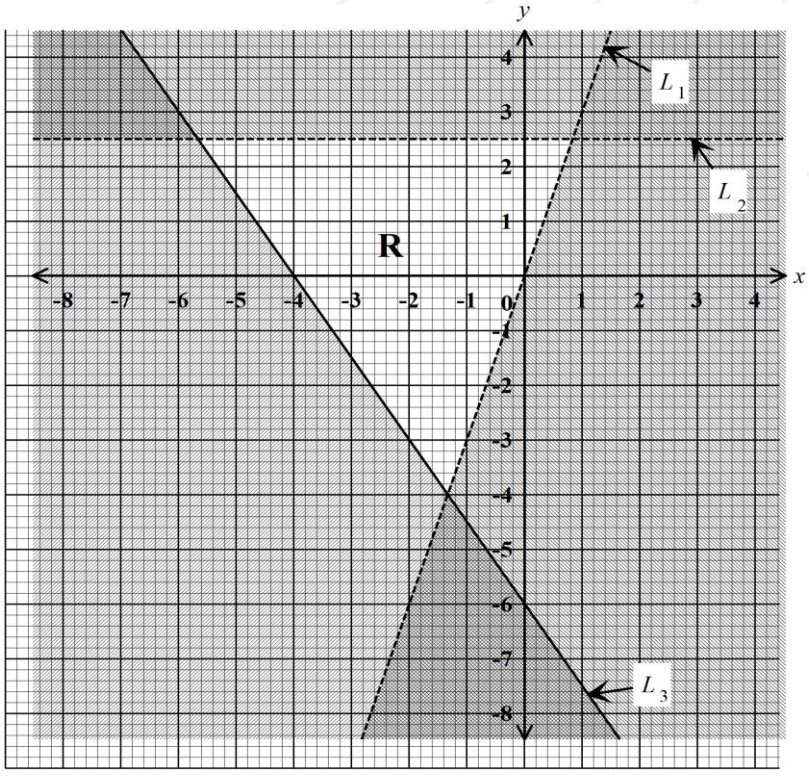


11. Using a ruler and a pair of compasses only, construct a parallelogram ABCD in which AB = 7.2 cm, BC = 4.5 cm and angle $DAB = 105^0$. Drop a perpendicular from D to BA produced at M. Measure the length of DM. **(3 marks)**

12. Given that $a=-2, b=5$ and $c=-1$, evaluate $\dfrac{4a^3+5b-c}{\frac{1}{3}(c^2-a^2)}$ **(3 marks)**

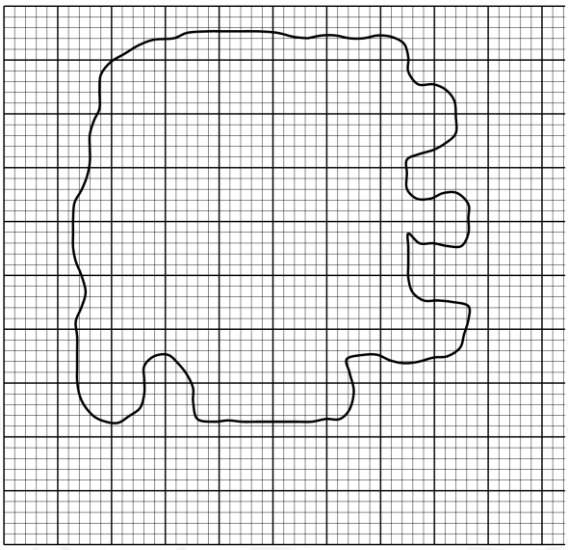
13. In a 4×100 m Relay Heat, Omanyala, Kiviasi, Imeta and Mukamba took 9.68 seconds, 9.72 seconds, 9.88 seconds and 9.77 seconds respectively. If an average of 0.65 seconds is spent on each baton exchange, calculate the time they completed the race if the race started at 11:59:32 am **(3 marks)**

14. Form the three inequalities that satisfy the given region **R** **(3 marks)**



15. Points $X(-4,1)$ and $Y(-2,-2)$ are mapped onto $X'(2,11)$ and $Y'(8,2)$ by enlargement. Find the scale factor and the centre of enlargement. **(4 marks)**

16. The figure below shows a forest sanctuary drawn on a square grid of side 1 cm.



(a) Calculate the area of the forest in cm^2 **(2 marks)**

(b) Given that the forest sanctuary covers an area of 6960000 ares. Determine the linear scale used as ratio. **(2 marks)**

SECTION II (50 marks)

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

17. In a mathematics test, 48 students scored the following marks:

89	75	56	90	68	74	85	69
70	86	55	87	75	83	70	90
88	75	96	84	71	71	90	74
87	84	58	43	65	70	98	93
62	86	56	64	80	73	69	59
74	56	60	80	84	89	63	40

(a) Using a class width of 10 and starting with the smallest mark recorded, make a frequency distribution table for the data. **(2 marks)**

(b) State the modal **frequency** **(1 mark)**

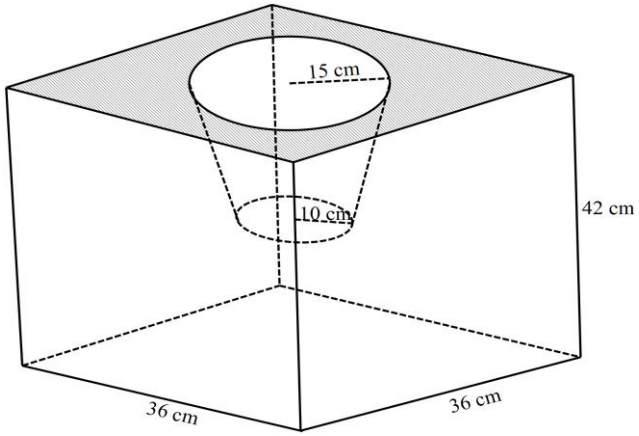
(c) Using the frequency distribution table in (a) above, calculate:

(i) the mean mark. **(3 marks)**

(ii) the median mark, correct to 2 decimal places **(2 marks)**

(d) On the grid provided, draw a frequency polygon to represent the above data. **(2 marks)**

18. The figure below is a solid cuboid with a square base of 36 cm and a height of 42 cm. A conical frustum with a vertical height of 12 cm is drilled. The top and the bottom radii of the frustum is 15 cm and 10 cm respectively. (Use $\pi = 3.142$)



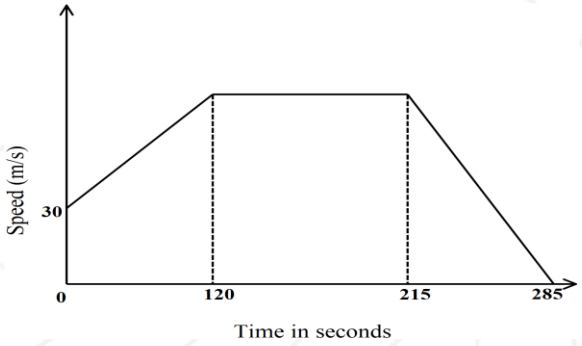
a) Calculate the slant height of the frustum. **(2 marks)**

b) Calculate:

(i) The total surface area of the solid. **(5 marks)**

(ii) The volume of the solid**.** **(3 marks)**

19. (a)The diagram below represents a speed time graph for a train travelling between two station.



If the distance between two stations is 16050 m, calculate:

(i) the maximum speed attained by the **train** **(3 marks)**

(ii) the distance traveled the last 14 seconds **(2 marks)**

(b) Two towns Nairobi and Kapenguria are 409 km apart. An express bus travelling at an average speed of 60 **km/h** left Nairobi for Kapenguria at 11.25 **a.m** . A car left Kapenguria on the same day for Nairobi at 12.55 **p.m** and met with the bus at 3.07 **p.m** .

(i) Determine the average speed of the car. **(3 marks)**

(ii) Nakuru town lies 160 **km** from Nairobi. How far from Nakuru did the two vehicles meet? **(2 marks)**

20. A line $\mathbf{L}_1$ Passes through points $(-3,2)$ and $(-1,6)$.

(a) Find its equation leaving your answer in the form $y=mx+c$. **(2 marks)**

(b) Find the equation of line $\mathbf{L}_2$ which is a perpendicular bisector of line $\mathbf{L}_1$. Leave your answer in the form $ax+by=c$ where a, b and c are integers. **(3 marks)**

(c) Line $\mathbf{L}_3$ is parallel to line $\mathbf{L}_1$ and passes through point $(6,5)$. Given that $\mathbf{L}_3$ intersects line $\mathbf{L}_2$ at point $\mathbf{Q}$, find the equation of $\mathbf{L}_3$ in the form $ax+by+c=0$ where a, b and c are integers **(2 marks)**

(d) Find the coordinates of Q **(2 marks)**

(e) Calculate the acute angle in which line $\mathbf{L}_3$ makes with $x-axis$ correct to 1 decimal place **(1 mark)**

21. (a)Given that matrix $\mathbf{A}=\begin{pmatrix}5 & 8\\ 5 & 6\end{pmatrix}$, find $\mathbf{A}^{-1}$ **(2 marks)**

(b) Maya bought 25 kgs of sugar and 40 kgs of rice for Ksh. 11400 from a wholesale. Wanjiku bought twice the amount of sugar Maya bought and 60 kgs of rice from the same wholesale and spent Ksh. 8200 more than Maya. Taking x to represent the price of one kg of sugar and y to represent the price of one kg of rice:

(i) Form two simplified equations representing the above information. **(1 mark)**

(ii)Use matrix method to determine the price of each item. **(4 marks)**

(c) The following month, the price of sugar increased in the ratio $5:4$ while that of rice increased by 25%. Use matrix method to determine Maya's expenditure for this month if she bought the same quantities of sugar and rice. **(2 marks)**

(d) Hence find the percentage increase on Maya's expenditure. **(1 mark)**

22. Four booster stations P, Q, R and S of a Telkom company are located in different parts of Lodwar county. Booster Q is 56 km on a bearing of 315^0 from booster P while booster R is 84 km directly south of Q. Given that booster S is on a bearing of 062^0 from R and directly East of P.

