

Name..... School.....Index No.....

121/2

MATHEMATICS

PAPER 2

FRIDAY 11TH MARCH 2016

8.00 am – 10.30 am

Time: 2 ½ Hours

OCTAGON JOINT EXAMS
FORM 4 FIRST TERM EXAMS SERIES 1 2016

Instructions to candidates

- Write your name, admission number and stream in the spaces provided above.
- This paper contains two sections, Section I and Section II
- Answer **ALL** the questions in **Section I** and only **FIVE** questions from **Section II**.
- All answers and working must be written on the question paper in the spaces provided
- Show all the steps in your working giving your answer at each stage in the spaces each question
- Marks may be given for correct working even if the answer is wrong
- Non-programmable silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.
- This paper consists of 14 printed pages.
- Candidates should check the question paper to ascertain that all the pages are printed as indicated and that 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

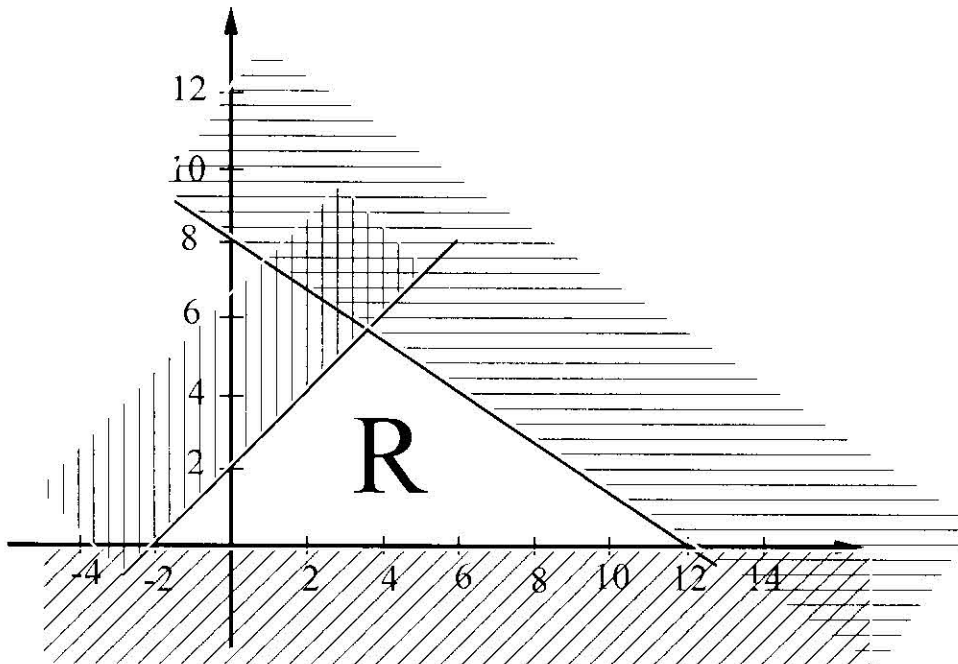
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SECTION II (50 Marks)

Answer all the questions in this section in the spaces provided

- 1) Using logarithm tables, evaluate $\left(\frac{324.2 \times 0.0052}{\sin 30^\circ}\right)^{-\frac{1}{3}}$ (4mks)

- 2) Write down three inequalities to represent unshaded region **R** (3mks)



- 3) Find the equation of a circle whose diameter has end points (4, -1) and (-6, 7) (3mks)

4) Given that matrix $\mathbf{P} = \begin{pmatrix} x-1 & x+4 \\ -3x & 2x \end{pmatrix}$ is a singular matrix find the two possible values of x (3mks)

5) A dam containing 4158m^3 of water is to be drained. A pump is connected to a pipe of radius 3.5cm and the machine operates for 8 hours per day. Water flows through the pipe at the rate of 1.5m per second. Find the number of days it takes to drain the dam. (3mks)

6)a) Expand $\left(1 - \frac{2}{x}\right)^4$ up to the term in x^{-3} (2mks)

b) hence evaluate $(0.98)^4$ correct to 5 significant figures (2mks)

7) How many litres of 70% alcohol solution must be added to 50 litres of 40% alcohol solution to produce 50% alcohol solution (3mks)

