

MATHEMATICS MOCKS

COMPRISES OF 10 TRIALS OF MOCKS

(BOTH PAPER 1 AND PAPER 2 ARE PRESENT IN EACH TRIAL)



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(SERIES 1)

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NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

MATHEMATICS MOCKS

SERIES 1 TRIAL 1 PAPER 1

Kenya Certificate of Secondary Exams

TIME:2HRS

SECTION A (50 Marks)

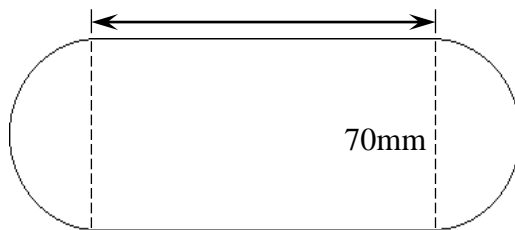
Attempt all questions in the spaces provided

1. Show that 8260439 is exactly divisible by 11, using test of divisibility. (2 marks)

2. Use logarithms tables to evaluate
 $\sqrt[3]{(4.562 \times 0.0380)(0.3 + 0.52)^{-1}}$
Give your answer to 3 significant figures (4 marks)

3. Without using a calculator, evaluate
 $\frac{36 - 8x - 4 - 15}{3x - 3 + -8(6 - (-2))} \div -3$ (3 marks)

The figure below (not drawn to scale) shows the cross-section of a metal bar of length 3 metres.



The ends are equal semicircles. Determine the mass of the metal bar in kilograms if the density of the metal is 8.87 g/cm^3 (3 marks)

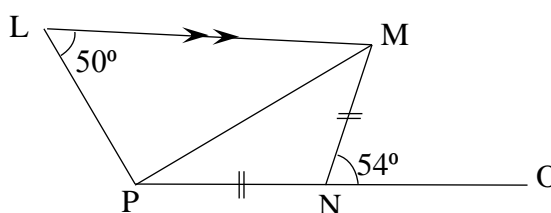
5. A solid metal cone has a diameter of 14cm and a height of 24cm. If the cone is melted and recast into a cylinder of the same diameter, what is the height of the cylinder? (3 marks)

6. Find the integral values of x which satisfy the following inequality.
 $2x + 3 > 5x - 3 > -8$ (3 mark)

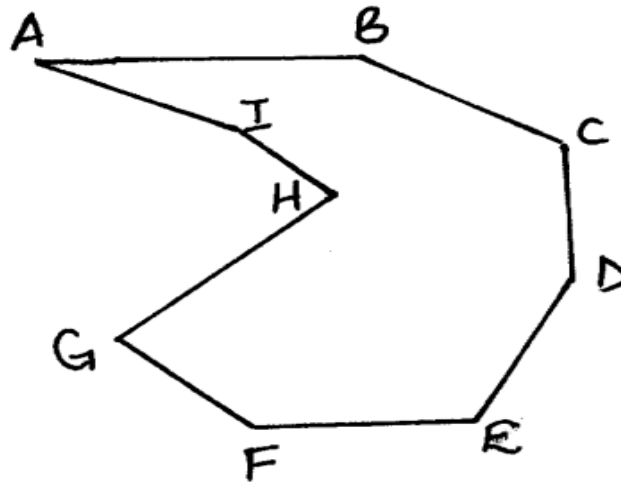
7. ABCD is a Rhombus with three of its vertices A (2, 5), B (1,-2), C (-5, 1). Determine the equation of line BD in the form of $y = mx+c$ (3 marks)
8. If $\sin \alpha = 5t$ and $\cos \alpha = 6t$, find t. (3 marks)
9. Factorise completely the expression, $3x^2y^2-8xy-51$ (3 marks)
10. On the grid below, draw a histogram to represent the following distribution. (4 marks)
(Provide graph paper)

Length (cm)	1 – 5	6 – 9	16 – 30	31 – 40
Frequency	2	4.5	3.33	4

11. An observer stationed 20m away from a tall building finds that the angle of elevation of the top of the building is 68° and the angle of depression of its foot is 50° . Calculate the height of the building. (3 marks)
12. Solve without using tables.
 $9^{x+1} + 3^{2x+1} = 108$ (3 marks)
13. In the figure below $\angle MNO = 54^\circ$, and $\angle PLM = 50^\circ$, $PN = NM$ and PO is parallel to LM . Find the value of $\angle LPM$. (3 marks)



14. A container of height 90cm has a capacity of 4.5litres. What is the height of a similar container of volume $9m^3$. (3 marks)
15. Express 0.45 as fraction in its simplest form (3 marks)
- 16.a) Find by calculation the sum of all the interior angles in the figure ABCDEFGHI below. (2 marks)



- b) Find the number of sides of a regular polygon whose interior angle is 162°
(2 marks)

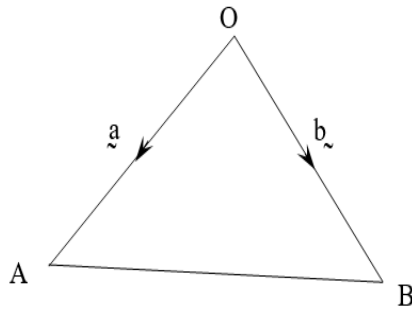
SECTION B (50 Marks)

Attempt five questions only from this section

17. The table below shows marks scored by 120 candidates in an examination.

Marks	1 – 10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Frequency	2	6	10	a	24	21	19	12	8	1

- a) Determine the value of a . (1 mark)
- b) Taking 1cm to represent 10 marks on the horizontal axis and 1cm to represent 10 pupils on the vertical axis draw an ogive. (3 marks)
(Provide a graph paper)
- From your graph
- Determine the median. (2 marks)
 - Determine the range of marks of the middle 60% of the students. (2 marks)
 - If 63% is the pass mark for grade B+, how many students will get B+ and above? (1 mark)
- a) State the median class (1 mark)
18. The position vectors of points A and B with respect to the origin are \mathbf{a} and \mathbf{b} respectively. P is a point on OA such that $\mathbf{OA} = 3\mathbf{OP}$. Q divides OB externally in the ratio 5:2. PQ intersects AB at N.
- a) Express the vectors AB, AP, OQ and PQ in terms of \mathbf{a} and \mathbf{b} . (3marks)



b) Express **AN** in two different ways. **(5 marks)**

c) In which ratio does **N** divide **AB** **(1 mark)**

d) Express **PN** in terms of **PQ**. **(1 mark)**

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

a) The distance from **B** to **C**. **(2 marks)**

b) Time taken between **C** and **D**. **(2 marks)**

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

d) If the return journey was at 54km/h, how long did he take for the journey? **(2 marks)**

20. On the upper part of a line **RQ** construct locus of points **(10 marks)**

a) T_1 such that angle $RTQ = 45^\circ$

b) M on RQ which is equidistant from R and Q .

c) S which is equidistant from R and Q and lies on T .

d) Calculate area bounded by loci T_1 and line RQ .

21. The marked price of a pick-up is Kshs.1, 087,500/=. A financial company bought this car at a discount of 20%, for a company employee, who was then to give a down payment of Kshs. 180, 000/= and 36 monthly instalments of Ksh.35, 600/= each.

a) Calculate the cash price. **(2 marks)**

b) How much will the employee have paid for the pick-up after 3 years? **(2 marks)**

c) What percentage profit did the financial company get from the employee on the pick up? **(2 marks)**

d) If the car was depreciating at the rate of 12% p.a, calculate the value of the car after 3years. **(2 marks)**

e) If the employee is to buy a new car at the same initial cost, at what percentage profit, on the value of the car after the third year, must he sell it?

(2marks)

Three planes **P**, **Q** and **R** departed Jomo Kenyatta International Airport at 0810 Hrs, 0840 Hrs and 0920 Hrs respectively. Plane **P** traveled at 300km/h along **N70°W**, plane **Q** traveled at 240 km/h along **ENE** and **R** traveled at 400 km/h along **210°**.

- a) Using a scale of 1cm to represent 100 km, locate the position of the planes at 1050 Hrs. (6 marks)
- b) Find the distance of plane **Q** and **R** at 1050 Hrs. (2 marks)
- c) Find the bearing of plane **Q** from plane **P** (1 mark)
22. Find the bearing of plane **R** from plane **Q**. (1 mark)
- a) Complete the following table for the function: $y = x^3 - 2x^2 + 5$. (2 marks)

x	-3	-2	-1	0	1	2	3	4
x^3		-8	-1	0	1		27	64
$-2x^2$	-18		-2	0	-2	-8	-18	
5	5	5		5	5	5	5	5
y	-40		2	5	4	5	14	

- b) By using the scale of 2cm to represent one unit on the horizontal scale and 1cm to represent 5 units on the vertical scale, draw the graph of $y = x^3 - 2x^2 + 5$. (provide graph paper) (3 marks)
- c) Using your graph estimate the roots of $x^3 - 2x^2 - 7x - 4 = 0$. (2 marks)
- d) Use integration to find the area bounded by the curve $y = x^3 - 2x^2 + 5$, the y-axis and line $y = 7x + 9$. (3 marks)
23. Water flows through a pipe of internal radius of 3.5cm at 9 metres per second into a storage tank of rectangular base of 12m by 8m. Calculate
- a) the volume of water delivered into the tank in one minute in litres. (2 marks)
- b) the capacity of water in litres that is consumed by a village of 435 families that depend on this water, in one week, if each family consumes an average of six jerrycan of 20 litres each per day. (2 marks)
- c) the minimum height of the water level in the storage tank that will ensure that the village doesn't suffer from water shortage within the week. (2 marks)
- d) how long will it take the pipe to fill the tank to that level giving your answer in hours. (2 marks)
- e) Calculate the monthly bill of the village if the cost of water is Kshs.1.50 per jerrycan (take a month of 30 days) (2 marks)

NAME.....ADM NO.....

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MATHEMATICS MOCKS

SERIES 1 TRIAL 1 PAPER 2

Kenya Certificate of Secondary Exams

TIME:2HRS

SECTION 1 (50 MARKS)

Instructions: Attempt all the questions in the spaces provided

1. Given that $\log a = -1.3748$ and $\log b = -1.5934$, evaluate $\log \sqrt{\frac{a}{b}}$. **(3 marks)**

2. Make x the subject of the formula. $P = \frac{x^{1/2}y}{x^{1/2} - y}$ **(3 marks)**

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

$$\sqrt[3]{\frac{9}{0.03746}} + 0.6042^2 \quad \textbf{(3 marks)}$$

4. A point $P(2,-3)$ undergoes transformation represented by the matrix $\begin{pmatrix} 3 & 0 \\ 0 & 1 \end{pmatrix}$.

Find the coordinate of the image of P . **(2 marks)**

5. Using a ruler and pair of compasses only. Construct an equilateral triangle ABC of sides 4cm construct the locus of a point P such that P is always on the same side of BC as A and $\angle BPC = 30^\circ$. Shade the region where Q can be found if Q is outside the triangle and angle $BQC > 30^\circ$. **(3 marks)**

6. A right circular cylinder is to be made so that the sum of its radius and its height is 6cm . Find the maximum possible volume of the cylinder. **(3 marks)**

7. The radius of a circle is measured to the nearest meter as 7m . Calculate the percentage error in the circumference. Leave your answer as a mixed number and take $\pi = \frac{22}{7}$. **(3 marks)**

8. The first, the fifth and eleventh terms of an increasing arithmetic progression are three consecutive terms of a geometrical progression. If the first term of the arithmetic progression is 6 . Find the common difference of the arithmetic progression **(3 marks)**

9. Wanjiku pays for a car on hire purchase in 15 monthly instalments. The cash price of the car is Ksh. 300,000 and the interest rate is 15% p.a. A deposit of Ksh 75,000 is made. Calculate her monthly repayments. **(4 marks)**
10. Factorize completely $6(x-4)^2-54$ **(3 marks)**

11. Without using tables, rationalize the denominator in

$$\frac{2 \tan 45^\circ - \tan 60^\circ}{4 \tan 45^\circ \sin 30^\circ - \sqrt{3}}$$
 (3 marks)

- 12.(a) Write the expansion of $(2 - \frac{1}{5}x)^5$ **(1 mark)**
 (b) Hence use the expansion to find the value of $(1.96)^5$ correct to 3 decimal places **(3 marks)**

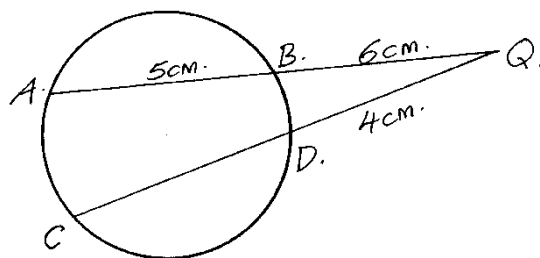
13. Solve the equation $3 \sin(2x - 50^\circ) = -1.5$ if $0^\circ < x < 360^\circ$ **(3 marks)**

14. Two teachers are chosen at random from a staff of three women and 2 men to attend a seminar. Calculate the probability that the two teachers chosen are

- (a) Of the same gender **(2 marks)**
 (b) Of opposite gender **(2 marks)**

15. Simplify $\frac{2x-2}{6x^2-x-12} \div \frac{x-1}{2x-3}$ **(3 marks)**

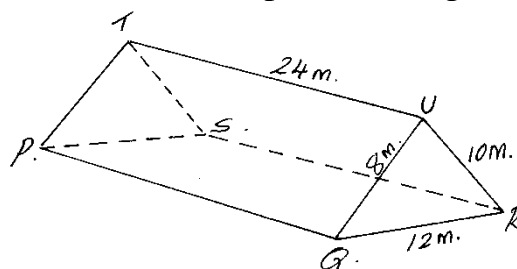
16. In the figure below AB and CD are chords of a circle that intersect externally at Q. if AB=5cm, BQ=6cm and DQ=4cm, calculate the length of chord CD **(3 marks)**



SECTION B (50 MARKS)

ATTEMPT ANY FIVE QUESTIONS IN THIS SECTION

17. The roof of a warehouse is in the shape of a triangular prism as shown below



Calculate

- (a) The angle between faces RSTU and PQRS (3 marks)
 (b) The space occupied by the roof (3 marks)
 (c) The angle between the plane QTR and PQRS (4 marks)

18.a) Complete the table below for $y = \sin 2x$ and $y = \sin (2x + 30)$ giving values to 2d.p

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

(2 marks)

b) Draw the graphs of $y = \sin 2x$ and $y = \sin (2x + 30)$ on the axis (4 marks)
 (provide a graph paper)

c) Use the graph to solve $\sin (2x + 30) - \sin 2x = 0$ (1 mark)

d) Determine the transformation which maps $\sin 2x$ onto $\sin (2x + 30)$ (1 mark)

e) State the period amplitude of $y = \sin (2x + 30)$ (2 marks)

19. A particle starts from rest at a point A and moves along a straight line coming to rest at another point B. During the motion, its velocity v (m/s) after time t (sec) is given by $v = 9t^2 - 2t^3$. Calculate:

a) the time taken for the particle to reach B. (2 marks)

b) the distance traveled during the first two seconds. (3 marks)

c) the time taken for the particle to attain its maximum velocity. (3 marks)

d) the maximum velocity attained (2 marks)

20.P and Q are two points on latitude 60°S . Their longitudes are 30°E and 90°W respectively.

Find:

(a) The distance between P and Q along the parallel of latitude (Take radius of earth = 6370 km and $\pi = \frac{22}{7}$) [to 1 decimal place] (2 marks)

(b) The shortest distance along the earth's surface between P and Q [to 1 decimal place]. (3 marks)

(c) A weather forecasters reports that the center of a cyclone at $(30^\circ\text{S}, 120^\circ\text{W})$ is moving due south at 24 knots. How long will it take to reach a point $(45^\circ\text{S}, 120^\circ\text{W})$? (3 marks)

(d) If it is 1400 hrs at Q, What will be the time at P? (2 marks)

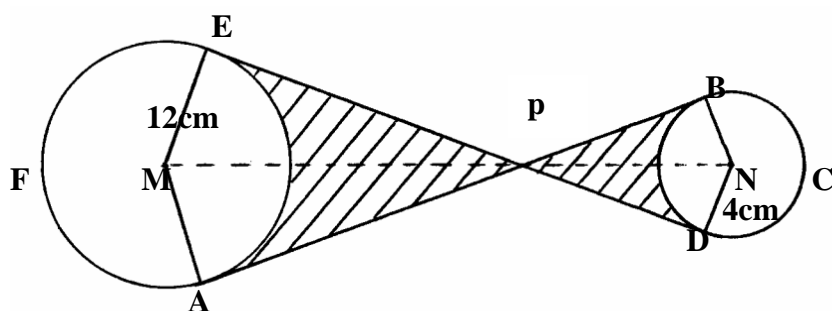
21. A company makes brands A and B of breakfast cereal both of which are enriched with vitamins P and Q. The necessary information about these cereals is given by the table below.

	Cereal	Minimum Daily Requirement
	A B	
Vitamin P(units/gram)	1	100

	2	
Vitamin Q(unit /gram)	5 3	300
Cost/gram	Sh 20 Sh 30	

- a) Form all inequalities to represent this information. **(3 marks)**
b) Draw the inequalities on the graphs showing the region which satisfy the inequalities. (Provide a graph paper) **(3 marks)**
c) From your graph determine the minimum daily requirements of vitamins P and Q at the lowest cost **(2 marks)**
d) Determine the lowest cost. **(2 marks)**

22. The figure below shows a pulley with wheels center M and N, with a rubber belt ABCDEFA stretched round the wheels. The diameters of the wheel are 24cm and 8cm and the centers are 20 cm apart. Point p divides MN in the ratio 3:1



Find the area of the shaded region **(10 marks)**

23. Given that P varies jointly as Q and R. Given that $Q=12$, $R=27$ when $P=18$ calculate;
(a) The value of P when $Q=9$ and $R=30$ **(3 marks)**
(b) The value of R when $P=60$ and $Q=30$ **(3 marks)**
(c) The percentage by which P is changed when Q is decreased by 12% and R increased by 12% **(4 marks)**

24. The following table shows the distribution of marks obtained by 50 students.

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

By using an assumed mean of 62, calculate

- a) the mean **(5 marks)**
b) the variance **(3 marks)**
c) the standard deviation **(2 marks)**

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

MATHEMATICS MOCKS

SERIES 1 TRIAL 2 PAPER 1

Kenya Certificate of Secondary Exams

TIME:2HRS

SECTION A (50 Marks)

Attempt all questions in the spaces provided

1. Evaluate without using a calculator (2 Marks)

$$\frac{23.4 - 2(5.2 + 5.3)}{3.2 \times 1.2}$$

2. In Blessed Church choir, the ratio of males to females is 2:3. On one Sunday service, ten male members were absent and six new female members joined the choir as guests for the day. If on this day the ratio of males to females was 1:3, how many regular members does the choir have? (3 Marks)
3. A Kenyan bank buys and sells foreign currency as shown below.

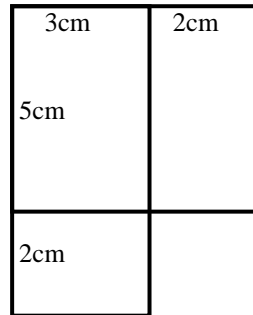
	Buying	Selling
	Kenya shillings	Kenya shillings
1 Euro	84.15	84.26
1 US Dollar	80.12	80.43

A tourist travelling from Britain arrives in Kenya with 5000 Euros. He converts all the Euros to Kenya shillings at the bank. While in Kenya he spends a total of KSh. 289,850 and then converts the remaining Kenya shillings to US dollars at the bank. Calculate (to nearest dollar) the amount he receives? (3 Marks)

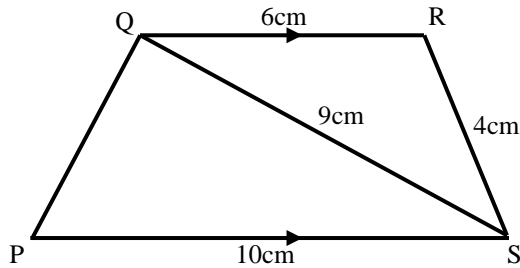
4. Simplify the expression. (3 Marks)

$$\frac{4x^2 - 16y^2}{6x^2 - 8xy - 8y^2}$$

5. Complete the figure below so as to make the net of a cuboid. Hence determine the surface area of the cuboid. **(4 Marks)**



6. The sum of the interior angles of a regular polygon is 1080° . Calculate
- (a) The number of sides of the polygon **(2 Marks)**
- (b) The sizes of the exterior and interior angles of the polygon. **(2 Marks)**
7. If $3^{(2x)} - 4(3^x) + 3 = 0$. Find the possible values of x **(3 Marks)**
8. Three similar pieces of timber of length 240cm, 320cm and 380cm are cut into equal pieces. Find the largest possible area of a square which can be made from any of the three pieces. **(3 Marks)**
9. The sum of digits formed in a two digit number is 16. When the number is subtracted from the number formed by reversing the digits, the difference is 18. Find the number **(3 Marks)**
10. Solve for x given that **(3 Marks)**
 $\text{Log}_{10}(x - 1) + 1 = \text{Log}_{10}(x - 4)$
11. Three pens and four exercise books cost Sh. 87. Two pens and five exercise books cost Sh. 93. Find the cost of one pen and one exercise book. **(4 Marks)**
12. A farmer has enough feed to last 45 cows for 30 days. If he buys 5 more cows, how long will the feed last? **(2 Marks)**
13. Find the equation of the line perpendicular to $3x - 7y - 20 = 0$, and passes through the point (5,2) **(3 Marks)**
14. Wanza sold a bag of potatoes for Sh. 420 and made a profit. If she sold it at Sh. 320, she could have made a loss. Given that the profit is thrice the loss, how much did she pay for the bag of potatoes? **(3 Marks)**
15. In the figure below PQRS is a trapezium with QR parallel to PS. QR = 6cm, RS = 4cm, QS = 9cm and PS = 10cm.



Calculate

(a) The size of angle SQR (2 Marks)

(b) The area of triangle PQS (2 Marks)

16. Given that $\cos(x - 20)^\circ = \sin(2x + 32)^\circ$ and x is an acute angle, Find $\tan(x - 4)^\circ$ (3 Marks)

SECTION II (50 MARKS)

Answer Only Five Questions In This Section

17. An expedition has 5 sections AB, BC, CD, DE and EA. B is 200m on a bearing of 050° from A. C is 500m from B. The bearing of B from C is 300° . D is 400m on a bearing of 230° from C. E is 250m on a bearing of 025° from D.

(a) Sketch the route (1 Mark)

(b) Use the scale of 1cm to 50m to draw the accurate diagram representing the route. (5 Marks)

(c) Use your diagram to determine

(i) Distance in metres of A from E (2 Marks)

(ii) Bearing of E from A

18. A business lady bought 100 quails and 80 rabbits for Sh. 25,600. If she had bought twice as many rabbits and half as many quails she would have paid Sh. 7,400 less. She sold each quail at a profit of 10% and each rabbit at a profit of 20%.