(a) Draw a scale diagram to represent the relative positions of the boosters. (1 cm rep 10 km) **(4 mrks)**

(b) Using the scale diagram in (a) above; find the bearing and the distance of S from Q. **(2 marks)**

(c) Another booster T is to be installed at a point equidistance from P and S and directly East of Q locate the position of booster T. **(2 marks)**

(d) Find the bearing and distance of Booster P from T **(2 marks)**

23. (a) In the beginning of the year 2020, the size of Chalbi desert in Marsabit was approximately 75800 ha. The county government supported a tree planting exercise whose target was to reduce the size of the desert by 3.5% p.a. Determine the size of the desert at the end of the year 2025 to the nearest hectares. **(3 marks)**

(b) In the beginning of the year 2020, the forest cover in Baringo county was approximately 45000 ha. The county government supported a tree planting exercise aimed at increasing the forest cover by 2% every 3 months. Determine the size of the forest cover to the nearest hectares by the end of the year 2025 **(3 marks)**

(c) Find the number of years at which the forest cover in Baringo county will be equivalent to Chalbi desert in the year 2025 rounded off to the nearest 100 ha in (a) above**.** **(4 marks)**

24. $y=2x^3+px+d$ is the equation of a curve that passes through $(0, -15)$ and its gradient at $x=2$ is 22.5.

a) Determine the values of p and d **(3 marks)**

(b) Determine the turning points and hence the nature of each stationary point. **(5 marks)**

b) Sketch the curve **(2 marks)**

KCSE 2024 FINAL PREDICTION

EXPECTED EXAM 6

101/2

MATHEMATICS

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Instructions to candidates

*(a) Write your **name**, **admission** number and **school** in the spaces provided above.*
(b) Sign and write the date of the examination in the spaces provided above.
*(c) The 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) 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 calculations, giving your answers at each stage in the spaces below each question.***
(g) Marks may be given for correct working even if the answer is wrong.
*(h) **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

For Marking Schemes Contact 0746 222 000 / 0742 999 000

SECTION I (50 marks)

*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√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 $0^0 \leq x \leq 360^0$ **(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)**

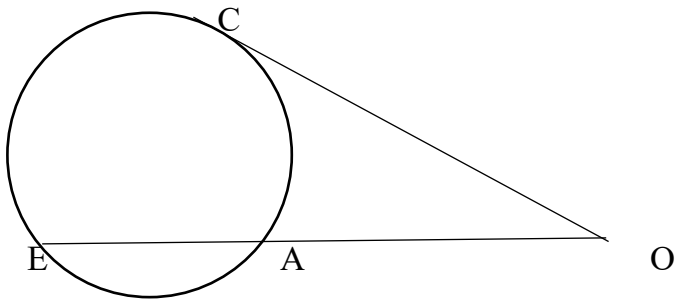
b) On the locus of P in (a) above, mark point T such that T is equidistant from M and N. **(2mks)**

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

$y=x^3+6x^2+$**8*x*** **(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)

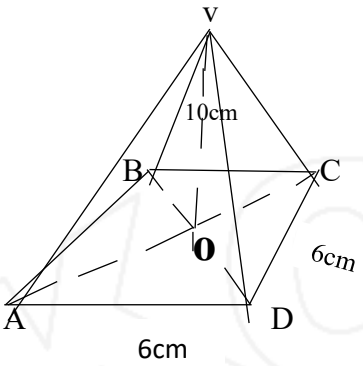
b) Use your graph to estimate the roots of the equations

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)**

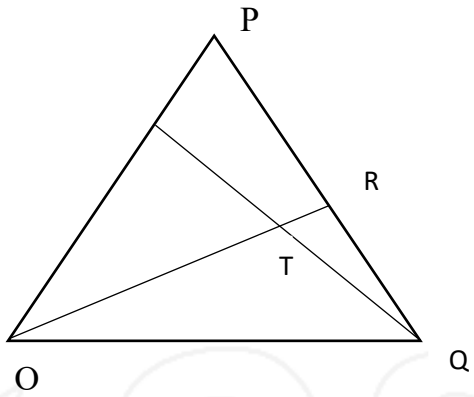
ii) The rate of interest r. **(2mks)**

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 $\overrightarrow{OS} = \frac{3}{4}\overrightarrow{OP}$ and $\overrightarrow{PR}$: $\overrightarrow{RQ}$= 2:1. Lines OR and SQ meet at T.



a) Given that $\overrightarrow{OP}$= **p** and $\overrightarrow{OQ}$ = **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 FINAL PREDICTION

EXPECTED EXAM 7

121/1

MATHEMATICS

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… SIGN……

INDEX NO…… ADM NO……

(Kenya Certificate of Secondary Education)

INSTRUCTIONS TO CANDIDATES

1. Write your name, Adm. No. and class in the spaces provided at the top of this page.
2. The paper contains two sections: Section **I** and **II.**
3. Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
4. Marks may be given for correct working even if the answer is wrong.
5. Non-programmable silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.

Section I **FOR EXAMINER'S USE ONLY**

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 1
(ANSWER ALL QUESTIONS IN THIS SECTION)

1. The difference between two numbers is 4 and their product is 165. What is the sum of their reciprocals **(4 marks)**

2. Solve for x and y in the equation:

$4^x(27)^y = 72$ **(2 marks)**

3. Simplify completely**:** **(4 marks)**

$\frac{1}{x-5} - \frac{x+6}{2x^2-9x-5}$

4. Equal squares as large as possible are ruled off on a rectangular board 54cm by 78cm. find the number of those squares **(3 marks)**

5. A regular polygon has an interior angle of 150° and a side of length 10cm.

(a) find the number of sides the polygon has **(1 mark)**

(b) Find the area of the polygon **(3 marks)**

6. The line passing through the points P (5, b) and Q (2, 3) is perpendicular to the line 4y + 3x = 1. Determine the value of b **(3 marks)**

7. Solve the simultaneous equations below by matrix method **(4 marks)**

$\text{Log}_2(2x + 5y) = 4$

$\text{Log}_{17}(3x + 4y) = 1$

8. The cost of a pair of shoes was Ksh. 800. A dealer raised the price by 10% and later reduced it by 20%. What is the current price of the pair of shoes **(2 marks)**

9. Given that $\sin\propto = \frac{\sqrt{5}}{3}$, where $\propto$ is an acute angle, find without using mathematical tables:

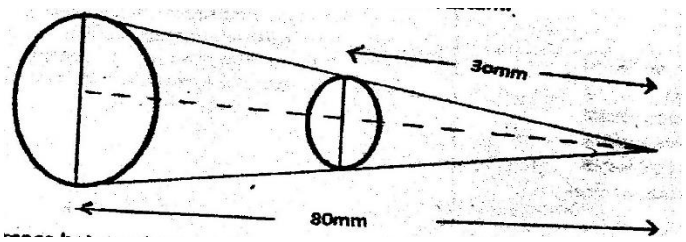
(a) $\tan^2 \propto - \sin^2 \propto$ **(2 marks)**

(b) $\sin(90 - \propto)°$ **(1 mark)**

10. Given that position vector OT = $\begin{pmatrix} 1 \\ -4 \end{pmatrix}$ and the column vector TN = $\begin{pmatrix} 7 \\ 10 \end{pmatrix}$, find the position vector ON **(2 marks)**

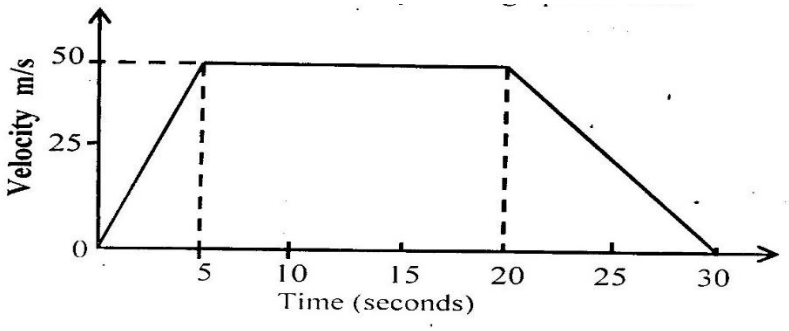
11. A pupil stands 20m away from a flag post. The angle of elevation of the top of the post is 30°. Find how far he has to walk towards the post for the angle of elevation to be 82°. (Assume the ground between him and the post is flat. Give the answer to one decimal place **(3 marks)**

12. A cone 80mm high has mass 7Kg. A frustrum of this cone is formed by cutting off the top 30mm of the cone as shown below. Find the mass of the frustrum **(4 marks)**



13. 10 million shillings was shared by three brothers. Salat got ¼ . Kipgwen got ½ . While Sang' got $\frac{1}{5}$. The remainder was donated to a children home. How much was donated to children home **(3 marks)**

14. The figure below is a velocity – time graph for a car.



Find the total distance travelled by the car **(2 marks)**

15. Find the integral values of x which satisfy the compound inequality **(3 marks)**
$3x - 2 \leq 8 + 5x > 12 + 6x$

16. Using a ruler and a pair of compasses only,

(a) Construct triangle ABC in which BC = 8cm, angle ABC= 112.5° and angle BAC = 45° **(2 marks)**

(b) Drop a perpendicular from A to meet CB produced at P. Measure length AP and find the area of the triangle ABC **(2 marks)**

SECTION II (50 marks)

Answer **only five** questions in this Section

17. A swimming pool is 20m by 12m and it slopes gently from a depth of 1m at the shallow end to a depth of 3m at the deep end.

(a) Calculate the volume of water in the swimming pool (in m^3) when it is full. **(3 marks)**

(b) If the swimming pool is to be drained by a pump which removes water at the rate of $2.5m^3$ per minute, how long will it take this pump to drain the swimming pool it was full? Give your answer in hours **(3 marks)**

(c) If the sides of the swimming pool and the floor are to be covered with square tiles of side 20cm, find to the nearest 100, the number of tiles required **(4 marks)**

18. The position vectors of A, B and C are A = 3i -2j, B = - 6i+4j and c = -9i -3j.

(a) State the column vectors

(i) AB **(2 marks)**

(ii) CB **(2 marks)**

(b) Find the distance from A to C **(2 marks)**

(c) Find the coordinates of the midpoint of AC **(2 marks)**

(d) If C' is the image of C under translation vector $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$ find the coordinates of C' **(2 marks)**

19. The points A'B'C' are the images of A(4,1) B(O,2) and C(-2,4) respectively under a transformation represented by the matrix m = $\begin{pmatrix} 1 & 1 \\ 2 & 3 \end{pmatrix}$

(a) Write down the coordinates of A'B'C' **(3 marks)**

(b) A"B"C" are the images of A'B'C' under another transformation whose matrix

N = $\begin{pmatrix} 2 & -1 \\ 1 & 2 \end{pmatrix}$. Write down the co-ordinates of A"B"C" **(3 marks)**

(c) Transformation M followed by N can be replaced by a single transformation P. Determine the matrix for P **(2 marks)**

(d) Determine the inverse of matrix P **(2 marks)**

20(a) Find the equation of a straight line which is perpendicular to 3y – 5x = 5 and passes through the point of intersection of the lines 2x + y = 5 and x – 2y = 0 **(5 marks)**

(b) A straight line y = $^2/_3\,x - \frac{2}{3}$ meets the x axis at point T.

(i) Determine the coordinates of T **(2 marks)**

(ii) Determine the acute angle between the line y = $\frac{2}{3}x - {}^2/_3$ and x – axis **(2 marks)**

(iii)Find the y –intercept of line y = $^2/_3\,x - {}^2/_3$ **(1 mark)**

21. Bujumba secondary school intends to buy a certain number of chairs for Ksh. 16200. The supplier agreed to offer a discount of Ksh. 60 per chair which will enable the school to get 3 chairs more. Taking y as the originally intended number of chairs.

(a) Write an expression in terms of y for:

(i) Original price per chair **(1 mark)**

(ii) Price per chair after discount **(1 mark)**

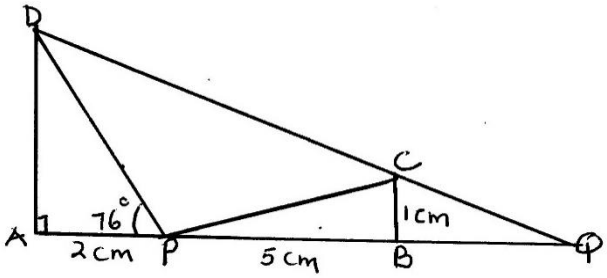
(b) Determine:

(i) The number of chairs the school originally intended to buy **(4 marks)**

(ii) Price per chair after discount **(2 marks)**

(iii) The amount of money the school would have saved per chair if it got the intended number of chairs at a discount of 15%. **(2 marks)**

22. The figure ABCD is a quadrilateral in which AB=7cm, angle DAB = angle ABC = 90°. Angle APD = 76°. Point P lies on AB such that AP = 2cm and PB is 5cm. length BC=1cm. AB produced meets DC produced at Q.



