THE ALLIANCE MATHEMATICS FORUM EXAMINATIONS.

Featuring Kenya Certificate Of Secondary Education (K.C.S.E.) 2025.

121/2 — MATHEMATICS — Paper 2

ALT A

FORM FOUR

POST-MOCK

September. 2025 — $2\frac{1}{2}$ hours

Name…….…….. Adm. Number:…….……....

Candidate's Signature…… Date…….. Stream:…….

Instructions to candidates

(a) Write your name and admission number in the spaces provided above.
(b) Sign and write the date of examination in the spaces provided.
(c) This paper consists of two sections: **Section I** and **Section II**.
(d) Answer all questions in **section I** and **only five** questions from section **II**.
(e) **Show all the steps in your calculations, giving the answers at each stage in the spaces provided below each question.**
(f) Marks may be given for correct working even if the answer is wrong.
(g) **Non-programmable** silent electronic calculators and KNEC mathematical tables may be used, except where stated otherwise.
(h) **This paper consists of 16 printed pages.**
(i) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
(j) **Candidates should answer the questions in English.**

For Examiner's Use Only

Section I

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

Section II

17	18	19	20	21	22	23	24	Total

Grand Total ☐

SECTION I (50 marks)

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

1. Given that $25x^2 - kx + 9$ is a perfect square; find the value of k. (3 marks)

2. The length and width of a rectangular flower bed measure 15m by 8m, respectively. Determine the relative error in calculating its area. (3 marks)

3. Find in radians, the value of x that falls in the second quadrant for which $2\,cos^2 x - \sin x = 1$. (3 marks)

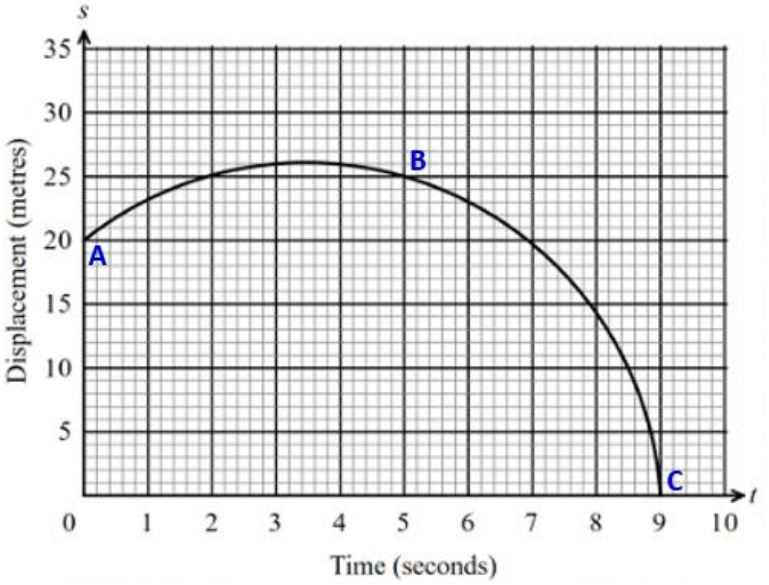
4. Solve for x in the equation $\text{Log}_2 (x + 5) = 2 - \log_2 (x + 2)$. (3 marks)

5. Without using mathematical tables or a calculator, evaluate $\frac{\sin 150^0 - \sin 60^0}{\tan 240^0}$. (3 marks)

6. Two towns A and B lie on the same parallel of latitudes 70°N. If the longitudes of A and B are 42°W and 138°E respectively. Find the exact shortest distance between A and B in nautical miles. (3 marks)

7. The 2nd, the 6th and the 16th terms of an arithmetic sequence AP, for the first 3 terms of a a geometric sequence GP. If the sum of the first five terms of the AP is 27.5, determine the first term of the AP.
(3 marks)

8. The graph below is a displacement–time graph of a ball kicked upwards from a height of 20 m above the ground.



Calculate;

a) The average rate of change between points A and B (2 marks)

b) The instant rate of change at Point B. (2 marks)

9. P and Q are two points such that **OP** = **i** + 2**j** + 3**k** and **OQ** = 4**i** + 5**j** – 3**k**. M is a point that divides PQ externally in the ratio 3:2. Find the coordinates of point M. (3 marks)

10. Three quantities; P, Q and R are such that P varies directly as the square of Q and inversely as the fourth root of R. If P = 6 when Q = R and R = 16. Find the value of P when Q = 15 and R = 6561. (3 Marks).

