

Name..... Adm No: ..... Class.....

Candidates Signature:.....

**MATHEMATICS ALTA  
121/2 MOCK  
PAPER 2**

July 10, 2014  
Time: 2 1/2 Hours

**ALLIANCE GIRLS' HIGH SCHOOL – 2014  
MOCK EXAMINATION**

**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. The paper contains two sections: **Section I** and **Section II**.
4. Answer **All** the questions in **section I** and **strictly any five** questions from **Section II**.
5. All answers and working must be written on the question paper in the spaces provided below each question.
6. Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
7. Marks may be given for correct working even if the answer is wrong.
8. Non-programmable silent electronic calculators and KNEC mathematical tables may be used, except unless stated otherwise.
9. This paper consists of 16 printed pages. Candidates should check the question paper to Ensure that all the pages are printed as indicated and no questions are missing

**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 I – Answer all Questions

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

$$\frac{\sqrt[3]{82.51 \times 0.0062}}{\log 2.502}$$

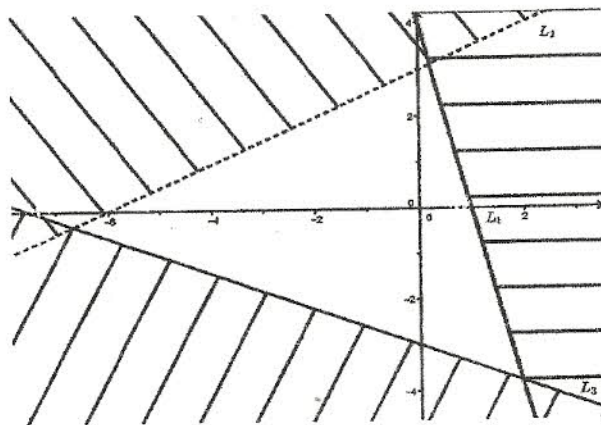
2. Form the three inequalities that satisfy the unshaded region in the diagram below. (3 marks)

Intercepts

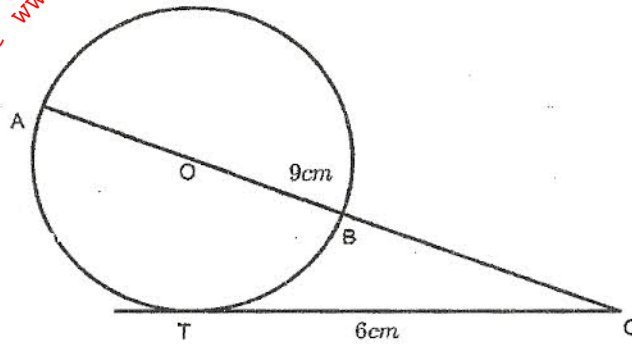
$$L_1 (1, 0) \text{ and } (0, 4)$$

$$L_2 (6, 0) \text{ and } (0, 3)$$

$$L_3 (-7.5, 0) \text{ and } (0, -3)$$



3. The diagram below shows a circle, centre O. AB is a secant to the circle and CT is a tangent to the circle at T.



Given that  $AC=9\text{cm}$  and  $CT = 6\text{cm}$ , determine the radius  $r$  of the circle. (3marks)

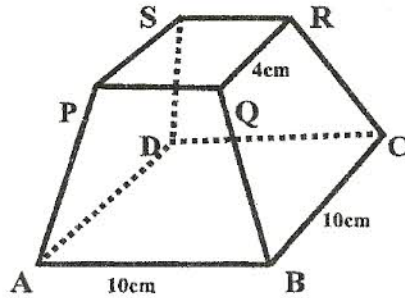
4. A trader bought three brands of rice at sh.80, sh120 and sh.150 per kg respectively. The trader mixed them in the ratio 3:5:4 respectively and sold the mixture so as to make a profit of 25%. Determine the selling price per kg of the mixture. (3marks)

5. a) Expand and simplify the expression  $((10 - \frac{3}{x})^7$  upto the fourth term.