(a) Form two equations to show how much she bought the quails and the rabbits (2 Marks)

(b) Find the cost of each (3 Marks)

(c) Calculate the profit she made from the sale of the 100 quails and 80 rabbits (3 Marks)

(d) What percentage profit did she make from the sale of the 100 quails and 80 rabbits (2 Marks)

19. The table below shows the length of 40 seedlings.

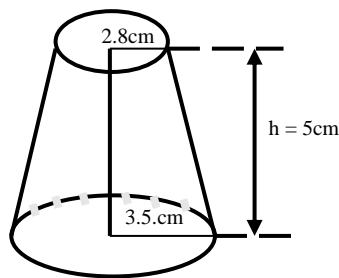
Length in (mm)	Frequency
118-126	3
127 – 135	4

136 – 144	10
145 – 153	12
154 – 162	5
163 – 171	4
172-180	2

Determine

- (a) (i) The modal class (1 Mark)
(ii) The median class (2 Marks)
- (b) (i) The mean of the seedlings (4 Marks)
(ii) The median of the seedlings (3 Marks)

20. Find

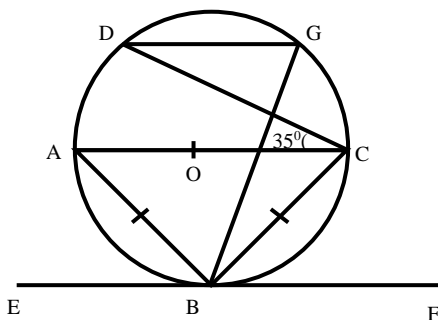


- (a) The surface area of the frustum (5 Marks)
(b) The volume of frustum shown. (5 Marks)
21. Triangle ABC vertices A (-2, 6), B (2, 3) and C (-2, 3) is reflected in the line $x = -3$ to give the image $A_1B_1C_1$. $A_1B_1C_1$ is translated by the vector $\begin{pmatrix} 10 \\ 2 \end{pmatrix}$ to give image $A_2B_2C_2$. $A_3B_3C_3$ with coordinates $A_3 (6,-6)$ $B_3 (2,-3)$ and $C_3 (6,-3)$ is the image of $A_2B_2C_2$ after transformation.

Plot all the triangles in the grid provided and determine

(provide a graph paper)

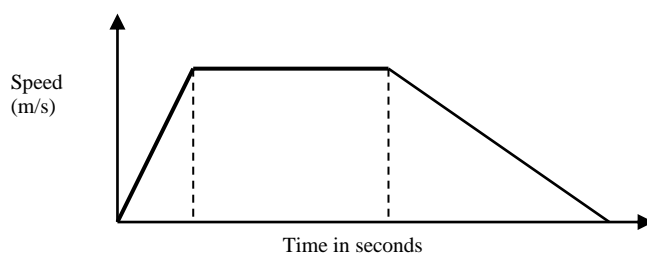
- (i) The transformation that maps $A_2B_2C_2$ onto $A_3B_3C_3$ (2 Marks)
(ii) The simple transformation that maps ABC onto $A_3B_3C_3$ (2 Marks)
22. In the figure below AOC is a diameter of the circle centre O; $AB = BC$ and $\angle ACD = 35^\circ$. EBF is a tangent to the circle at B. G is a point on the minor arc CD.



Giving reason

- (a) Calculate the size of
- (i) $\angle BAD$ (3 Marks)
 - (ii) The obtuse $\angle BOD$ (2 Marks)
 - (iii) $\angle BGD$ (2 Marks)
- (b) Show that $\angle ABE = \angle CBF$ (3 Marks)

23. The diagram below shows the speed-time graph for a bus travelling between two stations. The bus begins from rest and accelerates uniformly for 30 seconds. It then travels at a constant speed for 60 seconds and finally decelerates uniformly for 40 seconds.



Given that the distance between the two stations is 2090m. Calculate

- (a) The maximum speed, in km/h the bus attained (3 Marks)
 - (b) The acceleration (2 Marks)
 - (c) The distance travelled during the last 20 seconds (2 Marks)
 - (d) The time the bus takes to travel the first half of the journey (3 Marks)
24. The members of a photograph club decided to buy a camera worth Shs. 4000 by each contributing the same amount of money. Fifteen member failed to pay their contribution due to various reasons. As a result each of the remaining members had to contribute Sh. 60 more.
- (a) Find the number of members in the club (7 Marks)
 - (b) What was the percentage increase in the contribution per month? (3 Marks)

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

MATHEMATICS MOCKS

SERIES 1 TRIAL 2 PAPER 2

Kenya Certificate of Secondary Exams

TIME:2HRS

SECTION A (50 Marks)

Attempt all questions in the spaces provided

1. Use logarithms to evaluate:

$$\sqrt[3]{\frac{45.3 \times 0.00697}{0.534}} \quad (4 \text{ marks})$$

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

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

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

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

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

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

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

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

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

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

9. Given that $\sin\left(\frac{2}{3}x + 20^\circ\right) - \cos\left(\frac{5}{6}x + 10^\circ\right) = 0$. Without using a mathematical table or a calculator, determine $\tan(x + 20^\circ)$.
(3 marks)
10. Make P the subject of the formula $XY^P = Q^{PX}$ (3 marks)
11. The coordinates of the end points of diameter are A(2,4) B(-2,6). Find the equation of a circle in the form $ax^2 + by^2 + cx + dy + e = 0$ (3 marks)
12. A bag contains 10 balls of which 3 are red, 5 are white and 2 green. Another bag contains 12 balls of which 4 are red, 3 are white and 5 are green. A bag is chosen at random and a ball picked at random. Find the probability the ball so chosen is red. (3 marks)
13. The first, the second and sixth terms of an increasing arithmetic progression are the three consecutive terms of a geometric progression. If the first term of the arithmetic progression is 2, find:
- a) Common difference of the arithmetic progression (2 marks)
- b) Common ratio of the geometric progression. (1 mark)
14. Solve for x in the equation
$$\frac{6x-4}{3} - \frac{2x-1}{2} = \frac{6-5x}{6}$$
 (2 marks)
15. The length and breadth of a rectangular floor garden were measured and found to be 4.1m and 2.2m respectively. Find the percentage error in its area. (3 marks)
16. Given that $4y = 3 \sin \frac{2}{5}x$ for $0 \leq x \leq 360$. Determine:
- a) Amplitude of the curve. (1 mark)
- b) Period of the curve. (2 marks)

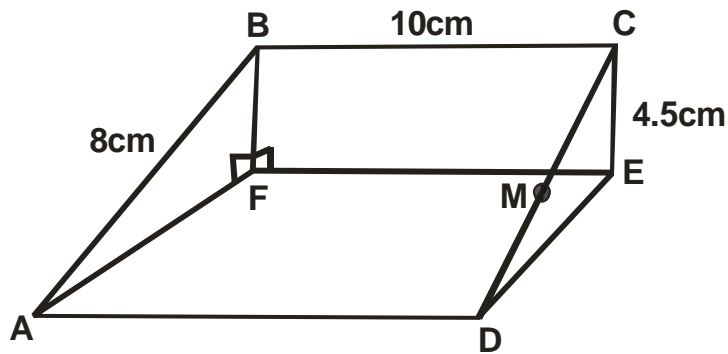
SECTION II (50 MARKS)

Answer any FIVE questions in this section.

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

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

- a) State the frequency of the modal class. (1 mark)
- b) Using 18 as an assumed mean, calculate:
- i) Actual mean (5 marks)
- ii) Variance (3 marks)
- iii) Standard deviation (1 mark)
- 18.



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

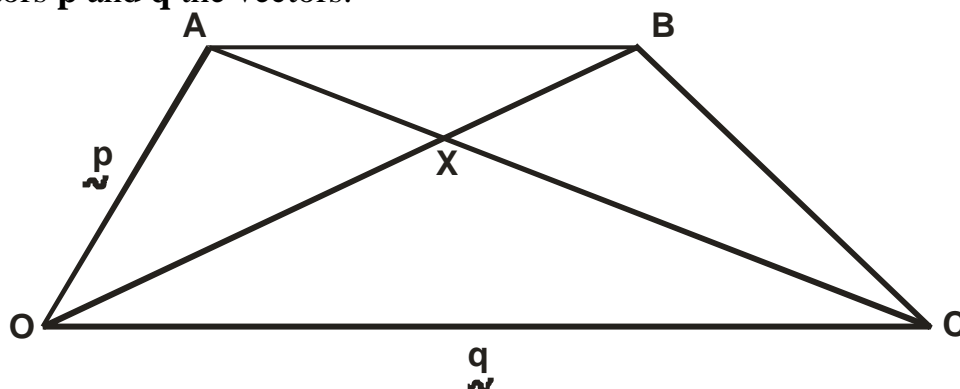
- a) The size of angle CDE. (2 marks)
- b) Calculate:
 - i) Length of AC. (2 marks)
 - ii) The angle CAE makes with the plane ADEF. (2 marks)
- c) Find the:
 - i) Length of MB. (2 marks)
 - ii) Angle CBM. (2 marks)

19. An aeroplane flies from a point P(60°N , 45°W) to a point Q(60°N , 135°E).

Given that the radius of the earth is 6370km,

- a) Calculate the shortest distance between P and Q:
 - i) in kilometres (km) (3 marks)
 - ii) in nautical miles (nm) (1 mark)
- b) If the plane flew at a speed of 600 knots, how long did it take to move from P to Q.? (2 marks)
- c) The plane left P at 10.00a.m on Monday. At what time did it arrive at Q if it travelled along a parallel latitude at the same speed. (4 marks)

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



- a)
 - i) AC (1 mark)
 - ii) OB (1 mark)
 - iii) BC (1 mark)
- b) Vector AC intersects with vector OB at X such that $AX = tAC$ and $OX = hOB$. By expressing OX in two ways in terms of t and h,

Find:

- i) Scalars t and h (5marks)
 ii) the ratio **OB: BX** (2 marks)

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

		CUBE					
		1	2	3	4	5	6
TETRAHEDRON	1						
	2						
	3						
	4						

- a) Find the probability that:
- i) The sum is 6. (1 mark)
 ii) The sum is an odd number. (1 mark)
 iii) The sum is 6 or 9. (2 marks)
- b) If a player wins a game by throwing a sum of 6 or 9, draw a tree diagram and use it to find probability that he wins at least once when the dice are thrown twice. (4 marks)

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

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

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

- NHIF – Ksh.320

- Union dues – Ksh.200
- Co-operative shares – Ksh.7500
- a) Calculate Mary’s monthly basic salary in Ksh. **(7 marks)**
- b) Calculate her monthly net salary. **(3 marks)**

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

- a) If n stands for the number of people working in the factory originally, show that the increase in the contribution per person was shs. $\frac{360000}{n(n-5)}$ **(3 marks)**
- b) If the increase in contribution per person was sh.1200, find the number of people originally working at the factory. **(4 marks)**
- c) Calculate the percentage increase in the contributions per person caused by retirement, giving your answer to one decimal place. **(3 marks)**

24.a) Complete the table below for the functions $y = 3\sin x$ and $y = 4\cos(2x - 10)$ **(2 marks)**

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

- b) Using a scale of 1cm to rep 1 unit on the vertical axis and 1cm to rep 150 on the horizontal axis, draw both curves on the same axes. **(Provide a graph paper)** **(5 marks)**
- c) Use your curves to solve $3 \sin x - 4 \cos(2x - 10) = 0$ **(2 marks)**
- d) State the phase angle of the curve $y = 4 \cos(2x - 10)$ **(1 mark)**

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

MATHEMATICS MOCKS

SERIES 1 TRIAL 3 PAPER 1

Kenya Certificate of Secondary Exams

TIME:2HRS

SECTION A (50 Marks)

Attempt all questions in the spaces provided

1. Simplify (3 marks)
$$\frac{\frac{2}{3} + \frac{2}{3} \text{ of } \frac{4}{9} \div \frac{8}{5} - \frac{2}{15} \div \frac{8}{15}}{\frac{5}{6} - \frac{2}{12} \div \frac{3}{2} \times \frac{9}{7}}$$
2. Nyongesa spent a total of sh 970 on buying 3 text books and 5 pens. If he had bought 2 text books and 8 pens he would have saved sh 90. Find the cost of one text book. (3 marks)
3. The volumes of two similar solid cones are 1080cm^3 and 1715cm^3 . If the curved surface area of the smaller cone is 840cm^2 , find the curved surface area of the larger cone. (4 marks)
4. The exterior angle of a regular polygon is a quarter the size of an interior angle. Determine the number of sides of the polygon. (3 marks)
5. $\cos \theta = \frac{1}{\sqrt{3}}$ where θ is an acute angle. Without using mathematical tables or calculator, find:
(a) $\sin \theta$ (2 marks)
(b) $\tan(90 - \theta)$ (1 mark)
6. Solve the inequality $4x - 3 > x \geq \frac{3x-5}{2}$ and give your answer as a compound inequality (3 marks)
7. Simplify $16^{-3/4} \times 64^{2/3} \times \left(\frac{1}{4}\right)^{-3/2}$ (3 marks)
8. Boaz comes to Kenya with 5 600 Euros which he exchanges to Kenya Shillings. While in Kenya he spends Kshs 280 700 touring various parts of Mombasa County and donates Kshs 120 000 to a school for the blind. He then converts the remaining amount to sterling pounds and leaves Kenya. The exchange rates at the time were as follows:

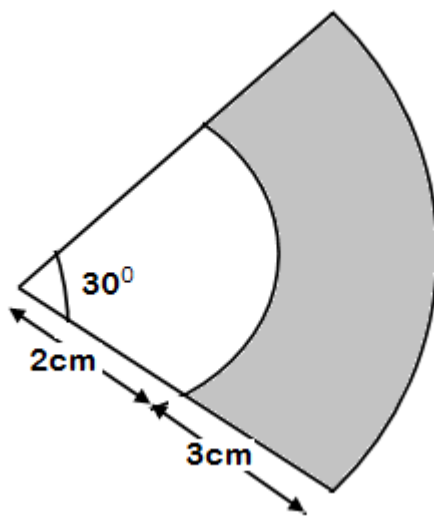
Currency	Buying (Kshs)	Selling (Kshs)
1 Euro	105.63	105.98
1 Sterling pound	120.23	120.54

Calculate the amount of sterling pounds that he had as he was leaving Kenya.

(3 marks)

9. Traffic lights at three different functions show green light at the intervals of 10 seconds, 12 seconds and 15 seconds. They all show green at 1.00pm. At what time had they previously shown green together? **(3 marks)**

10. Find the area of the shaded region in the figure below. **(3 marks)**



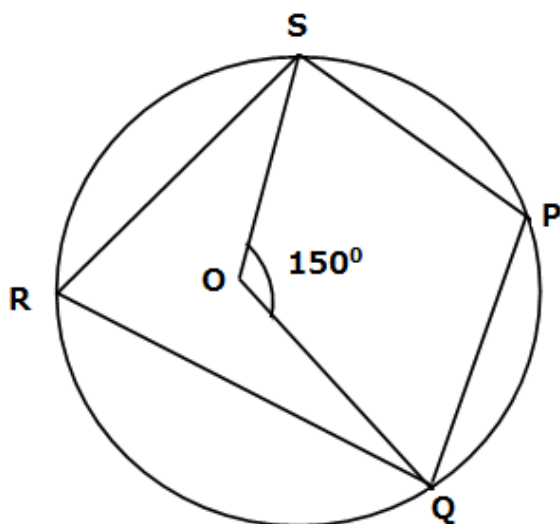
11. The point $M\left(\frac{1}{2}, 1\right)$ is the mid – point of points $A(a, -3)$ and $B(4, b)$. Find the values of a and b and hence the magnitude of \overrightarrow{AB} **(3 marks)**

12. Calculate the volume of 2kg of a cork if the density of the cork is 0.25g/cm^3 . **(3 marks)**

13. Solve the equation $2x^2 + 4x + 1 = 0$ using completing the square method. **(3 marks)**

14. PQRS is a trapezium in which PQ and SR are parallel. If $PQ = 7\text{cm}$, $SR = 3\text{cm}$, $QR = 5\text{cm}$ and the area of PQRS is 18cm^2 , calculate the height PS. **(3 marks)**

15. PQRS is a cyclic quadrilateral and O is the center of the circle. Angle QOS = 150° .



Find the size of:

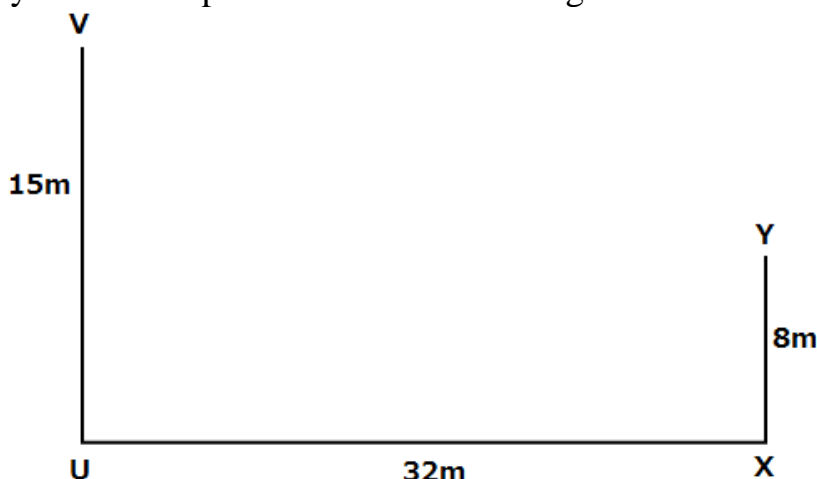
(a) Angle QPS

(2 marks)

(b) Angle QRS

(1 mark)

16. The heights of two vertical poles UV and XY are 15m and 8m respectively. They are 32m apart and on a horizontal ground as shown in the figure below.



Calculate the angle of elevation of V from Y

(3 marks)

SECTION II (50 MARKS)

Answer FIVE questions ONLY from this section

17. (a) Given the matrix $Q = \begin{pmatrix} 5 & 24 \\ 4 & 30 \end{pmatrix}$, find its inverse matrix Q^{-1} (2 marks)

(b) Two friends Kamara and Teso, bought bulls at sh b per bull and goats at sh g per goat. Kamara spent sh.96,000 in buying 5 bulls and 24 goats while Teso spent sh 93,000 in buying 4 bulls and 30 goats

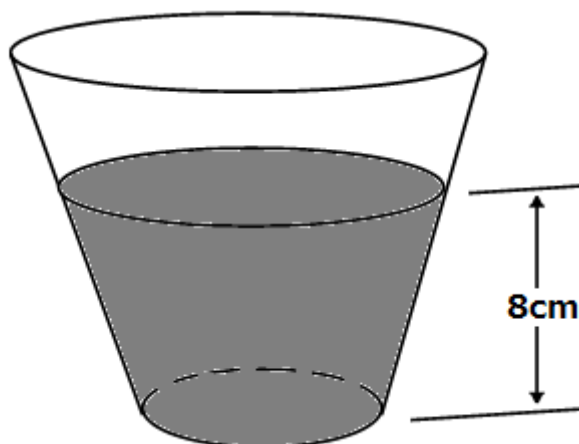
- (i) Form a matrix equation to represent this equation

(1 mark)

- (ii) Use the inverse matrix Q^{-1} in (a) above to find the cost of one bull and that of one goat **(3 marks)**
- (c) Kamara sold all his animals at a profit of 30% per bull and 40% per goat. Teso sold his animals at a profit of 25% per bull and 50% per goat. Determine who made more profit and by how much. **(4 marks)**
18. A bus left Kampala travelled towards Dar-es-Salaam at an average speed of 70km/h. after $3\frac{1}{2}$ hrs, a car left Dar-es-Salaam and travelled along the same road towards Kampala at an average speed of 90km/h. the distance between Kampala and Dar-es-Salaam is 1077km.
- a) Find:
- (i) The distance of the bus from Kampala when the car left Dar-es-salaam **(2 marks)**
- (ii) The distance of the bus from Dar-es-Salaam when the car left the bus **(4marks)**
- b) After the car met the bus, the car stopped for 30 minutes. The car then continued with its journey and reached Kampala at the same time the car reached Dar-es-Salaam. At what new average speed between the meeting point and Kampala car move. **(4marks)**
19. The following table shows masses to the nearest kilogram, of 200 animals in Moseti's farm.

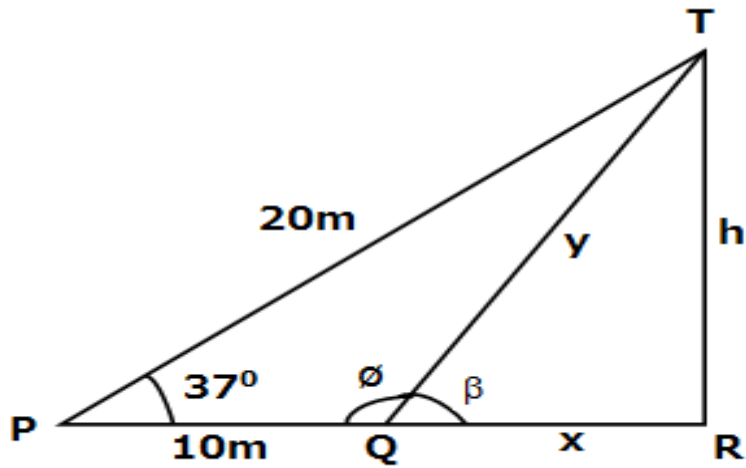
Mass (kg)	40-49	50-59	60-69	70-79	80-89	90-99	100-109
frequency	9	25	58	52	30	16	10

- a) Using the assumed mean of 74.5, find the actual mean **(4 marks)**
- b) Find the median mass **(3marks)**
- c) Calculate the standard deviation of the data **(3marks)**
20. The diagram below represents a glass in form of a frustum of a cone, with milk to a depth of 8cm. the internal radius of the glass bottom is 3cm while the radius of a circular surface of milk is 5cm.



