

Name: Index No:

Date: Signature.....

121/1

MATHEMATICS

Paper 1

March, 2015

2½ Hours

MOKASA JOINT EVALUATION EXAMINATION

Kenya Certificate of Secondary Education

INSTRUCTIONS TO CANDIDATES

- 1. Write your name, index number, signature and date in the spaces provided at the top of this page.
- 2. The paper contains two sections: Section I and Section II. Answer **ALL** the questions in Section I and **ANY FIVE** from Section II.
- 3. Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.
- 4. Marks may be given for correct working even if the answer is wrong.
- 5. Silent non - programmable electronic calculators and KNEC Mathematical tables may be used unless otherwise stated.

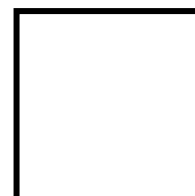
Section I

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

Section II

17	18	19	20	21	22	23	24	TOTAL

GRAND



This paper consists of fifteen (17) printed pages.

Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.

Paper1 section 1(50marks)

1. Points S(-2,2) and T(-3,7) are mapped onto S¹(4,-10) and T¹(0,10) by an enlargement . Calculate the enlargement scale factor. (3marks)

2. Given that $\frac{1}{2x} = (0.732)^3 + \sqrt[3]{85.3}$, use mathematical tables to find the value of x in standard form correct to 3 significant figures (3marks)

3. Simplify $\frac{12x^2+ax-6a^2}{9x^2-4a^2}$ (3 marks)

4. All prime numbers less than ten are arranged in ascending order to form a number.

(a) Write down the number formed (1 mark)

(b) Express the number in (a) above in expanded form (2 marks)

5. A two digit number is such that the one's digit is four more than the tens digit, and the sum of the digits is 14.
Find the number (3 marks)

- 6 Paul bought a refrigerator on hire purchase by paying monthly instalments of Ksh. 2000 per month for 40 months and a deposit of Ksh. 12,000. If this amounted to an increase of 25% of the original cost of the refrigerator, what was the cash price of the refrigerator? (3 marks)

7. Find all the integral values of x which satisfy the inequality

(3 marks)

$$3(1 + x) < 5x - 11 < x + 45$$

8. Without using calculator, evaluate

$$\left(\frac{7}{3} \left[\frac{2}{5} \text{ of } 1\frac{2}{3} - \frac{1}{2} \left(\frac{1\frac{2}{3} - 2\frac{1}{2}}{\frac{1}{3} - \frac{19}{27}} \right)^{\frac{1}{2}} + \frac{2}{3} \right] \right)^{\frac{1}{2}}$$
 leaving the answer as a mixed fraction. (4 marks)

9. During a certain month, the exchange rates in a bank were as follows;

	Buying (Ksh.)	Selling (Ksh.)
1 US \$	91.65	91.80
1 Euro	103.75	103.93

A tourist left Kenya to the United States with Ksh.1 000,000. On the air port he exchanged all the money to dollars and spent 190 dollars on air ticket. While in US he spent 4500 dollars for upkeep and proceeded to Europe. While in Europe he spent a total of 2000 Euros. How many Euros did he remain with? (3marks)

10. A school decided to make a beautiful picnic site to be used by students and teachers as a resting point. The site was designed to be triangular in shape measuring 40 metres, 60 metres and 80 metres. Calculate the area of the picnic site. (Answer correct to 1 d.p) (3 marks)

11 A regular n -sided polygon has its interior angle equal to 4 times its exterior. Find n . (3 marks)

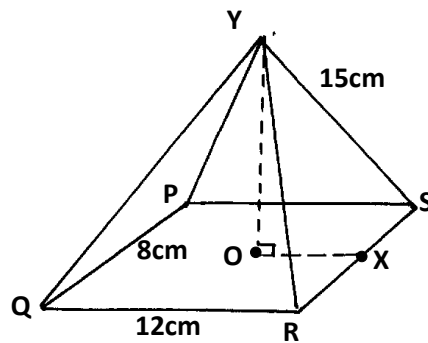
12. The ratio of the lengths of the corresponding sides of two similar rectangular petrol tanks is 3:5. The volume of the smaller tank is $8:1\text{m}^3$. Calculate the volume of the larger tank. (3 marks)

13. ABCD is a rhombus. A is the point (2, 1) and C is the point (4, 7). Find the equation of the diagonal BD in the form $ax + by = c$. (3marks)

14. A man walks directly from point A towards the foot of a tall building 240m away. After covering 180m, he observes that the angle of elevation of the top of the building is 45° . Determine the angle of elevation of the top of the building from A. (3 marks)