(2marks)

- b) Use the expansion in (a) above to find the value of  $(10.3)^7$

6. The diagram below shows a frustum of a square based pyramid of side 10cm. PQRS is a square of side 4cm and the slant edge  $PA = BQ = CR = DS = 6\text{cm}$ . Calculate the height of the pyramid from which the frustum was obtained.



7. Without using a calculator or mathematical tables, express

$$\frac{\sqrt{48}}{1 - \sin 765^\circ} \text{ in surd form and simplify.}$$

(3marks)

8. Evaluate without using a calculator or logarithms tables.

(3marks)

$$\frac{\log 27 - \log 8}{\log\left(\frac{2}{3}\right)} - \log_3\left(\frac{1}{9}\right)$$

9. Make N the subject of the formulae

$$h = \sqrt{\frac{P^2 - N^2k^2}{N^2}}$$

10. The line PQ is the diameter of a circle. Given that P(-2,3) and Q(6,5). Find the radius and the coordinate of the centre of the circle and hence the equation of the circle.

(4 marks)

11. Solve for  $x$  in the equation  
 $-3\sin^2 x + 8\cos x = 0$  for  $0^\circ \leq x \leq 360^\circ$  (3marks)

12. A right cone has a radius of 10cm and slant height of 15cm. Given that the radius and slant height has error of 2% and 3% respectively, find the percentage error in finding its surface area. (3 marks)

13. The cost ( $C$ ) of hiring a venue for a delegates conference is partly fixed and partly varies inversely to the number  $N$  of delegates. When 200 delegates attend the cost is sh.4500 per delegate while for 150 delegates the cost is sh.5500 per delegate. Calculate the fixed cost. (3marks)

14. The height in centimetre of the seedling are shown in the table below

Height (cm)	10-19	20-29	30-39	40-49	50-59	60-69
No. of seedlings	9	16	19	26	20	10

Calculate the median height of the seedlings in centimetres. (3marks)

15. The  $n$ th term of a sequence is given by  $4n-1$ .

i) Generate the first four terms (1 mark)

ii) Show that the sum of  $n$  terms of the sequence is given by  $S_n = 2n^2 + n$  (2marks)

