

SC4012
 WASSCE 2023
**FURTHER MATHEMATICS/
 MATHEMATICS (ELECTIVE) 2**
 2½ hours

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| CANDIDATE'S NAME |
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| INDEX NUMBER |
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THE WEST AFRICAN EXAMINATIONS COUNCIL

**West African Senior School Certificate Examination
 for School Candidates**

SC 2023

FURTHER MATHEMATICS/MATHEMATICS (ELECTIVE) 2
 [100 marks]

2½ hours

INSTRUCTIONS TO CANDIDATES

1. In the spaces provided above, insert your name, full index number, normal signature and the date of examination.
2. This booklet consists of two sections: A and B. Answer all the questions in Section A (compulsory) and four questions from Section B with at least one from each part.
3. In each question, all necessary details of working, including rough work, must be shown with the answer.
4. Give answers as accurately as data and tables allow.
5. Graph paper is provided for your use in the examination.
6. The use of non-programmable, silent and cordless calculator is allowed.
7. Write your name, index number and the number of each question you answer, at the top of each page.
8. Write on both sides of the paper unless otherwise instructed on the question paper.
9. Begin each answer to a question on a fresh page. Leave two lines between answers where there are sub-sections to the same question.
10. On no account should you tear off any part of the booklet. It is an examination malpractice to do so. The answer booklet will be collected at the end of the examination.
11. Write in the space provided below, the question number of the questions you have answered, in the order in which you have answered them.

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| For Examiner's Use Only | |
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| Question Number | Mark |
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SECTION A

[48 marks]

Answer all the questions in this section.

All questions carry equal marks.

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write in
this margin.

1. If $2x^2 + xy - 3y^2 = 9$, find $\frac{dy}{dx}$ at (1, 6).

2. The **first term** and sum to infinity of an exponential sequence (*G.P.*) are 54 and 162 respectively. Find the sum of the **5th** and **6th** terms.

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this margin.

3. If $\sqrt{q-3} + \sqrt{q+2} = 5$, find q .

4. (a) Solve: $9 \sin 2\theta - 28 \cos 2\theta = 0$, $0^\circ \leq \theta \leq 90^\circ$.

Do not
write in
this
margin.

(b) Find the binomial expansion of $(3r - 2s)^4$.

5. In a town, 15% of the people speak Twi. If **four** people are selected at random from the town, find the probability that:

(a) **more than half** speak Twi;

(b) **at most 2** speak Twi.

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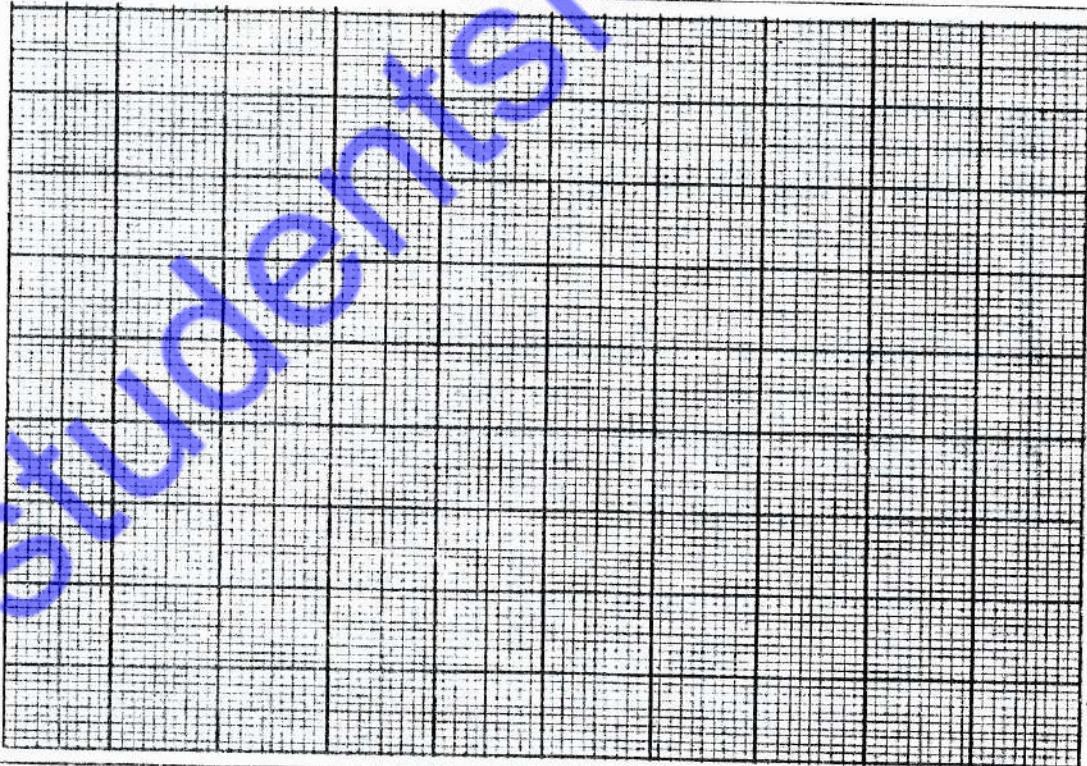
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6. The table shows the distribution of heights (in *cm*) of students in a class.

| Heights (in <i>cm</i>) | 125 - 129 | 130 - 134 | 135 - 139 | 140 - 144 | 145 - 149 |
|-------------------------|-----------|-----------|-----------|-----------|-----------|
| Number of students | 5 | 21 | 23 | 7 | 4 |

- (a) Draw a histogram for the distribution.



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8. The acceleration of a lorry at any time t seconds from rest is given by $a = \left(\frac{3}{2} - \frac{1}{10}t\right)ms^{-2}$.

Find its:

(a) velocity after 10 seconds;

(b) distance at time t seconds.

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13. The table shows the length (in *cm*) of 45 pieces of wood in a factory.

| Length | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-64 | 65-69 | 70-74 |
|--------------------------|-------|-------|---------|-------|----------|-----------|-------|-------|-------|
| Number of pieces of wood | 2 | 2 | $q - 1$ | 4 | $3q - 5$ | $q^2 - 3$ | 10 | 3 | 1 |

- (a) Find the value of q .
(b) Using the value of q in 13 (a), draw a cumulative frequency curve for the distribution.
(c) Using the curve in 13 (b), find the:
(i) median length;
(ii) 90th percentile of the distribution.

PART III

VECTORS AND MECHANICS

14. The vertices of a quadrilateral are $K(-1, 3)$, $L(2, 5)$, $Q(6, -3)$ and $R(m - 1, n - 2)$.

If \overline{KL} is equal to \overline{RQ} , find:

- (a) the values of m and n ;
(b) angle LKR , correct to the nearest degree.

15. (a) An object of mass 20 kg is suspended at a point G by two light inextensible strings \overline{XG} and \overline{YG} . The strings are inclined at 55° and 35° respectively to the downward vertical. Find, correct to **four** significant figures, the tensions in the strings.

[Take $g = 10 \text{ ms}^{-2}$]

- (b) A bullet of mass 180 g is fired horizontally into a fixed wooden block with a speed of 24 ms^{-1} . If the bullet is brought to rest in 0.4 sec by a constant resistance, calculate the distance moved by the bullet in the wood.

END OF PAPER