15. The G.C.D. and L.C.M. of three numbers are 3 and 1008 respectively. If two of the numbers are 48 and 72, find the least possible value of the third number. (3 marks)

16. An ant moved from X the midpoint of RS through P in the right pyramid below



Draw the net of the pyramid showing the path of the ant hence find the distance it moved. (4marks)

SECTION II (50 marks)

ANSWER ANY FIVE

17. Three warships A,B and C are at sea such that ship B is 500km on a bearing N30E from ship A. Ship C is 700km from ship B on a bearing of 120° . An enemy ship D is sighted 800km due south of ship B.

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

b) Find the bearing of:

i) Ship A from D (1 mark)

ii) Ship D from C (1 mark)

c) Use scale drawing to determine the distance between

i) D and A (1 mark)

ii) C and D. (1 mark)

d) Measure angle DAC and angle BCD (2 marks)

18. a) A rectangular tank of base 2.4m by 2.8m and a height of 3m contains 3600litres of water initially. Water flows into the tank at the rate of 0.5litres per second. Calculate:

i) The amount needed to fill the tank (2marks)

ii) The time in hours and minutes required to fill (3marks)

b). Pipe A can fill an empty tank in 3hours while pipe B can fill the same tank in 6hours .When the tank is full, it can be emptied by pipe C in 8hours .Pipes A and B are opened at the same time when the tank is empty .If one hour later pipe C is also opened, find the total time taken to fill the tank. (5marks)

19. A solid is 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:

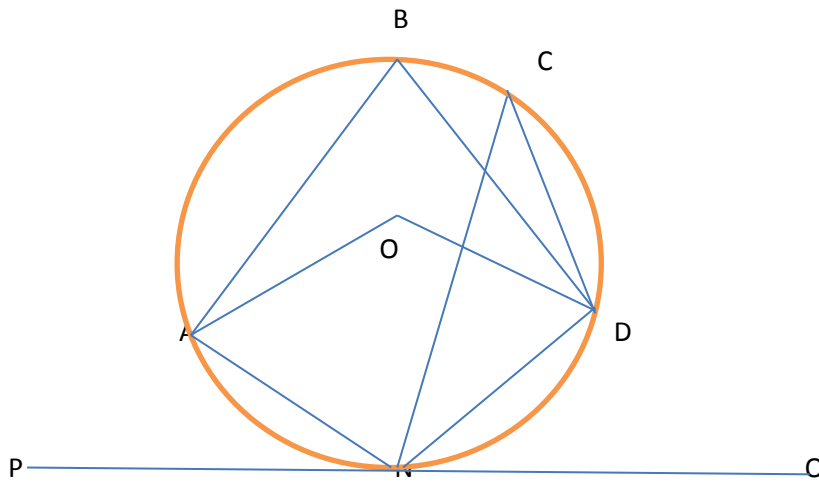
i) the circular base. (2 marks)

ii) the curved surface of the frustum (3 marks)

iii) the hemispherical surface (3marks)

b) A similar solid has a total surface area of 81.51cm^2 . Determine the radius of its base. (2marks)

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



Giving reasons find;

a) Angle DON (2marks)

b) Angle DNQ (2marks)

c) Angle DBA (2marks)

d) Angle ONA

(2marks)

e) Angle ODN.

(2marks)