16. The velocity  $V$  of a particle moving in a straight line is given by the expression

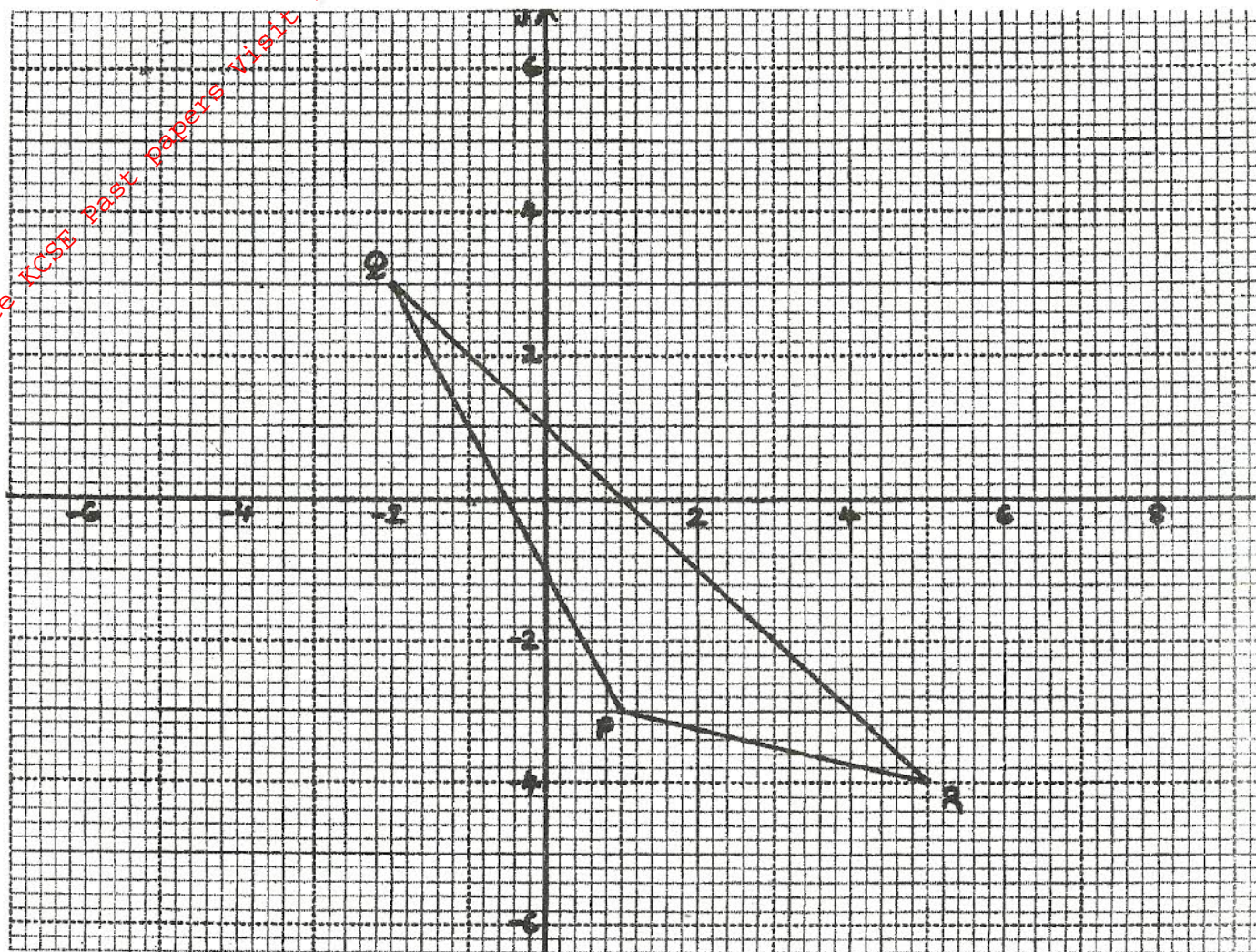
$$v = t^2 - \frac{1}{2}t + 2.$$

Determine the displacement of the particle during the third second. (3marks)

SECTION II ANSWER ANY FIVE

17. Given that point Q (-2,3) is mapped onto Q' (4,3) by a shear with x-axis invariant,

i) Draw triangle P'Q'R' , the image of PQR under the shear. (3marks)



ii) Determine the matrix representing the shear. (2marks)

b) Triangle P'Q'R' is mapped onto triangle P''Q''R'' by a transformation defined by the matrix  $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$

i) Draw triangle P''Q''R'' (3marks)

ii) Find a combined matrix that maps PQR onto P''Q''R'' (2 marks)



18.) The diagram below is a scale drawing of a piece of land. Three boundaries AB, AD and DE of the land are given. The fourth boundary is not given but it is known that the area of the land is greater than that of rectangle ABCD. Use a ruler and pair of compasses only in this question.

a) Construct the locus of all points equidistant from points B and C. (1mark)

b) The locus of any point P lying on the fourth boundary is such that  $\angle BPC = 45^\circ$ . Draw the fourth boundary. (4marks)