- a) How many litres of milk correct to 2 significant figures are in the glass? **(3marks)**

- b) A metallic hemisphere solid accidentally drops inside the milk. The level of glass in milk then rises by 6mm. if no milk splashed out of the glass when the solid dropped in, find
- (i) The volume of the hemisphere solid (4marks)
- (ii) The radius of the hemisphere solid (3marks)
21. In January, 2008, Kelly and Wasanga contributed sh 455,040 and sh 682,560 respectively and used the money to start a business. They agreed that the profit from the business would be shared as from the business would be shared as follows.
- 24% to be shared equally
36% to be shared in their ratio of contribution
40% to be retained for the running of the business.
- a) The total profit for the year was 2008 was sh 750,000
- (i) The difference in their total shares of profits (4 marks)
- (ii) Calculate the amount that was retained for the running of the business. (2marks)
- b) In January 2009, Wasanga took his whole share of profit to a bank that offered a compound interest at the rate of 6% per annum. If the interest was compounded semi-annually, calculate his total interest in the bank in December 2011. (4marks)
22. A rectangular tree nursery measuring 16m by 14 m is situated at the centre of a rectangular piece of land. A path of uniform width runs all around the tree nursery. The width of the path is x metres and the area of the piece of land 360m². The path is graveled at the cost sh 75 per square metre.
- a) Determine
- (i) The value of x (5marks)
- (ii) The dimensions of the field (2marks)
- b) Calculate the cost of gravelling the path (3marks)
23. The diagram below shows a vertical electricity pole TR supported by two wires PT and QT. the points PQ and R are collinear and on the horizontal ground. The angle of elevation of T from P is 37° and the distance between P and Q is 10m



Given that the length of PT is 20m , calculate to the nearest whole numbers

- a) The length of the wire QT **(3marks)**
 - b) The angle of elevation of T from Q **(3marks)**
 - c) The height of TR of the electricity pole **(2marks)**
 - d) The length of P from R **(2marks)**
- 24.** Two vertices of the triangle are $A(3,6)$ and $B(7,12)$
- a) Find the equation of the line AB **(3marks)**
 - b) Find the equation of the perpendicular bisector of line AB **(4marks)**
 - c) Given that AC is perpendicular to AB and the equation of line BC is $y = -5x + 47$, find the co-ordinates of C **(3marks)**

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

MATHEMATICS MOCKS

SERIES 1 TRIAL 3 PAPER 2

Kenya Certificate of Secondary Exams

TIME:2HRS

SECTION A (50 Marks)

Attempt all questions in the spaces provided

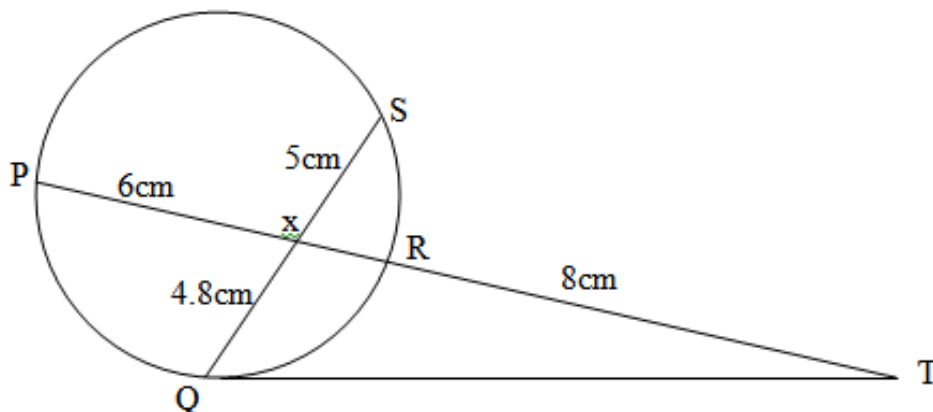
1. Use logarithm to solve tables to evaluate (4 marks)

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

2. The length and breadth of a rectangular paper were measured to be the **nearest** centimeter and found to be 20cm and 15 cm respectively. Find the percentage error in its perimeter leaving your answer to 4 significant figures. (3 marks)

3. Simplify the following surds leaving your answer in the form $a + b\sqrt{c}$
$$\frac{\sqrt{5}}{2\sqrt{2}-\sqrt{5}} + \frac{\sqrt{2}}{2\sqrt{2}+\sqrt{5}}$$
 (3 marks)

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



Find the length of QT (3 marks)

5. Mary and Jane working together can cultivate a piece of land in 6 days. Mary alone can complete the work in 15 days. After the two had worked for 4 days Mary withdrew the services. Find the time taken by Jane to complete the remaining work.
(3 marks)
6. The equation of a circle is given by $3x^2 + 3y^2 - 18x + 12y - 9 = 0$. Determine the radius and the center of the circle. (3 marks)
7. Make Q the subject of the formula (3 marks)
- $$T = P \sqrt{\frac{Q}{Q-1}}$$
8. Solve for x in the equation $2\sin^2 x - 1 = \cos^2 x + \sin x$ for $0^\circ \leq x \leq 360$ (3 marks)
9. Solve for x in $3\log_3 x + 4 = \log_3 24$ (3 marks)
10. In a transformation, an object with area 4cm^2 is mapped onto an image whose area is 48cm^2 by a transformation matrix $\begin{pmatrix} y+1 & y \\ 4 & 2 \end{pmatrix}$. Find the value of y (3 marks)
11. (a) Expand $(2 + 2y)^5$. (2 marks)
(b) Hence find the value of $(2.02)^5$, correct to 4 decimal places when substitution for y is up to y^4 . (2 marks)
12. A coffee blender mixes 6 parts of type A with 4 parts of type B. If type A costs sh 72 and type B costs him sh 66 per Kg respectively, at what price should he sell the mixture in order to make 5% profit? Give your answer to the nearest ten cents. (3 marks)
13. The data below represents the ages in months at which 11 babies started walking:
9, 15, 12, 9, 8, 13, 7, 11, 13, 14 and 10.
Calculate the interquartile range of the above data (3 marks)
14. Karimi deposited sh 45000 in a bank which paid compound interest of 12% per annum. Calculate the amount after 2 years to the nearest whole number. (3 marks)
15. Use tables of reciprocals only to work out (3 marks)
- $$\frac{3}{0.6735} + \frac{13}{0.156}$$
16. PQR is a triangle of area 9 cm^2 . If PQ is the fixed base of the triangle and 6cm long draw it and describe the locus of point R. (3 marks)

SECTION II (50 MARKS)

Answer FIVE questions ONLY from this section

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

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

Personal relief of ksh. 1056 per month

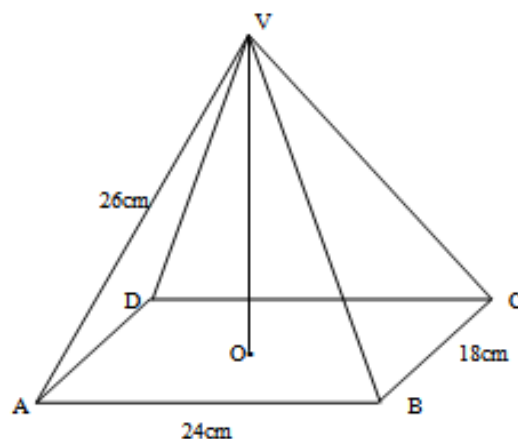
Insurance relief of ksh. 480 per month

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

Calculate;

- Mr. Kimathi's taxable income per annum in K£ (2marks)
 - Mr. Kimathi's net tax per month in Kenya shillings. (5marks)
 - Calculate Mr. Kimathi's net monthly salary in Kenya shillings. (3marks)
- 18.** (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:
- The number of terms in the series (4 marks)
 - The common difference of the progression (2 marks)
- (c) The sum of the first three terms of a geometric progression is 27 and first term is 36. Determine the common ratio and the value of the fourth term (4 marks)

- 19.** The diagram below represents a pyramid standing on rectangular base ABCO. V is the vertex of the pyramid and $VA = VB = VC = VD = 26$ cm. M and N are the midpoints of BC and AC respectively. $AB = 24$ cm and $BC = 18$ cm.



Calculate:-

- The length of the line AC (2marks)
- The length of projection of the VA on the plane ABCD. (1mark)
- The angle between line VA and the plane ABCD. (2marks)
- The vertical height of the pyramid. (2marks)

e) The size of the angle between the planes VBC and ABCD. (3marks)

20. Three quantities R, S and T are such that R varies directly as S and inversely as the square of T.

a) Given that $R = 480$ when $S = 150$ and $T = 5$, write an equation connecting R, S and T. (4marks)

b) (i) Find the value of R when $S = 360$ and $T = 1.5$. (2marks)

(ii) Find the percentage change in R if S increases and T decreases by 20%. (4marks)

21. The water supply in a town depends entirely on two water pumps. A and B. The probability of pump A failing is 0.1 and the probability of pump B failing is 0.2.

a) Draw a tree diagram to represent this information (2marks)

b) Calculate the probability that;

(i) Both pumps are working (2marks)

(ii) There is no water in the town (2marks)

(iii) Only one pump is working (2marks)

(iv) There is some water in the town. (2marks)

22. Complete the table below by filling in the blank spaces. (2 marks)

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

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

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

c) Use your graph to solve the equation $2 \cos \frac{1}{2} x - \cos x = 0$ (2 marks)

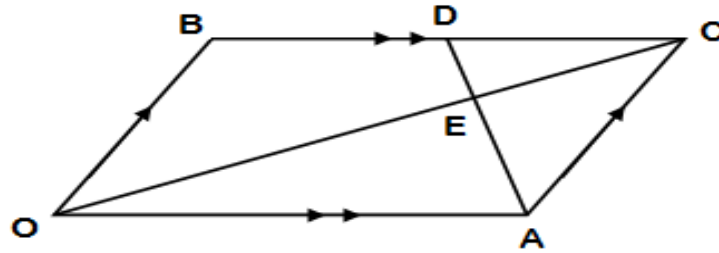
23. ABCD is a quadrilateral with coordinates $A(2, 1), B(3, 2), C(3, 4)$ and $D(0, 3)$. ABCD is mapped onto $A'B'C'D'$ under transformation **T** given by a shear with x – axis invariant such that $A'(4, 1)$.

a) Determine the 2×2 transformation matrix representing **T** and hence determine the coordinates of B', C' and D' . (4 marks)

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

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

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



- (a) Express the following in terms of \mathbf{a} , \mathbf{b} , h and k .
- | | |
|---------------------|----------|
| (i) \mathbf{OC} | (1 mark) |
| (ii) \mathbf{OE} | (1 mark) |
| (iii) \mathbf{AD} | (1 mark) |
| (iv) \mathbf{AE} | (1 mark) |
- (b) Find the values of h and k . (4 marks)
- (c) Determine the ratios:
- | | |
|----------------------------------|----------|
| (i) $\mathbf{AE} : \mathbf{ED}$ | (1 mark) |
| (ii) $\mathbf{OE} : \mathbf{OC}$ | (1 mark) |

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

MATHEMATICS MOCKS

SERIES 1 TRIAL 4 PAPER 1

Kenya Certificate of Secondary Exams

TIME:2HRS

SECTION A (50 Marks)

Attempt all questions in the spaces provided

1. Without using calculators evaluate: (3mks)

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

2. Find the possible values of X in the equation $9^{X^2} = 27^{(2X + 12)}$
(3mks)

3. . A Kenyan tourist left Germany for Kenya through Switzerland. While in Switzerland he bought a watch worth 52 Deutsche marks. Find the value of the watch in:-

(a) Swiss Francs

(b) Kenya shillings

(3 marks)

Use the exchange rates below

1 Swiss Franc = 1.28 Deutsche marks

1 Swiss Franc = 45.21 Kenya shillings

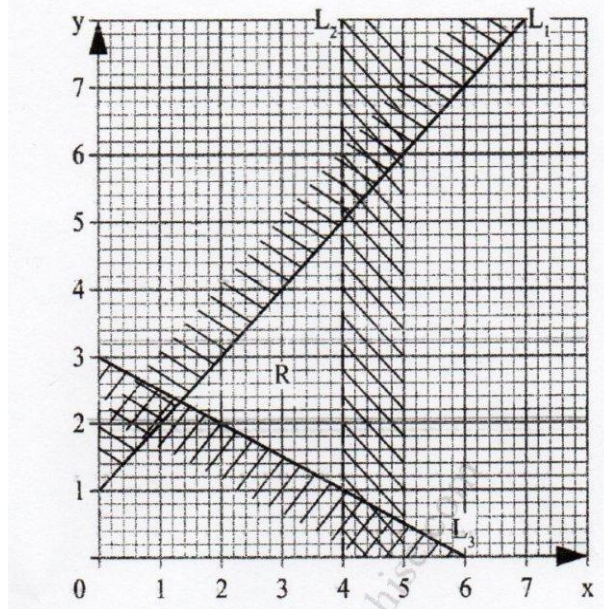
4. Juma, Ali and Hassan share the profit of their business in the ratios 3:7:9 respectively. If Juma receives sh 60 000. How much profit did the business yield?
(3mks)

5. Simplify the expression. (3 Marks)

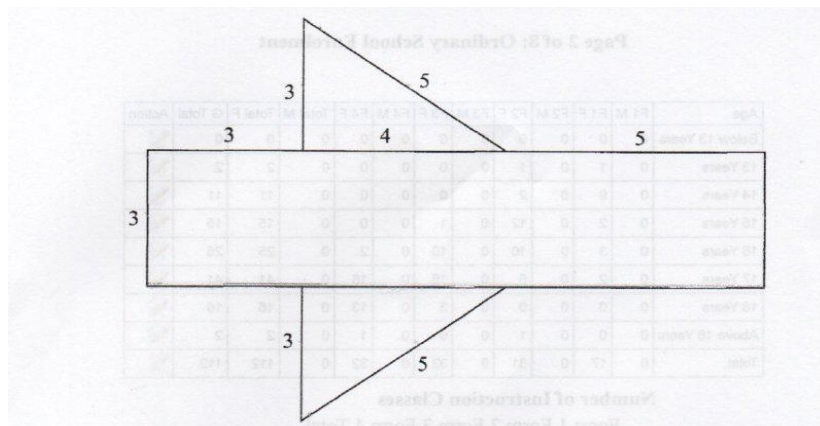
$$\frac{4x^2 - 16y^2}{6x^2 - 8xy - 8y^2}$$

6. Given that x is an acute angle and $\cos x^\circ = \frac{2}{5}\sqrt{5}$ find, without using mathematical tables or a calculator, $\tan (90 - x)^\circ$.
(2 marks)

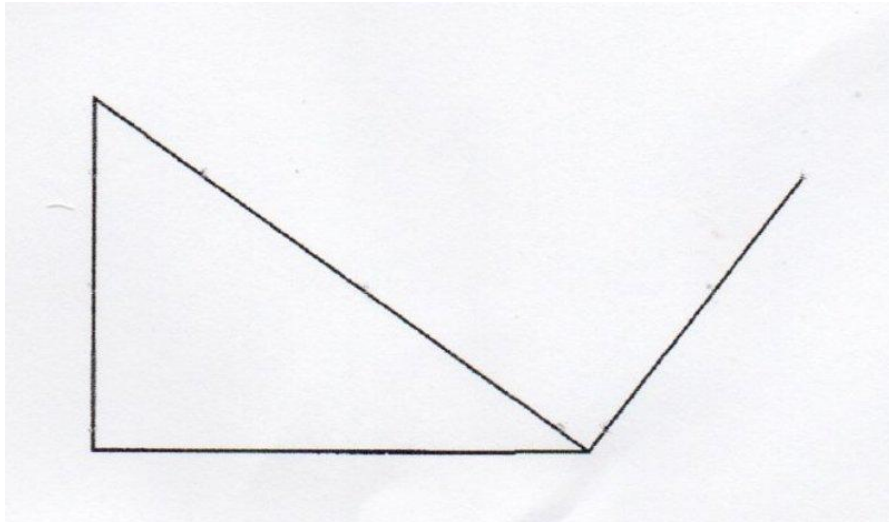
7. Find the equation of the line perpendicular to $3x - 7y - 20 = 0$, and passes through the point (5,2) (3 Marks)
8. The sum of the interior angles of a regular polygon is 1080° . Calculate
 (a) The number of sides of the polygon (2 Marks)
 (b) The sizes of the exterior and interior angles of the polygon. (2 Marks)
9. The diagram below shows a region R bounded by three lines L_1 , L_2 and L_3



- Form three inequalities that satisfy the given region R (3Marks)
10. The figure below shows a net of solid (measurements are in centimeters).



- Below is a part of the sketch of the solid whose net is shown above. Complete the sketch of the solid, showing the hidden edges with broken lines (3Marks)



11. Use tables of cubes, square roots and reciprocals to evaluate **(3 mks)**

$$\frac{4}{(0.3485)^3 - \sqrt{437.6}}$$

12. Peter is 15m away from the bottom of a tower. He spots a bird on top of the tower at an angle of elevation of 62° . Also John spots the same bird at an angle of elevation of 30° . Find the distance between John and Peter if they are on the same line. **(3mks)**
13. Three similar pieces of timber of length 240cm, 320cm and 380cm are cut into equal pieces. Find the largest possible area of a square which can be made from any of the three pieces. **(3 Marks)**
14. Two similar containers have capacities of 540cm^3 and 160cm^3 . The small one has a base area of 25cm^2 . Find the height of the larger one. Leave your answer to (4sf) **(4marks)**
15. Wanza sold a bag of potatoes for Sh. 420 and made a profit. If she sold it at Sh. 320, she could have made a loss. Given that the profit is thrice the loss, how much did she pay for the bag of potatoes? **(3 Marks)**
16. A rectangular water tank measures 2.6m by 4.8m at the base and has water to a height of 3.2m. Find the volume of water in liters that is in the tank. **(4marks)**

SECTION II (50 MARKS)

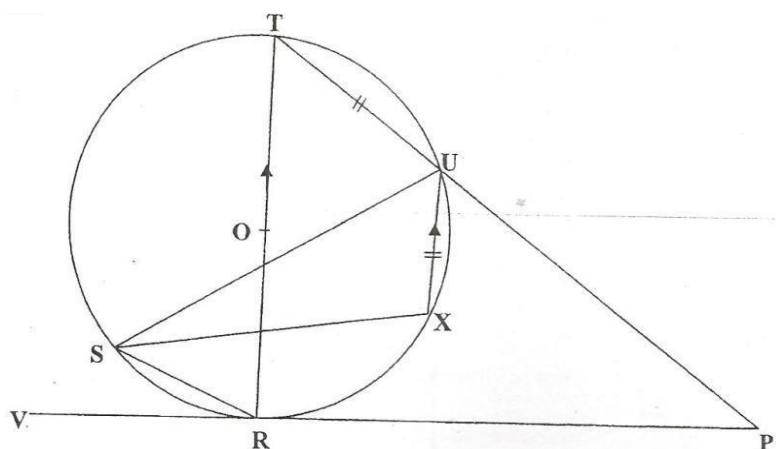
Answer Only Five Questions in This Section

17. Four towns **A, B, C** and **D** are such that **B** is on a bearing of 247° and 6km from **A**. **C** is due SE and 4.8km from **B**. **D** is to the south of **A** and the bearing of **C** from **D** is $S44^\circ W$
- (a) Make a scale drawing showing the relative positions of **A, B, C** and **D** using the scale 1cm represents 1km **(4marks)**
- (b) Use your drawing to determine
- (i) The bearing of **A** from **C** **(1mark)**
- (ii) The distance between **C** and **D** **(1mark)**
- (iii) How far **D** is east of **B** **(1mark)**

(c) The average speed of a cyclist from C to A if he takes 30 minutes between A and D and 20 minutes between D and A

(3mks)

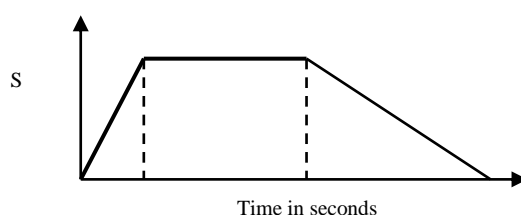
18. In the figure below, O is the centre of the circle TOR is the diameter and PRV is tangent to the circle at R.



Given that $\angle SUR = 25^\circ$, $\angle URP = 60^\circ$, $TU = UX$ is parallel to the diameter; giving reasons calculate;

- a) $\angle TOU$ (2 marks)
- b) $\angle XUP$ (2 marks)
- c) $\angle STR$ (2 marks)
- d) Reflex $\angle SXU$ (2 marks)
- e) $\angle RPU$ (2 marks)

19. The diagram below shows the speed-time graph for a bus travelling between two stations. The bus begins from rest and accelerates uniformly for 30 seconds. It then travels at a constant speed for 60 seconds and finally decelerates uniformly for 40 seconds.



Given that, the distance between the two stations is 2090m. Calculate

- (a) The maximum speed, in km/h the bus attained (3 Marks)
 - (b) The acceleration (2 Marks)
 - (c) The distance travelled during the last 20 seconds (2 Marks)
 - (d) The time the bus takes to travel the first half of the journey (3 Marks)
20. (a) complete the table below for the function $y = 2x^2 + 4x - 3$ (2marks)

X	-4	-3	-2	-1	0	1	2
$2x^2$	32		8	2	0	2	
$4x-3$			-11		-3		
Y			-3			3	13

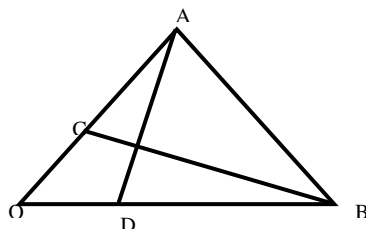
(b) Draw the graph of the function $y = 2x^2 + 4x - 3$ on the grid provided. (provide graph paper) **(3marks)**

(c) Use your graph to estimate the roots of the equation $2x^2 + 4x - 3 = 0$ **(1mark)**

(d) Use your graph to obtain the roots of the equation $2x^2 + x - 5 = 0$ to 1 decimal place. **(3marks)**

(e) Draw the line of symmetry to pass through the turning point of this curve. **(1mark)**

21.. The diagram given below show triangle OAB. $OA = \mathbf{a}$, $OB = \mathbf{b}$ C divides OA in the ratio **2:3** and D divides OB in the ratio 3:4 while AD and BC meet at E.



Find in term of \mathbf{a} and \mathbf{b}

(a) (i) \overrightarrow{OC} **(2 Marks)**

(ii) \overrightarrow{CB} **(4 Marks)**

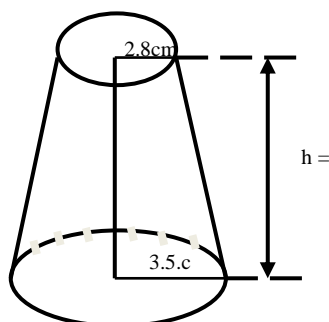
(b) Given that $\overrightarrow{CE} = m\overrightarrow{CB}$ and $\overrightarrow{DE} = n\overrightarrow{DA}$ where m and n are scalars

(i) Write down two distinct expressions for \overrightarrow{OE} **(2 Marks)**

(ii) Hence find the values of m and n **(4 Marks)**

(iii) Find \overrightarrow{OE} in terms of \mathbf{a} and \mathbf{b} only **(1 Mark)**

22. Find



(a) The surface area of the frustum **(5 Marks)**

(b) The volume of frustum shown. **(5 Marks)**

23. The table below gives a field book showing the results of a survey of a section of a piece of land between A and E. All measurements are in metres.

	E	
D33	95	
	90	F 36
C21	70	
B 42	30	G 25
	25	H 40
	A	

(a) Draw a sketch of the land. (4marks)

(b) Calculate the area of this piece of land in hectares (6marks)

24.(a) Given that $A = \begin{pmatrix} 3 & x \\ x+1 & 2 \end{pmatrix}$, $X = \begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}$ find values of x for which AB is singular matrix.

(4marks)

(b) Mambo bought 3 exercise books and 5 pens for a total of ksh 165. If Mambo had bought 2 exercise books and 4 pens, he would have spent ksh 45 less.

Taking x to represent the price of an exercise book and y to represent the price of a pen:

(i) Form two equations to represent the above information (1mark)

(ii) Use matrix method to find the price of an exercise book and that of a pen.

(3marks)

(iii) A teacher of a class of 36 students bought 2 exercise books and 1 pen for each student. Calculate the total amount of money the teacher paid for the books and pens (2marks)

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

MATHEMATICS MOCKS

SERIES 1 TRIAL 4 PAPER 2

Kenya Certificate of Secondary Exams

TIME:2HRS

SECTION A (50 Marks)

Attempt all questions in the spaces provided

1. Use logarithms to evaluate (4 Marks)

$$\sqrt[3]{\left(\frac{1.23 \times 0.0468}{\text{Log}_6}\right)}$$

2. Express in surd form. $\frac{1}{2+\sin 45^\circ}$ (3 Marks)
hence rationalize the denominator

3. Make r the subject of the formula. (3 Marks)

$$S = \sqrt{\frac{r^2 + 2xb}{n}}$$

4. By correcting each number to one significant figure, approximate the value of 788×0.006 . Hence calculate the percentage error arising from this approximation. (3mks)

5. A merchant blends 350kg of tea costing Sh. 84 kg with 140kg of tea costing Sh. 105 per kg. At what price must he sell the mixture to gain 25% (3 Marks)

6. Solve the equation (3 marks)
 $2 \log x - \log (x-2) = 2 \log 3$

7. A circle whose equation is $(x - 1)^2 + (y - k)^2 = 10$ passes through the point (2, 5). Find the value of k. (3 marks)

8. (a)Expand the expression $(1 + \frac{1}{2}x)^5$ in ascending powers of x, leaving the coefficients as fractions in their simplest form. (2 marks)

- (b)Use the first three terms of the expansion in (a) above to estimate the value of $(1^{1/20})^5$. (2 marks)

9. Given that $OA = i + 2j - 3k$ and $OB = 2i - j - 2k$
Find |AB| (2 Marks)

10. An arc 11 cm long subtends an angle of 70° at the centre of a circle. Calculate the length, Correct to one decimal place, of a chord that subtends an angle of 90° at the centre of the same circle. (4 marks)

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

(i) Find the equation connecting Q and R (3 Marks)

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

12. Find in radians, the values of x in the interval $0^\circ < x < 2\pi^\circ$ for which $2 \cos^2 x - \sin x = 1$.

(Leave the answer in terms of π) (4 marks)

13. Find the inverse of the matrix $\begin{pmatrix} 3 & 2 & 5 & 4 \end{pmatrix}$ (4 Marks)

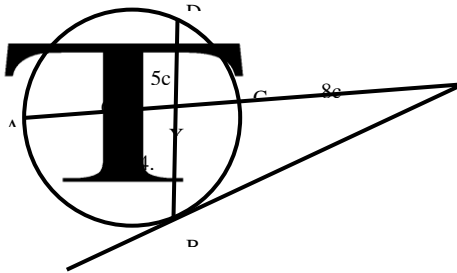
Hence or otherwise solve the simultaneous equations

$$3x + 2y = 4$$

$$5x + 4y = 9$$

14. Mogutu and Onacha working together can do a piece of work in 6 days. Mogutu working alone takes 5 days longer than Onacha. How many days does it take Onacha to do the work alone? (3 Marks)

15. In the diagram below, BT is a tangent to the circle at B. AXCT and BXD are straight lines. $AX = 6\text{cm}$, $CT = 8\text{cm}$, $BX = 4.8\text{cm}$ and $XD = 5\text{cm}$.