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

9) The quadratic curve $y = ax^2 + bx + 4$ intersects line $y = 2x - 2$ at P (2, 2) and Q (-1.5, -5).
Find the values of a and b (3mks)

10) Mrs. Musundi bought a television set on hire purchase by paying a down payment of Kshs. 5,000 and monthly installments of Kshs. 1, 250 for 2 years. If the interest rate charged was 12% p.a, what is the carrying charge to the nearest hundreds? (3mks)

11) Given that $\frac{2\sqrt{3}}{1+\sqrt{3}} - \frac{\sqrt{3}}{1-\sqrt{3}} = a + b\sqrt{c}$ Find the values of a, b and c (3mks)

12) Given that $y + d(x-1) + 3$ is a perfect square, find the value of d (3mks)

13) A ball is dropped from the top of a building and its height h , metres above the ground at any time t , seconds is given by $h = 350 + 65t - t^2$.

(i) Find the velocity of the ball when $t = 2$ seconds. (2mks)

(ii) State the time when the ball hits the ground. (2mks)

14) A quantity V varies directly as q and inversely as the square root of t .
Find the percentage change in V if q is increased by 20% and t decreased by 36% (3mks)

15) Solve for x given that

$$\log_6 2 - \log_4 x + \frac{7}{6} = 0 \quad (3mks)$$

16) The sum of the third term and ninth term of an AP is 8. calculate the sum of the first 11 terms of the AP (2mks)

SECTION II (50 Marks)

Answer only five questions in this section in the spaces provided

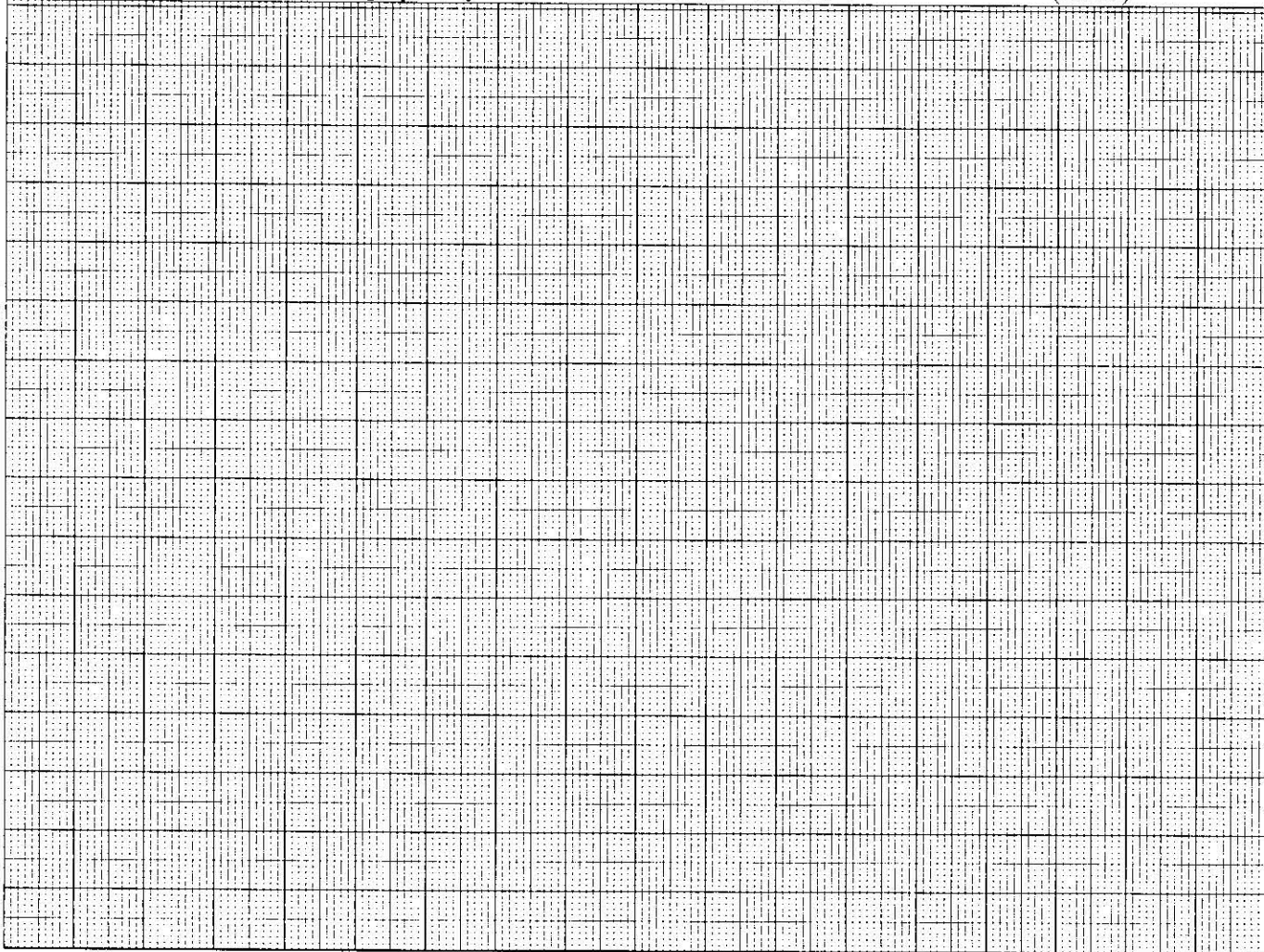
17)a) Complete the table below for the equation $y = 5x^3 + 2x^2 - 5x - 2$.