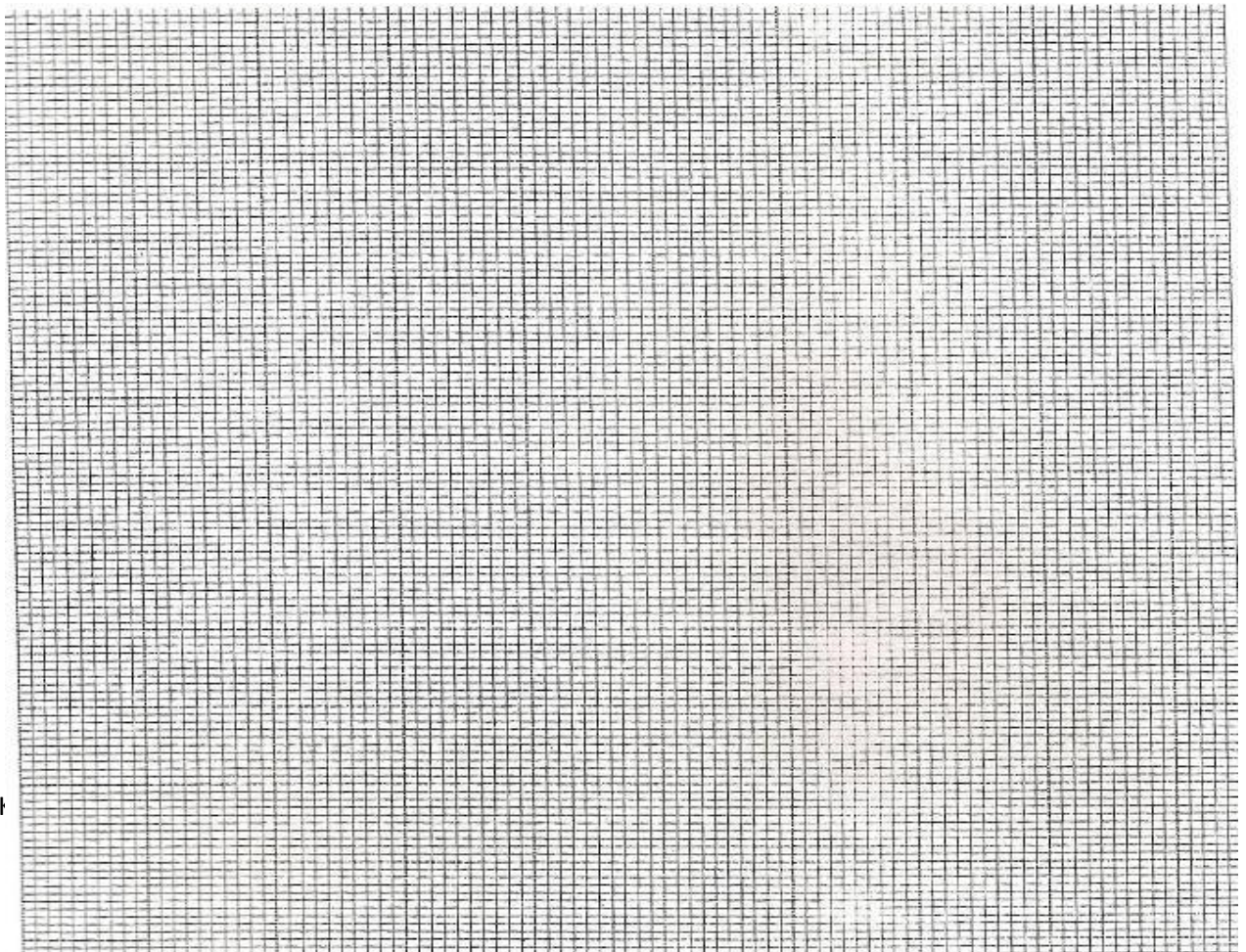
20. Two quantities P and Q are connected by the equation $P = KQ^n$. The table below gives the values of P and Q

P	1.2	1.5	2.0	205	3.5	4.5
Q	1.58	2.25	3.39	4.74	7.86	11.5

a) State the linear equation connecting P and Q

(1 mark)

b) Using a scale of 1cm to represent 0.1 units in both axes, draw a suitable straight line graph on the grid provided (5 marks)



c) Use your graph in b) above to determine the approximate values of **K** and **n**. (2 marks)

d) From the graph, find the value of Q when P=3 (2 marks)

22. The displacement h metres of a particle moving along a straight line after t seconds is given by

$$h = -2t^3 + \frac{3}{2}t^2 + 3t.$$

a) Find its initial acceleration (3 marks)

b) Calculate;

i) The time when the object was momentarily at rest (3 marks)

ii) Its displacement by the time it comes to rest (2 marks)

c) Calculate the maximum speed attained

(2 marks)