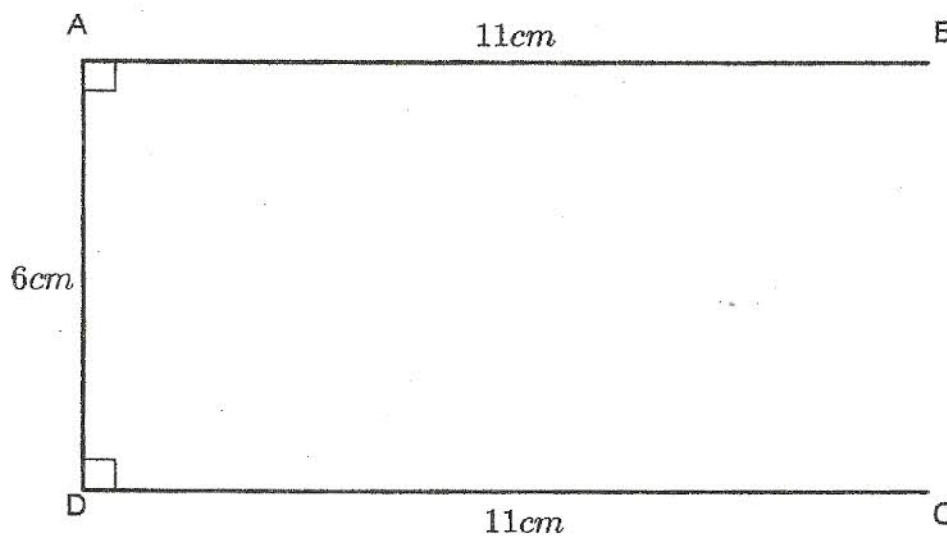
c) Shade the region within the scale drawing in which a variable point X must lie giving that X satisfies the following conditions.

i) X is at least 1cm from each of the four boundaries

ii) X is at least 6cm from A

iii) Area of  $\triangle AXD \geq 15\text{cm}^2$

(5marks)



19. Two towns A and B lie on the same parallel of latitudes  $60^{\circ}\text{N}$ . if the longitude of A and B are  $42^{\circ}\text{W}$  and  $29^{\circ}\text{E}$  respectively

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

b) Find the local time at A if at B is 1.00pm. (2marks)

c) Find the shortest distance between A and B along the circle of latitude in km. (3marks)  
(Take  $\pi = \frac{22}{7}$  and  $R = 6370\text{km}$ .)

d) If C is another town of East longitude of A and 10010 km away from A, find the position of C. (3marks)

20. The cash price of a car is sh 825,000. Michael paid Ksh.1 076 600 on hire purchase terms with an initial deposit of Ksh.155 000 followed by Ksh.76 800 monthly instalments. Calculate;

a)

i) How many months Michael took to pay for the car. (3marks)

ii) Express the percentage increase of the hire purchase price to the cash price. (3marks)

b) Three years ago, the land under tea cultivation was  $199\,982\text{m}^2$ . Due to soil erosion over the years, the area under cultivation has reduced to  $150\,700\text{m}^2$ . Calculate the rate of soil erosion. (4marks)