(2mks)

x	-3	-2	-1	0	1	2	3	4
$5x^3$		-40		0				320
$2x^2$		8		0			18	
$-5x$	15	10	5	0	-5	-10	-15	
y	-104				0			

b) On the grid provided, draw a graph of $y = 5x^3 + 2x^2 - 5x - 2$ for $-2 \leq x \leq 4$

(3mks)



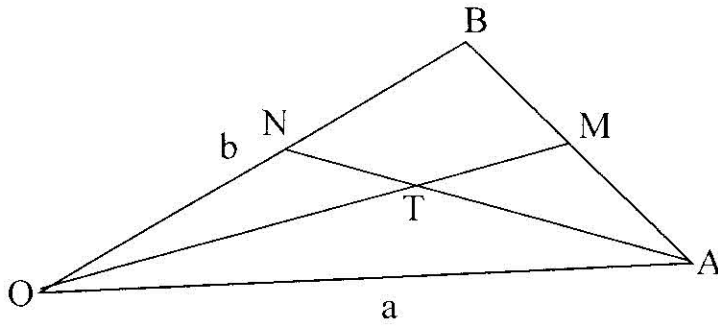
c) Use your graph to estimate the roots of the equation $5x^3 + 2x^2 - 5x - 2 = 0$

(2mks)

d) By drawing a suitable line on the same axis, estimate the roots of the equation,
 $5x^3 + 2x^2 - 8x - 4 = 0$

(3mks)

18) In triangle OAB , $OA = \mathbf{a}$, $OB = \mathbf{b}$. $ON:NB = 1:3$ and $AM:MB = 1:2$. Line OM and AN meet at T



a) Express in terms of \mathbf{a} and \mathbf{b}

i) \mathbf{AB}

(1mk)

ii) \mathbf{AN}

(1mk)

iii) \mathbf{OM}

(1mk)

b) Given that $\mathbf{OT} = h\mathbf{OM}$ and $\mathbf{AT} = k\mathbf{AN}$, express \mathbf{OT} in two different ways hence find the values of h and k (5mks)

c) Show that the points N , T and A are collinear

(2mks)

19) Using a ruler and a pair of compass only,

- a) Using a ruler and pair of compasses only, construct triangle **ABC** in which **AB=9cm**, **BC=8.5cm** and $\angle\mathbf{BAC}=60^\circ$. (3mks)