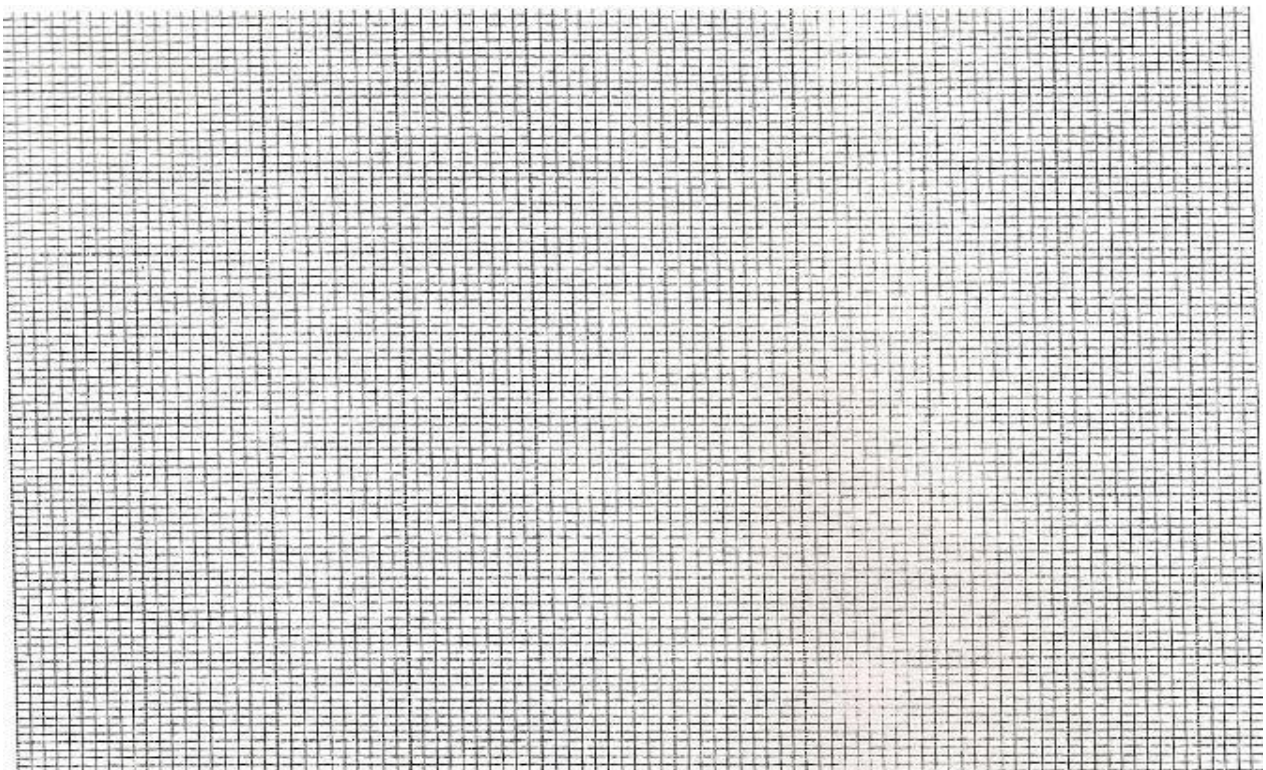
23.a) Complete the table below for graphs of $y=\sin x$ and $y=2\sin(x+30)$

(2 marks)

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

e) Using a suitable scale on the grid below draw the graphs of $y = \sin x$ and $y = 2\sin (x +30)$ for $0 \leq x \leq 360^\circ$

(4 marks)



c) State the transformations that would map $y = \sin x$ onto $y = 2\sin(x+30)$. (2 mark)

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

24. A trailer moving at a speed of 80km/h is being overtaken by a car moving at 100km/h in a clear section of a road. Given that the bus is 21m long and the car is 4m long.

a) How much time (in seconds) will elapse before the car can completely overtake the bus? (3 marks)

b) How much distance (in metres) will the car travel before it can completely overtake the bus? (2 marks)

c) Given that as soon as the car completed overtaking the trailer, a bus heading towards the trailer and the car and moving at a speed of 90km/h became visible to the car driver. It took exactly 18 seconds for the car and the bus to completely by pass each other from the moment they first saw each other.

NAME.....INDEX NO.....ADM NO.....
CANDIDATE'S SIGN.....DATE.....
SCHOOL.....

MOKASA JOINT EXAMINATIONS

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

121/2
MATHEMATICS
PAPER 2
MARCH/APRIL 2015
TIME: 2 ½ HOURS

INSTRUCTIONS TO CANDIDATES.

- 1) Write **your name** and **index number** in the spaces provided above.
- 2) Sign and write the date of examination in the spaces provided above.
- 3) This paper consists of two section **I** and **II**.
- 4) Answer **ALL** questions in section **I** and only **five** questions from section **II**.
- 5) Answers and working must be written on the question paper in the spaces provided below each question.
- 6) Marks may be given for correct working even if the answer is wrong.
- 7) Non-programmable electronic calculators may be used.

FOR EXAMINERS' USE ONLY.