11. The table shows income tax rates.

Monthly taxable pay Ksh.	Rate of tax (%)
1-8700	10
8701-17400	15
17401-26100	20
26101-34800	25
Excess over 34800	30

A company employee earns a monthly basic salary of Ksh. 23,000, a house allowance of sh.9000 and is also given non-taxable allowances amounting to Ksh. 5000. He is also entitled to a monthly personal tax relief of sh. 1040. Calculate his net pay given that he is deducted sh 850 for Social Health Fund, and sh. 1200 housing levy (3 marks)

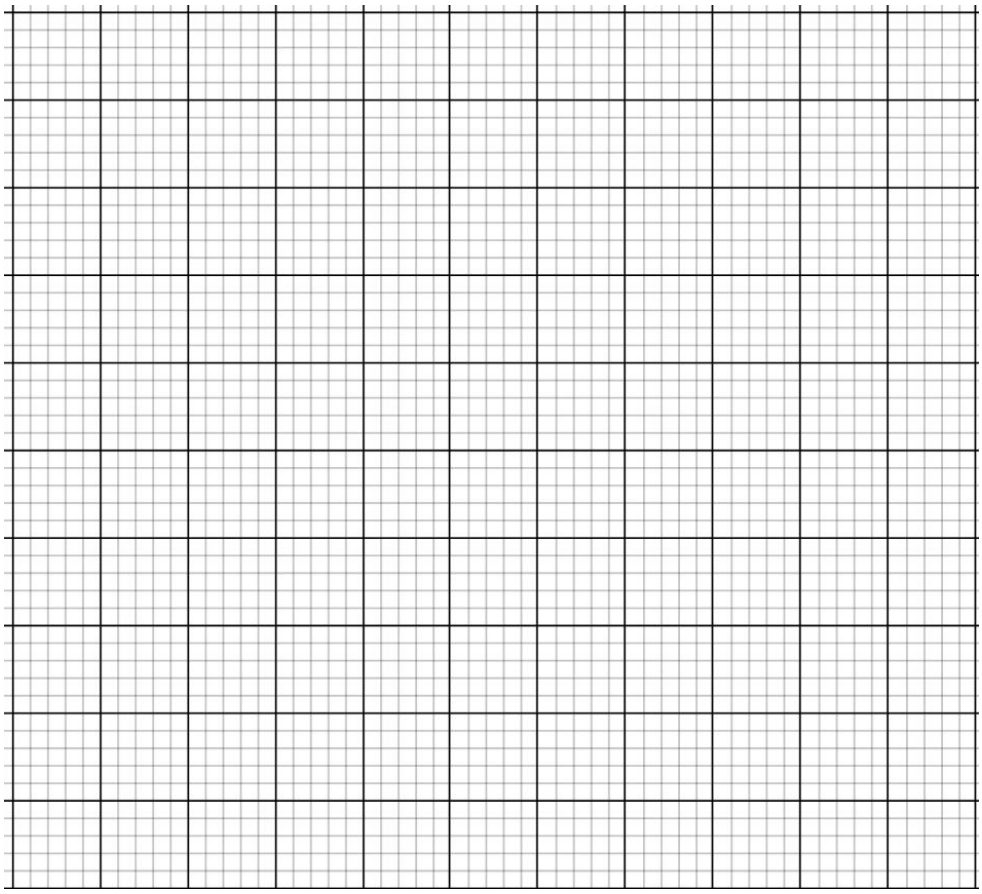
12. By shading the wanted region, show the locus of points (x, y) that satisfy the four inequalities below; (4 marks)