Find the length of BT. (2 Marks)

16. The area of triangle FGH is 21 cm^2 . The triangle FGH is transformed using the matrix

$$\begin{pmatrix} 4 & 5 \\ 1 & 2 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 \\ 4 & 5 \end{pmatrix}$$

Calculate the area of the image of triangle FGH (2 marks)

SECTION II (50 MARKS)

Answers only five questions in this section

17. The following frequency distribution table shows the heights of students in a school.

Height (cm)	Number of students
146 – 150	3
151 – 155	9
156 – 160	20
161 – 165	14
166 – 170	4

Using assumed mean of 157.5, calculate

(a) The mean height correct to 3 decimal place (5mks)

(b) The standard deviation correct to 4 s.f. (5mks)

18. A triangle formed by A(1, 3), B(3, 1) and C (2, -1) is rotated through a positive quarter about (1, 1). Find the coordinates of the resulting triangle $A^1B^1C^1$. (3 marks)

(b) Triangle $A^1B^1C^1$ is transformed by the matrix $\begin{pmatrix} 1 & 2 \\ -1 & 3 \end{pmatrix}$ into $A^{11}B^{11}C^{11}$. Find the coordinate of $A^{11}B^{11}C^{11}$. (3 marks)

(c) Draw accurately all the three triangles. (4 marks)

(provide a graph paper)

19. A red and black dice are rolled and the events X, Y and Z are defined as follows.

X - The red die shows a 4

Y - The sum of the scores of the two dice is 6

Z - The black die shows a 3

(a) Find the probability of event X (2 Marks)

(b) The probability of events X and Z (3 Marks)

(c) Which event is mutually exclusive to X (1Mark)

(d) Which event is independent of X (2Marks)

(e) The probability of event Y (2 Marks)

20. A tourist took 1 hour 20 minutes to travel by an aircraft from town T(3°S, 35°E) to town U(9°N, 35°E). (Take the radius of the earth to be 6370km and $\pi = \frac{22}{7}$)

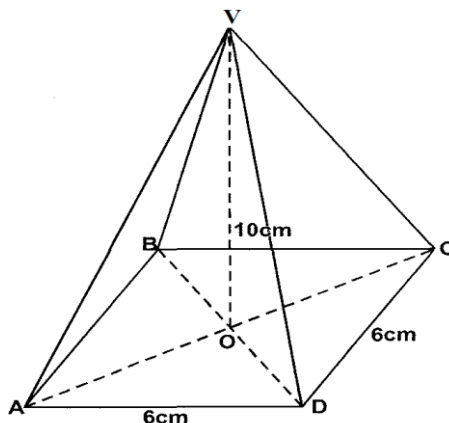
(a) Find the average speed of the aircraft. (3 marks)

(b) After staying at town U for 30 minutes, the tourist took a second aircraft to town V (9°N, 5°E). The average speed of the second aircraft was 90% that of the first aircraft. Determine the time, to the nearest minute; the aircraft took to travel from U to V. (3 marks)

(c) When the journey started at town T, the local time was 0700 h. find the local time at V when the tourist arrived. (4 marks)

21. The figure below is a square based pyramid ABCDV with AD=DC = 6cm and height V = 10cm.

a) State the projection of VA on the base ABCD. (1 mark)



b) Find:

i) The length of VA (3 marks)

- ii) The angle between VA and ABCD (2 marks)
- iii) The angle between the planes VDC and ABCD (2 marks)
- iv) Volume of the pyramid (2 marks)

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

- (i) The amount of money which was deposited. (2marks)
- (ii) The annual rate of interest that the bank paid. (2marks)

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

- (i) Kioko 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 sh. 2625. Calculate the number of instalments. (3 marks)
- (ii) Had Kioko bought the computer on cash price terms he would have been allowed a discount of $12\frac{1}{2}\%$ on marked price. Calculate the difference between the cash price and hire purchase price and express it as a percentage of the cash price. (3marks)

23. The first, fifth and seventh terms of an arithmetic progression (AP) correspond to the first three consecutive terms of a decreasing Geometric Progression (G.P.). The first term of each progression, is 64, the common difference of the AP is d and the common ratio of the G.P. is r .

- (a) (i) Write two equations involving d and r . (2 marks)
- (ii) Find the values of d and r . (4 marks)
- (b) Find the sum of the first 10 terms of:
 - (i) The arithmetic progression (A.P.); (2 marks)
 - (ii) The Geometric Progression (G.P.) (2 marks)

24.(a) Complete the table given below by filling the blank spaces.

X	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	4.00		2.00	0	-2.00	-3.46	-4.00	-3.46	-4.00	-3.46	-2.00		4.00
2 Sin (x + 30)	1.00	1.73	2.00	1.73		0	-1.00	-1.73	-2.00	-1.73		0	1.00

(2 Marks)

(b) On the grid provided draw the graph of $y = 4 \text{ Cos } 2x$ and $y = 2 \text{ Sin } (2x + 30^0)$ for $0^0 \leq x \leq 180^0$. Take the scale 1cm for 15^0 on the x – axis and 2cm for 1 unit on the y-axis. (5 Marks)

(Provide a graph paper)

- (c) (i) State the amplitude of $y = 4 \text{ Cos } 2x$ (1 Mark)
- (ii) Find the period of $y = 2 \text{ Sin } (2x + 30^0)$ (1 Mark)
- (d) Use your graph to solve $4 \text{ Cos } 2x - 2 \text{ Sin } (2x + 30) = 0$ (1 Mark)

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

MATHEMATICS MOCKS

SERIES 1 TRIAL 5 PAPER 1

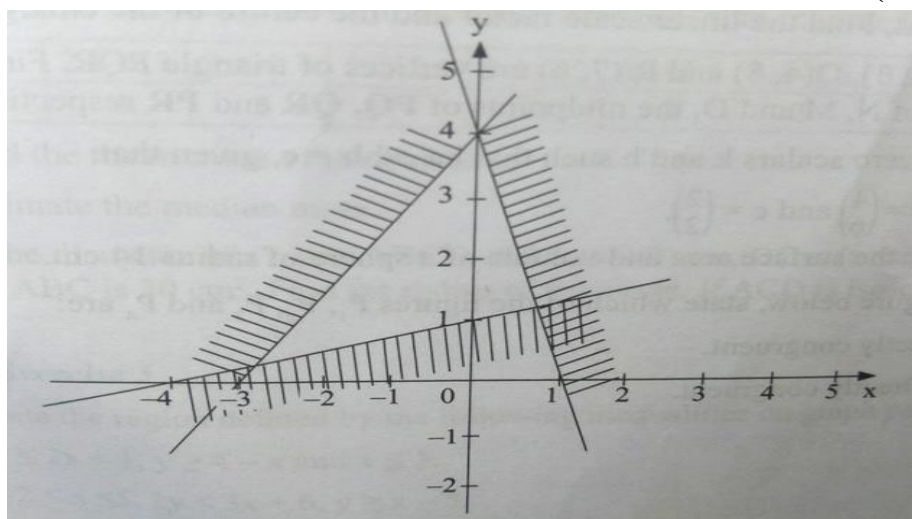
Kenya Certificate of Secondary Exams

TIME:2HRS

SECTION A (50 Marks)

Attempt all questions in the spaces provided

1. If $2^{x+y} = 16$ and $4^{2x-y} = \frac{1}{4}$, find the value of x and y . (3mks)
2. 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. (3mks)
3. Given that $\cos A = \frac{5}{15}$ and angle A is acute, find the $\tan (90-A)$. (2mks)
4. 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? (4mks)
5. In the figure below, find the inequalities which describe the unshaded region. (3mrks)



6. Without using a calculator evaluate; (3 mks)

$$\left[\frac{\frac{1}{2} \text{ of } 3\frac{1}{2} + 1\frac{1}{2} \quad 2\frac{1}{2} \left(\frac{2}{3} \right)}{\frac{3}{4} \text{ of } 2\frac{1}{2} \div \frac{1}{2}} \right]$$

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

8. Determine the equation of the line passing through (-1, 3) and parallel to the line whose equation is $3x - 5y = 10$. (2mks)

9. A ship covers 60km on a bearing of 230° . It then changes its course and heads due west for 80km.. Calculate its direct distance from the starting point. (4mks)

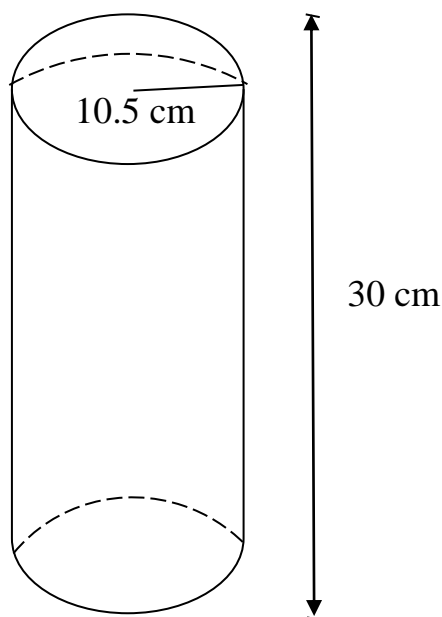
10. Five shirts and four pairs of trousers cost sh 6160. Three similar shirts and a pair of trousers cost sh 2800. Find the cost of four shirts and a pair of trousers. (3mks)

11. 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. (4mks)

12. The sum of the interior angles of a regular polygon is 1080°
 a) Find the size of each exterior angle (2mks)
 b) Name the polygon. (1mks)

13. A two digit number is such that the sum of the ones and the tens digit is ten. If the digits are reversed the new number formed exceeds the original number by 54. Find the number. (3mks)

14. The solid shown below consists of a cylinder and hemisphere of equal radius 10.5cm. If the height of the solid is 30cm. find its surface area. (Take $\pi = \frac{22}{7}$). (4mks)



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

16. Evaluate without using tables or calculator; (3mks)

$$\frac{0.036 \times 0.0049}{0.07 \times 0.048}$$

SECTION II: (50MARKS).

Attempt any five questions in this section.

17. Using a ruler and a pair of compass only;

a) Construct triangle ABC in which AB=5cm, BC=5.9cm and angle BAC=45° (4mks)

b) Draw an incircle of the triangle ABC and measure its radius. (3mks)

c) By taking AB as the base, find the area of the triangle. (3mks)

18. Three warships P, Q and R are at sea such that ship Q is 400km on a bearing of 030° from ship P. Ship R is 750 km from ship Q and on a bearing of 120° from ship Q. An enemy ship S is sighted 1000km due south of ship Q.

a) Taking a scale of 1cm to represent 100km, locate the relative positions of ships P, Q, R and S. (4mks)

b) Find the compass bearing of;

i. P from S (2 mks)

ii. S from R

c) Use the scale drawing to determine the distance of:

i. S from P (2 mks)

ii. R from S

d) Find the bearing of:

i. Q from R (2 mks)

ii. P from R

19. Two friends Jane and Tom live 40km apart. One day Jane left her house at 9:00am and cycled towards Tom's house at an average speed of 15km/hr. Tom left his house at 10.30am on the same day and cycled towards Jane's house at an average speed of 25km/hr.

a. Determine:

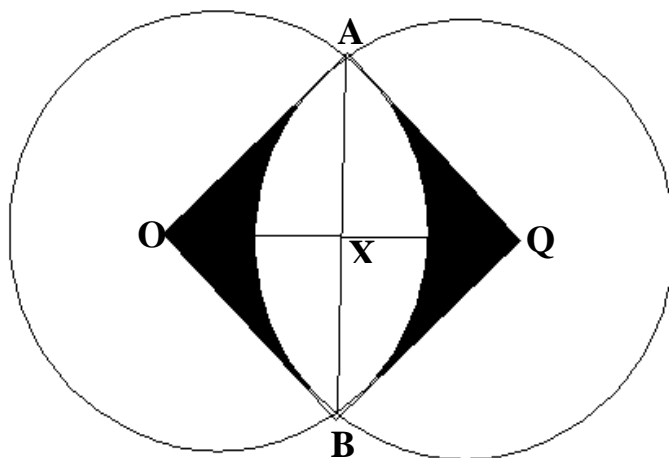
i. The distance from Jane's house to where the two friends met. (4mks)

ii. The time they may (2mks)

iii. How far Jane was from Tom's house when they met. (2mks)

b. The two friends took 10 minutes at the meeting point and then cycled to Tom's house at an average speed of 12km/hr. Find the time they arrived at toms house (2mks)

20. Two equal circles with centres O and Q and radii 8cm intersect at points A and B as shown below. Given that the distance between O and Q is 12cm and that line AB meets OQ at X.



Find;

- i. The length of chord AB. (2mks)
 - ii. The area of the shaded region. (6mks)
 - iii. The reflex angle AOB. (2mks)
21. A kite ABCD has vertices at A(1,1), B(6,2), C(6,6) and D(2,6).
- a) On the axes draw the image and state its coordinates;
 - i) A'B'C'D' of ABCD under a rotation of 90^0 about the origin. (3 mks)
 - ii) A''B''C''D'' of A'B'C'D' under a reflection in the line $y=x$. (3mks)
 - iii) A'''B'''C'''D''' of A''B''C''D'' under a reflection in the line $x=0$. (2mks)
- (Provide graph paper)**
- b) Describe a single transformation that maps A"B"C"D onto ABCD. (2mks)
22. A triangular plot ABC is such that AB=72m, BC=80m and AC=84m.
- a) Calculate the:
 - i) Area of the plot in square meters. (3mks)
 - ii) Acute angle between the edges AB and BC. (3mks)
 - iii) Perpendicular height from A to the line BC. (2mks)
 - b) A water tap is to be installed inside the plot such that the tap is equidistant from each of the vertices A, B and C. Calculate the distance of the tap from the vertex A. (2mks)
23. a) Find the equation of a straight line passing through the point (3, 2) and (-3, 6) giving your in the form $\frac{x}{a} + \frac{y}{b} = 1$ where a and b are constants. (4mks)

- b)** State the coordinates of points A and B at which the line in (a) above crosses the x-axis and y-axis respectively. **(2mks)**
- c)** Using the information in (a) and (b) above, find the area of triangle AOB where O is the origin. **(2mks)**
- d)** Find the acute angle the line in (a) above makes with the x-axis. **(2mks)**
- 24.** A flag post 12m long is fixed on top of a tower. From a point on horizontal ground, the angles of elevation of the top and bottom of the flag post are 46° and 33° respectively.
- Calculate;
- a)** The horizontal distance from the point on the ground to the base of the tower. **(4mks)**
- b)** The total height of the tower and the flag post. **(2mks)**
- c)** The shortest distance from the point on the ground to
- i)** The top of the flag post. **(2mks)**
- ii)** The top of the tower. **(2mks)**

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

MATHEMATICS MOCKS

SERIES 1 TRIAL 5 PAPER 2

Kenya Certificate of Secondary Exams

TIME:2HRS

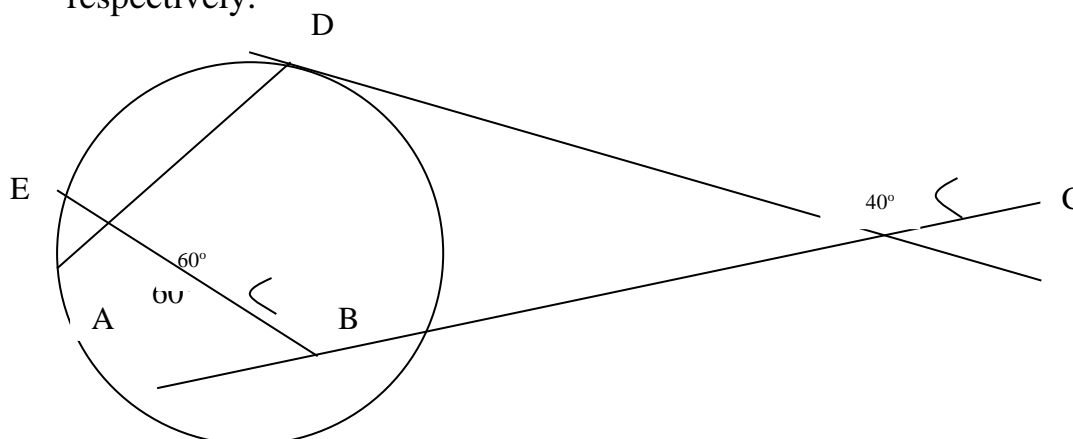
SECTION A (50 Marks)

Attempt all questions in the spaces provided

1. Find the percentage error in calculating the volume of the cuboid whose dimensions are 8.2cm by 6.2cm by 5.7cm **(3mks)**
2. Using the mid-ordinate rule of 5 strips, determine the area under the curve $y = 3x^2 + 10$. The lines $x = 1$, $x = 6$ and x -axis. **(3 mks)**
3. $OA = 2i + 3j + 4k$ while $OB = 5i + 9j - 2k$. P divides AP externally in the ratio 2:1. Find the coordinates of P. **(3 mks)**
4. Use mathematical tables to evaluate: **(4mks)**

$$3\sqrt{\frac{0.8423 \times 72.5}{930.5}}$$

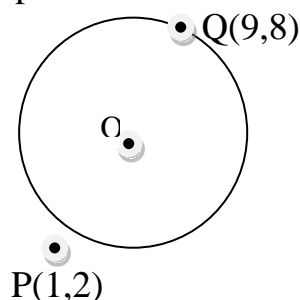
5. On the figure below, line ABC and DC are tangents of the circle at B and D respectively.



Calculate;

- (a) $\angle CBD$ **(1 mk)**
- (b) $\angle CDE$
6. Without using a calculator evaluate: **(3mks)**
 $(\log_2 x)^2 + \log_2 8 = \log_2 x^4$

7. P and Q are the points on the ends of the diameter of the circle below.



(a) Write down in terms of X and Y the equation of the circle in the form:

$$ax^2 + by^2 + x + y + c = 0 \quad (2 \text{ mks})$$

(b) Find the equation of the tangent at Q in the form $ax + by + c = 0$ (2 mks)

8. Solve the equation $4 - 4\cos^2 x = 4\sin x - 1$ for the range $0^\circ \leq x \leq 360$ (3 mks)

9. Expand $(1 - \frac{1}{2}x)^9$ up to the fourth term, hence use your expansion to evaluate 0.995^9 , correct to 4 decimal places. (4 mks)

10. Make x the subject of the formula (3 mks)

$$P = \frac{1}{d} \sqrt{\frac{g+x}{1-x}}$$

11. Solve the following quadratic equation by completing the square method. Give your answer to one decimal place. (3 mks)

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

12.(a) Given that $P = \begin{pmatrix} 3 & -1 \\ 2 & 4 \end{pmatrix}$ and $O = \begin{pmatrix} 4 & 1 \\ -2 & 3 \end{pmatrix}$. Find PO (1 mk)

(b) Hence, find the point of intersection of the lines $4x + y = 9$ and $3y = 2x - 1$. (2 mks)

13. Two types of tea which cost Ksh 200 per kg and Kshs 250 per kg are mixed so that their weights are in the ratio 5:3 respectively. Calculate the cost of 20kg of the mixture. (3 mks)

14. Expand the expression $(3\sqrt{2} + 5)(3\sqrt{2} - 5)$. Hence work out the following. (3 mks)

$$\frac{4}{3\sqrt{2} + 5} - \frac{3}{3\sqrt{2} - 5}$$

14. T is a transformation represented by the matrix $\begin{pmatrix} 5x & 2 \\ -3 & x \end{pmatrix}$. Under T, a square of area of 18cm^2 is mapped onto a square of area 110cm^2 . Find the value of x.

(3 mks)

16. After how many years would Khs 15,000 amount to Kshs 24,015.50 at a rate of 16% p.a compounded quarterly? (3 mks)

SECTION II (50 MARKS)

Answer only FIVE questions in this section in the spaces provided.

17. The table below shows the Kenya tax rates in a year

Income (Ksh per annum)	Tax rate (per %)
1 – 116,160	10%
116,161 – 225,600	15%
225,601 – 335,040	20%
335,041 – 444,480	25%
Over 444,481	30%

In that year, Ushuru earned a basic salary of Ksh 30000 per month. In addition, he was entitled to a medical allowance of Ksh 2,800 per month and a traveling allowance of Ksh 1800 per month. He is housed by the employer and pays a nominal rent of 2000. He also claimed a monthly family relief of Ksh 1056. Other monthly deductions were union dues Ksh 445, WCPS Ksh 490, NHIF Ksh 320, COOP shares Ksh 1000 and risk fund Ksh 100

Calculate:

- (a) Ushuru's annual taxable income. (2marks)
(b) The tax paid by Ushuru in that year. (5marks)
(c) Ushuru's net income in that year (3marks)

18.

Mark (%)	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Frequency	2	5	7	9	11	8	5	3

- (a) On the grid provided, draw a cumulative frequency curve of the data. (Provide a graph paper) (3marks)
(b) From your curve in (a) above
(i) Estimate the median mark. (1mark)
(ii) Determine the Interquartile deviation. (2marks)
(iii) Determine the 10th to 90th percentile range. (2marks)
(c) It is given that students who score over 45 marks pass the test. Use graph in (a) above to estimate the percentage of students that pass. (2marks)

- 19.(a) The first term of a G.P is 4. If the common ratio is 2, find the greatest number of terms that will give a sum less than 40 (4marks)
- (b) The 2nd, 4th and 7th terms of a A.P are the first 3 consecutive terms of a G.P. if the common difference of AP is 2 Find

(i) The common ratio (3marks)

(ii) The sum of the first eight terms of the G.P. (3marks)

20. An aeroplane flies from a point P(60°N, 45°W) to a point Q(60°N, 135°E). Given that the radius of the earth is 6370km,

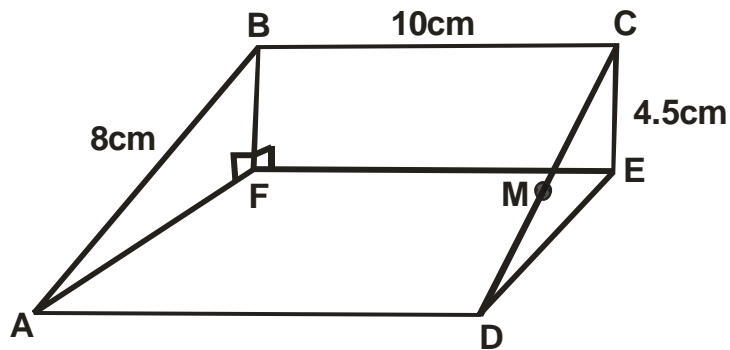
d) Calculate the shortest distance between P and Q:

i) In kilometres (km) (3marks)

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

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

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



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

b) Determine the size of angle CDE. (2marks)

b) Calculate:

i) Length of AC. (2marks)

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

c) Find the:

i) Length of MB. (2marks)

ii) Angle CBM. (2marks)

22. The probability that a school team will win a match is 0.6. The probability that the team will lose the match is 0.3 and the probability that the team will draw in the match is 0.1. Given that the team will play two matches.

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

(b) What is the probability that the team will

(i) Win the two matches (2marks)

(ii) Either wins all the matches or losses all the matches? (2marks)

(iii) Wins one match and losses one (2 marks)

(iv) Tie in one match. (2 marks)

23. Three variables p , q and r are such that p varies directly as q and inversely as the square of r .

(a) When $p = 18$, $q = 24$ and $r = 4$.

Find p when $q = 30$ and $r = 10$.

(4marks)

(b) Express q in terms of p and r .

(1mark)

(c) If p is increased by 20% and r is decreased by 10% find:

(i) A simplified expression for the change in q in terms of p and r .

(3marks)

(ii) The percentage change in q .