Calculate to one decimal place

(a)The length AD **(1 mark)**

(b) The size of angle CPD **(2 marks)**

(c) The area of quadrilateral ABCD **(2 marks)**

(d) The length BQ **(2 marks)**

(e) The area of triangle CDP **(3 marks)**

23. Andai recorded data on observation of time spent by a local university's first year bachelor of commerce students in the library as follows:

Time spent in minutes	11-20	21-30	31-40	41-50	51-60
Cumulative frequency	70	170	370	470	500

Calculate:

(a) The mean **(4 marks)**

(b) The median **(3 marks)**

(c) On the grid provided, draw a frequency polygon from this data **(3 marks)**

24. The displacement S metres of a moving particle after t seconds is given by $S = 2t^3 - 5t^2 + 4t + 3$.

Determine:

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

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

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

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

KCSE 2024 FINAL PREDICTION

EXPECTED EXAM 7

121/2

MATHEMATICS

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

(Kenya Certificate of Secondary Education)

INSTRUCTIONS TO CANDIDATES

1. *Write your name and Index number in the spaces provided at the top of this page.*
2. *The paper contains two sections: Section I and II.*
3. *Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.*
4. *Marks may be given for correct working even if the answer is wrong.*
5. *Non-programmable silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.*

Section I — FOR EXAMINER'S USE ONLY

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

1. Use logarithms to evaluate **(4mks)**

$$\sqrt[3]{\frac{24.36 \times 0.066547}{1.48^2}}$$

2. Express the following in surd form and simplify by rationalizing the denominator **(3mks)**

$$\frac{1}{cos60° - sin45°}$$

3. Make q the subject of the formula **(3mks)**

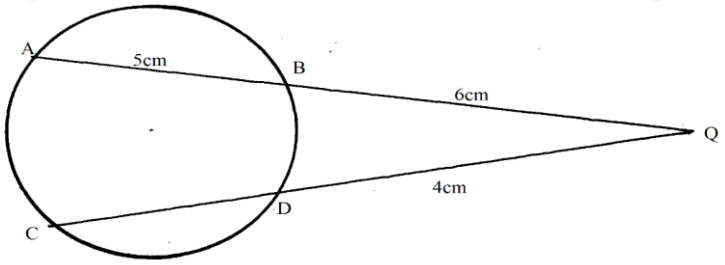
$$P = \sqrt[3]{\frac{nq-m}{q}}$$

4. Without using logarithms tables or calculator evaluate **(3mks)**

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

5. The volume V of a cylinder varies jointly as its height, (h) and the square of its radius, (r), calculate the percentage increase in its volume V, when radius increases by 5% and height, h increases by 10%. **(3 mks)**

6. Chords AB and CD in the figure below intersects externally at Q. If AB=5cm BQ=6CM and DQ=4cm, calculate the length of chord CD **(2mks)**



7. Jane can do a piece of work in 4 days while Mary can do the same piece of work in 7 days. Mary and Jane did the job together for two days before Jane fell sick. Mary was left to complete the job. How long did it take to do the job **(3mks)**

8. Solve the equation below in the range $\theta \leq x \leq 180°$ **(3mks)**

$2 \sin (3x+10) = -1.674$

9. Expand and simplify $(3x - y)^4$ hence use the first three terms of the expansion to approximate the value of $(6 - 0.2)^4$ **(3mks)**

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

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

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

13. Use matrix method to determine the co-ordinates of the point of intersection of the two lines. **(3mks)**

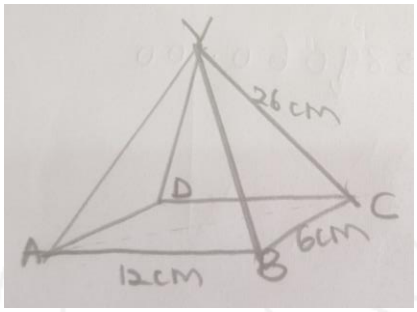
$3x-2y=13$

$2y+x+1=0$

14. The sum of two numbers is 9. The sum of the square of the number is 41. Find the numbers **(4 Marks)**

15. Draw a line DF=4.6cm. Construct the locus of a point K above DF such that the angle DKF=90°, **(3mks)**

16. A right pyramid has a rectangular base of 12 cm by 16cm. its slanting lengths are 26 cm. Determine: (a) The length of AC **(1 mk)**



(b) The angle AV makes with the base ABCD. **(2 mks)**

SECTION II (Answer only five questions)

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

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

ii. The common difference of the progression **(2mks)**

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

18. A′(−6,0), B′(−2,−3) and C′(−2,0) are the vertices of the image of triangle ABC under a transformation described by the matrix **M**=$\begin{pmatrix} 1 & -2 \\ 0 & 1 \end{pmatrix}$

(a) Determine the coordinates of triangle ABC **(3 marks)**

(b) (i) On the same grid, draw triangles ABC, A′B′C′ **(2 marks)**

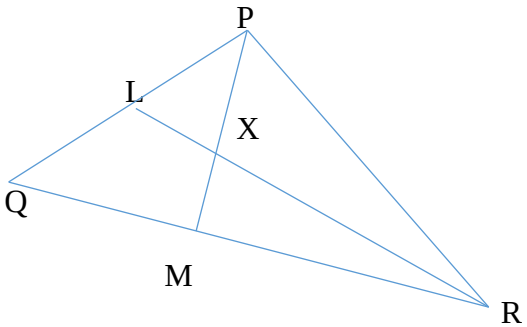
(ii) Describe fully the transformation **M** **(1 mark)**

(c) Triangle A″B″C″ is the image of triangle A′B′C′ such that A″(0,6), B″(6,2) and C″(0,2)

(i) Draw triangle A″B″C″on the same axes **(1 mark)**

(ii) Find a single matrix of transformation that maps triangle ABC onto triangle A″B″C″ **(3 marks)**

19. 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 = $\tilde{\boldsymbol{b}}$ and PR = $\tilde{\boldsymbol{c}}$



Q L m XP R

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

i) QR **(1 mark)**

ii) Pm **(1 mark)**

iii) RL **(1 mark)**

b) By taking PX = kPm and RX = hRL 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 constants h and k. **(6 marks)**

c) Determine the ratio LX : XR. **(1 mark)**

20. The curve given by the equation y = x^2 +1 is defined by the values in the table below.

a) Complete the table by filling in the missing values.

X	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
Y	1.0		2.0		5.0		10.0		17.0		26.0		37.0

b) Sketch the curve for y = x^2 + 1 for $0 \leq x \leq 6$

c) Use the mid-ordinate rule with 6 ordinates to find the area of the region bounded by the curve y = x^2 + 1, the axis the lines x = 0 and x = **6** **(2mk)**

d) Use method of integration to find the exact value of the area of the region in (C) above. **(2mk)**

e) Calculate the percentage error involved in using the mid- ordinate rule to find the area. **(2mk)**

21. The table below shows the taxation rates for income earned.

Income in Ksh p.m	Tax rates %
1 – 9680	10
9681 – 18800	15
18801 – 27920	20
27921 – 37040	25
Excess over 37041	30

In that year, Mr. Hamisi paid a net tax of KSh. 5,512 per month. He gets a house allowance of KShs. 10,000, medical allowance of KShs. 2400 and acting allowance of KShs. 2820 per month. He was entitled to a monthly personal relief of KShs. 1162. He has a life insurance policy for which he pays a monthly premium of KSh. 1,500 and claims a relief at a rate of 10% of the premium paid per month. The following deductions also made every month.

(i) N.H.I.F. KSh. 320

(ii) Co-operative society shares KSh. 6000

(iii) Union dues KSh. 200

(a) Calculate Mr. Hamisi's monthly basic salary in KSh. **(7 Marks) (b)** Calculate his net monthly salary. **(3 Marks)**

22. The table below gives the marks obtained in a mathematics test by 47 students.

Marks	41-45	46 -50	51-55		61-65	66-70
No. of students	3	7	14	13	7	3

a) (i) Fill in the missing class **(1mark)**

(ii) State the modal class ***(1 mark)***

(b) Draw a cumulative frequency curve to represent the above data. **(3 marks)**

(c) Use your graph to estimate

(i) Median ***(1 mark)***

(ii) Lower quartile ***(1 mark)***

(iii) Upper quartile ***(1 mark)***

(d) Calculate the quartile deviation ***(2 marks)***

23. An aircraft leaves town P (30^oS, 17^oE) and moves directly towards Q (60^oN, 17^oE). 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. **(2 marks)**

b) The position of town R. **(4 marks)**

c) The local time at R if local time at Q is 3.12p.m **(2 marks)**

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

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

(a) Write down in terms of x and y all the inequalities representing the information above. ***(4 marks)***

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

(c) Given that type G costs Ksh500 per shirt and type B costs Ksh. 300 per shirt

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

(ii) Determine the maximum profit ***(1 mark)***

KCSE 2024 FINAL PREDICTION

EXPECTED EXAM 8

121/1

MATHEMATICS

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)**

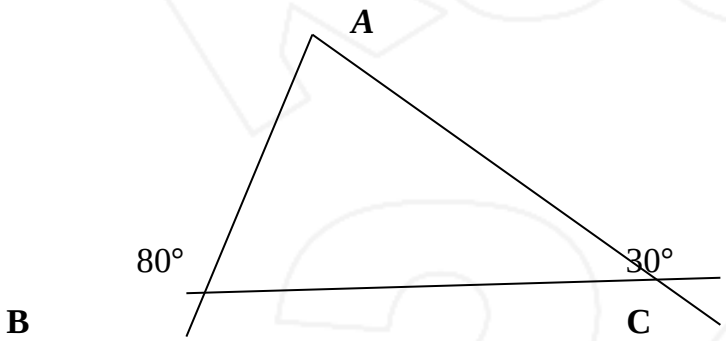
$$\frac{2\frac{1}{2}\ of\ 1\frac{3}{4} - 5\frac{1}{4}}{1\frac{2}{5} + 2(1\frac{1}{4} - 2\frac{3}{4})}$$