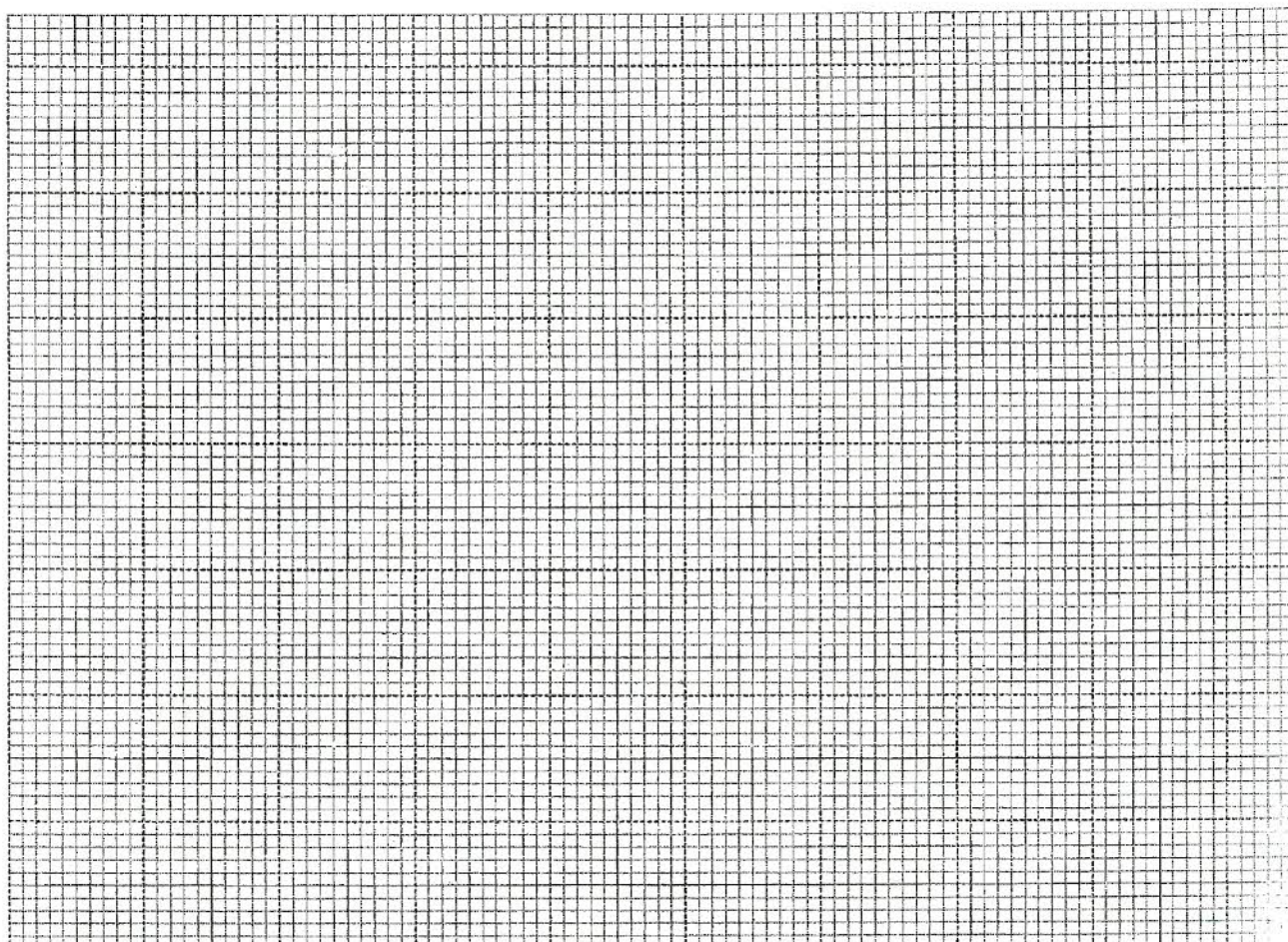
- 21.) Resistance  $R$  and the voltage  $V$  in a certain conductor are connected by the law  $RV = a + bV$ , where  $a$  and  $b$  are constants. The following are the values of  $R$  and  $V$  obtained when the experiment was done by a student.

R	1	2	3	4	5	6
V	0.4	0.111	0.067	0.047	0.035	0.029

- a) Rewrite the equation connecting  $R$  and  $V$  into linear form. (1mark)

- b) Use the table and the equation obtained in (a) above to draw a line graph.

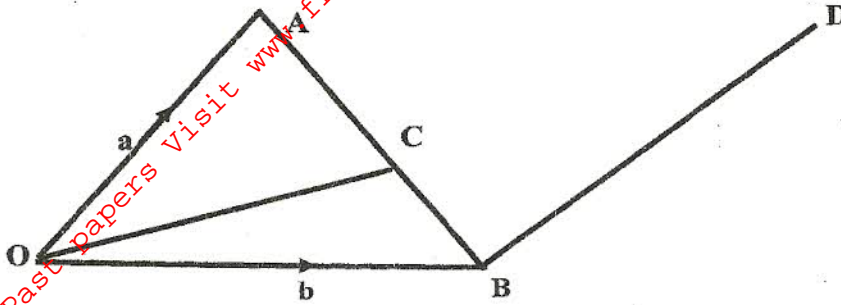
R	1	2	3	4	5	6
$1/V$						



- c) Use your graph to estimate the values of the constants  $a$  and  $b$ . (3marks)