(3marks)

24.a) Using a ruler and pair of compasses only construct triangle ABC in which $AB = 6.5\text{cm}$, $BC = 5.0\text{cm}$ and angle $ABC = 60^\circ$. Measure AC **(3mark)**

On same side of AB as C

i) Determine the locus of a point P such that angle $APB = 60^\circ$ **(3marks)**

ii) Construct the locus of R such that $AR = 3\text{cm}$. **(1mark)**

iii) Identify the region T such that $AR \geq 3$ and $\angle APB \geq 60^\circ$ by shading the unwanted part. **(3marks)**

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

MATHEMATICS MOCKS

SERIES 1 TRIAL 6 PAPER 1

Kenya Certificate of Secondary Exams

TIME:2HRS

SECTION A (50 Marks)

Attempt all questions in the spaces provided

1. Evaluate $\frac{-4 \text{ of } (-4 + -15 \div 5 + -3 - 4 \div 2)}{84 \div -7 + 3 - -5}$ (3 mks)

2. Simplify $\frac{9x^2 - 1}{3x^2 + 2x + 1}$ (2 mk)

3. Solve the following inequality and state the integral solutions. (3 marks)
 $\frac{1}{2}(24 - 4x) > 6(3x - \frac{4}{3}) \geq -\frac{2}{3}(42 + 3x)$

4. The position vector of P is $\mathbf{OP} = 2\mathbf{i} - 3\mathbf{j}$ and M is the mid - point of PQ.
Given $\mathbf{OM} = \mathbf{i} + 4\mathbf{j}$, Obtain the vector \mathbf{PQ} . (3 marks)

5. Use tables of reciprocals only to work out. (3 mks)
 $\frac{5}{0.0396} + \frac{12}{0.593}$

6.A straight line passes through points A (-2,6) and B (4, 2).

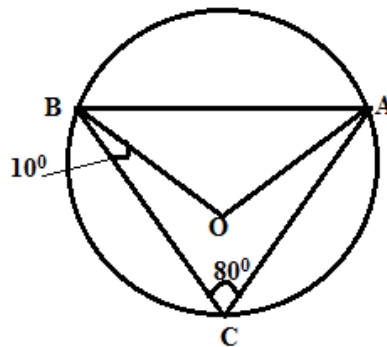
(a)M is the midpoint of line AB. Find the coordinate of M. (2 mks)

(b)Determine the equation of a straight line passing through point M and is perpendicular to AB. (2 mks)

7.An open right circular cone has radius of 5cm and a perpendicular height of 12cm. Calculate the surface area of the cone. (take $\pi=3.142$). (3 mks)

8.Mary spends a total of sh. 970 on buying 3 text books and 5 pens. If she had bought 2 textbooks and 8 pens, she would have saved sh. 90. Find the cost of one textbook. (3 mks)

9. In the figure below O is the centre of the circle. $\angle BCA = 80^\circ$ and $\angle CBO = 10^\circ$. Determine the size of $\angle CAB$. (3 mks)



10. In a bookstore, 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 cartons in next and so on.

(a) How many cartons will be there in 8th row. (2 mks)

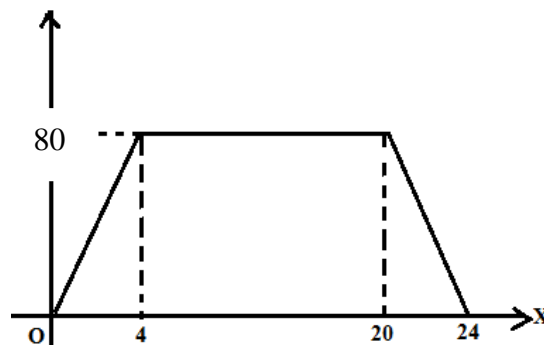
(b) If there are 20 rows in total, find the total number of cartons in the books store. (2 mks)

11. Find the value of x if. (3 mks)

$$\left(\frac{27}{8}\right)^{x+7} = \left(\frac{4}{9}\right)^{-3x}$$

12. The image of a point K (1,2) after translation is K¹ (-1,2). What is the coordinate of the point R whose image is R¹ (-3,3) after undergoing the same translation? (3 mks)

13. The figure below is a velocity time graph for a car.



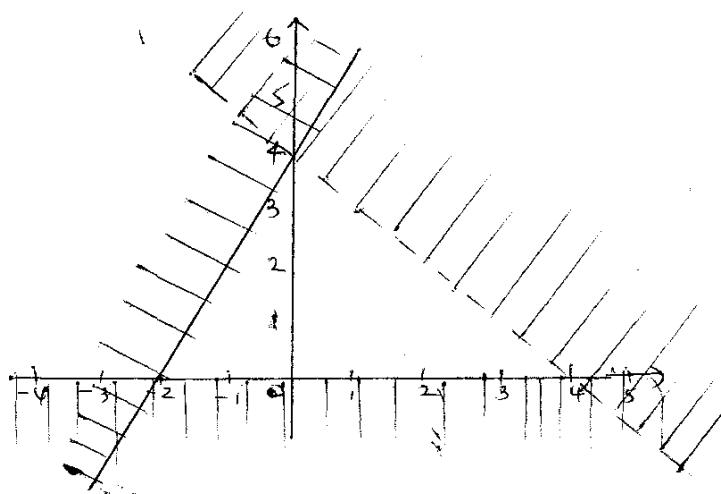
(a) Find the total distance travelled by the car (2 mks)

(b) Calculate the deceleration of the car. (2 mks)

14. Security light poles have been erected along both sides of a street in Bahati town. The poles are 50m apart along the left-hand side of the road while they are 80m apart along the right-hand side. At one end of the road the poles are directly opposite each other. How many poles will be erected by time the poles are directly opposite each other at end of the road? (3 mks)

15. The exterior angle of a regular polygon is equal to one third of the interior angle. Calculate the number of sides of the polygon. (3 mks)

16. Write down the inequalities that define the unshaded region marked R in the figure, below. (3 mks)



17. Nakuru county government is to construct a floor of an open wholesale market whose area is 800m^2 . The floor is to be covered with a slab of uniform thickness of 200mm . In order to make the slab, sand, cement and ballast are to be mixed such that their masses are in the ratio $3:2:3$ respectively. The mass of dry mass of dry slab of volume 1m^3 is 200kg .
- (a) Calculate
- (i) The volume of the slab. (2 mks)
 - (ii) The mass of the dry slab. (2 mks)
 - (iii) The mass of cement to be used. (2 mks)
- (b) If one bag of cement is 50kg , find the number of bags to be purchased. (1 mk)
- (c) If a lorry carries 10 tonnes of ballast, calculate the number of lorries of ballast to be purchased. (3 mks)

18. Paul is a sales executive earning sh $20,000$ and a commission of 8% for the sales in excess of $100,000$. In January 2014 he earned a total of 48000 in salaries and commissions.

- (a) Determine the amount of sales he made in that month. (4 mks)
- (b) If the total sales in the month of February and march increased by 18% and then dropped by 25% respectively. Calculate.
- (i) Paul's commission in the month of February. (3 mks)
 - (ii) His total earnings in the month of March. (3 mks)

19. Two tanks are similar in shape. The capacity of the tanks are $1,000,000$ litres and $512,00$ litres respectively.

- (a) Find the height of the smaller tank if the larger one is 300cm tall. (5 mks)
- (b) Calculate the surface area of the tank if the smaller one has a surface area of 768cm^2 (3 mks)
- (c) Calculate the mass of the larger tank if the mass of the larger one is 800kg .

(2 mks)

20. The vertices of a triangle ABC are A (2,5) B (4,3) and C (2,3). It rotates half-turn about the origin.

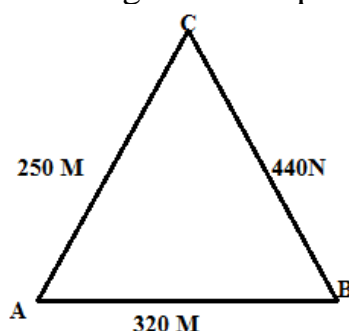
(a) Draw triangle ABC and $A^1B^1C^1$ under it. (4 mks)

(provide graph paper)

(b) The image $A'B'C'$ is mapped onto $A''B''C''$ under a reflection R in the line $x=0$ followed by a translation $T = \begin{pmatrix} 0 \\ -2 \end{pmatrix}$. Find the coordinates of $A''B''$ and C'' and $A'''B'''C'''$. Hence draw triangle $A'''B'''C'''$. (4 mks)

(c) Find the area of the triangle $A''B''C''$. (2 mks)

21. Ombati owns a farm that is triangular in shape as shown below.



(a) Calculate the size of angle BAC. (2 mks)

(b) Find the area of the farm in hectares. (3 mks)

(c) Ombati wishes to irrigate his farm using a sprinkler machine in the farm such that it is equidistant from points A, B and C.

(i) The sprinkler rotates in a circular motion so that the maximum point reached by the water jets is the vertices A, B and C. Calculate the area outside the farm that will be irrigated. (5 mks)

22. Transline bus left Nairobi at 8.00 am and travelled to Nakuru at an average speed of 80km/h. A car left Nakuru at 3.30 am and travelled to Nairobi at an average speed of 120km/h. Given that the distance between Nairobi and Nakuru is 400km, Calculate.

(a) The time the car arrived in Nairobi. (3 mks)

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

(c) The distance from Nairobi to the meeting point. (2 mks)

(d) The distance of the bus from Nakuru when the car arrived in Nairobi. (2 mks)

23. Town B is 102km on the bearing of 122° from town A. Town C is 94 km on bearing of 062° from B. Town D is on a bearing of 073° from A and 336° from C.

(a) Using a scale of 1cm to represent 20km, draw a scale diagram to show the relative positions of town A, B, C and D. (4 mks)

(b) Using your diagram, determine.

(i) The bearing B from D. (1 mk)

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

(iii) The distance from town A to D. (1 mk)

(iv) The distance from town B and D. (1 mk)

24. The table below gives some of the values of x and y for the functions $y = \frac{1}{2}x^2 + 22x + 1$ in the interval $0 \leq x \leq 6$.

x	0	1	2	3	4	5	6
y	1					23.5	

(a) Complete the values in the table above. (1 mk)

(b) Use the values in the table to draw the graph of function on the grid provided below. (2 mks)

(Provide a graph paper)

(c) Using the graph and the mid-ordinate rule with 6 stripes, estimate the area bounded by the curve, the x -axis, the y -axis and the line $x=6$. (3 mks)

(d) Using integration, calculate the exact area and hence find percentage error made when mid-ordinate rule is used. Give your answer correct to 2.dp. (4 mks)

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

MATHEMATICS MOCKS

SERIES 1 TRIAL 6 PAPER 2

Kenya Certificate of Secondary Exams

TIME:2HRS

SECTION A (50 Marks)

Attempt all questions in the spaces provided

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

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

2. Make x the subject of the equation **(3 marks)**

$$\frac{t}{s} = \frac{b}{\sqrt{x-4}}$$

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

(3 marks)

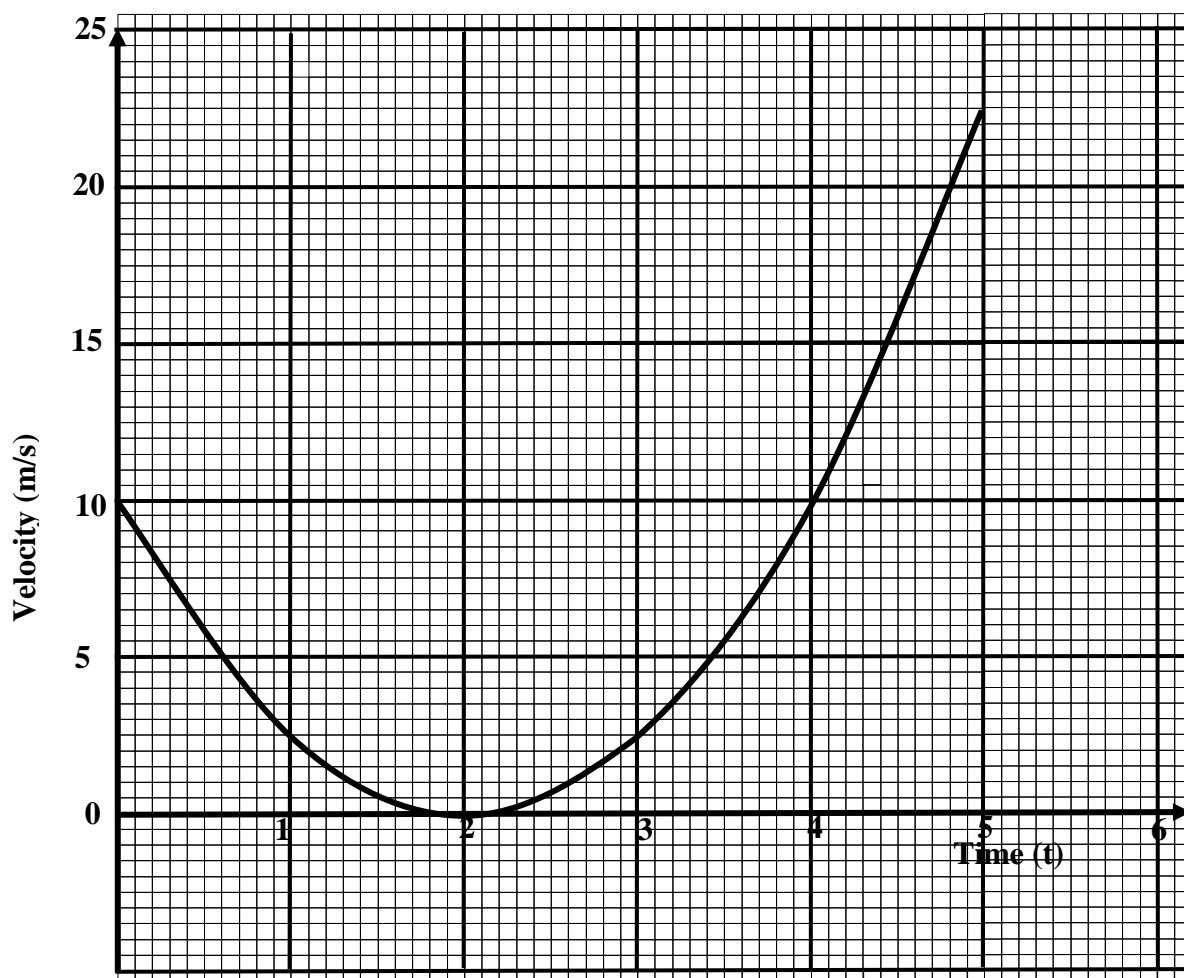
4. Given that $M=i - 3j + 4k$, $W= 6i + 3j - 5k$ and $Q = 2M + 5N$, find the magnitude of Q to 3 significant figures. **(3 marks)**

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

6. Construct a circle centre O and radius 3 cm. Construct two tangents from a point T, 6.5 cm from O to touch the circle at W and X. measure Angle WTX. **(3 marks)**

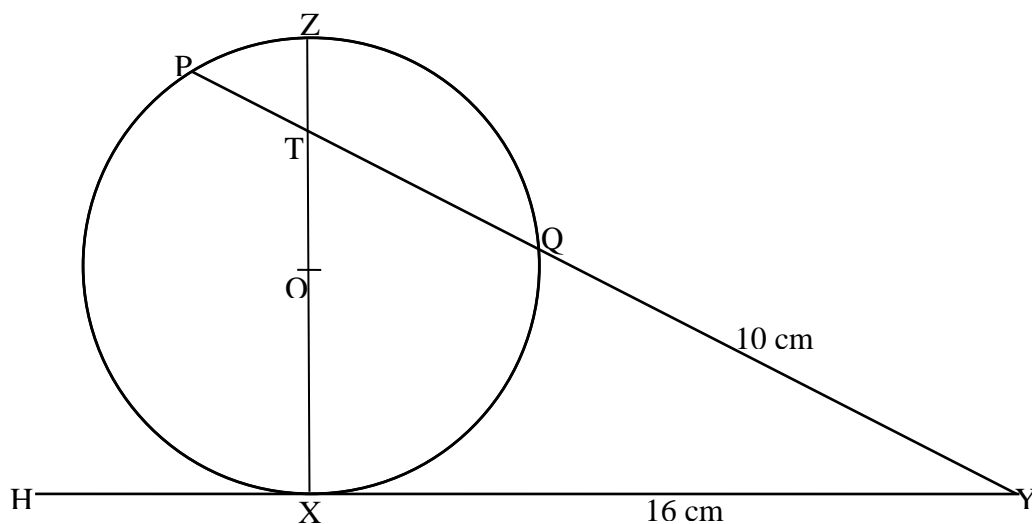
7. Grace deposited Ksh 16 000 in a bank that paid simple interest at the rate of 14% per annum. Joyce deposited the same amount of money as Grace in another bank that paid compound interest semi- annually. After 4 years, they had equal amounts of money in the banks.Determine the compound interest rate per annum, to I decimal place, for Joyce's deposit. **(4 marks)**

8. Simplify $\frac{\sqrt{7}}{\sqrt{7-3}}$, leaving your answer in the form $a+b\sqrt{c}$, where a, b, and c are integers. (2 marks)
9. Solve the equation (4marks)
 $x - y = 1$
 $x^2 + 2y^2 = 1$
10. Grade I coffee cost sh 500 per kilogram while grade II coffee costs sh 400 per kilogram. The grades are mixed to obtain a mixture that costs sh 420 per kilogram. In what ratio should the two grades be mixed? (3 marks)
11. The base length and height of parallelogram were measured as 8.4 cm and 4.5 cm respectively. Calculate the maximum absolute error in the area of the parallelogram. (3 marks)
12. (a) Expand $(1 + \frac{1}{2}x)^{10}$ up to the fourth term.
 (b) Hence, find the value of $(0.84)^{10}$. (3 marks)
13. The graph below shows the relationship between velocity of a body and time (t) seconds in the interval $0 \leq t = 5$.



Use the graph to determine ;

- (a) the average rate of change of velocity between $t = 2.5$ seconds and $t = 5$ seconds. **(2 marks)**
- (b) the instantaneous rate of change at $t = 4$ seconds. **(2 marks)**
14. In the figure below, the tangent **HXY** meets chord PQ produced at Y. Chord XZ passes through the centre, O, of the circle and intersects PQ at T. Line XY = 16 cm and QY = 10 cm.



- (a) Calculate the length **PQ**. **(2 marks)**
- (b) If **ZT = 4 cm** and **PT: TQ = 3:5**, find **XT**. **(2 marks)**
15. Quantity **P** varies partly as **Q** and partly varies inversely as square of **Q**. When **Q = 1**, **P = 1** and when **Q = 1/2**, **P = -3**. Find the equation of the relationship connecting **P** and **Q**. **(3 marks)**
16. $OA = \begin{pmatrix} 4 \\ 1 \\ 0 \end{pmatrix}$ and $OB = \begin{pmatrix} 1 \\ -2 \\ 3 \end{pmatrix}$. A point **Q** divides line **AB** externally the ratio **5:2**. Find the position vector of point **Q**. **(3 marks)**

SECTION II (50 Marks)

Answer any five questions from this section.

17. Two tanks of equal volume are connected in such a way that one tank can be filled by pipe A in 1 hour 20 minutes. Pipe B can drain one tank in 3 hours 36 minutes but pipe C alone can drain both tanks in 9 hours. **Calculate:**
- (a) The fraction of one tank that can be filled by pipe A in one hour. **(2mks)**
- (b) The fraction of one tank that can be drained by both pipes B and C in one hour. **(4mks)**

(c) Pipe A closes automatically once both tanks are filled. Assuming that initially both tanks are empty and all pipes opened at once, calculate how long it takes before pipe A closes. **(4mks)**

18. An examination involves a written test and a practical test. The probability that a candidate passes the written test is $\frac{6}{11}$ if the candidate passes the written test, then the probability of passing the practical test is $\frac{3}{5}$, otherwise it would be $\frac{2}{7}$

(a) **Illustrate** this information on a tree diagram. **(2mks)**

(b) **Determine** the probability that a candidate is awarded

(i) Credit for passing both tests. **(2mks)**

(ii) Pass for passing the written test. **(2mks)**

(iii) Retake for passing one test. **(2mks)**

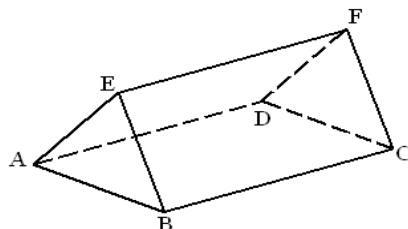
(iv) Fail for not passing the written test. **(2mks)**

19. (a) Construct triangle PQR with $PQ = 7.2\text{cm}$, $QR = 6.5\text{cm}$ and angle $PQR = 48^\circ$ **(3mks)**

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

(c) A point x moves within triangle PQR such that $QX \geq QM$. Shade and label the locus of X. **(3mks)**

20. The figure below represents a prism with a cross section of an equilateral triangle of side 8cm and length 12cm, as shown below.



(c) Draw the net of the prism **ABCDEF** **(2mks)**

(d) **Calculate** the angle between the plane ABCD and the line BF. **(2mks)**

(e) M is the midpoint of EF. **Calculate**

(i) The length BM **(2mks)**

(ii) The perimeter of triangle BMD. (2mks)

(f) Calculate the angle between the plane ABM and the base plane ABCD. (2mks)

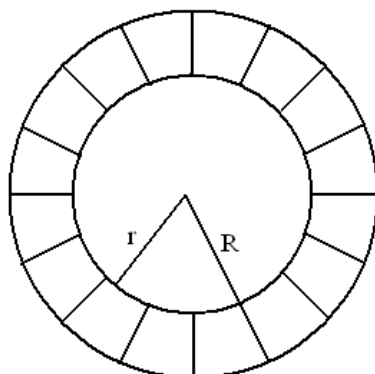
21. Give the matrix $A = \begin{pmatrix} -1 & -4 \\ 1 & 3 \end{pmatrix}$

(a) (i) Calculate A^2 and A^3 (2mks)

(ii) Find the values of the constants p and q for which $A^2 = pA + qI$ where I is the identity matrix. (3mks)

(iii) The triangle ABC maps onto $A^1B^1C^1$ under the transformation represented by matrix A. Find the area of triangle ABC if the area of triangle $A^1B^1C^1$ is 21cm^2 (3mks)

(b) The figure shows two concentric circles such that the ratio of their radii is 1:3. If the area of the shaded region is 78.4 square units, calculate the area of the larger circle. (2mks)



22) . A certain uniform supplier is required to supply two types of shirts: one for girls labelled G and the other for boys labelled B. The total number of shirts must not be more than 400. e as 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. (3mks)

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

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

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

- (ii) **Calculate** the maximum possible profit. **(2mks)**
23. (a) The equation of a curve is given by $y = X^3 + X^2 - bx$. **Show** that the value of X at the minimum turning point is $\frac{-1 + \sqrt{19}}{3}$ **(3mks)**
- (b) The displacement X metres of a particle moving along a straight line after t seconds is given by $X = 4t + 2t^2 - t^3$
- (i) **Find** its initial acceleration **(2mks)**
- (ii) **Calculate** the time when the particle was momentarily at rest. **(2mks)**
- (b) (i) **Find** the values of X where the curve $y = X^2(x - 2)$ crosses the x-axis. **(1mk)**
- (ii) Hence **find** the area enclosed by the curve $y = X^2(x - 2)$, the lines $x = 0$, $x = 2\frac{2}{3}$ and the x-axis. **(2mks)**
23. The marks of 50 students in a mathematics test were taken from a form 4 class and recorded in the table below.

Mark (%)	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Frequency	2	5	7	9	11	8	5	3

- (d) On the grid provided, **draw** a cumulative frequency curve of the data. **(3mks)**

Take: 1cm to represent 5 students on the vertical scale and 1cm to represent 10 marks on the horizontal scale.