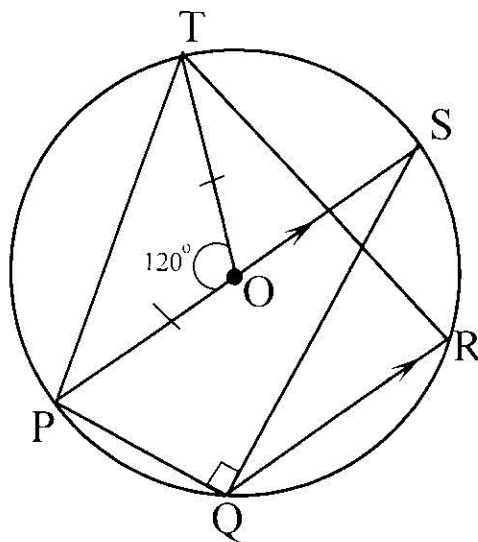
(b) On the same side of **AB** as **C**:

- (i) Determine the locus of a point **P** such that $\angle\mathbf{APB} = 60^\circ$. (3mks)

(ii) Construct the locus of **R** such that $\mathbf{AR} > 4\text{cm}$. (2mks)

(iii) Determine the region **T** such that $\angle\mathbf{ACT} \geq \angle\mathbf{BCT}$. (2mks)

20) In the figure below, O is the centre of the circle and PS is a diameter of the circle. QR is parallel to PS . If angle $PSQ=25^\circ$ and angle $POT=120^\circ$. Find the sizes of the given angles giving reasons for each



a) Angle QRT (3mks)

b) Angle QPT (3mks)

c) Angle POR (2mks)

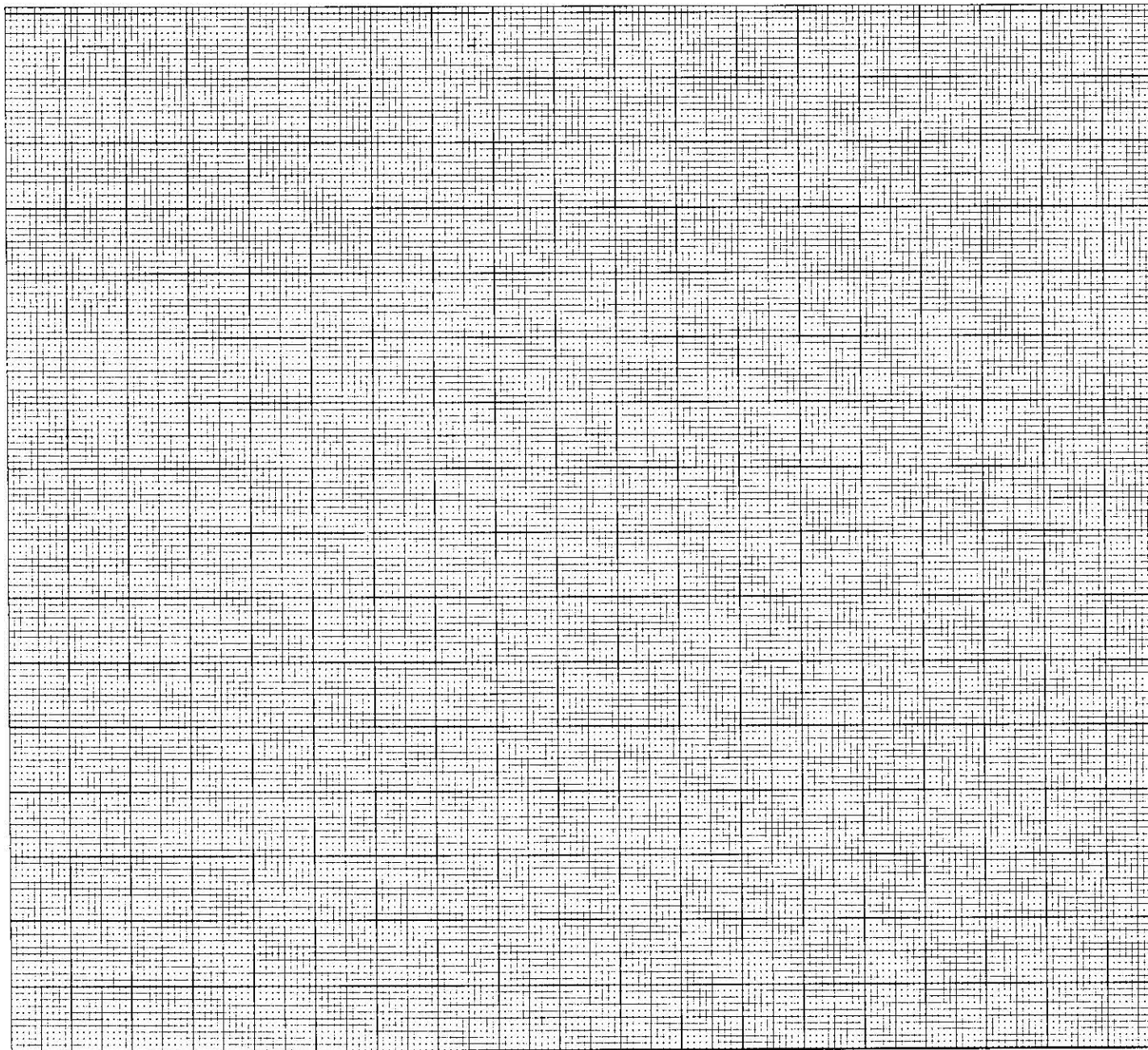
d) Angle PTR (2mks)