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)**

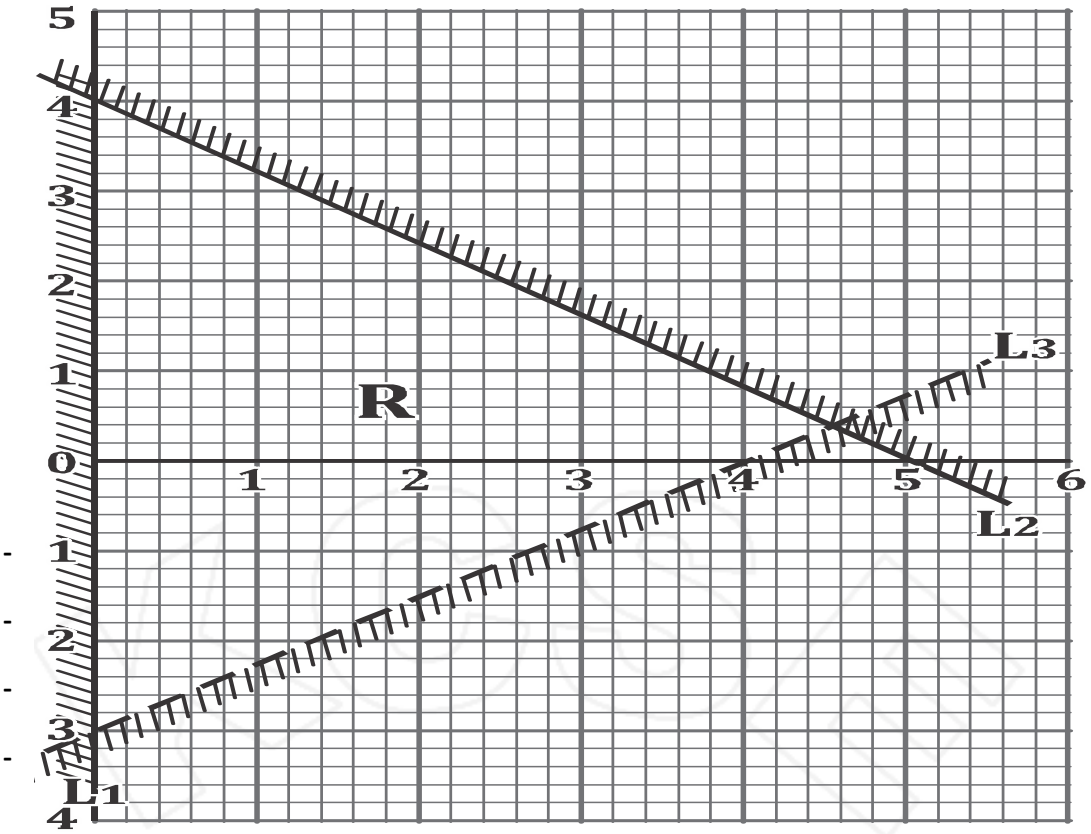
7. Find the obtuse angle the line with equation 2y+5x+2=0 makes with the x-axis**.** **(3mks)**

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 **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

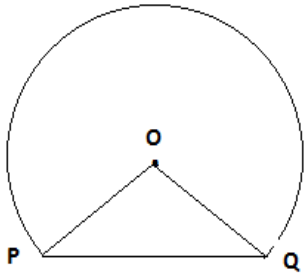
a) Prepare a frequency distribution table using a class interval of 10 starting from 21-30 **(3mks)**

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)**

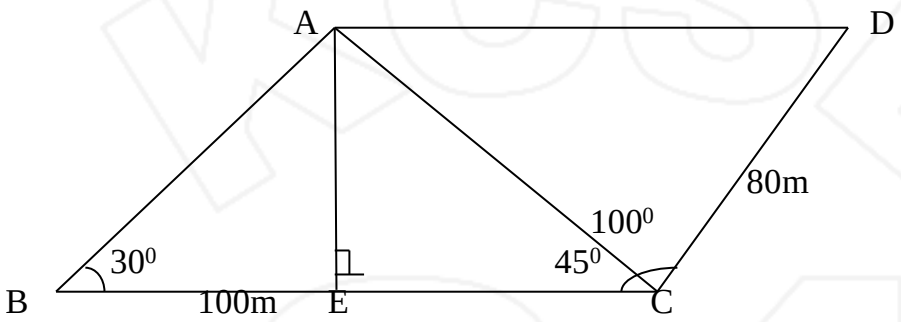
(b) In the parking lot at night, a third of the petrol was stolen.

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:

h) 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 FINAL PREDICTION

EXPECTED EXAM 8

121/2

MATHEMATICS

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 1 (*50 marks*)

Answer all the questions in this section in the space provided

1. Find without using tables or a calculator, the values of x which satisfy the equation**;(3mks)**

$\log_3 (x^2 - 9) = 2 \log_3 3+1$

2. Construct rectangle ABCD in which AB = 4cm and BC = 3cm. Inside the rectangle construct the locus of point L_1 which is 3cm from A. Locus of L_2 which is equidistant from the line AB and AD and locus of L_3which is 2cm from line AB**.** **(4mks)**

3. Make q the subject of the formula **(3mks)**

$\sqrt[3]{\frac{nq-m}{q}}$

4. Under transformation represented by a matrix $\begin{pmatrix} 5x & 2 \\ -3 & x \end{pmatrix}$ a triangle of area 10cm^2 is mapped onto a triangle whose area is 110cm^2. Find x**;** **(3mks)**

5. Simplify; **(3mks)**

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

6. If $\frac{1}{3-\sqrt{5}} - \frac{2 + 2\sqrt{5}}{3+\sqrt{5}} = a + b\sqrt{c}$, find the value of a b and c**.** **(3mks)**

7. Find the radius and centre of a circle whose equation is $x^2 + 4x + y^2 - 8y + 11 = 0$. **(3mks)**

8. (a) Expand $(1 - 2x)^4$; **(2mks)**

(b) Use the first four terms of your expansion in (a) above to find the values of $(0.99)^4$; **(2mks)**

9. The cash prices of a bed is Kshs 6,500. A man buys it on hire purchase by making a down payment of Ksh 2,300 followed by 12 monthly instalments of Kshs 490. Calculate the rate of carrying charge per month. **(3mks)**

10. Tap A takes 4 minutes to fill a tank and tap B takes 6 minutes to empty the tank. If the tank has a capacity of 3000litres, find the volume of the tank after 2 minutes when both taps are open. **(3mks)**

11. Determine the amplitude, period and phase angle of the curve $y=5 \sin (3x - 120)^o$; **(3mks)**

12. The gradient function of a curve is given by $\frac{dy}{dx} = 3x^2 - 8x + 2$. If the curve passes through the (2 -2) find its equation; **(3mks)**

13. Two brands of coffee Arabica and Robusta cost Kshs 4700 and 4200 per kilograms respectively, are mixed to produce a blend that cost Kshs 4,600 per kilograms. Find the ratio of the mixture. **(3mks)**

14. Find the number of terms that will give a sum of 800 in the series; **2mrks**

2 + 6 + 10 ……..

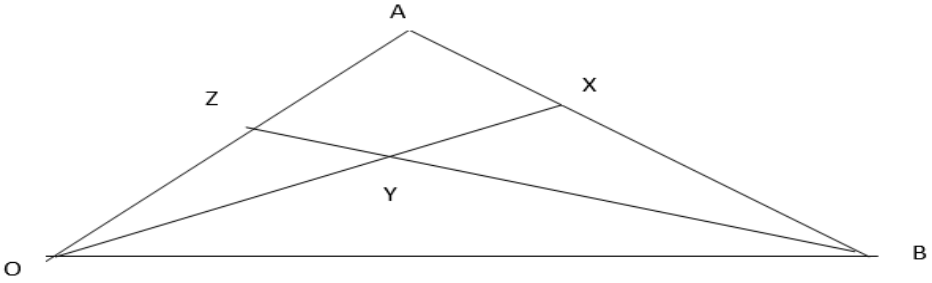
15. An aircraft flies 600nm northward from a point P on the equator, along the meridian to Q. It then flies 2400km eastwards along the circle of latitude to R. If the longitude of P is 50^{o}E, Calculate the latitude and longitude of R (Take the radius of the earth to be 6370 km) **(4mks)**

16. Kiptanui earned Kshs 350,000, Kshs 420,000 and Kshs 504,000 in 2012, 2013 and 2014 respectively. How much will he earn in 2017? **(3mks)**

SECTION II: (50 MARKS)

Answer only FIVE questions in this section.

17.



In the figure above, O is the origin OA = a and OB = b. The point x is on AB such that 2 AX = XB and y is the mid point of OX.

(a) Find in terms of a and b the vectors;

(i) OX **(2mks)**

(ii) BY **(2mks)**

(iii) BY produced meets OA at z. Given that OZ = h a and BZ = kBY where h and k are constants. Find the values of h and k. **(4mks)**

(iv) Find the position vector OZ and obtain the ratio oz:zn **(2mks)**

18. The second, third and fourteenth terms of arithmetic progression are the three consecutive terms of a geometric progression. The 10^{th} term of the arithmetic progression is 18. Find:

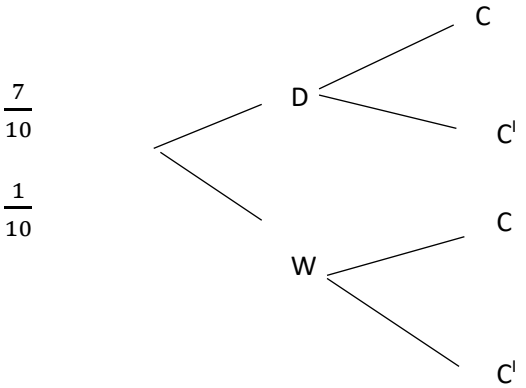
(a) The first term and the common difference of the progression; **(5mks)**

(b) The sum of the first 10 terms of the progression; **(3mks)**

(c) The sixth term of the A.P. **(2mks)**

19. During a certain motor rally it is predicted that the weather will be either dry (D) or wet (W). The probability that the weather will be dry is $\frac{7}{10}$. The probability for a driver to complete (c) the rally during wet weather is $\frac{5}{6}$ during wet weather is $\frac{1}{10}$;

(a) Complete the probability tree diagram given below;



(b) What is the probability that;

(i) The driver completes the rally; **(2mks)**

(ii) The weather is wet and the driver doesn't compete the rally.

(iii) The weather is wet but the driver completes the rally.

(c) Given that the probability of having a puncture on a wet weather at the rally is $\frac{1}{3}$, find the probability that on a wet weather, the rally was completed because the driver did not have a puncture;

20. (a) Complete the table below for the functions, y = sin x and y=2sin (x+30)^o for $0 \leq x \leq 360^o$. **(2mks)**

x^o	0	30	60	90	120	150	180	210	240	270	300	330	360
Sinx	0	0.5	0.87		0.87	0.5	0		-0.87	-1		-0.5	0
2sin(x+30)	1		2	1.73		0	1	-1.73		-1.73	-1	0	1

(b) Draw the graph of y=sinx and y=2sin (x+30)^o on the same grid**.** **(4mks)**

c. i. State the amplitude of the graph y=2sin (x+30)^o **(1mk)**

ii. State the period of the graph y = sin x

(d) Use your graph to solve the equation sin x – 2sin (x+30) = 0**.** **(2mks)**

21. The table below show income tax for a certain year;

Monthly Income in Kshs	**Tax Rate**
0-10164	10%
10165 – 19740	15%
19741 – 29316	20%
29317 – 38892	25%
Over 38892	30%

A tax relief of Kshs 1162 per month was allowed. In a certain month of the year, an employees taxable income in the fifth band was 2108.