- (e) From your curve in (a) above
- (i) **Estimate** the median mark. **(1mk)**
- (ii) **Determine** the Interquartile deviation. **(2mks)**
- (iii) **Determine** the 10th to 90th percentile range. **(2mks)**
- (f) It is given that students who score over 45 marks pass the test. Use graph in (a) above to **estimate** the percentage of students that pass. **(2mks)**

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

MATHEMATICS MOCKS

SERIES 1 TRIAL 7 PAPER 1

Kenya Certificate of Secondary Exams

TIME:2HRS

SECTION A (50 Marks)

Attempt all questions in the spaces provided

- Without using a calculator or mathematical table evaluate
 $\frac{1}{3}$ of $(2\frac{3}{4} - 5\frac{1}{2}) \times 3\frac{6}{7} \div \frac{9}{4}$ **(3mks)**
- Solve for x in the equation. **(3mks)**
 $9^{(2x-1)} \times 3^{(2x+1)} = 243$
- A line P whose equation is $y = \frac{1}{3}x + 4$ is parallel to another line Q. Find the equation of line Q in the form $y = mx + c$ given that it passes through Point (3, 6) **(3mks)**
- Using reciprocals, cubes and square tables, evaluate correct to 4 significant figures: **(4mks)**
 $\sqrt[3]{\frac{1}{27.38}} + 1.897^2$
- A point P (2, 3) is mapped onto P' (-7, 0) under an enlargement with scale factor of -2 without drawing find the centre of enlargement. **(3mks)**
- A businessman bought 100 textbooks and 80 pens for sh. 25,600. If she had bought twice as many textbooks and half as many pens she would have paid sh. 7,400 less. Find the cost of one textbook and one pen. **(3 mks)**
- The table below shows the number of faulty balls from 40 samples.

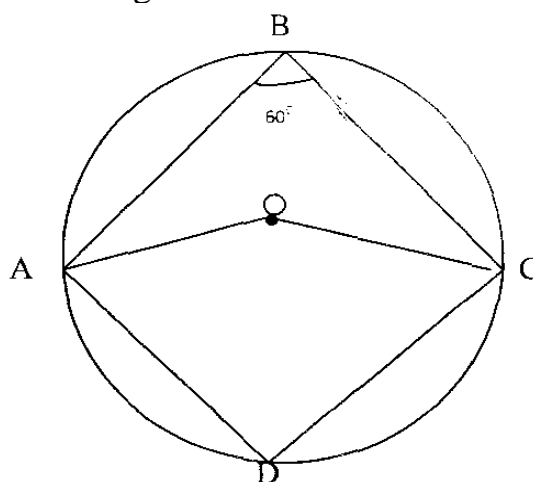
No. of faulty balls (χ)	0	1	2	3	4	5
Frequency	20	8	6	1	1	4

Calculate the mean. **(3mks)**

8. Draw a sketch and find the area in hectares of a coffee field whose measurements are entered in a field book as shown below. Take $XY = 200\text{m}$ as the baseline. **(4 marks)**

	Y	
	180	40 to Q
To R 80	140	
To S 160	100	
	40	100 to P
	X	

9. In the following figure, O is the centre of the circle. Given that Angle ABC 60° , find the value of the angle ADC. **(2mks)**



10. From the top of a cliff the angle of depression of a ship when it is at A is 30° . When the ship moves 100m to point B, nearer the cliff, the angle of depression becomes 45° . Find the height of the cliff leaving your answer to 3.s.f **(4mks)**

11. During a football match, sh. 1,462,800 was realized from stadium entrance fees. If the entrance fee was sh. 80 per person, calculate how many fans paid to watch match. **(2 mks)**

12. A Kenya Bank buys and sells foreign currencies as shown

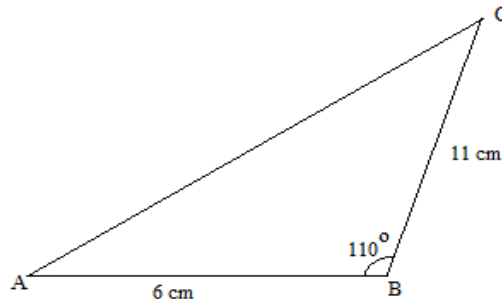
	Buying (Kshs)	Selling (Kshs)
1 Euro	84.15	84.26
100 Japanese Yen	65.37	65.45

A Japanese travelling from France to Kenya had 5000 Euros. He converted all the 5000 Euros to Kenya shillings at the bank. While in Kenya, he spent a total of Kshs. 289850 and then converted the remaining Kenya shillings to Japanese Yens at the Bank. Calculate the amount in Japanese Yen that he received. **(3mks)**

13. The width of a rectangular hall of Ruiru Girls Secondary School is 16m less than its length. Calculate the length of the hall if its area is 132m^2 . Hence calculate its perimeter. **(4 mks)**

14. The volume of a hemisphere is 41.2cm^3 . Calculate, correct to one decimal place, the radius of the hemisphere **(3mks)**

15. The figure below shows a triangle ABC in which $AB = 6\text{cm}$, $BC = 11\text{cm}$ and angle $ABC = 110^\circ$. Calculate to the decimal places the length of AC. **(3mks)**



16. A regular polygon has internal angle of 150° and side of length 10cm.

Find the number of sides of the polygon. **(2mks)**

Find the perimeter of the polygon. **(2mks)**

SECTION 1I (50 MARKS)

Answer any five questions from this Section.

17. A matatu left town K at 7.00a.m and travelled towards town M at an average speed of 60km/hr. A car left town M at 9.00a.m and travelled towards K at an average speed of 80km/hr. The distance between the two towns is 324km. Find:-

(a) The time each vehicle arrived at their destination

(i) Matatu **(2mks)**

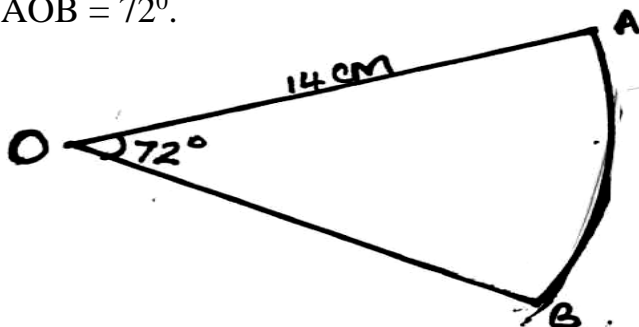
(ii) Car **(2mks)**

b. (i) the distance the matatu had covered before the car started to move from town M to town K. **(1mk)**

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

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

18. The figure below shows a sector of a circle. If the radius $OA = 14\text{cm}$ and the angle $AOB = 72^\circ$.



- (a) Calculate the area of the sector. (2mks)
- (b) The sector is folded to form a cone. Calculate:-
- (i) The radius of the cone formed. (2mks)
- (ii) The volume of the solid formed. (3mks)
- (c) A solid cone of same size as the one in (b) above is melted down and casted into circular washers. Each washer has an external diameter of 4cm, internal diameter of $1\frac{1}{2}$ cm and 0.3cm thick. Calculate number of washers made. (3mks)

19.a) Find the inverse of matrix $A = \begin{bmatrix} 5 & 6 \\ 7 & 9 \end{bmatrix}$ (2mks)

b) Okelo bought 5 physics book and six mathematics book for a total of Ksh.2440. Ali bought 7 physics book and 9 mathematics books for a total cost of ksh.3560.

i) Form a matrix equation to represent the a book information (1mk)

ii) Use matrix method to find the price of a physics book and that of a mathematic (3mks)

c) A school bought 36 physics books and 50 mathematics books. A discount of 5% was allowed on each Physics book whereas a discount of 8% was allowed on each Mathematics book. Calculate the percentage discount on the cost of all the books bought. (4mks)

20). Forty students in a form 2 class were weighed and their masses recorded to the nearest kilogram as shown below.

45	48		56		39		47		36		45
37	46	35	43		51		42		47	47	
	40	46	41		45		43		46		54
	42	51	39	42		45		44		49	50
	46	39	42	48	50		38		45	35	
	52		46								

a) Starting with the class 35-39 tabulate this data in a frequency table (3mks)

b) Find the modal class (1mk)

c) Calculate the mean mass of the students (3mks)

d) Estimate the median mass (3mks)

21. In triangle OAB, $OA = a$ and $OB = b$. Points P and T divide OB and AB in the ratio 2:3 and 1:3 respectively. Lines OT and AP intersect at Q.

(a) Draw the diagram to represent the above information. (1mk)

(b) Express \vec{OP} and \vec{AP} in term of \vec{a} and \vec{b} . (2mks)

(c) Express \vec{OT} in terms of \vec{a} and \vec{b} . (1mk)

(d) Given further that $\vec{OQ} = t\vec{OT}$ and $\vec{AQ} = s\vec{AP}$, express \vec{OQ} in two ways and hence find the values of s and t . (6mks)

22. 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. (4mks)

(b) If metal R is divided into two equal parts and each half reinforced by adding metal X to get to initial volume.

- i) Find the density of the new alloy. **(4mks)**
2. The two metals are mixed in a ratio of 4:1 respectively. What is the density of the alloy?
(2mks)

23. Meshach and Kelvin contributed shs. 60,000 and sh. 90,000 respectively in order to start business. They employed a manager and agreed to pay him sh. 4,500 per month from the profit made each year. They also agreed that 20% of the profit made each year would be put back into the business while the rest would be shared between them in the ratio of their initial contribution. During the first year they made a profit of sh. 365,000. Calculate:-

- (a) The manager's annual salary for that year **(1mk)**
(b) The money put back into business that year. **(2mks)**
(c) The business net profit for that year. **(2mks)**
(d) How much each partner received that year. **(3mks)**
(e) The capital for the following year. **(2mks)**

24. A car starts from rest and builds up a speed of 40m/s in 1 min 40 seconds. It then travels at this speed for 5 minutes. Brakes are then applied and the car is brought to a halt in 2 minutes.

- (a) Draw a velocity-time graph to represent the information above. **(3mks)**
(provide a graph paper)
(b) Use your graph to find
(i) The initial acceleration. **(2mks)**
(ii) The deceleration when the car is brought to a halt. **(2mks)**
(iii) The distance traveled in km. **(3mks)**

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

MATHEMATICS MOCKS

SERIES 1 TRIAL 7 PAPER 2

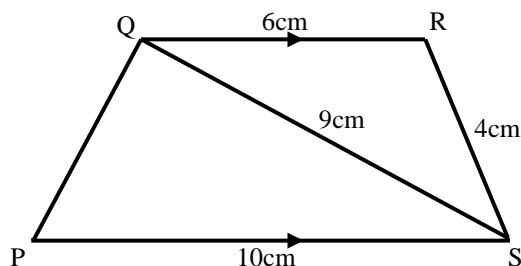
Kenya Certificate of Secondary Exams

TIME:2HRS

SECTION A (50 Marks)

Attempt all questions in the spaces provided

1. A positive two digit number is such that the product of the digits is 24. When the digits are reversed, the number formed is **greater** than the original number by 18. Find the number. **(2mks)**
2. In the figure below PQRS is a trapezium with QR parallel to PS. QR = 6cm, RS = 4cm, QS = 9cm and PS = 10cm.

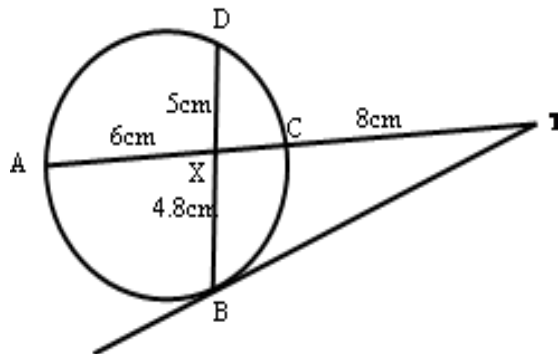


Calculate to two decimal places

- (a) The size of angle **SQR** **(2Marks)**
 - (b) The area of triangle **PQS** **(2Marks)**
3. The height and radius of a cone are measured as 21 cm and 14.0 cm respectively. Taking $\pi = 3.142$, find the **percentage error** in the volume of the cone. **(4mks)**
 4. Express the following in **surd form** and simplify by rationalizing the denominator without using a calculator and leave your answer in the form $a + b\sqrt{c}$ **(3mks)**
$$\frac{1 + \cos 30^\circ}{1 - \sin 60^\circ}$$
 5. Solve for **x** in: $\log_2(x + 7) - \log_2(x - 7) = 3$ **(3mks)**
 6. A businessman obtained a loan of Ksh 450,000 from a bank to buy a Matatu that was valued at the same amount. The bank charges interest at 24% per annum compounded quarterly per year. Calculate the **total amount** of

money the businessman paid to clear the loan in $4\frac{1}{2}$ years to the nearest shilling. (2mks)

7. In the diagram below, BT is a tangent to the circle at B. AXCT and BXD are straight lines. AX = 6cm, CT = 8cm, BX = 4.8cm and XD = 5cm.



Find the length of BT. (3Marks)

8. Find the possible values of x given that $\begin{pmatrix} x + 8 & 8 \\ 6 & x \end{pmatrix}$ is a **singular** matrix. (3mks)

9. The cost C of operating an electronic business is partly constant and partly varies as the square of labour input L. If $C=25,000$ when $L=20$ and $C=45,000$ when $L=30$. Find C when $L=8$. (3Mks)

10. The 2nd, 4th and 7th terms of an A.P. are the first 3 consecutive terms of a G.P. Find the **common ratio** of the G.P if the common difference of the A.P. is 2. (3mks)

11. P and Q are two points such that $OP=i + 2j + 3k$ and $OQ = 4i + 5j - 3k$. M is a point that divides PQ externally in the ratio 3:2. Find the co-ordinates of M, given that O is the origin. (2mks)

10. Two bags labeled A and B are on the table. Bag A contains 5 red balls and 3 white balls, while bag B contains 2 red balls and 6 white balls. A bag is chosen at random and two balls are drawn from it, one after the other **without replacement**. Find the probability that the two balls chosen are of different colours. (4mks)

11. Tap A can fill an empty tank in 3 hours, while tap B can fill the same tank in 2 hours. When the tank is full, tap C can empty the tank in 5 hours. Tap A and C are opened for 4 hours and then closed.

a) Determine the fraction of the tank that is still empty. (2mks)

b) Find how long it would take to fill the remaining fraction of the tank if all the three taps are opened. (2mks)

12. Determine the interquartile range for the following set of numbers. (3mks)

4, 9, 5, 4, 7, 6, 2, 1, 6, 7, 8.

13. Solve the equation $\sin(3x - 10)^\circ = 0.4337$ for $0^\circ \leq \theta \leq 180^\circ$ (3mks)

14. (a) Expand and simplify $(3x - y)^4$ (2mks)

(b) Use the first three terms of the expansion to approximate the value of $(6 - 0.2)^4$ (2mks)

SECTION 1I (50 MARKS)

Answer any five questions from this Section.

15.(a) Taking the radius of the earth, $R = 6370\text{km}$ and $\pi = \frac{22}{7}$, calculate the shortest distance between the two cities P (24°N , $29^\circ 48'\text{W}$) and Q (24°N , $30^\circ 12'\text{E}$) along the parallel of latitude.

(i) In nautical miles. (3mks)

(ii) In Km. (2mks)

(iii) If it is 1200hrs at P, what is the local time at Q. (2mks)

(b) An airplane flew due south from a point A (60°N , 45°E) to a point B. The distance covered by the airplane was 8000km. Determine the position of B. (3mks)

16. A particle moves along a straight line such that its displacement S metres from a given point is $S = t^3 - 5t^2 + 3t + 4$.

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

b) The velocity of the particle when $t = 5$ (3mks)

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

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

17.(i) A solution was gently heated, its temperature readings taken at intervals of 1 minute and recorded as shown in the table below.

Time (min)	0	1	2	3	4	5
Temperature($^\circ\text{C}$)	4	5.2	8.4	14.3	16.8	17.5

a) Draw the time-temperature graph on the grid provided (3mks)
(provide a graph paper)

b) Use the graph to find the average rate of change in temperature between $t = 1.8$ and $t = 3.4$ (2mks)

(ii) The points with coordinates (5,5) and (-3, -1) are the ends of a diameter of a circle center A. Determine

(a) The coordinates of A. (2mks)

(b) The equation of the circle, expressing it in form of $x^2 + y^2 + ax + by + c = 0$ (3mks)

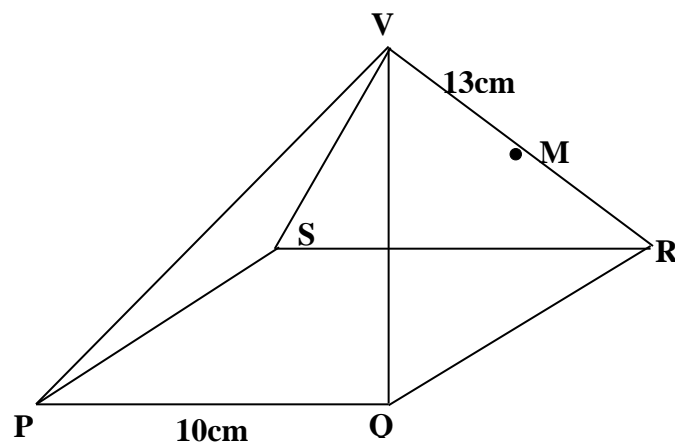
18. Mrs. Mutua earns a basic salary of K£ 12,000 p.a. and is housed by the employer at a nominal rent of Shs 1,200 per month. She is entitled to a personal relief of K£ 1,320 p.a. and a premium relief of 10% on her insurance premium of K£ 800 p.a. The housing benefit when you are housed by the employer is 15% of the basic salary. The table of tax rate is as below.

Taxable income (K£ p.a.)	Rate (%)
1 – 2100	10
2101 – 4200	15
4201 – 6300	20

6301 – 8400	25
Over 8400	30

Calculate;

- a) Calculate the net tax per annum. (7mks)
- b) Other deductions includes W.C.P.S Shs 600 per month, NHIF Shs. 500 per month. Calculate her net pay per month. (3mks)
19. Using a ruler and a compass only, construct a triangle ABC such that $AB = 6.8$ cm, $BC = 5.6$ cm and angle $ABC = 37\frac{1}{2}^\circ$ (3mks)
- (b) Locate the :
- (i) Locus P such that angle $APB =$ angle ACB (3mks)
- (ii) Locus Q such that Q is equidistant to points A and B (2mks)
- (iii) Locus R such that R is equidistant to lines AB and AC (2mks)
20. The diagram below shows a square based pyramid V vertically above the middle of the base. $PQ = 10$ cm and $VR = 13$ cm. M is the midpoint of VR.



Find to 2 decimal places

- (a) (i) the length PR. (2mks)
- (ii) The height of the pyramid. (2mks)
- (b) (i) the angle between VR and the base PQRS. (2mks)
- (ii) The angle between MR and the base PQRS. (2mks)
- (iii) The angle between the planes QVR and PQRS. (2mks)
21. A farmer has at least 50 acres of land on which he plans to plant potatoes and cabbages. Each acre of potatoes requires 6 men and each acre of cabbages require 2 men. The farmer has 240 men available and he must plant at least 10 acres of potatoes. The profit in potatoes is Ksh 1,000 per acre and on cabbages ksh. 1,200 per acre. If he plants x acres of potatoes and y acres of cabbages:
- (a) Write down three inequalities in x and y to describe this information. (3mks)
- (b) Represent the above inequalities on the graph below. (5mks)
- (Provide a graph paper)

(c) Use your graph to find the number of acres of each crop that the farmer should plough to get maximum profit. Calculate the maximum profit.

(2mks)

22. a) On the grid provided, draw a graph of the function $y = \frac{1}{2}x^2 - x + 3$ for $0 \leq x \leq 6$.

(3mks)

(provide a graph paper)

b) Determine the midordinates for 5 strips between $x=1$ and $x=6$, and hence use the mid-ordinate rule to approximate the area under the curve between $x=1$ and $x=6$ and the x -axis.

(3mks)

c) Assuming that the area determined by integration to be the actual area, calculate the percentage error in using the mid-ordinate rule.

(4mks)

NAME.....ADM NO.....

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MATHEMATICS MOCKS

SERIES 1 TRIAL 8 PAPER 1

Kenya Certificate of Secondary Exams

TIME:2HRS

SECTION A (50 Marks)

Attempt all questions in the spaces provided

1. Evaluate: 3mks

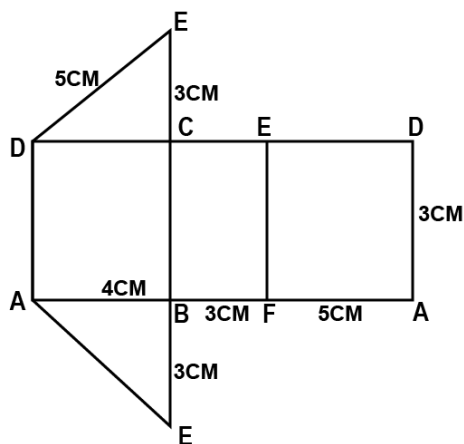
$$\frac{2\frac{1}{2} \text{ of } 1\frac{3}{4} - 5\frac{1}{4}}{1\frac{2}{5} + 2(1\frac{1}{4} - 2\frac{3}{4})}$$

2. An electrician made a loss of 30% by selling a multi plug at Sh. 1400. What profit would he have made if he sold the multi plug at sh 2300. 3mks

3. Simplify $\sqrt{\frac{12x^4y^{-1}z^5}{3x^{-2}y^{-3}z^3}}$ 2mks

4. Solve the following inequalities and represent the solutions on a number line
 $X + 1 \leq 4x - 5 < 3x + 2$

5. The figure below shows a net of a solid.



- a. Sketch the solid of the net showing the hidden edges with broken lines. 2mks
- b. Find the surface area of the solid. 2mks

6. Determine the quartile deviation for the following distribution. **3mks**
 3,4,9,5,4,7,6,2,1,6,7,8,9
7. Given that $2^{3/2x} = 4096$, find the value of x **2mks**
8. It would take 15men 8days to dig a trench of 240m long. Find how many days it would take 18men to dig a trench 360meters long working at the same rate. **3mks**

9. Use logarithms to evaluate. **4mks**

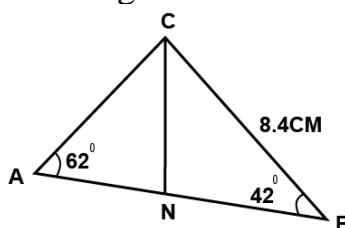
$$\sqrt[3]{\frac{0.921 \times 0.00739}{0.023}}$$

10. A regular polygon is such that its exterior angle is one eighth the size of interior angle. Find the number of sides of the polygon. **3mks**

11. A translation vector $\begin{pmatrix} x - 1 \\ 2 - y \end{pmatrix}$ maps a point A(4,6) onto A¹(9,12). Find the value of x and y. **3mks**

12. A Canadian tourist arrived in Nairobi with Canadian dollars 6200. She converted all his money into Kenya Shillings and then spent a total of Kshs. 100,000. She paid her Kenyan tour guide a commission equivalent to 20% of the remainder. Given that 1 canadian dollar = Ksh. 48.12. calculate
- A. How much she got in kenya shillings after converting all her money. **1mk**
- B. The amount of kenya shillings she was left with at the end. **2mks**

13. In the figure below $\angle A = 62^\circ$, $\angle B = 42^\circ$, BC = 8.4cm and CN is a bisector of angle ACB. Calculate to 1dp the length of CN. **3mks**



14. A father is now four times as old as his son. Five years ago, he was exactly one year and half times as old as his son will be in ten years from now. Determine the sum of their present ages. **4mks**
15. An arc length of 11cm subtends an angle of 140° at the circle. Find the area of the enclosed sector. **4mks**
16. Factorize and simplify the expression. **3mks**

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

SECTION II (50 marks)

Answer any FIVE questions from this section

17. The triangle ABC with coordinates A(2,3), B(4,2) and C(1,1) is mapped onto triangle A¹B¹C¹ by a reflection in the line $y + x = 0$.
- a. (i) Draw triangle ABC and its image A¹B¹C¹ on the same plane. **3mks**

(ii) Triangle $A^1B^1C^1$ is mapped onto $A^{11}B^{11}C^{11}$ by a transformation represented by the matrix. $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

Draw triangle $A^{11}B^{11}C^{11}$ and describe fully a single transformation that maps triangle ABC onto triangle $A^{11}B^{11}C^{11}$ **4mks**

b. Triangle ABC is mapped onto xyz with A being mapped onto x , B onto Y and C onto Z . given that the coordinates of x is $(-4,3)$, Y is $(0,2)$ and Z is $(-1,1)$, find the matrix representing the transformation. **3mks**

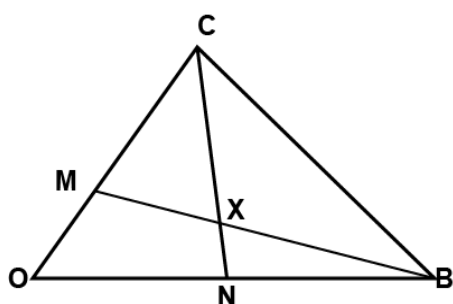
18. A lorry left town A for B at 6.50pm at an average speed of 60km/h. at 8.35pm, a car left town A for B at an average speed of 90km/h. if A is 317km from B . determine:

- a. The distance of the lorry from town A when the car took off. **3mks**
- b. The distance the car travelled to catch up with the lorry. **4mks**
- c. What time of the day did the car catch up with the lorry? Give your answer in 24hrs system. **3mks**

19. Three ships X , Y and Z are approaching a harbour H . X is 150km from the harbour on a bearing of 090° . Y is 130km from the harbour on a bearing of $130^\circ E$ and Z is 180km to the west of Y .