21) The vertices of a triangle ABC are A(1, 1), B(4, 1), and C(9, 4). A transformation represented by

$$\text{matrix } T = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \text{ maps } \triangle ABC \text{ onto } \triangle A'B'C'$$

A second transformation represented by $U = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ maps $\triangle A'B'C'$ onto $\triangle A''B''C''$

a) On the same axes draw the three triangles $\triangle ABC$, $\triangle A'B'C'$ and $\triangle A''B''C''$ (7mks)



b) Describe a single transformation that maps $\triangle ABC$ onto $\triangle A''B''C''$ and find its matrix (3mks)

22) The table below shows distribution of mass of luggage of 70 passengers measured to the nearest kg at Frankfurt International airport

mass of luggage (kg)	101-200	101-300	101-400	101-500	101-600	101-700	101-800	101-900	901-1000
frequency	2	7	12	14	23	8	5	2	4

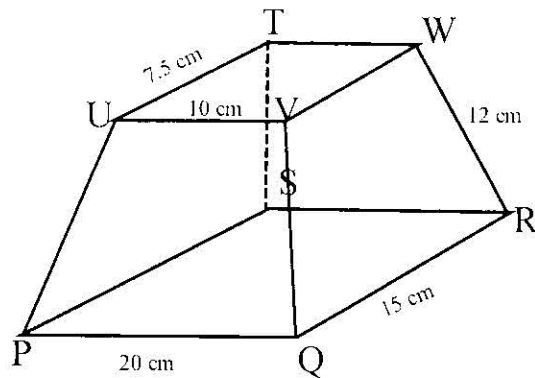
a) State the modal class (1mk)

b) Calculate the median mass (3mks)

c) Determine the mean mass (3mks)

d) Find the standard deviation for the distribution (3mks)

- 23) The figure below shows a frustum $PQRSTU$ of a right pyramid. $PQ = 20\text{cm}$, $QR = 15\text{cm}$, $UV = 10\text{cm}$, $UT = 7.5\text{cm}$ and $PU = QV = RW = ST = 12\text{cm}$.



Leave all your answer to 4 s.f.

- a) Find the altitude of the pyramid from which the frustum was cut. (3mks)

- b) Find the angle between;
 i) PW and base $PQRS$ (4mks)

- ii) $PQVU$ and the base $PQRS$ (3mks)