SECTION I

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

SECTION II

17	18	19	20	21	22	23	24	TOTAL

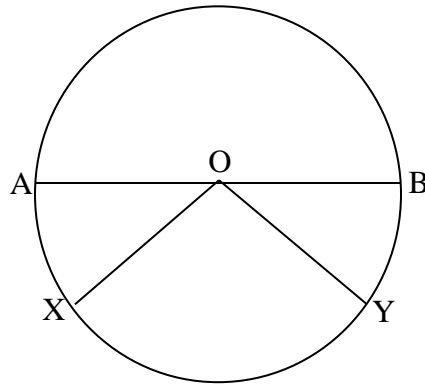
Grand Total

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SECTION A- 50 MARKS

1. The cost of maize flour and millet flour is Ksh.40 and Ksh.52 respectively. Calculate the ratio in which they were mixed if a profit of 15% was made by selling the mixture at Ksh.52.90 per kilogram. (3marks)

2. In the figure below $XY = 8\text{cm}$ and O is the centre of the circle



Determine the area of the circle if angle $AOX = 15^\circ$ (3marks)

3. $\mathbf{OA} = 3\mathbf{i} + 4\mathbf{j} - 6\mathbf{k}$ and $\mathbf{OB} = 2\mathbf{i} + 3\mathbf{j} + \mathbf{k}$ are two position vectors. P divides a line AB in the ratio 3:-2. Write down the coordinates of P. (3marks)

4. The table below show tax rates on a certain year

Income (K£ p.a)	Rate (Ksh.per £)
1 – 4200	2
4201 -8000	3
8001 – 12600	4
12601 and above	5

Rose earns a basic salary of ksh. 20,000 per month, she is given allowances amounting to ksh.5000.She is housed by her employer therefore pays a nominal rent of sh. 700 per month and is entitled to a personal relief of Ksh. 1200 per month. Calculate;

i) Her taxable income in Kenya pounds per year. (2marks)

ii) Her gross tax per month. (2marks)

5. Rationalize the denominator and simplify (3marks)

$$\frac{\sqrt{3}}{\tan 60 - 1}$$

6. Solve for x in (3marks)
 $3\log_3 x + 4 = \log_3 24$

7. The transformation represented by the matrix $\begin{bmatrix} x-1 & x \\ 1 & 2x \end{bmatrix}$ maps a triangle whose vertices are **A (-1, 2)**, **B (4, 1)** and **C (1,-4)** onto a straight line. Find the possible values of x. (3marks).

8. Expand $(2 + \frac{1}{4}x)^6$, hence find the value of $(2.025)^6$ rounded off to 3 decimal places. (4marks)

9. The resistance to the motion of a car is partly constant and partly varies as the square of the speed. At 40km/h^{-1} the resistance is 530 and at 60kmh^{-1} it is 730N. What will be the resistance at 70kmh^{-1} (4marks)

10. By completing the square, solve for x in the equation $2x^2 - 6 = x$. (3marks)

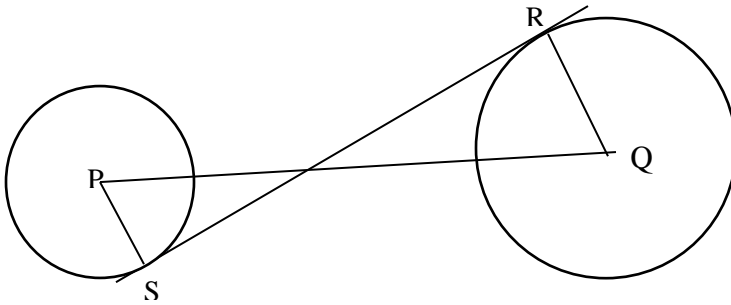
11. A die has two of its faces numbered 3. Calculate the probability of obtaining a 1 or a 3 on a single cast. (3marks)

12. Solve the equation $4\cos(3x - 10)^\circ = -3.0640$ for $0^\circ \leq x \leq 180^\circ$ (3marks)

13. The top of a table is regular pentagon. Each side of the pentagon measures 40.0cm. Find the maximum percentage error in calculating the perimeter of the top of the table. (3marks)