(i) $(x-1)^2+(y-2)^2 \leq 25$

(ii) $x < 3$

(iii) $x \geq 0$

(iv) $y \leq x$



13. Use binomial expansion to evaluate up to the term in y^2;

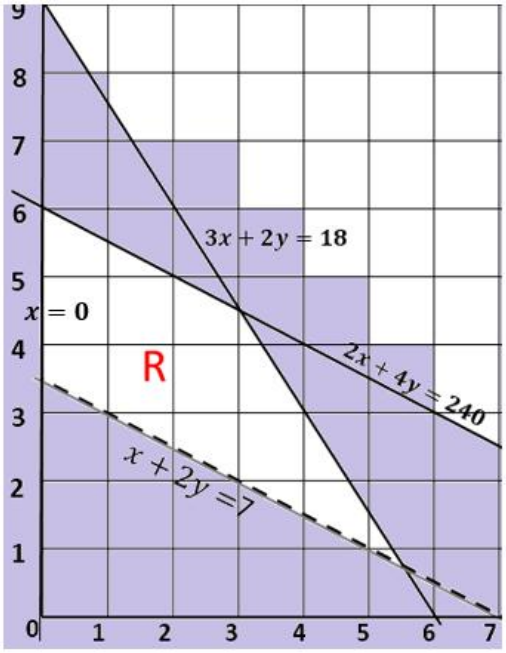
a) $(2x-3y)^5$ (1 mark)

b) Hence use the expansion to solve $\left(3\,{}^{17}/_{20}\right)^5$ (2 marks)

14. Using $\pi = {}^{22}/_{7}$, calculate the area of a circle whose equation is $2y = \sqrt{(28 + 4x)(7 - x)}$. (3 marks)

15. Find the area of the region bound by the curve $y = x^2$, y = 1, y = 4 and the y-axis. (3 marks)

16. The diagram below shows the feasible region representing various possibility constraints.



Given the objective function $3x + 4y = k$ use a search line or otherwise to determine the maximum and minimum points of the scenario represented by the diagram. (3 marks)

SECTION II (50 marks)

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

17. Mercy bought three brands of perfume; A, B and C. The cost price of the three brands were Ksh. 25, Ksh. 30 and Ksh. 45 per millilitre respectively. She mixed the three brands in the ratio 5:2:1 respectively. After selling the mixture, she made a profit of 20%.

a. How much profit did she make per millilitre of the mixture. (4 marks)

b. After one year the cost price of each brand was increased by 10%.

i. For how much did she sell one millilitre of the mixture to make a profit of 15%? (Give your answer to the nearest 5 cents). (3 marks)

ii. What would have been her percentage profit if she sold one millilitre of the mixture at Ksh. 45? (3 marks)

18. The points A(1,1), B(2,-3) and C(3,0) are the vertices of ABC.

a. Find the co-ordinates of the vertices of its image A'B'C' under transformation defined by the matrix $\begin{pmatrix} 3 & 0 \\ 1 & 1 \end{pmatrix}$. (3 marks)