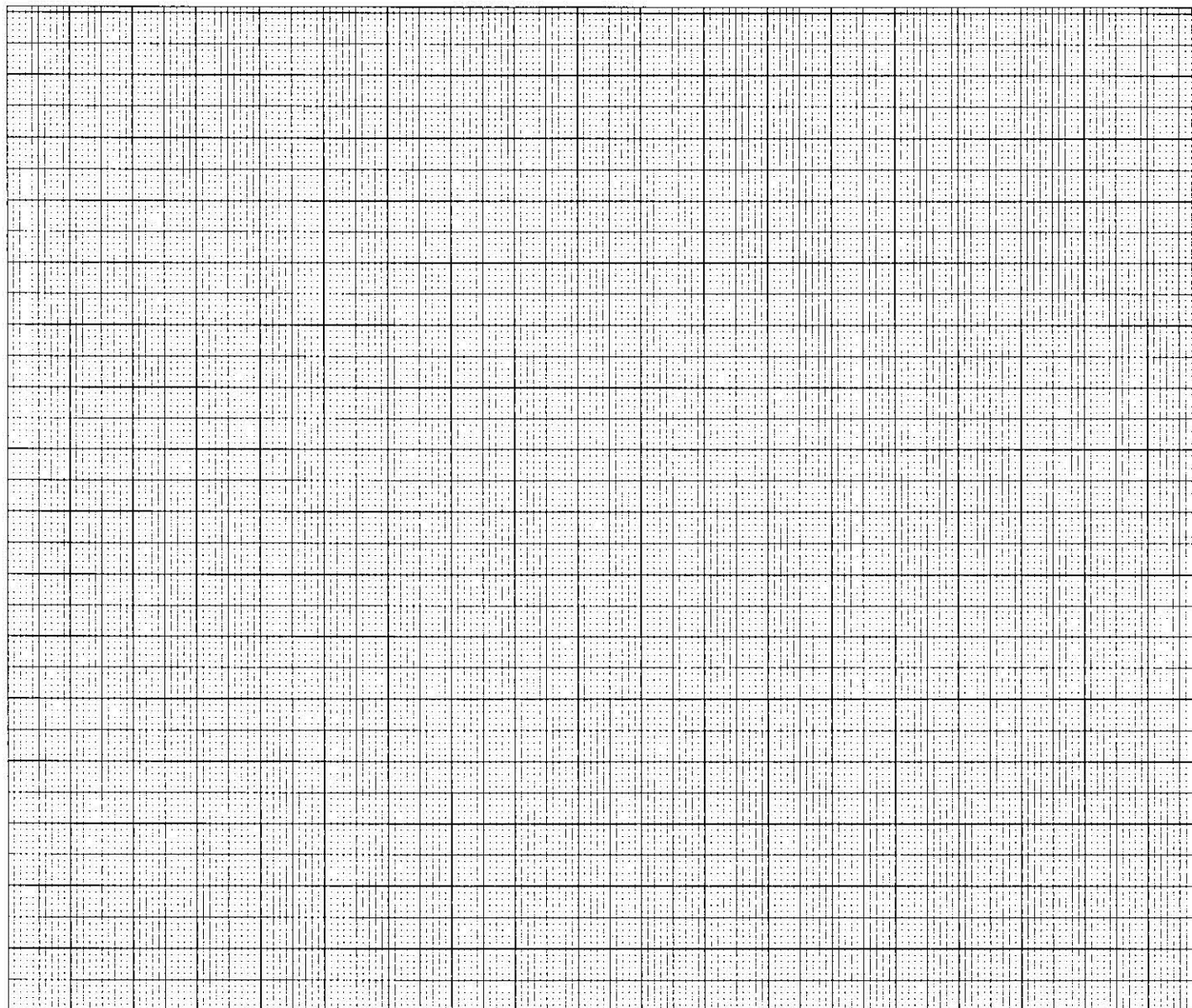
24)a) Complete the table below for the function $y = 2 \sin \frac{1}{2}x$ and $y = \cos(2x + 15^\circ)$

for the interval $-90^\circ \leq x \leq 270^\circ$

x	-90°	-60°	-30°	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°
$2 \sin \frac{1}{2}x$	-1.41	-1.0	-0.52	0.00	0.52			1.73			1.93	1.73	
$\cos(2x + 15^\circ)$	-0.97			-0.97	0.71		-0.97		0.26	0.97			-0.97

b) Using a scale of 2cm represents 30° in the x-axis and 1 cm represents 0.2 units in y-axis, draw the

graph of $y = 2 \sin \frac{1}{2}x$ and $y = \cos(2x + 15^\circ)$ on the same axes



c) Using your graph;

i) State the amplitude of $y = 2 \sin \frac{1}{2}x$ and $y = \cos(2x + 15^\circ)$ (1mk)

ii) Find the values of x for which $2 \sin \frac{1}{2}x - \cos(2x + 15^\circ) = 0$ (2mks)

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