14. The points P(8,4) and Q(2,2) are the ends of a diameter of a circle. Find the equation of the circle. (3marks)

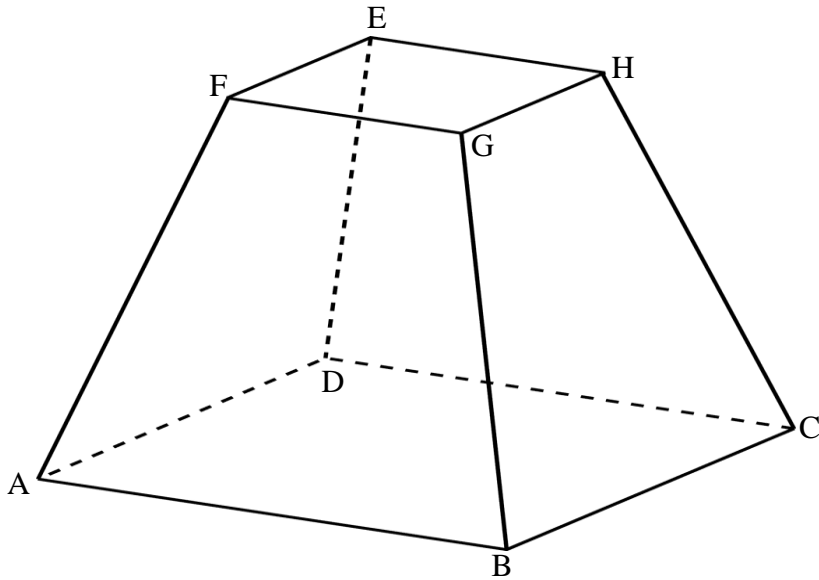
15. In the diagram below, $PQ = 10\text{cm}$, and the radius of the circle centers P and Q are 2cm and 4cm respectively, calculate the length of the transverse common tangent SR. (3marks)



16. Line $y = \frac{3}{5}x$ is parallel to diameter LM of circle $x^2 + y^2 + 6x - 8y = 0$. Find the equation of the tangent to the circle at L. (4marks)

SECTION B 50 MARKS

17. The figure below shows a frustum ABCDEFGH of a right pyramid such that $AB=9\text{cm}$, $BC=12\text{cm}$, $FG=6\text{cm}$, $GH=8\text{cm}$ and the height of the frustum is 10cm.



Find the

a) Height of the pyramid

(2marks)

b) Length of

(i) AC

(2marks)

(ii) AH

(2marks)

c) Calculate the angle between:

i) Line AH and the plane ABCD

(2marks)

ii) The planes ABHE and ABCD

(2marks)

18. A and B are two points on the latitude 40°N . The two points lie on the longitudes 20°W and 100°E respectively.

(a) Calculate:

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

(ii) The shortest distance from A to B along a great circle. (4marks)

(b) Two planes P and Q left A for B at 400 knots and 600 knots respectively. If P flew along the great circle and Q along parallel latitude, which one arrived earlier and by how long. Give your answer to the nearest minute (Take $R = 6370\text{ km}$ and $\pi = \frac{22}{7}$). (3marks)

19. 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

a) By using an assumed mean of 62, calculate:

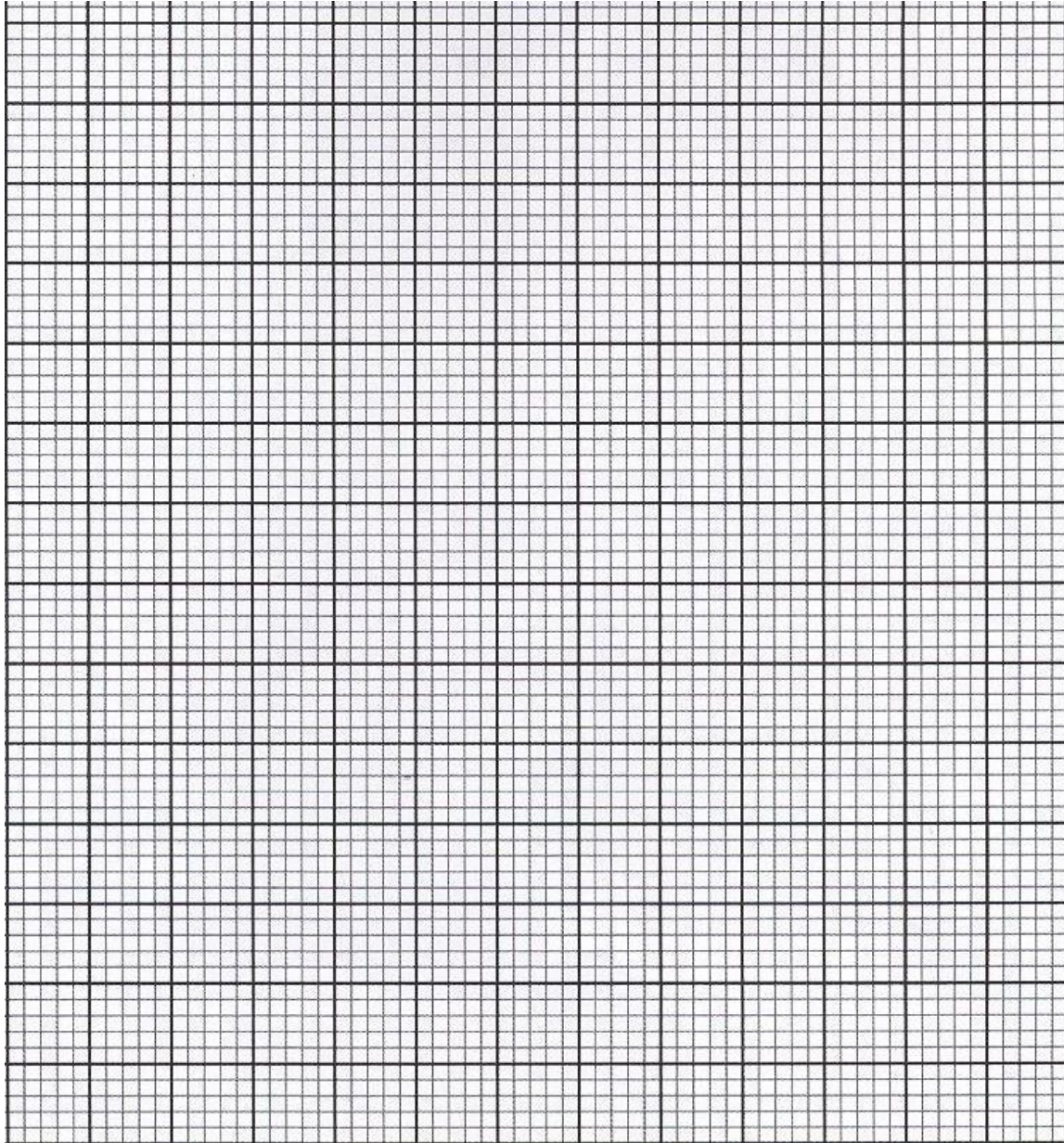
(i) The mean (5marks)

b) The variance (3marks)

c) The standard deviation (2marks)

20. Matrix **S** represents a reflection on line $y = x$, matrix **T** represents a rotation through positive 90° centre $(0,0)$. A triangle whose vertices are $A(-2,0)$, $B(1,-2)$ and $C(0,1)$ is subjected to these transformations, such that the triangle $A^1B^1C^1$ is the image of ABC under transformation matrix **S** and that $A^{II}B^{II}C^{II}$ is the image of $A^1B^1C^1$ under transformation matrix **T**.

a) Plot the three triangles on the grid provided below. (4marks)



b) Find a single matrix that will map $A''B''C''$ onto ABC. (3marks)

c) Describe the matrix in b) above. (1mark)