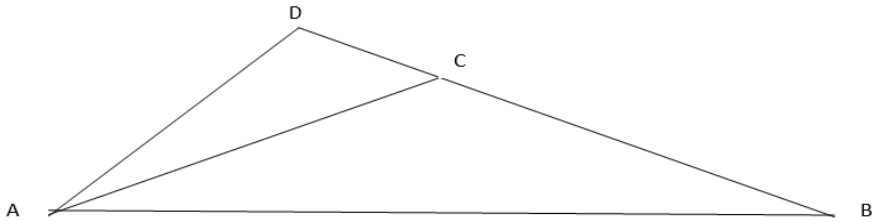
(a) Calculate;

(i) Employees total taxable income in that month; **(2mks)**

(ii) The tax payable by the employees in that month**;** **(5mks**

(b) The employees income include a house allowance of Kshs 15000 per month. The employees contributed of the 5% basic salary to a cooperative society calculate the employees net pay for that month. **(3mks)**

22. In the figure below (not to scale) AB = 8cm, AC = 6cm, AD = 7cm, CD = 2.82cm and angle CAB = 50^o.



Calculate (to 2 decimal places);

(a) The length BC **(2mks)**

(b) The size of angle ABC **(3mks)**

(c) The size of angle CAD **(3mks)**

(d) The area of triangle ACD **(2mks)**

23. (a) After t seconds a particle moving along a straight line has a velocity of Vm/s and an acceleration of $(5 - 2t)m/s^2$, the particles initial velocity is 2 m/s;

(i) Express V in terms of t **(3mks)**

(ii) Determine the velocity of the particle at the beginning of third second **(2mks)**

(b) Find the time taken by the particle to attain maximum velocity and the distance it covered to attain the maximum velocity. **(5mks)**

24. In an agricultural research stations, the lengths of a sample of leaves were measured and recorded as shown in the frequency distribution table below;

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

(a) State the modal class **(1mks)**

(b) Calculate the median (4dp) **(3mks)**

(c) Using an assumed mean of 5.2, find:

(i) Mean (4dp) **(3mks)**

(ii) Standard deviation (4dp) **(3mks)**

KCSE 2024 FINAL PREDICTION

EXPECTED EXAM 9

121/1

MATHEMATICS

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 class in the spaces provided above.
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) All working and answers must be written on the question paper in the spaces provided below each question.
e) Marks may be awarded for correct working even if the answer is wrong.
f) Negligent and slovenly work will be penalized.
g) Non-programmable silent electronic calculators and mathematical tables are allowed for use.

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)

Attempt All Questions in this section

1. Find the value of y given that **(3 marks)**

$$\frac{-2(5+3)-9\div 3+5}{-3\times -5y+2y\times 4}=1$$

2. The length of a minute hand of a clock is 3.5cm. What will be the time if from 10.15am it sweeps through an area of 19.25cm^2? **(4marks)**

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

$$\sqrt{\frac{1}{24.56}+4.346^2}$$ **(3marks)**

4. Given that sin $(90\text{-}x)^0$ =0.8, where x is an acute angle, find without using mathematical table the value of 2 tan x+cos(90-x) **(3marks)**

5. Find the equation of the tangent and the normal to the curve $y=2x^3-3x^2+6$ at the point (2,10) **(4marks)**

6. Simplify $\frac{2y^2+3xy-2x^2}{x^2-4y^2}$ **(3marks)**

7. Find greatest integral value of x which satisfies

$$\frac{2x+3}{2}<\frac{8-3x}{5}<\frac{5x+6}{3}$$ **(3marks)**

8. One of the roots of the equation $x^2+(k+1)x+28=0$ is 4. Find the values of k and hence the second root **(4marks)**

9. Solve for x in the following without using a calculator or mathematical table.

$9^x\left(27^{(x-1)}\right)=\tan 30^o$ **(3marks)**

10.A shear parallel to the x-axis maps point (1, 2) onto a point (5, 2). Determine the shear factors and hence state the shear matrix (invariant line is y=0) **(3marks)**

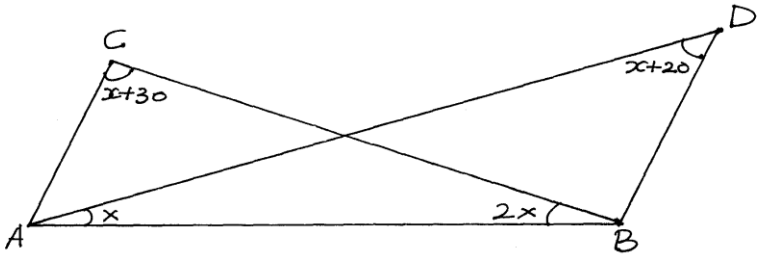
11.A solid is in the shape of a right pyramid on a square base on side 8cm and height 15cm. A frustum whose volume is a third of the pyramid is cut off. Determine the height of the frustum. **(3 marks)**

12. The interior angle of a regular polygon is 20^o more than three times the exterior angle. Determine the number of sides of the polygon **(2marks)**

13. Three fifths of work is done on the first day. On the second day $\frac{3}{4}$ of the remainder is completed. If the third day $\frac{7}{8}$ of what remained id done, what fraction of work still remain to be done. **(3marks)**

14.A two-digit number is such that the sum of the digits is ten. If the digits are reversed, the new number formed is less than the original number by 18. Find the number **(3marks)**

15. In the figure bellow, $\angle$CBD= 2$\angle$CAD. Find the value of x **(3marks)**



16. Two boys, Ababu and Chungwa, on the same side of a tall building are 100m apart. The building and the two boys are in a straight line and the angles of elevation from the boys to the top of the building are 30^o and 20^o respectively calculate the height of the building. **(3marks)**

SECTION II (50 MARKS)

Attempt only five Questions from this section

17. A business lady bought 100 quails and 80 rabbits for sh25600. If she had bought twice as many rabbits as half as many quails she would have paid sh7400 less. She sold each quail at a profit of 10% and each rabbit at a profit of 20%.

a) Form two equations to show how much she bought the quails and the rabbits. **(2marks)**

b) Using matrix method, find the cost of each animal. **(5mrks)**

c) Calculate the total percentage profit she made from sale of the 100 quails and 80 rabbits. **(3marks)**

18. A(3,7) B(5,5), C(3,1), D(1,5) are vertices of a quadrilateral

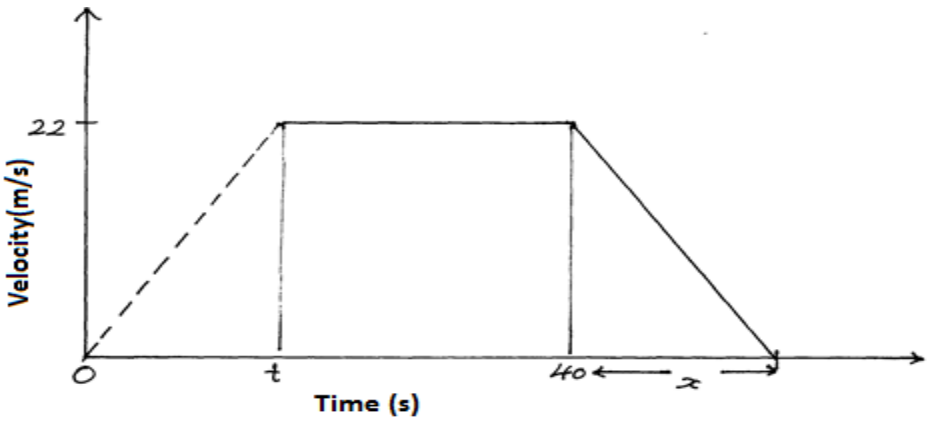
a) On the grid provided below, plot ABCD on a Cartesian plan **(2marks)**

b) $A^1B^1C^1D^1$ is the image of ABCD under a translation T $\begin{pmatrix} -6 \\ -9 \end{pmatrix}$ plot $A^1B^1C^1D^1$and state its coordinates **(2marks)**

c) Plot $A^{11}B^{11}C^{11}D^{11}$ the image of $A^1B^1C^1D^1$ after a rotation about (-1,0) through a positive quarter turn. State its coordinates. **(3marks)**

d) $A^{111}B^{111}C^{111}D^{111}$ is the image of $A^{11}B^{11}C^{11}D^{11}$ after a reflection in the line y=x+2. Plot $A^{111}B^{111}C^{111}D^{111}$ and state its coordinates **(3marks)**

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



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

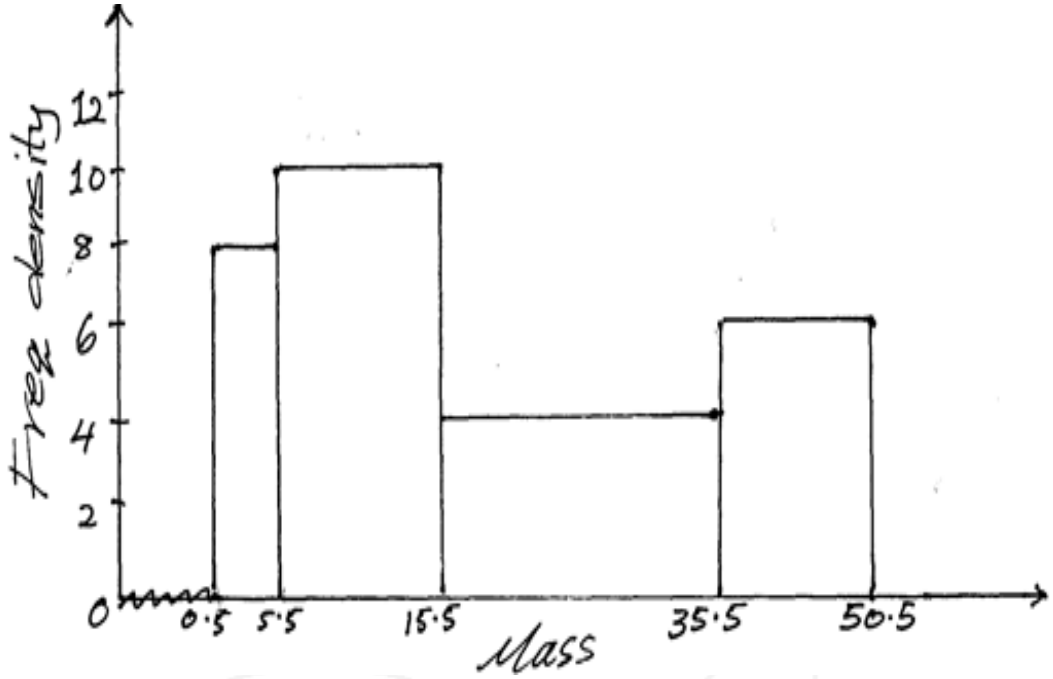
a) The value of t, the acceleration time **(2marks)**

b) The distance travelled during the first t seconds. **(2marks)**

c) The value of x, the deceleration time **(4marks)**

d) The rate of deceleration **(2marks)**

20. The diagram below shows a histogram representing the mass of some pupil in a school.



a) Prepare a frequency distribution table of the data **(3marks)**

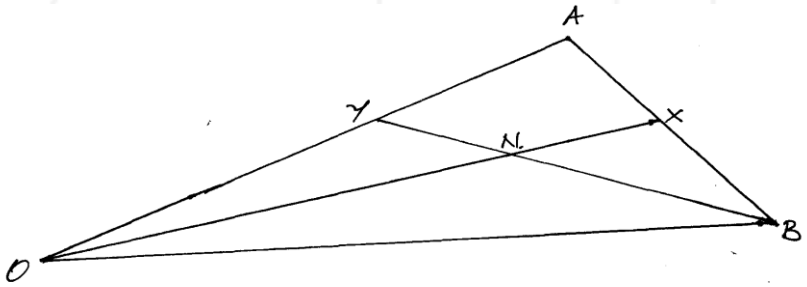
b) From the table above, estimate

i) The mean mass of the pupils to 3 s.f **(3marks)**

ii) The median mass **(3marks)**

iii)How many pupils were 40kg and above **(1marks)**

21. In the figure below **OY**:**YA**=1:3 AX:XB=1:2 **OA**=$\underset{\sim}{a}$ and **OB**= $\underset{\sim}{b}$. N is the point of intersection of **BY** and **OX**



a) Determine

i) **OX** **(2marks)**

ii) **BY** **(1mark)**

b) Give that $\vec{BN} = k\vec{BY}$ and **ON**=hOX, express $\vec{ON}$ in two ways in terms of $\underset{\sim}{a}$ $\underset{\sim}{b}, h$ and k