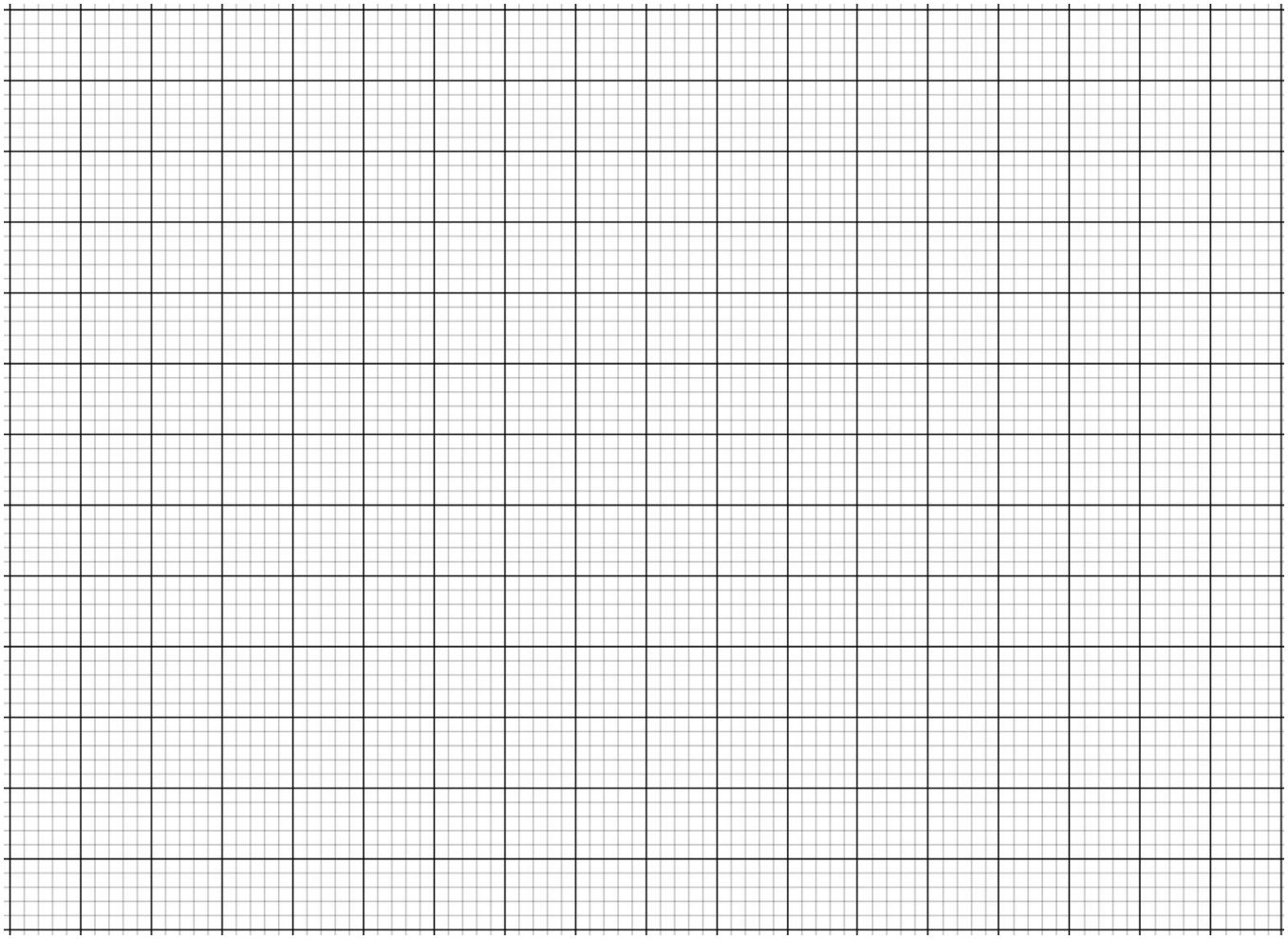
b. Draw the object ABC and its image A'B'C' on the grid provided. (2 marks)

c. The triangle A'B'C' is them transformed to triangle A''B''C'' by the transformation matrix $\begin{pmatrix} 1 & 0 \\ -1 & 3 \end{pmatrix}$

i. Write down the co-ordinates of A''B''C''. (2 marks)

ii. Draw the triangle A''B''C'' on the same grid. (1 mark)

iii. Describe fully the transformation that transform A''B''C'' onto ABC. (2 marks)



19. The cash price of a TV set is sh 24 000. It can also be bought using either of the two plans below;

Plan A : A deposit of sh 6000 and 15 monthly instalment;

Plan B : 20 equal monthly instalment of sh 1680 each;

(a) If the total payment in plan A is 25% more than the cash price, find:

(i) The amount of each instalment. (2 marks)

(ii) The annual rate of compound interest. (3 marks)

(b) Find the annual rate of compound interest in plan B. (3 marks)

(c) Which plan is cheaper and by how much? (2 marks)

20. The table below shows the distribution of the wages in a week for 50 employees in a certain factory:

Wages (Ksh)	800 - 899	900 - 999	1000 - 1099	1100 - 1199	1200 - 1299
No. Of workers	3	10	25	9	3

(a) Using ksh 1049.5 per week as the assumed wage, calculate:

(i) The mean for the grouped wages. (3 marks)

(ii) The standard deviation of the wages. (4 marks)

(b) Estimate the quartile deviation. (3 marks)

21. In driving to work , Wekesho has to pass through three sets of traffic lights. The probability that she will have to stop at any of the lights is $\frac{3}{5}$

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

(b) Using the tree diagram, determine the probability that on any one journey, she will have to stop at:

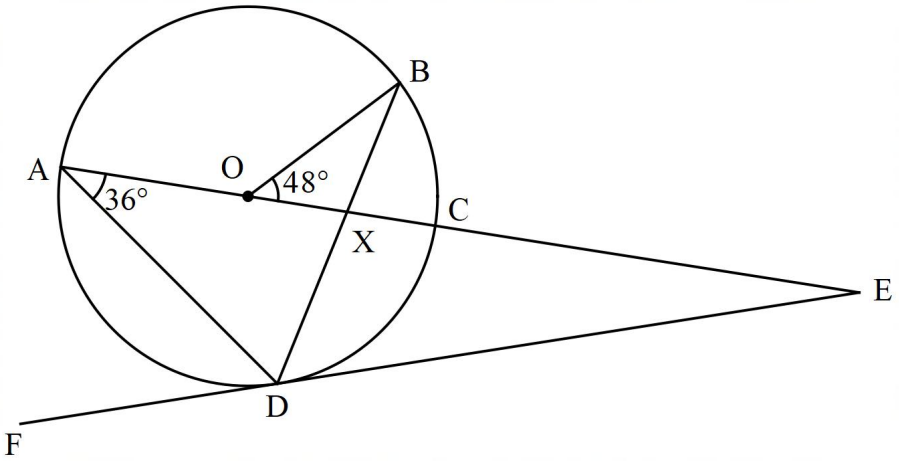
(i) All the three sets. (2 marks)

(ii) Only one of the sets. (2 marks)

(iii) Only two of the sets. (2 marks)

(iv) None of the sets. (2 marks)

22. In the figure below, O is centre of the circle. A, B, C and D are points on the circumference of the circle. A, O, X and C are points on a straight line. DE is a tangent to the circle at D. Angle $\text{BOC} = 48°$ and $\text{CAD} = 36°$.



(a) Giving reasons in each case, find the value of the following angles:

i. Angle CBA (2 marks)

ii. Angle BDE (2 marks)

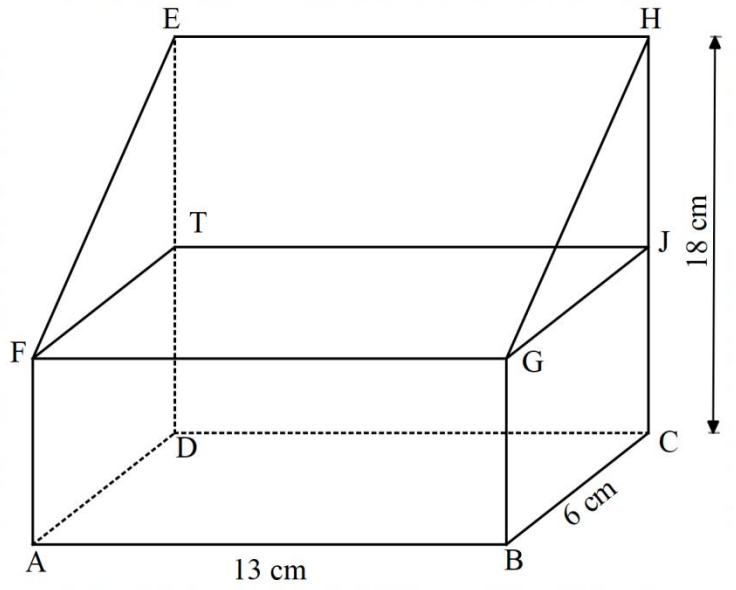
iii. Angle CED (2 marks)

(b) It is also given that $\text{AX} = 12\text{cm}, \text{XC} = 4\text{cm}$ and $\text{DB} = 14\text{cm}$ and $\text{DE} = 15\text{cm}$. Calculate

i. DX (2 marks)

ii. AE (2 marks)

23. The figure below shows a wedge mounted on a cuboid with the given dimensions. AB = BG = 13 cm, BC = 6 cm and CH = 18 cm.



Calculate the following to 2 decimal places;

(a) The length GH. (2 marks)

(b) The angle between EB and the plane ABCD. (2 marks)