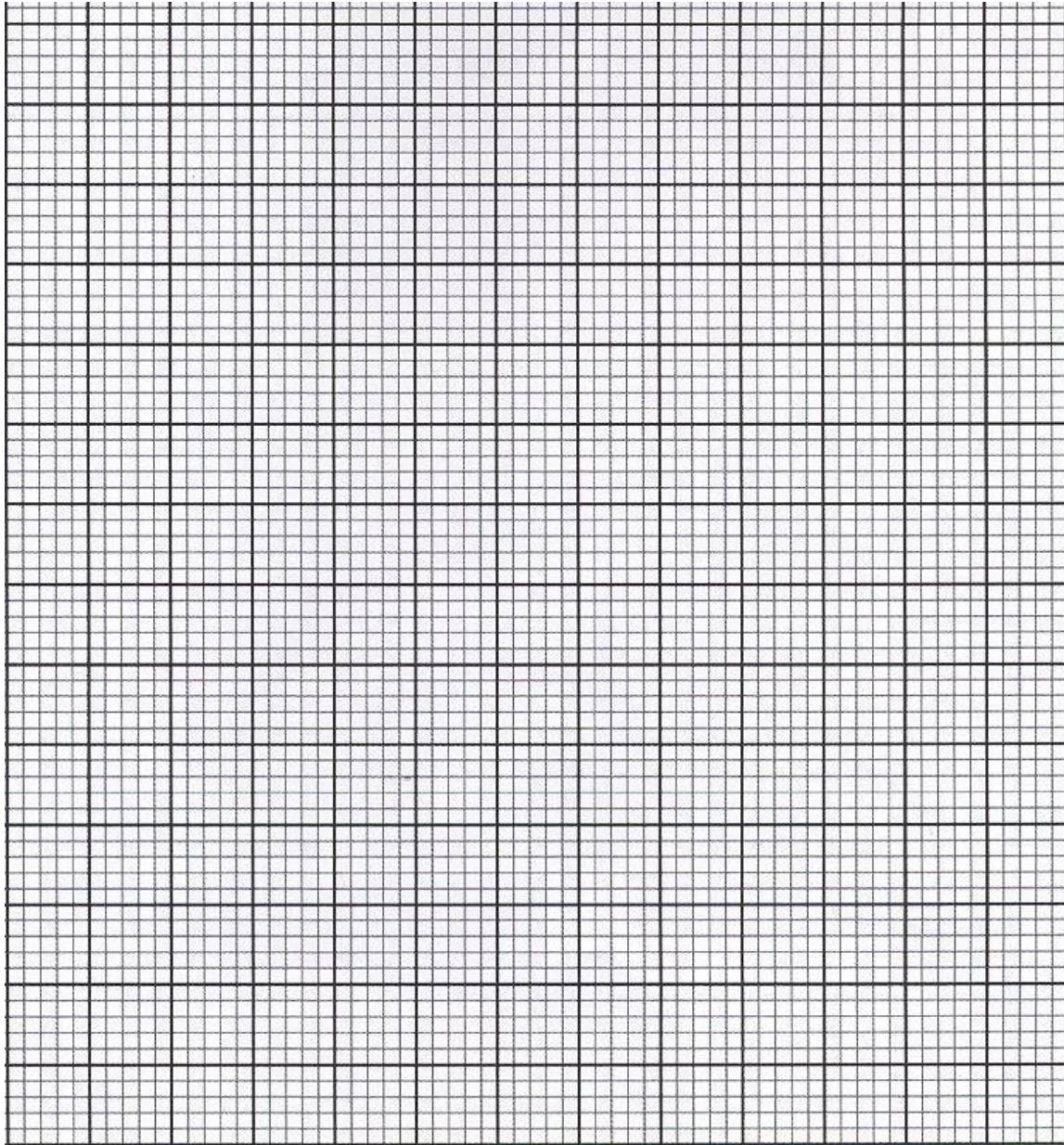
d) If triangle ABC is sheared, shear factor 2 with the y-axis invariant, find the coordinates of the image. (2marks)

21. Sigei's Flower Achievers Company has 36 hectares of land. The company decides to prepare the land for planting wheat and maize. The labour cost of planting maize is Ksh. 300 per hectare while it costs Ksh 900 to plant a hectare of wheat. Maize takes 3 labourers per hectare while wheat takes 6 labourers per hectare. At least 72 labourers are to be hired and Ksh. 15,000 is to be spent for labour costs. The company hopes to make a profit of Ksh 2,000 per hectare of maize and Ksh 4,500 per hectare of wheat. *let the number of hectares for maize be x*

let the number of hectares for wheat be y

(a) Write down inequalities representing the above information (3marks)

(b) On the grid provided, draw the inequalities by shading unwanted regions (4marks)



c) Use the graph to:

(i) determine the number of hectares of maize and wheat that should be prepared in order for the company to maximize profit (2marks)

(ii) Calculate the maximum profit (1mark)

22.a) Using a ruler and a pair of compasses only, construct parallelogram ABCD in which $AB=7\text{cm}$, $BC=5\text{cm}$ and angle $CBA=45^\circ$. (4marks)

b) From a point T, 3cm from D on DC, construct the locus of a point Q, 3.5cm from T to intersect AD and DC at V and W respectively. Measure angle VTW. (4marks)

c) Find the area of the minor sector TVW in cm^2 (2marks)

23. The thirteenth term of an arithmetic progression is 27. Given that the seventh term equals to three times the second term, find

a) The first term and the common difference of the progression. (4marks)

b) The sum of the first three even numbered terms of the progression. (3marks)

c) It's given that $(b - \frac{9}{4})$, b and $(b + 3.375)$ are the 2nd, 3rd and 4th terms of a geometric progression.

Determine the value of b . (3marks)

24. The equation of a curve is given by $y = 11x - x^2$

(a) Determine coordinates of the stationary point.

(3marks)

b) By integration, determine the actual area bounded by the curve $y = 11x - x^2$ and the line

$y = 2x$

(4marks)

c) Find the equation of the normal to the curve at $x = 2$

(3marks)