(3marks)

c) Find the value of h and k and hence show that O,N and X are collinear **(4marks)**

22. Using a ruler and a pair of compass only, construct triangle XYZ where XY is 6cm and XYZ is 135^o and YZ=7cm **(2marks)**

a) Measure XZ **(1mark)**

b) Drop a perpendicular from Z to meet line XY at K , measure ZK. **(2marks)**

c) Bisect line XY and let the bisector meet line XZ at Q **(1mark)**

d) Join Q to Y and measure angle XQY **(2marks)**

e) Find the area of triangle XYZ **(2marks)**

23. Four towns are situated in such that a way that town Q is 500km on a bearing of 120^o from P. Town R is 240 km on a bearing of 210^o from town P, while town S is due north of town Q and due east of town P

a) Draw a sketch diagram showing the relative position of P,Q,R and S (scale:1cm :100km) **(3marks)**

b) Find by calculation

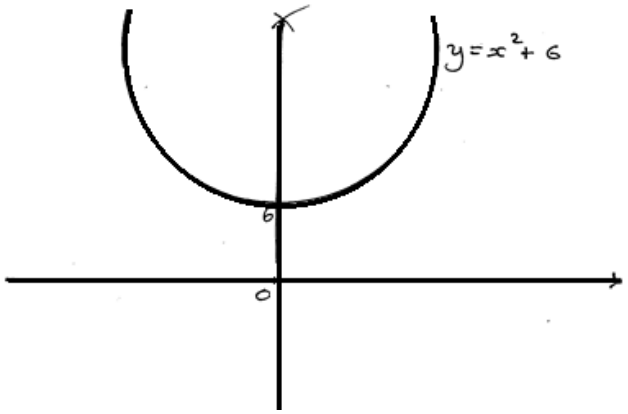
i) The distance QR **(1mark)**

ii) The distance QS **(2marks)**

iii) The angle PRSQ **(2marks)**

iv) The area of triangle PQS **(2marks)**

24. The figure below shows a sketch of the graph of $y = x^2 + 6$.



a) Estimate the area bounded by the curve, the x-axis and the line x =-4 and x=4 using

i) The trapezium rule with 8 sides **(3marks)**

ii) The mid- ordinates rule with and strips **(3marks)**

b) What percentage error is caused by estimating the area of the curve using the mid ordinates rule as in a (ii) above **(4marks)**

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KCSE 2024 FINAL PREDICTION

EXPECTED EXAM 9

121/2

MATHEMATICS

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

(Kenya Certificate of Secondary Education)

INSTRUCTIONS TO CANDIDATES

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

For 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

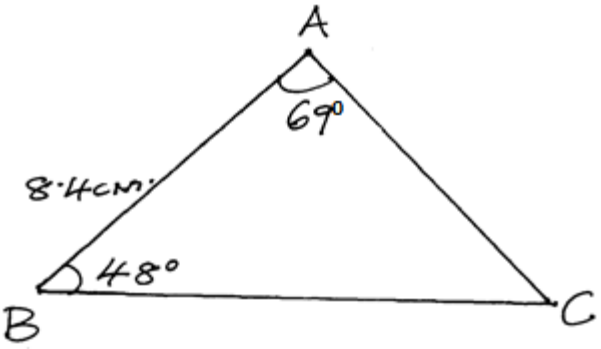
SECTION A (50MARKS)

Answer All Questions in this section

1. The area of a rectangle is 48.4cm^2 and its length is 9.37cm. Calculate the percentage error in width **(3marks)**

2. The base of a triangle is $(3x-2)$cm. The height of the triangle is 5cm shorter than its base. Given that the area of the triangle is 25cm^2. Find length of the base. **(4marks)**

3. Find the area of the triangle shown below **(3marks)**



4. Express the following expression in surd form and simplify by rationalising the denominator

$$\frac{2}{1-\tan 30}$$ **(3marks)**

5. Solve for x in the expression $(\log_2 x)^2 + \log_2 x^3 = 10$ **(3marks)**

6. The table below is part of the tax for monthly income for the year 2007

Monthly income (ksh)	Rate %
Under ksh 10165	10
From 10165 but under ksh19741	15
From 19741 but under ksh29317	20

In that year, John's monthly gross tax was Ksh 2885. Calculate his monthly income **(3marks)**

7. A quantity E is partly constant and partly variaes as square root of F.

i) Write down an equation connecting E and F where K and C are constants respectively.

ii) If F=25 where E=22 and F=49 when E=28. Find the value of K and C **(3marks)**

8.a) Expand $\left(1+\frac{1}{2}x\right)^7$ in ascending power of x **(1mark)**

b) Using the first four times of the expansion in (a) above estimate the value of $\left(1\frac{1}{30}\right)^7$ **(2marks)**

9. Find the number of terms of the series 5+8+11+14+17+…….. that will give a sum of 2183 **(3marks)**

10. Find the inverse of the matrix $M = \begin{pmatrix} 4 & -3 \\ 2 & 1 \end{pmatrix}$ hence find the co-ordinates of the point at which line $4x-3y=4$ *and* $2x+y=7$ intersect **(3marks)**

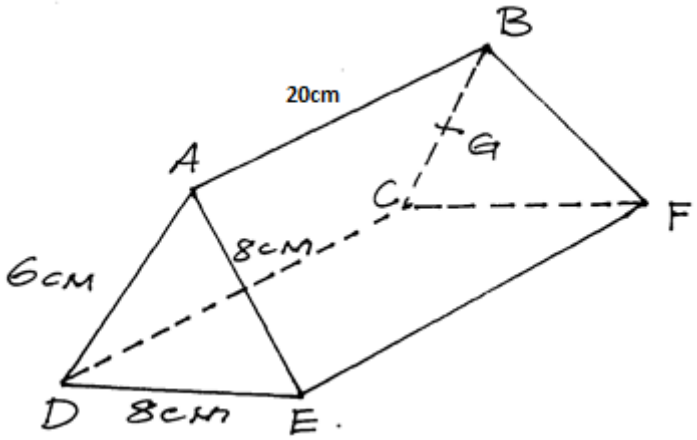
11. A trader mixed grade I, II and III of coffee in the ratio 2:3:5 respectively. Grade I cost Sh650 per kg, grade II costs sh 500 per kg and grade III costs sh 420 per kg.

a) Find the cost of one kg of the mixture **(2marks)**

b) If the trader sold the mixture at a profit of 20% calculate the selling price of 3kg of the mixture **(2marks)**

12. Solve for the equation $4\cos^2 x = 5 - 4\sin x$ for $0^o \le x \le 360$ **(3marks)**

13. The figure below has a cross-section of the prism which is an isosceles triangle of side AE= 8cm, DE= 8cm and AD=6cm, where AB=20cm



a) If G is the mid- point of side BC find

i) GF **(1mark)**

ii) AG **(1mark)**

b) The angle between line DF and plane ABCD **(2marks)**

14.a) Construct triangle PQR in which PQ=QR=5cm and angle PQR=90^o **(2marks)**

b) Draw the locus of S which moves in such a way that it is always on the same side of PR as Q and angle $P\hat{S}R = 45^o$ **(1mark)**

15. Determine the amplitude and period in the function $y = \frac{1}{2}\sin(3x - 60)$ **(2marks)**

16. Two towns P and Q are located on the equator such that P is due east of Q. The distance between the two towns is 1920nm. If the latitude of p is 50^{o}E. Determine the longitude of Q **(3marks)**

SECTION B (50 MARKS)

Answer any five questions from this section

17. The cost of Jane's car at the beginning of year 2000 was sh 750,000. It depreciated in value by 7% per year for the first 3 years, by 8% for the next two years and 11% per year for the subsequent years.

a) Find the value of the car at

i) The start of the year 2003 **(2marks)**

ii) The end of year 2007 **(3marks)**

b) At the beginning of 2008, Jane sold the car through Mary,s dealers at 22% more than its actual depreciated value to Lucy. Taking Mary's sale price as the car's value after depreciation. Find the average monthly rate of depreciation for the 8years. **(5marks)**

18. MNP is a triangle with vertices M,(2,2),N(2,-2) and P(-1,-4). Draw the triangle MNP. **(1mark)**

a) If vertex N(2,-2) is mapped to N^1 (5,-2) by a shear with x-axis invariant, draw triangle $M^1N^1P^1$, the image of triangle MNP under the shear. **(2marks)**

b) Find the matrix that represent the shear in (a) above **(2marks)**

c) A transformation where matrix is $T = \begin{pmatrix} 0 & 1 \\ 1 & 1.5 \end{pmatrix}$ maps triangle $M^1N^1P^1$ onto $M^{11}N^{11}P^{11}$. Draw the triangle $M^{11}N^{11}P^{11}$ **(3marks)**

d) Describe fully a single transformation that maps triangle $M^{11}N^{11}P^{11}$ back onto triangle MNP and give its transformation matrix. **(2marks)**

19. Complete the table below for the equation $y = x^3 - 3x^2 - 5x + 7$ **(2marks)**

x	-3	-2	-1	0	1	2	3	4	5
y	-32		8	7	0		-8		32

b) Draw the graph of $y = x^3 - 3x^2 - 5x + 7$ **(3marks)**

c) Use your graph to estimate the roots of the equation $x^3 - 3x^2 - 5x + 7 = 0$ **(2marks)**

d) Use your graph to solve the equation $x^3 - 3x^2 - 10x + 17 = 0$ **(3marks)**

20. The table below shows marks scored by 40 students in a test

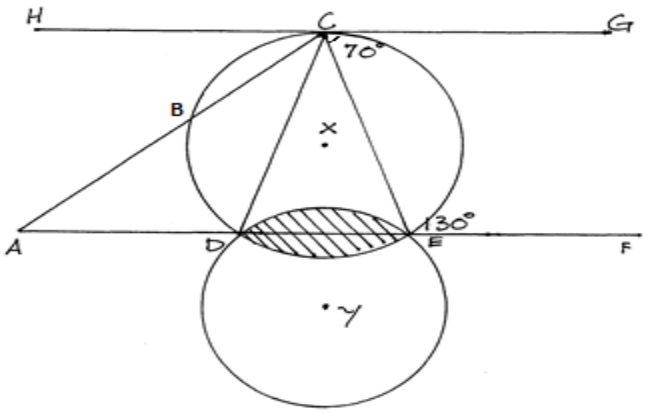
Marks	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90
frequency	1	5	8	12	7	4	2	1

a) Calculate the upper quartile and lower quartile **(4marks)**

b) If 30% of students failed the test, find the pass mark **(3marks)**

c) The pass mark was set at 25 marks. How many students passed the test. **(3marks)**

21.) The diagram below shows two intersecting circles with centres X and Y. HG is a tangent to the circle centre X at C. Angle GCE=70° and angle CEF=130°. Given that CB=5cm, BA=4cm, AE=12cm and radius DY=6cm.



a) Determine

i) Angle DXE **(2marks)**

ii) Length DE **(2marks)**

iii) Angle DYE **(2marks)**

b) Calculate the area of the shaded region (take $\pi = \frac{22}{7}$) **(4marks)**