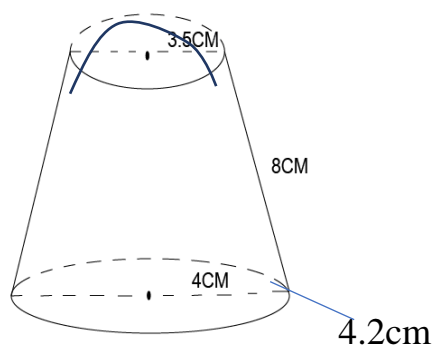
- a) Taking a scale of 1cm to represent 20km, make a scale drawing of the routes of the three ships to the harbour. **2mks**
- b) What is the distance between ships X and Z ? **2mks**
- c) Find the bearing of H from Z . **2mks**
- d) If ship Y is travelling at a speed of 50km/h how long will it take to reach the harbor. **2mk**

20. The figure below shows a triangle OAB with O as the origin. $OA = \underline{a}$ $OB = \underline{b}$, $OM = \frac{2}{5}\underline{a}$ and $ON = \frac{2}{3}\underline{b}$.



- a) Express in terms of \underline{a} and \underline{b} the vectors
 - (i) \underline{BM} **1mk**
 - (ii) \underline{AN} **1mk**
- b) Vector \underline{OX} can be expressed in two ways: $\underline{OB} + k\underline{BM}$ or $\underline{OA} + h\underline{AN}$, where k and h are constants.
Express \underline{OX} in terms of:
 - i. \underline{a} , \underline{b} and k . **2mks**
 - ii. \underline{a} , \underline{b} and h . **2mks**

- c) find the values of k and h . 4mks
21. In a certain meeting, there were 95 men in attendance. There were 50 more women than men and twice as many children as men.
- Determine the number of people in attendance. 2mks
 - Find the percentage of children in attendance, correct to 3 significant figures. 2mks
 - A hall for the meeting was fitted with benches that could accommodate either 10 children or 7 adults per bench. Find the number of benches
 - Used by the children 2mks
 - Completely filled by the adults. 2mks
 - Adults who would fill the unoccupied space. 2mks
22. a) The point $A(-2, 4)$ and $B(3, -6)$ lies on a straight line AB , find
- the equation of the line perpendicular to AB and passing through A
 - The equation of the line parallel to AB and passing through the point $(3, -1)$. 3mks
- b) The points A and B are translated by a vector $M = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$. Find
- the images of A and B . 2mks
 - the equation of the line passing through A^1 and B^1 the images of A and B respectively. 2mks
23. The figure below represents a solid made up of a conical frustum and a hemispherical top. The slant height of the frustum is 8cm and its base radius is 4.2cm.



If the radius of the hemispherical top is 3.5cm

- Find the area of:
 - The circular base 2mks
 - The curved surface area of frustum. 4mks
 - The hemispherical surface 2mks
- A similar solid has a total surface area of 81.5cm^2 . Determine the radius of the base. 2mks

24. Using a ruler and a pair of compasses, construct parallelogram ABCD such that AB = 8cm, diagonal AC = 12cm and angle BAC = 22.5° **4mks**

a) Measure

(i) The diagonal BD

1mk

(ii) The angle ABC

1mk

b) Draw the circumference of triangle ABC

2mks

c) Calculate the area of the circle drawn

2mks

NAME.....ADM NO.....

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MATHEMATICS MOCKS

SERIES 1 TRIAL 8 PAPER 2

Kenya Certificate of Secondary Exams

TIME:2HRS

SECTION A (50 Marks)

Attempt all questions in the spaces provided

1. Make x the subject of the formula **3mks**

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

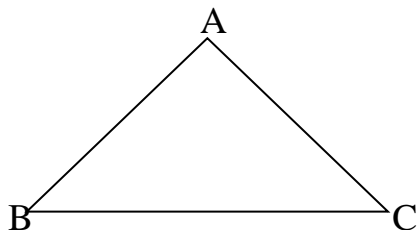
2. P varies partly as the square of v and partly as the cube of v. when $V=2$, $P = -20$ and when $v = -3$, $P=135$. Find the relationship between P and v. **3mks**

3. Expand $(1 + 2x)^7$ up to x^3 , hence use the expansion to estimate the value of $(1.02)^7$ correct to four decimal places. **3mks**

4. Simplify the following by rationalizing the denominator. **3mks**

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

5. The diagram below represents a field ABC.



- (a) Draw the locus of points equidistant from sides AB and AC **2mks**

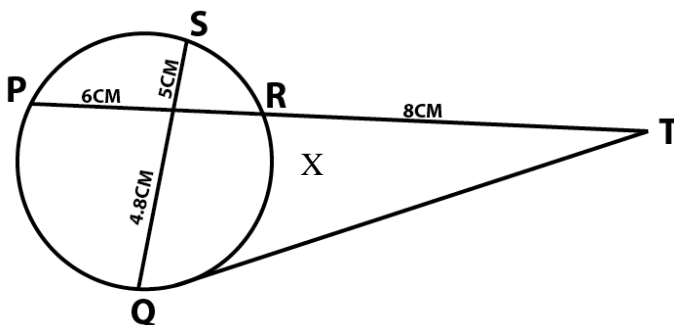
- (b) Draw the locus of points equidistant from points A and C. **2mks**

C) A coin is lost within a region which is nearer to point A than to point C and closer to side AC than to side AB. Shade the region where the coin can be located. **2mks**

6. Given $x = 13.4\text{cm}$ and $y=4.3\text{cm}$. calculate the percentage error in x/y correct to 4 d.p

3mks

7. If matrix $A = \begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix}$ Find B given that $A^2 = (A + B)$. **3mks**
8. In the figure below QT is a tangent to a circle at Q. PXRT and QXS are straight lines. PX = 6cm, RT = 8cm, QX = 4.8cm



Find the length of

- a. XR **2mks**
- b. QT **2mks**
9. A circle whose equation is $(x - 1)^2 + (y - k)^2 = 10$ passed through point (2,5). Find the coordinates of the two possible centres of the circle. **3mks**
10. A blender mixes two brands of juice A and B to obtain 70mls of the mixture worth Ksh. 165 per litre. If brand A is valued at Kshs. 168 per litre and brand B at Ksh. 153 per litre bottle, calculate the ration in which the brands A and B are mixed. **(2mks)**
11. Without using logarithm tables solve the equation $\log(5x - 4) = \log(x + 2) + \frac{1}{3} \log 27$. **3mks**
12. a) Use reciprocal tables to find the value of $= \frac{1}{0.325}$ **1mk**
- b) Hence, evaluate $\frac{\sqrt[3]{0.000125}}{0.325}$ **1mk**
13. The G.C.D of three numbers is 45 and the LCM is 18900. Two of the numbers are 675 and 540. Find the other possible numbers. **3mks**
14. solve for θ given that θ is acute and $\sin(3\theta - 50^\circ) - \cos(20 + 10^\circ) = 0$ **3mks**
15. A container of height 90cm has a capacity of 4.5L. What is the height of a similar container of volume 9cm³. **3mks**
16. A point R divides a line PQ internally in the ration 3:4. Another point S, divides the line PR externally in the ratio 5:2. Given that PQ = 8cm, calculate the length of RS, correct to 2 decimal places. **3mks**

SECTION II (50mrks)

Attempt any FIVE questions from this section

17. Complete the table below for the function
 (a) $y = x^2 + \frac{12}{x} - 15$ for $0.5 \leq x \leq 4$

X	0.5	1	1.5	2	2.5	3	3.5	4
y	9.25			-5	-4			

(b) Draw the graph of $y = x^2 + \frac{12}{x} - 15$ for $0.5 \leq x \leq 4$. using a scale of 2cm rep 1 unit on the x – axis and 2cm for 5 units on the y – axis. **3mks**

(c) (i) from your graph, state the range of values of x for which $y = x^2 + \frac{12}{x} \leq 18$ **3mks**

(ii) By adding a suitable straight line to your graph, solve the equation $y = x^2 + \frac{12}{x} - 5x + 20$ **3mks**

18. The product of the first three terms of a geometric progression is 64. If the first term is a and the common ratio is r.

(a) Express r in terms of a **3mks**

(b) Given that the sum of the three terms is 14,

(i) Calculate the values of a and r and hence write down two possible sequences each up to the 4th term. **5mks**

(ii) Find the product of the 50th terms of the two sequences **2mks**

19. The table below shows income tax rates for certain year.

Monthly income in Kenya Shillings (Kshs)	Tax rate in each shillings
0 – 10164	10%
10165 – 19740	15%
19740 – 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 employee's taxable income in the fifth band was Ksh. 2108.

(a) Calculate

i) Employees total income in that month **2mks**

ii) The tax payable by the employee in that month. **5mks**

(b) The employee's income includes a house allowance of Ksh. 15,000 per month. The employees contributed 5% basic salary to a cooperative.

Calculate the employee net pay for that month. **3mks**

20. The following table shows the distribution of marks obtained by 50 students in a test.

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

By using an assumed mean of 62, calculate

- a) The mean **5mks**
 b) The variance **3mks**
 c) The standard deviation **2mks**

21. A red and black dice are rolled and the events x, y and z are defined as follows.

X = the red die shows a 4

Y = the sum of the scores of the two dice is 6

Z = the black dice shows a 3

- a. Find the probability of event x **2mks**
 b. The probability of events x and y **3mks**
 c. Which event is mutually exclusive to x **1mk**
 d. Which event is independent of x **2mks**
 e. The probability of event Y **2mks**

22.a) Complete the table below **2mks**

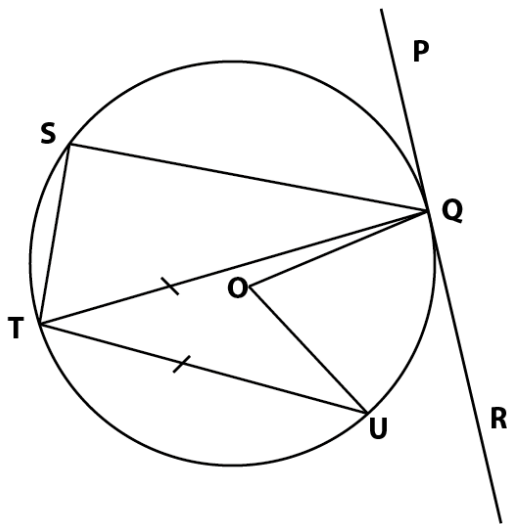
X	0	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
- Cos x	-1		-0.5		0.5	0.87		0.87			-0.5	0.87	
Sin(x-30°)		0.0	0.5			0.87	0.5		-0.5			-0.87	-0.5

b) Draw the graphs of $y = \sin(x-30)$ and $y = -\cos x$ on the same axes, for $0^\circ \leq x \leq 360^\circ$ **(5mks)**

Grid square

c) Use your graph to solve the equation $\sin(x - 30^\circ) + \cos x = 0$ **(3mks)**

23. In the figure below, O is the centre of the circle, PQR is the tangent to the circle at Q, Angle PQS = 28°, angle UTV = 54° and UT = TQ



Giving reasons, determine the size of

- | | |
|---------------------|-------------|
| a) Angle STR | 2mks |
| b) Angle TQU | 2mks |
| c) Reflex angle TQS | 2mks |
| d) Reflex angle UOQ | 2mks |
| e) Angle TQR | 2mks |

24. The cost c of producing n items varies directly as n and partly as the inverse of n to produce two items it costs Ksh. 135 and to produce three items it costs Ksh. 140. Calculate

- | | |
|--|-------------|
| a) The constant of proportionality and hence write the equation connecting c and | 5mks |
| b) The cost of producing 10 items | 2mks |
| c) The number of items produced at a cost of Ksh. 756. | 3mks |

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

MATHEMATICS MOCKS

SERIES 1 TRIAL 9 PAPER 1

Kenya Certificate of Secondary Exams

TIME:2HRS

SECTION A (50 Marks)

Attempt all questions in the spaces provided

- Without using a calculator evaluate (3 marks)
$$\frac{-2(-5 + 8) - 9 \div 3 - 5}{-3 \times -5 + -2 \times 4}$$
- (a) use mathematical tables to find the:
(i) The square of 86.46 (1 mark)
(ii) The reciprocal of 27.56 (1 mark)
(b) Hence or otherwise calculate the value of; (2 marks)
$$\frac{86.46^2}{27.56}$$
- The sum of the interior angles of an n – sided polygon is 1440° . Find the value of n and hence deduce the name of the polygon. (3 marks)
- Two containers have base areas of 750cm^2 and 120cm^2 respectively. Calculate the volume of the larger container in litres given that the volume of the smaller container is 400cm^3 . (3 marks)
- Given that the column vectors $\mathbf{a} = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} -3 \\ -2 \end{pmatrix}$ and $\mathbf{c} = \begin{pmatrix} -2 \\ -1 \end{pmatrix}$ and that $\mathbf{P} = 2\mathbf{a} - 4\mathbf{b} + 3\mathbf{c}$. Express P as a column vector. (3 marks)
- Solve the following inequalities and represent the range of values of x on a single number line. (3 marks)
 $5 - 3x > -7$
 $x - 6 \leq 3x - 4$
- The cost of a car outside Kenya is US \$ 4800. You intend to buy one such car through an agent who deals with Japanese Yen. The agent will charge 15% commission on the price of the car and further 72 220 Japanese Yens for shipment of the car. How many Kenya shillings will you need to send to the agent to obtain the car given that:
1 US \$ = 117.20 Japanese Yens

1US \$ = Kshs 72.34

(3 marks)

8. Two numbers p and q are such that $p^3 \times q = 189$. Find p and q (3 marks)

9. Evaluate without using mathematical tables. (3 marks)

$$1000 \left(\sqrt{\frac{0.0128}{200}} \right)$$

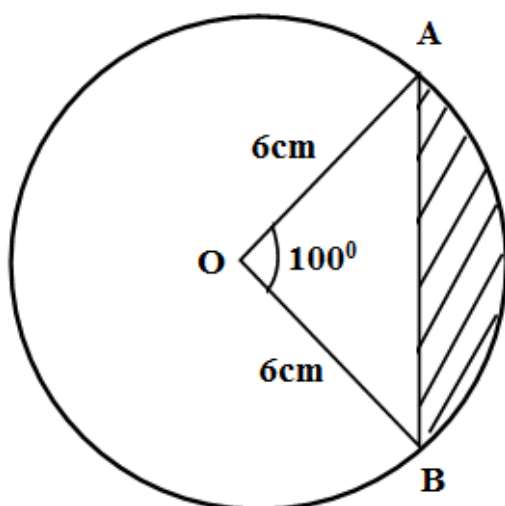
10. Simplify the following expression by reducing it to a single fraction. (3 marks)

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

11. Thirty men working at a rate of 10 hours a day can complete a job in 14 days.

Find how long it would take 40 men working at the rate of 7 hours a day to complete the same job. (3 marks)

12. The figure below shows a circle centre O and radius 6cm . sector OAB subtends an angle of 100° at the centre of the circle as shown.



Calculate to 2 decimal places the area of the shaded region. (Take $\pi = \frac{22}{7}$)

(3 marks)

13. Use the prime factors of 1764 and 2744 to evaluate

(3 marks)

$$\frac{\sqrt{1764}}{\sqrt[3]{2744}}$$

14. A rectangular block is 50cm long and 15cm wide. If its mass is 18kg and its density is 2.4g/cm^3 , find its height. (3 marks)

15. A triangle ABC is such that $AB = 12\text{cm}$, and $AC = 17\text{cm}$. If its area is 512cm^2 , find the size of angle BAC (3 marks)

16. (a) Find the greatest common divisor of the terms $9x^3y^2$ and $4xy^4$ (1 mark)

(b) Hence factorize completely the expression (2 marks)

$$9x^3y^2 - 4xy^4$$

SECTION II (50 MARKS)

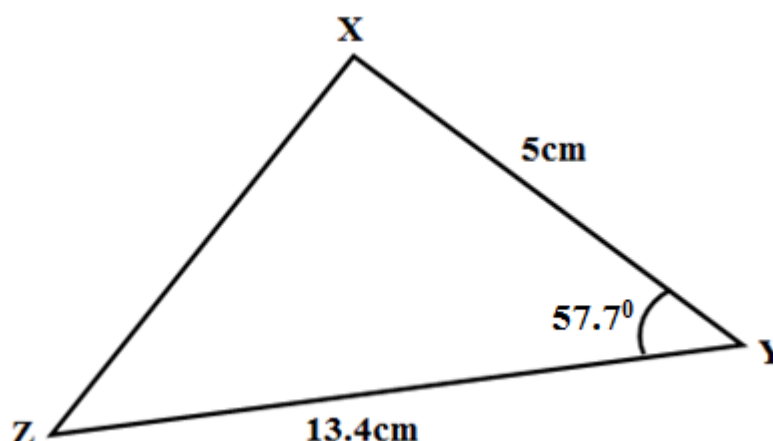
Answer FIVE questions ONLY from this section

17. A straight line $y = \frac{2}{3}x - \frac{2}{3}$ meets the x – axis at point T.
- (a) Determine the coordinates of T. (2 marks)
- (b) A second line L_2 is perpendicular to line L_1 at T. Find the equation of line L_2 in the form $ax + by = c$ where a , b and c are constants. (3 marks)
- (c) A third line L_3 passes through $(-4,1)$ and is parallel to L_1 . Find:
- (i) The equation of line L_3 in the form $y = mx + c$ (2 marks)
- (ii) The coordinates of point S at which L_3 intersects L_2 . (3 marks)
18. A particle moves in a straight line so that its velocity is given by $V = \frac{1}{2}t^2 - 3t + 7$ where t is time in seconds. Find:
- (a) The velocity after 8 seconds. (2 marks)
- (b) The acceleration when $t = 0$ (2 marks)
- (c) The minimum velocity attained. (2 marks)
- (d) The distance travelled in the first 2 seconds. (4 marks)
19. 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)
20. The distance between two towns A and B is 460 km. a minibus left town A at 8.45 am and travelled towards B at an average speed of 65km/hr. A matatu left B at 10.55 am on the same day and travelled towards A at an average speed of 80km/hr.
- (a) How far from town B did they meet? (4 marks)
- (b) At what time did the two vehicles meet? (2 marks)
- (c) A motorist started from his home at 9.15am on the same day and travelled to B at an average speed of 120km/hr. he arrived at the same time as the minibus. Calculate the distance from B to his home. (4 marks)
21. A paper cup is made in the shape of a frustum of a cone with an open top of diameter 10.5cm and a sealed bottom of diameter 7cm. it has a depth of 12cm, calculate:
- (a) The total surface area of the cup. (6 marks)
- (b) The capacity of the cup to the nearest deciliter. (4 marks)

22. The table below shows the marks scored by form four students in a mathematics test in Bidii secondary school.

Marks (%)	40 – 44	45 – 49	50 – 54	55 – 59	60 – 64	65 – 69	70 – 74
No of students	3	30	29	33	13	1	1

- (a) State the modal class. (1 mark)
- (b) Using an assumed mean of 57, calculate:
- (i) The mean (3 marks)
- (ii) The standard deviation. (3 marks)
- (c) Find the mark scored by the 50th student. (3 marks)
23. The figure below shows triangle XYZ in which line XY = 5cm, line YZ = 13.4cm and the size of angle XYZ = 57.7°



- (a) Calculate the length of line XZ (4 marks)
- (b) Calculate the size of angle XZY (4 marks)
- (c) Calculate the size of angle YXZ to 4 significant figures (2 marks)
24. Four towns P, Q, R and S are such that town P is 200 km West of Q. Town R is at a distance of 80km on a bearing of 049° from P. Town S is due East of R and due North Of Q.
- (a) Using a scale of 1cm to represent 20km, make an accurate scale drawing to show the relative positions of the towns. (4 marks)
- (b) Find:
- (i) Determine the bearing of S from P (1mark)
- (ii) Determine the distance of Q from S (2 marks)
- (iii) Determine the bearing of Q from R (1 mark)
- (iv) Determine the distance of R from S (2 marks)

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

MATHEMATICS MOCKS

SERIES 1 TRIAL 9 PAPER 2

Kenya Certificate of Secondary Exams

TIME:2HRS

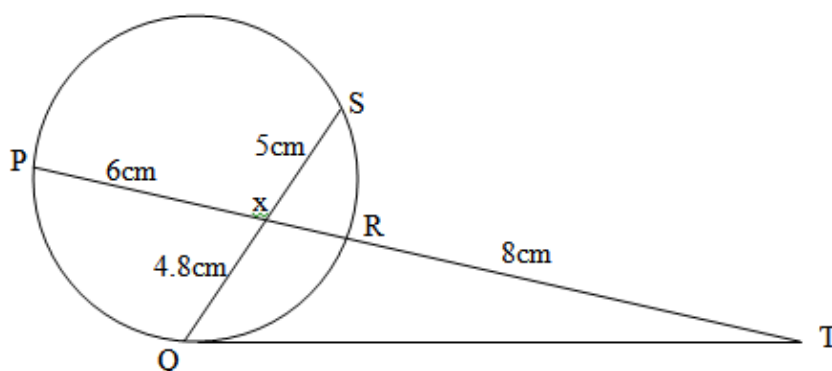
SECTION A (50 Marks)

Attempt all questions in the spaces provided

1. Use Logarithms correct to four significant figures to evaluate. (4marks)

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

2. Find the percentage error in the total length of four rods measuring 12.5cm, 24.5cm, 12.9cm and 10.1cm all the nearest 0.1cm. (3 marks)
3. In the figure below QT is a tangent to the circle at Q. PXRT and QXS are straight lines.
PX = 6cm, RT = 8cm, QX = 4.8cm and XS = 5cm.