- d) State the equation connecting  $R$  and  $V$ . (1mark)

22.) In the figure below,  $\vec{OA} = \mathbf{a}$ ,  $\vec{OB} = \mathbf{b}$ ,  $\vec{BD} = \frac{1}{2} \vec{OA}$ . and C divides AB in the ratio 2:1



a) Find in terms of  $\mathbf{a}$  and  $\mathbf{b}$

i)  $\vec{AB}$

(1mark)

ii)  $\vec{AC}$

(1mark)

iii)  $\vec{OC}$

(2mark)

iv)  $\vec{OD}$

(1mark)

b) Given further that  $\vec{OC} = k\vec{OD}$

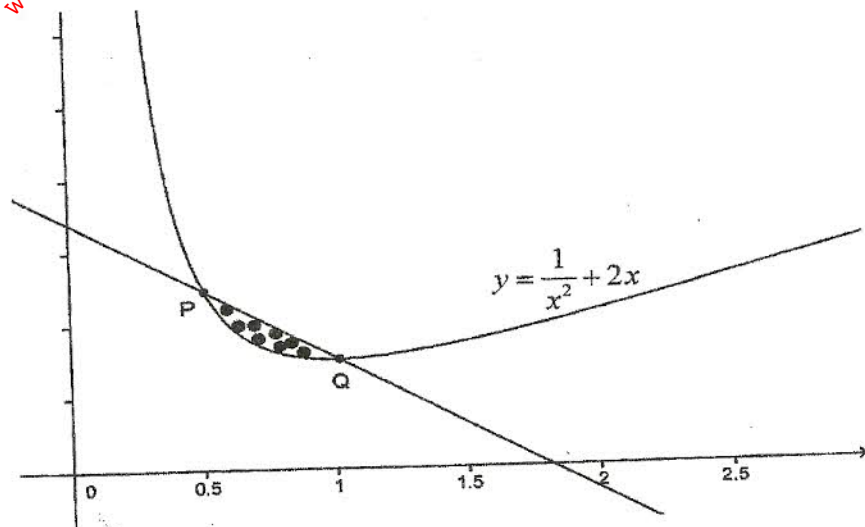
i) Show that O, C and D are collinear

( 4 marks )

ii) State the ratio in which C divides  $\vec{OD}$ .

( 1 marks )

- 23.) In the diagram below the curve  $y = \frac{1}{x^2} + 2x$  intersects a line at points P (0.5, a) and Q (1, b).