22.a) Wekesa has two fair tetrahedral solids one red and other green. The faces of red solid are numbered 1to 4 while the faces of green solid are numbered 2,3,5 and 6. He tosses the two solids at the same time and recorded the number that is the bottom face of each solid. If **k** is the number that is at the bottom face of red solid while **t** is the number that is at the bottom face of green solid, find the probability that

i) 2k+t=7 **(1mark)**

ii) (2k+t) is at most 9 **(1mark)**

iii) $2k \geq t$ **(2marks)**

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

i) Has high pressure only **(2marks)**

ii) Has high level of cholesterol only **(1mark)**

iii)Hass high blood pressure and high level of cholesterol **(1mark)**

iv)Has either high blood pressure or high level of cholesterol **(2marks)**

23.A company was contracted to transport 1200 tonnes of sand. The company used type A and type B trucks to do the job. Each type A truck carries 10 tonnes of sand per trip while B curries 15 tonnes per trip. The total number of trips must not be less than 70 and type B truck must make at least twice as many trips as type A truck while the later must make not less than 10trips. Taking x to represent the number of trips made by type A trucks and y to represent the number of trips made by type B trucks

a) Write down all the inequalities representing the above information **(4marks)**

b) Represent the inequality graphically **(4marks)**

c) The company makes a profit of sh2000 per trip made by each type A truck and sh 3000 per trip made by each type B truck.

i) Using a search line, determine the number of trips each type of truck must be made to maximise the profit **(1mark)**

ii) Hence calculate the maximum profit **(1mark)**

24.a) Find the area of the region bounded by the cuver $y = x^3 - x$ and the axes between the point x=-1 and x=1 **(4 marks)**

b) At a certain instant a body is moving in a straight line at 20cm/s. Its acceleration during the first 5seconds of the subsequent motion is (30-6t) cm/s^2 where t is the time in seconds. After 5 seconds it travels with a constant speed. Find

i) Its velocity after 2seconds **(2marks)**

ii) The greatest velocity attained **(2marks)**

iii)The distance travelled in 10 seconds **(2marks)**

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KCSE 2024 FINAL PREDICTION

EXPECTED EXAM 10

121/1

MATHEMATICS

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… SIGN……

INDEX NO…… ADM NO……

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.
*c) This paper consists of **TWO** sections I and II.*
d) Answer ALL questions in section I and any five from section II.
e) All answers and working must be done on the question paper in the spaces provided below each question.
f) Show all the steps in your calculations giving your answers at each stage in the spaces below each question.
g) Marks may be given for correct working even if the answer is wrong.
h) Non-programmable silent electronic calculation and KNEC Mathematical tables may be used.

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)

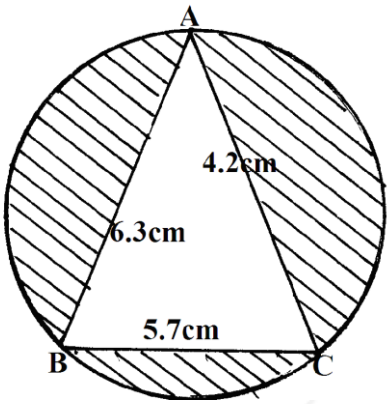
Answer all questions in this section in the spaces provided

1. Without using tables or calculator, evaluate the following. **(3mks)**

$$\frac{-8 + (-13) \times 3 - (-5)}{-1 + (-6) \div 2 \times 2}$$

2. The straight line through the points D (6, 3) and E (3, -2) meets the y – axis at point F. Find the co-ordinates of F. **(3 mks)**

3. The circle below whose area is 18.05cm^2 circumscribes a triangle ABC where AB = 6.3cm,BC = 5.7cm and AC = 4.2cm. Find the area of the shaded part to 2 dp. **(3 mks)**



4. A number n is such that when it is divided by 27, 30, or 45, the remainder is always 3. Find the smallest value of n. **(3 mks)**

5. The actual area of an estate is 3510 hectares. The estate is represented by a rectangle measuring 2.6cm by 1.5cm on the map whose scale is l: n. Find the value of n. (give your answer in standard form) **(3 mks)**

6. Find the obtuse angle the line y – 2x = 7 makes with the x – axis **(2 mks)**

7. Given the column vector $\underset{\sim}{p} = \begin{pmatrix} -5 \\ 3 \end{pmatrix}, \underset{\sim}{q} = \begin{pmatrix} 4 \\ -8 \end{pmatrix}$ *and* $\underset{\sim}{r} = \begin{pmatrix} 6 \\ -9 \end{pmatrix}$ *and* $\underset{\sim}{t} = 2\underset{\sim}{p} - \frac{1}{2}\underset{\sim}{q} + \frac{1}{3}\underset{\sim}{r}$

(i) Express $\underset{\sim}{t}$ as a column vector **(2mks)**

(ii) Calculate the magnitude of vector $\underset{\sim}{t}$ in (i) above correct to two decimal places. **(2mks)**

8. Muthoni went to a shop and bought 50 packets of milk and 25 packets of salt all for Kshs.200.00. She sold the milk at a profit of 28% and the salt at a profit of 24% thereby making a net profit of Kshs.53.50. Find the cost price of a packet of milk and a packet of salt. **(3 mks)**

9. The angles of elevation from two points A and B to the top of a storey building are 48^0 and 57^0 respectively. If AB = 50m and the point A and B are opposite each other; Calculate;

a) The distance of point A to the building **(3 mks)**

b) The height of the building **(1 mks)**

10. Find x if $3^{2x+3} + 1 = 28$ **(2 mks)**

11. Simplify as simple as possible $\dfrac{(4x+2y)^2-(2y-4x)^2}{(2x+y)^2-(y-2x)^2}$ **(3 mks)**

12. The cost of a camera outside Kenya is US$1000. James intends to buy one camera through an agent who deals in Japanese Yen. The agent charges him a commission of 5% on the price of the camera and further 1260 Yen as importation tax. How much in Ksh. Will he need to send to the agent to obtain the camera, given that:- **(3 mks)**

1 US$= 105.00 Yen. 1 US$= Kshs.63.00

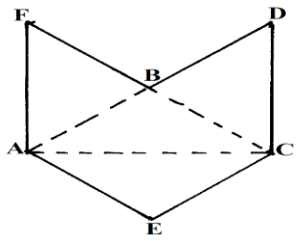
13. State all the integral values of x which satisfy the inequality

$$\frac{3x+2}{4} \le \frac{2x+3}{5} \le \frac{4x+15}{6}$$ **(3mks)**

14. Without using a protractor, construct a triangle ABC such that angle ABC = 135^0, AB = 4.6cm and BC =6.1cm. Measure AC and angle ACB **4 mks)**

15. Without using mathematical tables or calculators, find the volume of a container whose base is a regular hexagon of side $\sqrt{3}$ cm and height $2\sqrt{3}$ cm **(3 mks)**

16. Below is a net of a model of a three dimensional figure. The lengths AB = BC = AC = 6.0cm and lengths AF = FB = BD = CD = CE = AE = 8.0cm.



a) Draw the solid when the net is folded by taking ABC as the base and the height 5cm. **(3 mks)**

b) State the name of the figure drawn **;**..... **(1 mk)**

SECTION II (50 Marks)

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

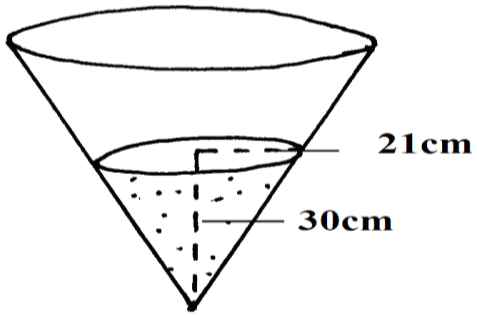
17. The distance between towns A and B is 360km. A minibus left A at 8.15am and traveled towards B at an average speed of 90km/hr. A matatu left B two and a third hours later on the same day and traveled towards A at an average speed of 110km/hr.

a) i) At what time did the two vehicles meet? **(4mks)**

ii) How far from A did the vehicles meet? **(2mks)**

b) A motorist started from his home which is between A and B at 10.30am on the same day and travelled at an average speed of 100km/hr. He arrived at B at the same time as the minibus. Calculate the distance from A to his house. **(4 mks)**

18. Consider the vessel below



a) Calculate the volume of water in the vessel. (Take $\pi = 3.142$) **(2mks)**

b) When a metallic hemisphere is completely submerged in the water, the level of the water rose by 6cm. Calculate:

i) the radius of the new water surface**.** **(2mks)**

ii) the volume of the metallic hemisphere (to 2 d.p**.)** **(3mks)**

iii) the diameter of the hemisphere (to 1 d.p) **(3 mks)**

19.The American government hired two planes to airlift football fans to Qatar for the World cup tournament. Each plane took 10½ hours to reach the destination.

Boeing 747 has carrying capacity of 300 people and consumes fuel at 120 litres per minute. It makes 5 trips at full capacity. Boeing 740 has carrying capacity of 140 people and consumes fuel at 200 liters per minute. It makes 8 trips at full capacity. If the government sponsored the fans one way at a cost of 800 dollars per fan, and the fans pays for the return ticket. Calculate:

(a) The total number of fans airlifted to Qatar. **(1mk)**

(b) The total cost of fuel used if one litre costs 0.3 dollars. **(5mks)**

(c) The total collection in dollars made by each plane. **(2mks)**

(d) The net profit made by each plane. **(2mks)**

20. The following data shows the length of trees grown in Mau Forest measured to the nearest cm by a research team. Use the given data to answer the given questions.

230	240	250	253	260	253	274	238	263	260	231	284	257	260	275
	271	257	267	255	265	241	256	256	257	260	262	234	259	263
	244	254	248	281	240	247	236	256	282	242	246	277	238	250
	279	252	269	284	271	249	273							

(a) Arrange the data in a frequency distribution table with a class interval of five and starting with the class of 230 – 234,… **(6mks)**

(b) Using the frequency distribution in (a) above and 257 as an assumed mean, find:-

(i) Mean of the data. **(2mks)**

(ii) The standard deviation of the data. **(2mks)**

21. Using a ruler and a pair of compasses only, draw a triangle ABC such that AB = 5cm, BC = 8cm and angle ABC = 60^0. Measure AC and angle ACB. **(5mks)**

a) Locate point O in triangle ABC such that OA = OB = OC. Using O as the center and radius OA draw a circle (3mks)

b) Construct a perpendicular from A to BC to meet BC at D. Measure AD, hence find the area of triangle ABC. **(2mks)**

22.Three brick layers have to lay a total of 5400 bricks . The average number of bricks they can lay in an hour are in the ratio 5:6:9.If the slowest man lays 60 brick in an hour. Calculate;

(a) How many bricks each of the other two men lay in an hour. (**4mks)**

(b) How many of the bricks each man will lay to complete the work if they are all employed for the same number of hours. **(6mks)**

23. Four towns P, Q, R and S are such that town Q is 120km due east of town P. Town R is 160km due North of town Q. Town S is on a bearing of 330^o from P and on a bearing 300^o from R. use a ruler and a pair of compasses only for all your constructions.

a. Using a scale of 1cm to represent 50km, construct a scale drawing showing the positions P, Q, R and S**.** **(6mks)**

. Use the scale to determine

i. The distance from town S to town P. **(1mk)**

ii. The distance from town S to town R**.** **(1mk)**

iii. The bearing of town S from town Q. **(2mks)**

24. A carpenter constructed a closed wooden box with internal measurements 1.5m long 0.8m wide and 0.4m high. The wood used in constructing the box was 1.0cm thick and had a density of $0.6g/cm^3$.