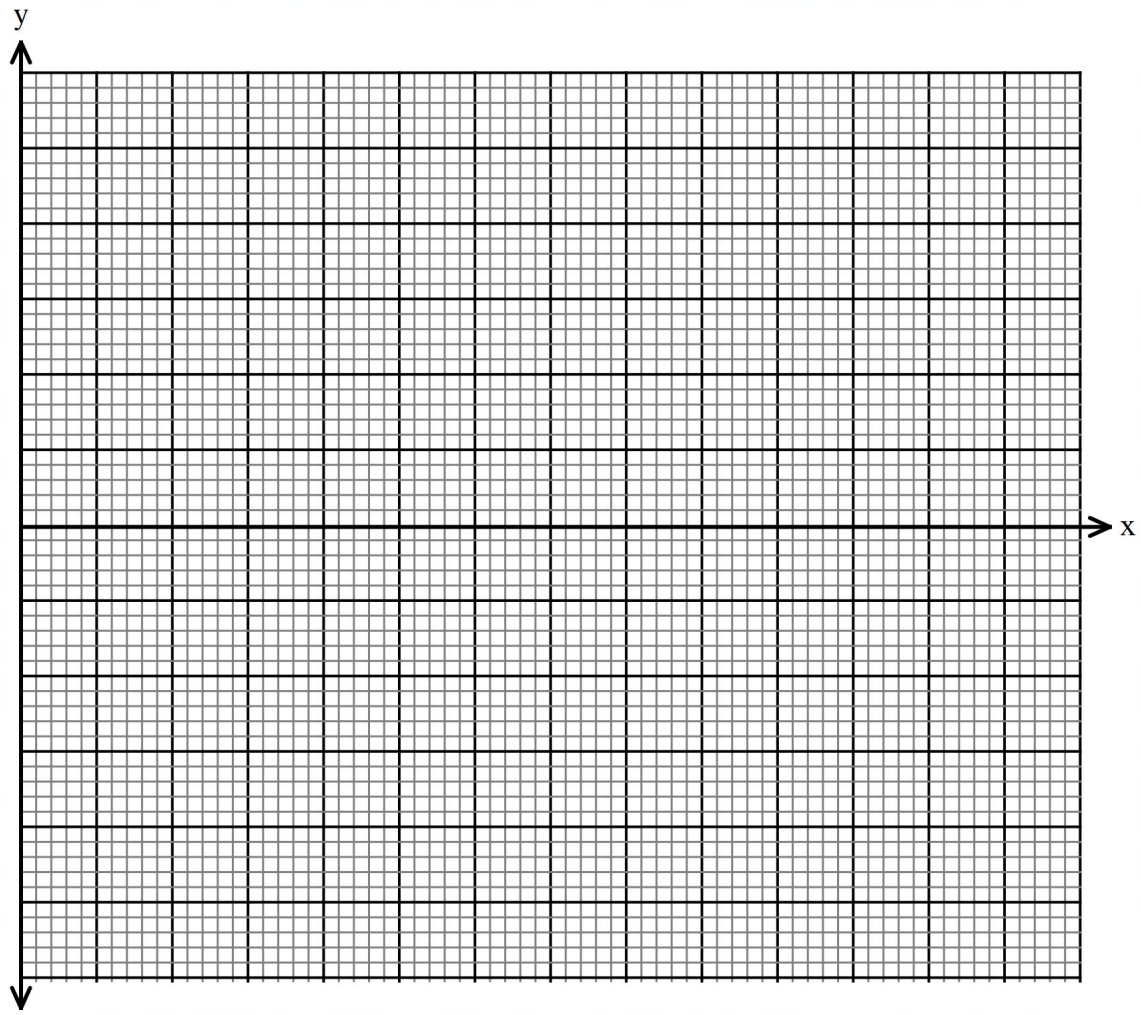
(c) The angle between the planes EFGH and ABCD. (3 marks)

(d) The angle between the planes EFGH and DCGF. (3 marks)

24. (a) Complete the table below giving the values correct to 2 decimal place. (2 marks)

x^0	0^0	30^0	60^0	90^0	120^0	150^0	180^0	210^0	240^0	270^0	300^0	330^0	360^0
$4\sin(x-30) - 3\cos(x-30)$	-4.60	-3.00			4.00		4.60		0.60	-1.96			-4.60
$3\cos(x-60)$		2.60	3.00		1.50			-2.60			-1.50	0.00	

(b) On the grid provided and using the same axis, draw the graph of $y = 4\sin(x-30)^\circ - 3\cos(x-30)^\circ$ and $y = 3\cos(x-60)^\circ$ for $0° \leq x \leq 360°$. (4 marks)



(c) Using the graphs in part (b);

(i) Find the values of x for which $2\sin(x-30)^\circ = 1 + 1.5\cos(x-30)^\circ$. (2 marks)

(ii) Determine the range of x for which $4\sin(x-30)^\circ - 3\cos(x-30)^\circ > 3\cos(x-60)^\circ$ (2 marks)

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