

2024 WASSCE MOCK – ELECTIVE MATHEMATICS 2**SECTION A****[48 marks]**

Answer all the questions in this section

All questions carry equal marks.

1. If $x = 2 + \sqrt{5}$, find the value of $x - \frac{1}{x}$ and leave the answer in the form $m + n\sqrt{5}$.
2. If $\int_1^t (2x + 5)dx = 18$, where $t > 0$ find the value of t .
3. Given that $\mathbf{B} = \begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix}$ and $\mathbf{B}^2 + 3\mathbf{B} + 2\mathbf{I} = 3\mathbf{N}$, where $\mathbf{I}$ is the (2×2) unit matrix, find the matrix $\mathbf{N}$.
4. a. The radius of a circle $x^2 + y^2 - 4x - 2y + C = 0$ is $3\sqrt{2}$ find the value of C ,
b. without using mathematical tables or calculator, find, leaving the answer in surd form, the value of $\sin 15^\circ$
c. A basket contains 4 ripe oranges, 3 unripe oranges and 5 bananas. In how many ways can
(a) 1 orange and 1 banana be selected from the basket?
(b) 3 oranges and 4 bananas be selected from the basket?
(c) 2 unripe oranges, 1 ripe orange and 3 bananas be selected from the basket?
d. The table below shows the age distribution of workers in a factory

Using the graphical method find the modal age of workers.

Age(years)	20 – 24	25 – 29	30 – 34	35 – 39	40 – 44	45 – 49	50 – 54	55 – 59
Number of workers	22	24	30	38	36	30	18	12

- e. A triangle PQR have vertices P(2,2), Q(3, -1) and R(4, 0) . Using vector method calculate angle PQR.
- f. A ball is thrown vertically upwards. Its height $h(m)$ at time t s is given by $h = 5 + 30t - 5t^2$. Find
a. the velocity of the ball at time $t = 2s$,
b. the maximum height reached.

SECTION B**[52 marks]**Answer **four** questions **only** from this section with **at least one** question from **each** part.**All questions carry equal marks****PART I****PURE MATHEMATICS**

- (a) The function $f(x) = px^2 + qx + r$, where p, q and r are constant. If $f(1) = 0$, $f(-1) = 4$ and $f(2) = 7$. Find the
 - (i) Values of p, q and r
 - (ii) Factors of $f(x)$
- (b) A function is defined by $(x) = \frac{2x^2 - x - 3}{(x+1)(x^2+2)}$. Express $f(x)$ as partial fractions
- g. (a) Find from first principle the derivative of $5x - \frac{6}{x^2}$ with respect to x
(b) Find $\int x\sqrt{1-x} \, dx$

11. (a) The thirteenth term of an Arithmetic Progression is 27 and the seventh term is three

times the second term, find the

- (i) **first** term
- (ii) common difference
- (iii) sum of the **first** ten terms.

b) i) Find the first four terms of the binomial expansion of $(1 - 2x)^6$ in ascending powers of x .

ii) using the expansion in (i), calculate, correct to **four** decimal places, the value of $(0.98)^6$.

PART II

STATISTICS AND PROBABILITY

12. The table gives the distribution of marks obtained some students in an examination

Marks	0 - 9	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70 - 79	80 - 89	90 - 99
Frequency	4	6	10	10	13	17	20	15	4	1

a. Draw a cumulative frequency curve of the distribution

b. From your curve estimate,

- (i) the 80th percentile
- (ii) the median
- (iii) the inter - quartile range

13. One out of every 3 bolts produced by a machine is defective. If 4 of the bolts produced by the machine are selected at random, find the probability that;

- a. exactly 2 are defective
- b. at least 1 is defective
- c. at most 2 are defective

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PART III

VECTORS AND MECHANICS

14. (a) The vectors **m** and **n** are such that $|m| = 5$, $|n| = 12$ and $|m + n| = \sqrt{229}$. Find

(i) the angle between **m** and **n**

(ii) the scalar dot product of **m** and **n**

(b) If **a** = 6**i** - 5**j**, **b** = 2**i** + 7**j** and **c** = 8**i** + 2**j**, find the values of the scalars, x and y such that **c** = $x\mathbf{a} + y\mathbf{b}$

15. A particle Q is projected from a point with velocity 30 ms^{-1} and it moves in a straight line in such a way that its velocity after t seconds is given by $v = a + 7t + bt^2$, where a and b are constants. If one second after projection, the acceleration of the particle is 5 ms^{-2} . Find

- a) the values of a and b ,
- b) the time when the particle is momentarily at rest,
- c) the distance travelled by the time it is momentarily at rest, correct to **two** decimal places.

END OF PAPER 2