(a) Determine the:

(i) Volume in cm^3 of the wood used in constructing the box. **(4 mks)**

(ii) Mass of the box in kg correct to 1 d.p **(2 mks)**

(b) Identical cylindrical tins of diameter 10cm height 20cm with a mass of 120g each were packed in the box. Calculate the:

(i) Maximum number of tins that were packed **(2 mks)**

(ii) Total mass of the box with the tins in kg. (to 1d.p) **(2 mks)**

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KCSE 2024 FINAL PREDICTION

EXPECTED EXAM 10

121/2

MATHEMATICS

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 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 spaces provided*

1. Use logarithms, correct to **4 decimal places**, to evaluate **(4mks)**

$$\sqrt[3]{\frac{83.46x0.0054}{1.52^2}}$$

2. Given that the ratio of x:y = 4:5, find to the **simplest form** the ratio of (7x-2y):(x+2y) **(2mks)**

3. Ruto bought a plot of land for Ksh.280,000. After 4 years, the value of the plot was Ksh.495,000. Determine the rate of appreciation, per annum, **correct to one decimal place**. **(3mks)**

4. The height in centimeters, of 100 tree seedlings in a tree nursery are shown in the table below.

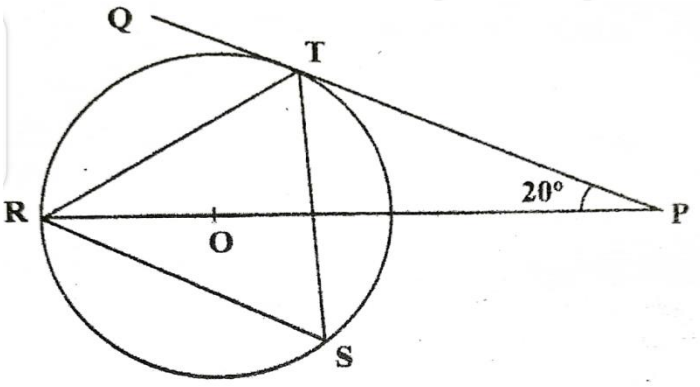
Height(cm)	10-19	20-29	30-39	40-49	50-59	60-69
Number of trees	9	16	19	26	20	10

Find the quartile deviations of the heights. **(3mks)**

5. The equation of a circle is given by $4x^2$-12x+$4y^2$- 8y - 3= 0. Determine the coordinates of the centre of the circle and the radius of the circle. **(4mks)**

6. Simplify the expression $\frac{\sqrt{48}}{\sqrt{5}+\sqrt{3}}$, leaving the answer in the form a$\sqrt{b}$ +c where a, b and c are integers **(3mks)**

7. In the figure below R, T and S are points on a circle centre O. PQ is a tangent to the circle at T, POR is a straight line and <QPR = 20^0.



Giving reasons find the size of $< RST$ **(2mks)**

8. a) Expand the expression $\left(1+\frac{1}{2}x\right)^5$ in ascending powers of x, leaving the coefficients as fraction in their simplest form. **(2mks)**

b) Use the first three terms of the expansion in (a) above to estimate the value of $(1.05)^5$ correct to **4** significant **figures** **(2mks)**

9. Make t the subject of the formula in $s = \sqrt{\frac{3d(t-d)}{8}}$ **(3mks)**

10. A trader bought maize for Ksh 20 per kilogram and beans for Ksh 60 per kilogram. She mixed the maize and beans and sold the mixture at Ksh 48 per kilogram. If she made a 60% profit, determine the ratio of maize:beans per kilogram in the mixture**.** **(3mks)**

11. The cash price of a digital television is Ksh. 27,500. A customer decided to buy it on hire purchase terms by paying a deposit of Ksh 17,250. Determine the monthly rate of compound interest charged on the balance if the customer is required to repay by six equal monthly instalments of Ksh. 2,100 each. **(3mks)**

12. The first, the third and the seventh terms of an increasing arithmetic progression are three consecutive terms of a geometric progression. If the first term of the arithmetic progression is 10, find the common difference of the arithmetic progression. **(4mks)**

13. The lengths of two similar pieces of wood were given as 12.5 m and 9.23 m. Calculate the absolute error in calculating the difference in length between the two bars. **(3mks)**

14. Solve for x given that $\frac{1}{3}log_2 8 + log_2(2x-4) = 5$ **(3mks)**

15. In nomination for a committee, two people were to be selected at random from a group of 3 men and 5 women. Find the probability that a man and a woman were selected. **(2mks)**

16. Pipe A can fill an empty tank in 3 hours while, pipe B can fill the same tank in 6 hours. When the tank is full it can be emptied by pipe C in 8 hours. Pipe A and B are opened at the same time when the tank is empty. If one hour later, pipe C is opened, find the total time taken to fill the tank. **(4mks)**

SECTION II (50 marks)

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

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

Monthly taxable income in Ksh	Tax rate (%) in each shilling
1-11,180	10
11,181-21,714	15
21,715-32,248	20
32,249-42,782	25
Over 42,782	30

i. During the year, Njuguna's monthly income was as follows: Basic salary Ksh 40,000, House allowance Ksh 11,090 and Commuter allowance Ksh 7,000.

Calculate a) Njuguna's total monthly taxable income. **(1mk)**

b) Total income tax charged on Njuguna's monthly income **(4mks)**

ii. Njuguna's net monthly tax was Ksh. 10,750.80. Determine the monthly tax relief allowed. **(1mk)**

iii. A proposal to expand the size of the first income tax band by 50% while retaining the size of the next three bands was made. The tax rates would remain as before in each band. Using the proposal, calculate:

a) the tax Njuguna would pay in the first band. **(2mk)**

b) the tax Njuguna would pay in the last tax band. **(2mks)**

18. a) Given that $\mathbf{A}=\begin{bmatrix} 3 & x \\ x+1 & 2 \end{bmatrix}$ and $\mathbf{B}=\begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix}$, find the values of x for which AB is a singular matrix. **(3mks)**

b) Otieno bought 3 exercise books and 5 pens for a total of Ksh 165. If Otieno had bought 2 exercise books and 4 pens, he would have spent Ksh 45 less. Taking letter **e** to represent the price of an exercise book and letter **p** to represent the price of a pen

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

ii. Use matrix method to find the price of an exercise book and that of a pen. **(3mks)**

iii. The principal of Njabini boys decided to reward 36 students **each** with 2 exercise books and one pen. Calculate the total amount of money he paid**.** **(2mks)**

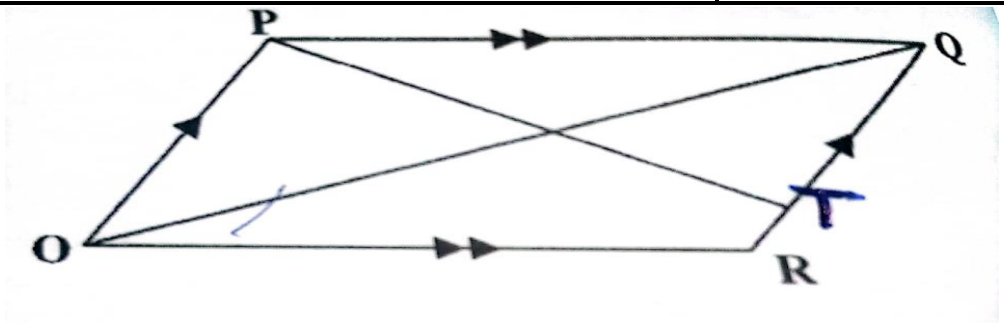
19. Three quantities X, Y and Z are such that X varies directly as the square root of Y and inversely as the fourth root of Z. When X=64, Y=16 and Z= 625.

i.Determine the equation connecting X, Y and Z. **(4mks)**

ii. Find the value of Z when Y=36 and X=160 **(2mks)**

iii. Find the percentage change in X when Y is increased by 44% and Z decreased by 19% correct **to one decimal** place. **(4mks)**

20. The figure below shows a parallelogram OPQR with O as the origin, **OP = p** and **OR= r.** Point T divides RQ in the ratio 1:4. PT meets OQ at S.



a) Express in terms of **p** and **r** the vectors

i. OQ (1mk)

ii. OT (1mk)

b) Vector OS can be expressed in two ways; i) **OS**= m**OQ** ii) **OS**= **OT** + n**TP**, where m and n are constants. Express **OS** in terms of

i. m, **p** and **r** **(1mk)**

ii. n, **p** and **r** **(1mk)**

Hence find the

iii. value of n and m **(5mks)**

iv. ratio **OS**:**SQ** **(1mk)**

21. A quadrilateral ABCD has vertices at A(1,1), B(4,2), C(1,3), D(2,2).

a) Draw ABCD on the grid provided (1mk)

b) Give that $\mathbf{X}=\begin{bmatrix}1 & 0\\ 0 & -1\end{bmatrix}$ $\mathbf{Y}=\begin{bmatrix}-1 & 0\\ 0 & 1\end{bmatrix}$ $\mathbf{V}=\begin{bmatrix}0 & -1\\ -1 & 0\end{bmatrix}$. Find the coordinates of $A^1B^1C^1D^1$, $A^{11}B^{11}C^{11}D^{11}$ and $A^{111}B^{111}C^{111}D^{111}$ the images of ABCD under combined transformation **VXY.** Show all your working of coordinates below;

i. Coordinates of $A^1B^1C^1D^1$ and draw it on the grid. **(2mks)**

ii. Coordinates of $A^{11}B^{11}C^{11}D^{11}$ and draw it on the grid. **(2mks)**

iii. Coordinates of $A^{111}B^{111}C^{111}D^{111}$ and draw it on the grid. **(2mks)**

c) Showing your working find a single matrix that will map ABCD onto $A^{111}B^{111}C^{111}D^{111}$.

(3mks)

22. a) Complete the table below for $y = x^3+4x^2 -5x-5$ **(2mks)**

X	-5	-4	-3	-2	-1	0	1	2
$y = x^3+4x^2 -5x-5$			19			-5		

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

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

ii) By drawing a suitable straight line graph, solve the equation

$x^3 + 4x^2 - x - 4 = 0$ **(3mks)**

23. A polytechnic planned to buy x lockers for a total cost of Ksh 16,200. The supplier agreed to offer a discount of Ksh 60 per locker. The polytechnic was then able to get three extra lockers for the same amount of money.

a) Write an expression in terms of x, for the:

i) Original price of each locker; **(1mk)**

ii) Price of each locker after the discount. **(1mk)**

b) Form an equation in x and hence determine the number of lockers the polytechnic bought. **(5mks)**

c) Calculate the discount offered to the polytechnic as a percentage **(3mks)**

24. i) Using ruler and compasses only construct triangle ABC such that AB=4 cm, BC= 5cm and $\angle ABC = 120^0$. **(3mks)**

ii) Measure AC **(1mk)**

iii) On the same diagram draw a locus of points equidistant from point A and point C and label the locus as L_1. **(1mk)**

iv) Draw on the same diagram a locus of points L_2 equidistant from point C and point B and lable the locus as L_2 **(1mk)**

v) label the point where L_1 *and* L_2 meet as O. Using O as a centre draw a locus of points L_3 touching points A, B and C. Measure the length from point O to L_3. **(2mks)**

vi) Draw the locus of points L_4 equidistant from line AC and Line AB. Extend L_4 to meet line BC and lable where they meet point D. Measure the length AD. **(2mks)**

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PLEASE DO NOT PANIC!

KCSE 24

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