Find the length of **QT** (3 marks)

4. Use the trapezium rule with seven ordinates to find the area bounded by the curve $y = x^2 + 1$ lines $x = -2$, $x = 4$ and $x - axis$ (3 marks)
5. Given that $x = \sqrt{\frac{tp}{2\mu+p}}$ make p the subject of the formula (3 marks)
6. Solve for x in the equation below:
 $\text{Log } 3(x + 3) = 3 \log 3 + 2$ (3 marks)
7. The points $(5, 5)$ and $(-3, -1)$ are ends of a diameter of a circle centre A. Determine:
 a) The coordinates of A. (1 mark)
 b) The equation of a circle expressing it in form $x^2 + y^2 + ax + by + c = 0$ (2 marks)
8. A transformation is represented by the matrix $\begin{bmatrix} 1 & 3 \\ 4 & 2 \end{bmatrix}$. This transformation maps a triangle ABC of the area 12.5cm^2 onto another triangle A'B'C'. Find the area of triangle A'B'C'. (3marks)
9. Two taps A and B can fill a water bath in 8 minutes and 10 minutes respectively. Tap A is opened for 2 minutes then closed. Tap B is later opened for one minute then closed. How long will the two taps take running together to fill the remaining part of the water bath? (3 marks)
10. i) Expand and simplify $(1-3x)^5$ up to the term in x^3 (2 marks)
 ii) Hence use your expansion to estimate $(0.97)^5$ correct to 4d.p. (2 marks)
11. Solve for x in the equation:
 $2\cos 4x = -1$ for $0^\circ \leq x \leq 180^\circ$ (3 marks)
12. Wanjiku pays for a car on hire purchase in 15 monthly instalments. The cash price of the car is Ksh.300, 000 and the interest rate is 15%p.a. A deposit of Ksh.75, 000 is made. Calculate her monthly repayments. (3 marks)
13. The gradient function of a curve is given $\frac{dy}{dx} = 3x^2 - 8x + 2$. If the curve passes through the point, $(2, -2)$, find its equation. (3 marks)
14. Rationalize the denominator and simplify

$$\frac{2\sqrt{5}}{\sqrt{5} + 2}$$
 (3 marks)
15. The sum of two numbers is 24. The difference of their squares is 144. What are the two numbers? (3marks)
16. The data below represents the marks scored by 15 form 4 students in an exam:
 58, 61, 40, 37, 39, 40, 41, 43, 44, 37, 70, 44, 47, 36 and 52
 Calculate the interquartile range of the above data (3 marks)

SECTION II (50 MARKS)

Answer five questions only from this section

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

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

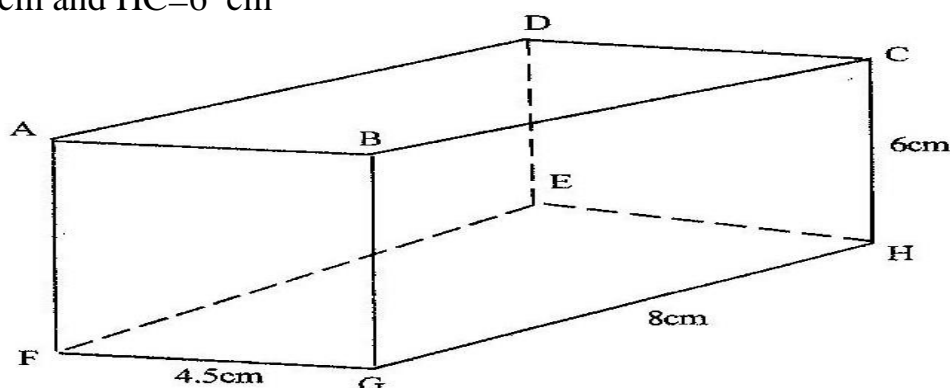
A civil servant earns a basic salary of Ksh.35750 and a monthly house allowance of sh.12500. The civil servant is entitled to a personal relief of sh.1062 per month. Calculate:

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

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

Calculate his net monthly earning. **(3 marks)**

18. The diagram below represents a cuboid ABCDEFGH in which $FG = 4.5$ cm, $GH = 8$ cm and $HC = 6$ cm

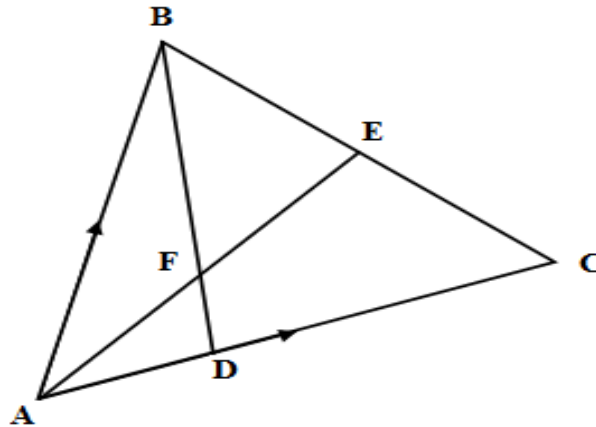


Calculate:

- a) The length of FC **(2 marks)**
b) (i) The size of the angle between the lines FC and FH **(2 marks)**

- (ii) The size of the angle between the lines AB and FH (3 marks)
- c) The size of the angle between the planes ABHE and the plane FGHE (3 marks)
19. A plane S flies from a point P (40°N, 45°W) to a point Q (35°N, 45°W) and then to another point T (35°N, 135°E).
- a) Given that the radius of the earth is 6370km find the distance from P to Q in Km.
(Take $\pi = \frac{22}{7}$) (2 marks)
- b) Find in nm
- (i) The shortest distance between Q and T. (2 marks)
- (ii) The longest distance between Q and T (to the nearest tens) (2 marks)
- c) Find the difference in time taken when S flies along the shortest and longest routes if its speed is 420 knots (4 marks)
20. The probability that a pupil goes to school by a boda-boda is $\frac{2}{3}$ and by a matatu is $\frac{1}{4}$. If he uses a boda-boda the probability that he is late is $\frac{2}{5}$ and if he uses matatu the probability of being late is $\frac{3}{10}$. If he uses other means of transport the probability of being late is $\frac{3}{20}$.
- a) Draw a tree diagram to represent this information. (3marks)
- b) Find the probability that he will be late for school. (3marks)
- c) Find the probability that he will be late for school if he does not use a matatu. (2marks)
- d) What is the probability that he will not be late to school? (2marks)
21. A farmer has 50 acres of land. He has a capital Shs. 2,400 to grow carrots and potatoes as cash crops. The cost of growing carrots is Shs.40 per acre and that of growing potatoes is Shs.60 per acre. He estimates that the respective profits per acre are Shs.30 (on carrots) and Shs. 40 (on potatoes). By letting x and y to represent carrots and potatoes respectively:-
- a) Form suitable inequalities to represent this information. (4marks)
- b) By representing this information on a graph, determine on how many acres he should grow each crop for maximum profit. (4marks)
- c) Find the maximum profit. (2 marks)
22. An arithmetic progression is such that the first term is -5, the last term is 135 and the sum of the progression is 975.
- (a) Calculate
- (i) The number of terms in the series (4 marks)
- (ii) The common difference of the progression (2 marks)
- (b) The sum of the first three terms of a geometric progression is 27 and first term is 36.
- c) Determine the common ratio and the value of the fourth term (4 marks)

23. 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 $AB = \mathbf{b}$ and $AC = \mathbf{c}$, find:

i) BD (2marks)

ii) AE (2marks)

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

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

24. Given that $y = 2\sin 2x$ and $y = 3\cos (x + 45^\circ)$

(a) Complete the table below. (2mks)

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

(b) Use the data to draw the graphs of $y = 2 \sin 2x$ and $y = 3 \cos (x + 45^\circ)$ for $0^\circ \leq x \leq 180^\circ$ on the same axes. (provide a graph paper) (4marks)

(c) State the amplitude and period of each curve. (2marks)

(d) Use the graph to solve the equation $2 \sin 2x - 3 \cos (x + 45^\circ) = 0$ for $0^\circ \leq x \leq 180^\circ$ (2marks)

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

MATHEMATICS MOCKS

SERIES 1 TRIAL 10 PAPER 1

Kenya Certificate of Secondary Exams

TIME:2HRS

SECTION A (50 Marks)

Attempt all questions in the spaces provided

1. Evaluate: 3mks

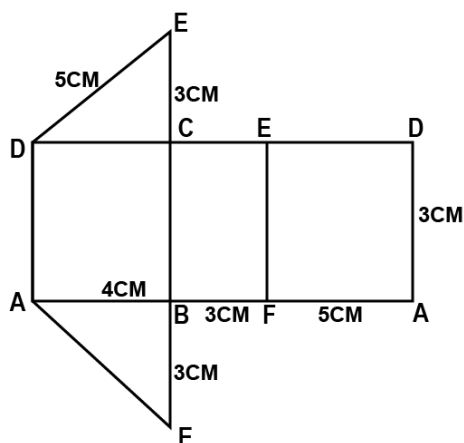
$$\frac{2\frac{1}{2} \text{ of } 1\frac{3}{4} - 5\frac{1}{4}}{1\frac{2}{5} + 2(1\frac{1}{4} - 2\frac{3}{4})}$$

2. An electrician made a loss of 30% by selling a multi plug at Sh. 1400. What profit would he have made if he sold the multi plug at sh 2300. 3mks

3. Simplify $\sqrt{\frac{12x^4y^{-1}z^5}{3x^{-2}y^{-3}z^3}}$ 2mks

4. Solve the following inequalities and represent the solutions on a number line
 $X + 1 \leq 4x - 5 < 3x + 2$

5. The figure below shows a net of a solid.



- a. Sketch the solid of the net showing the hidden edges with broken lines. 2mks
- b. Find the surface area of the solid. 2mks
6. Determine the quartile deviation for the following distribution. 3mks
3,4,9,5,4,7,6,2,1,6,7,8,9
7. Given that $2^{3/2x} = 4096$, find the value of x 2mks

8. It would take 15men 8days to dig a trench of 240m long. Find how many days it would take 18men to dig a trench 360meters long working at the same rate. 3mks
9. Use logarithms to evaluate. 4mks

$$\sqrt[3]{\frac{0.921 \times 0.00739}{0.023}}$$

10. A regular polygon is such that its exterior angle is one eighth the size of interior angle. Find the number of sides of the polygon. 3mks

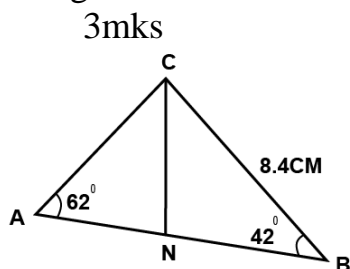
11. A translation vector $\begin{pmatrix} x - 1 \\ 2 - y \end{pmatrix}$ maps a point A(4,6) onto A¹(9,12). Find the value of x and y. 3mks

12. A Canadian tourist arrived in Nairobi with Canadian dollars 6200. She converted all his money into Kenya Shillings and then spent a total of Kshs. 100,000. She paid her Kenyan tour guide a commission equivalent to 20% of the remainder. Given that 1 canadian dollar = Ksh. 48.12. calculate

A. How much she got in kenya shillings after converting all her money. 1mk

B. The amount of kenya shillings she was left with at the end. 2mks

13. In the figure below $\angle A = 62^\circ$, $\angle B = 42^\circ$, BC = 8.4cm and CN is a bisector of angle ACB. Calculate to 1dp the length of CN. 3mks



14. A father is now four times as old as his son. Five years ago, he was exactly one year and half times as old as his son will be in ten years from now. Determine the sum of their present ages. 4mks

15. An arc length of 11cm subtends an angle of 140° at the circle. Find the area of the enclosed sector. 4mks

16. Factorize and simplify the expression. 3mks

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

SECTION II (50 marks)

Answer any FIVE questions from this section

17. The triangle ABC with coordinates A(2,3), B(4,2) and C(1,1) is mapped onto triangle A¹B¹C¹ by a reflection in the line $y + x = 0$.

a. (i) Draw triangle ABC and its image A¹B¹C¹ on the same plane. 3mks

(ii) Triangle $A^1B^1C^1$ is mapped onto $A^{11}B^{11}C^{11}$ by a transformation represented by the matrix. $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

Draw triangle $A^{11}B^{11}C^{11}$ and describe fully a single transformation that maps triangle ABC onto triangle $A^{11}B^{11}C^{11}$ **4mks**

b. Triangle ABC is mapped onto xyz with A being mapped onto x , B onto Y and C onto Z . given that the coordinates of x is $(-4,3)$, Y is $(0,2)$ and Z is $(-1,1)$, find the matrix representing the transformation. **3mks**

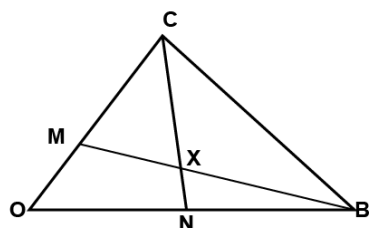
18. A lorry left town A for B at 6.50pm at an average speed of 60km/h. at 8.35pm, a car left tow A for B at an average speed of 90km/h. if A is 317km from B . determine:

- a. The distance of the lorry from town A when the car took off. **3mks**
- b. The distance the car travelled to catch up with the lorry. **4mks**
- c. What time of the day did the car catch up with the lorry? Give your answer in 24hrs system. **3mks**

19. Three ships X , Y and Z are approaching a harbour H . X is 150km from the harbour on a bearing of $O90^\circ$. Y is 130km from the harbour on a bearing of $130^\circ E$ and Z is 180km to the west of Y .

- a) Taking a scale of 1cm to represent 20km, make a scale drawing of the routes of the three ships to the harbour. **2mks**
- b) What is the distance between ships X and Z ? **2mks**
- c) Find the bearing of H from Z . **2mks**
- d) If ship Y is travelling at a speed of 50km/h how long will it take to reach the harbor. **2mks**

20. The figure below shows a triangle OAB with O as the origin. $OA = \underline{a}$ $OB = \underline{b}$, $OM = \frac{2}{5}\underline{a}$ and $ON = \frac{2}{3}\underline{b}$.



d) Express in terms of \underline{a} and \underline{b} the vectors

- (i) \underline{BM} **1mk**
- (ii) \underline{AN} **1mk**

e) Vector \underline{OX} can be expressed in two ways: $\underline{OB} + \underline{KBM}$ or $\underline{OA} + \underline{hAN}$, where K and h are constants.

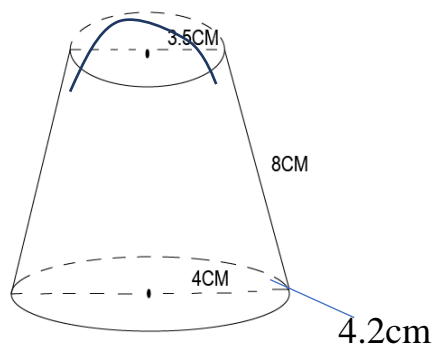
Express \underline{OX} in terms of:

- i. \underline{a} , \underline{b} and k . **2mks**

- ii. a, b and h. 2mks
- f) find the values of k and h. 4mks
21. In a certain meeting, there were 95 men in attendance. There were 50 more women than men and twice as many children as men.
- a. Determine the number of people in attendance. 2mks
- b. Find the percentage of children in attendance, correct to 3 significant figures. 2mks
- c. A hall for the meeting was fitted with benches that could accommodate either 10 children or 7 adults per bench.
- Find the number of benches
- i. Used by the children 2mks
- ii. Completely filled by the adults. 2mks
- iii. Adults who would fill the unoccupied space. 2mks

22. a) The point A(-2, 4) and B(3, -6) lies on a straight line AB, find
- (i) the equation of the line perpendicular to AB and passing through A 3mks
- (ii) The equation of the line parallel to AB and passing through the point (3, -1). 3mks
- b) The points A and B are translated by a vector $M = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$. Find
- (i) the images of A and B. 2mks
- (ii) the equation of the line passing through A¹ and B¹ the images of A and B respectively. 2mks

23. The figure below represents a solid made up of a conical frustum and a hemispherical top. The slant height of the frustum is 8cm and its base radius is 4.2cm.



If the radius of the hemispherical top is 3.5cm

- a. Find the area of:
- i. The circular base 2mks
- ii. The curved surface area of frustum. 4mks
- iii. The hemispherical surface 2mks
- b. A similar solid has a total surface area of 81.5cm². Determine the radius of the base. 2mks
24. Using a ruler and a pair of compasses, construct parallelogram ABCD such that AB = 8cm, diagonal AC = 12cm and angle BAC = 22.5° 4mks
- a) Measure

- | | |
|--|-------------|
| (i) The diagonal BD | 1mk |
| (ii) The angle ABC | 1mk |
| b) Draw the circumference of triangle ABC | 2mks |
| c) Calculate the area of the circle drawn | 2mks |

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

MATHEMATICS MOCKS

SERIES 1 TRIAL 10 PAPER 2

Kenya Certificate of Secondary Exams

TIME:2HRS

SECTION A (50 Marks)

Attempt all questions in the spaces provided

1. Make x the subject of the formula **3mks**

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

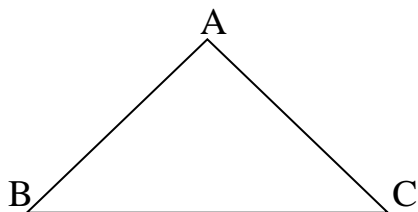
2. P varies partly as the square of v and partly as the cube of v . when $V=2$, $P = -20$ and when $v = -3$, $P=135$. Find the relationship between P and v . **3mks**

3. Expand $(1 + 2x)^7$ up to x^3 , hence use the expansion to estimate the value of $(1.02)^7$ correct to four decimal places. **3mks**

4. Simplify the following by rationalizing the denominator. **3mks**

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

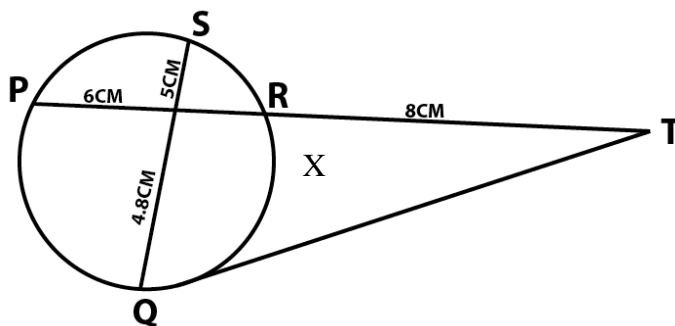
5. The diagram below represents a field ABC.



- (a) Draw the locus of points equidistant from sides AB and AC **2mks**
(b) Draw the locus of points equidistant from points A and C. **2mks**
C) A coin is lost within a region which is nearer to point A than to point C and closer to side AC than to side AB. Shade the region where the coin can be located. **2mks**
6. Given $x = 13.4\text{cm}$ and $y=4.3\text{cm}$. calculate the percentage error in $\frac{x}{y}$ correct to 4 d.p **3mks**

7. If matrix $A = \begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix}$ Find B given that $A^2 = (A + B)$. **3mks**

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



Find the length of

a. XR **2mks**

b. QT **2mks**

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

10. A blender mixes two brands of juice A and B to obtain 70mls of the mixture worth Ksh. 165 per litre. If brand A is valued at Kshs. 168 per litre and brand B at Ksh. 153 per litre bottle, calculate the ration in which the brands A and B are mixed. **(2mks)**

11. Without using logarithm tables solve the equation $\log(5x - 4) = \log(x + 2) + \frac{1}{3} \log 27$. **3mks**

12.a) Use reciprocal tables to find the value of $= \frac{1}{0.325}$ **1mk**

b) Hence, evaluate $\frac{\sqrt[3]{0.000125}}{0.325}$ **1mk**

13. The G.C.D of three numbers is 45 and the LCM is 18900. Two of the numbers are 675 and 540. Find the other possible numbers. **3mks**

14. solve for θ given that θ is acute and $\sin(3\theta - 50^\circ) - \cos(2\theta + 10^\circ) = 0$ **3mks**

15. A container of height 90cm has a capacity of 4.5L. What is the height of a similar container of volume 9cm³. **3mks**

16. A point R divides a line PQ internally in the ratio 3:4. Another point S, divides the line PR externally in the ratio 5:2. Given that PQ = 8cm, calculate the length of RS, correct to 2 decimal places. **3mks**

SECTION II (50mrks)

Attempt any FIVE questions from this section

17. Complete the table below for the function

(a) $y = x^2 + \frac{12}{x} - 15$ for $0.5 \leq x \leq 4$

X	0.5	1	1.5	2	2.5	3	3.5	4
y	9.25			-5	-4			

(b) Draw the graph of $y = x^2 + \frac{12}{x} - 15$ for $0.5 \leq x \leq 4$. using a scale of 2cm rep 1 unit on the x – axis and 2cm for 5 units on the y – axis. **3mks**

(c) (i) from your graph, state the range of values of x for which $y = x^2 + \frac{12}{x} \leq 18$ **3mks**

(ii) By adding a suitable straight line to your graph, solve the equation $y = x^2 + \frac{12}{x} - 5x + 20$ **3mks**

18. The product of the first three terms of a geometric progression is 64. If the first term is a and the common ratio is r.

(a) Express r in terms of a **3mks**

(b) Given that the sum of the three terms is 14,

(i) Calculate the values of a and r and hence write down two possible sequences each up to the 4th term. **5mks**

(ii) Find the product of the 50th terms of the two sequences **2mks**

19. The table below shows income tax rates for certain year.

Monthly income in Kenya Shillings (Kshs)	Tax rate in each shillings
0 – 10164	10%
10165 – 19740	15%
19740 – 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 employee's taxable income in the fifth band was Ksh. 2108.

(a) Calculate

i) Employees total income in that month **2mks**

ii) The tax payable by the employee in that month. **5mks**

(b) The employee's income includes a house allowance of Ksh. 15,000 per month. The employees contributed 5% basic salary to a cooperative.

Calculate the employee net pay for that month. **3mks**

20. The following table shows the distribution of marks obtained by 50 students in a test.

Marks	45-49	50-54	55-59	60-64	65-69	70-74	75-79
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No. of Students	3	9	13	15	5	4	1
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By using an assumed mean of 62, calculate

- a) The mean 5mks
- b) The variance 3mks
- c) The standard deviation 2mks

21. A red and black dice are rolled and the events x, y and z are defined as follows.

X = the red die shows a 4

Y = the sum of the scores of the two dice is 6

Z = the black dice shows a 3

- a. Find the probability of event x 2mks
- b. The probability of events x and y 3mks
- c. Which event is mutually exclusive to x 1mk
- d. Which event is independent of x 2mks
- e. The probability of event Y 2mks

22.a) Complete the table below

2mks

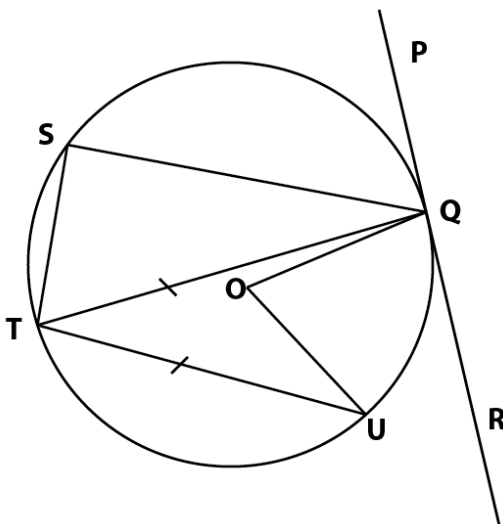
X	0	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
- Cos x	-1		-0.5		0.5	0.87		0.87			-0.5	0.87	
Sin(x-30°)		0.0	0.5			0.87	0.5		-0.5			-0.87	-0.5

b) Draw the graphs of $y = \sin(x-30^\circ)$ and $y = -\cos x$ on the same axes, for $0^\circ \leq x \leq 360^\circ$ (Provide a graph paper) (5mks)

Grid square

c) Use your graph to solve the equation $\sin(x - 30^\circ) + \cos x = 0$ (3mks)

23. In the figure below, O is the centre of the circle, PQR is the tangent to the circle at Q, Angle PQS = 28°, angle UTV = 54° and UT = TQ



Giving reasons, determine the size of

- a) Angle STR **2mks**
- b) Angle TQU **2mks**
- c) Reflex angle TQS **2mks**
- d) Reflex angle UOQ **2mks**
- e) Angle TQR **2mks**

24. The cost c of producing n items varies directly as n and partly as the inverse of n to produce two items it costs Ksh. 135 and to produce three items it costs Ksh. 140. Calculate

- a) The constant of proportionality and hence write the equation connecting c and n . **5mks**
- b) The cost of producing 10 items **2mks**
- c) The number of items produced at a cost of Ksh. 756. **3mks**



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