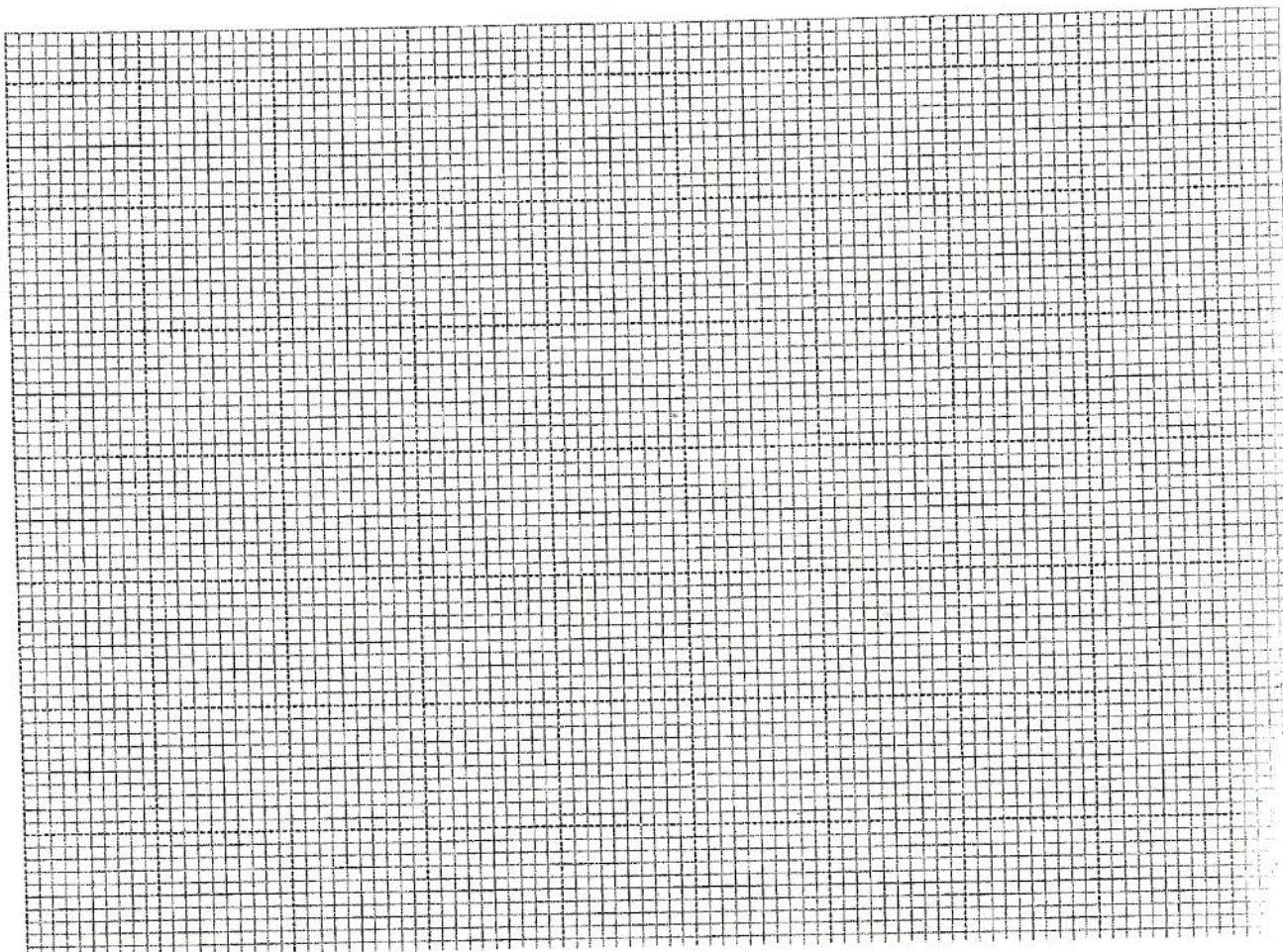
- a) Find the values of a and b. (2mks)
- b) Find the equation through the point P and Q (3mks)
- c) Find the area of the shaded region (5 mks)

- 24.) A part of a farm is to be planted with sugar cane and another part with beans observing the following restrictions.

Labour per hectare (days)	Sugarcane	Beans	Maximum available
	4	3	32
Cost of labour per hectare (shs)	10	20	180
Cost of fertilizer per hectare(shs)	40	10	240

- a) Assuming that sugarcane is on  $x$  hectares and beans on  $y$  hectares, write down three inequalities in addition to  $x \geq 0, y \geq 0$  that will satisfy the restrictions given in the table above. (3marks)

- b) i) Plot the inequalities obtained above on the grid provided. (4 marks)



ii) If a profit of sh30,000 and sh 15,000 per hectare of sugarcane and beans respectively is made find the number of hectares of sugarcane and beans that can be planted to give a maximum profit. ( 3 mks )

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