MINISTRY OF EDUCATION AND HIGHER EDUCATION

GRADE 12   EXAMS, 2023

MATHEMATICS

20
23

P/LAND NATIONAL EXAMINATION BOARD

SomExams

MINISTRY OF EDUCATION AND HIGHER EDUCATION
PUNTLAND NATIONAL EXAMINATIONS BOARD

Name of Student	
Roll Number	
Name of School	
Region:	District:

FORM FOUR EXAMINATION, 2023
TIME: 2 HOURS AND 10 MINUTES FOR READING

MATHEMATICS

Instructions to candidates

- Answer all the questions
- This paper consists of 10 pages, count it and if any is missing inform your invigilator
- Write your **name and roll number** on the exam paper
- No extra paper is allowed.
- If you make a mistake, **cross out the incorrect** answer and **write your correct answer.**

This exam paper consists of following Parts

Parts	Marks
Part one: Multiple Choice	10 marks
Part two: Structured Questions	90 marks
Total:	**100 Marks**

For the markers only

PARTS	MARKS
Part one:	
Part two	
Total:	

Use this page for rough work. It will NOT be marked.

PART ONE:- MULTIPLE CHOICE QUESTIONS (10 MARKS)

1) In which quadrants cosine is positive
   A. 1st and 4th
   B. 1st and 2nd
   C. 1st and 3rd
   D. 2nd and 4th

2) $\frac{d}{dx}(Sinx)$ is equal to
   A. Cotx
   B. Cosx
   C. Tanx
   D. Secx

3) $\int 2x^{-3}dx$ is equal to
   A. $x^{-3} + c$
   B. $-x^{-2} + c$
   C. $x^{-2} + c$
   D. $-x^{-3} + c$

4) The range of this data   12, 40, 18, 54, 77, 22, 15 is
   A. 28
   B. 65
   C. 66
   D. 55

5) $^6P_3$ is equal to
   A. 60
   B. 130
   C. 120
   D. 40

6) Two dice are rolled at once, the probability of getting sum of 13 is
   A. 0
   B. 1/6
   C. 1/36
   D. 1

7) The sum of $(2 + 5i) + (2 - 3i)$ is equal to
   A. $4 + 2i$
   B. $4 + 8i$
   C. $4 - 2i$
   D. $4 + 15i$

8) Expressing $\sqrt{-36}$ in terms of i is equal to

   A. $3i$

   B. $4i$

   C. $6i$

   D. $-6i$

9) $\sin 45°$ is equal to

   A. $\tan 45°$

   B. $\sin 60°$

   C. $\cos 45°$

   D. $\cos 30°$

10) $\frac{7!3!}{6!}$ is equal to

   A. 72

   B. 42

   C. 40

   D. 32

PART TWO:- STRUCTURED QUESTIONS   (90 MARKS)
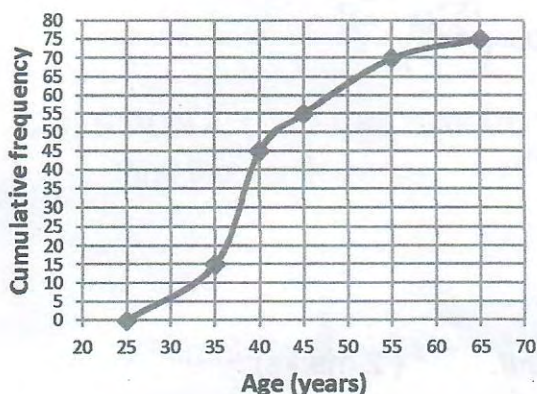## QUESTION 1: (LIMIT)

A. Evaluate $\lim\limits_{x\to1}(x+4)^3$ (2 marks)

B. Find $\lim\limits_{x\to9}\dfrac{x^2-2x-63}{x-9}$ (3 marks)

QUESTION 2: (STATISTICS)

A. The ogive curve below represents age of staff in a company

Estimate from the graph
i)   Lower quartile   ……………… (1 mark)
ii)   Median   …………………… (1 mark)
iii) Upper quartile   ……………… (1 mark)

Calculate
iv)   The inter quartile range   (1 mark)

v)   The quartile deviation   (1 mark)

B. For the following set of data 5,13,15,25,12

i) Find the arithmetic mean   (1 mark)

ii)   complete the table below   (3 marks)

X	$d = x - \bar{x}$	$d^2 = (x - \bar{x})^2$
5		
13		
15		
25		
12		
Σx = ...		$\Sigma d^2 =$ ....

iii)   Calculate the standard deviation   .   (3 marks)

(Hint use proper mean formula $S.D. = \sqrt{\dfrac{\sum (x - \bar{x})^2}{n}}$

QUESTION 3: (TRIGONOMETRY)

A. If $Sin\theta = \dfrac{4}{5}$ and $Cos\theta = \dfrac{3}{5}$ Find $2Sin\theta$.   (2 marks)

B. Write as product $Sin7x + Sin3x$ (3 marks)

C. Prove this identity   (3marks)
   $(1 - cos^2 x)(cscx) \equiv sinx$

D. Solve this trigonometric equation   (3 marks)

$4cos\theta + 4 = 0 \quad for \quad 0° \leq \theta \leq 180°$

E. Express the following expression as single angle then evaluate.

(3 marks)

$Sin50°cos10° + cos50°sin10°$

QUESTION 4: (DIFFERENTIATION)

A. Find the derivative of $y = e^{sinx}$ (2 marks)

B. Differentiate $y = (2x - 1)^3$ using chain rule.   (3 marks)

C. If $y = x^2(x + 2)$. Find $\frac{dy}{dx}$ using product rule   (3 marks)

D. Differentiate $f(x) = \ln(Cosx)$ (2 marks)

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QUESTION 5: (APPLICATION OF DIFFERENTIATION)

A. The displacement s meters of a body at time t seconds is given by $s = t^3 - 2t^2 + 12$. Find

i) Distance covered after 2 seconds   (1 mark)

ii) The velocity of the body when t = 3 seconds   (2 marks)

iii) The acceleration after 3 seconds   (1 mark)

B. Find the equation of the tangent to the curve
$y = x^2 + 3$ at (2,7)   (3 marks)

C. Find the stationary points of the following function   (5 marks)

$y = x^3 - 3x^2 + 3$

D. A farmer wishes to fence off a rectangular sheep pen and uses all of 100 m of fencing. An adjoining wall is to be used as one side of the pen as shown in the diagram below. Determine the maximum area of the pen (4 marks)
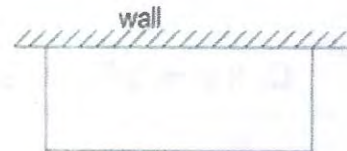
QUESTION 6: (INTEGRATION)

A. Find the equation of a curve whose gradient function is $2x$ and passes through the point $(0, -2)$ (3 marks)

B. Find $\int_0^6 (4x - x^2)dx$ (3 marks)

C. Find the area between the line y = 2x+3 and the X-axis from $x = 4 =$ to $x = 6$ (3 marks)

QUESTION 7: (PROBABILITY)

A. Given that P (A) $=\frac{5}{9}$, P (B) $= \frac{2}{9}$ and   P (A ∩ B) $= \frac{4}{9}$ Find P (A ∪ B)   (2 marks)

B. How many different arrangements can be made from the letters of the word ERIGAVO if each arrangement consists of two letters?
(2 marks)

C. A box contains 6 red pencils and 8 blue pencils. A pencil is chosen at random and not replaced. A second pencil is then chosen at random.

i) Complete the tree diagram.   (2 marks)
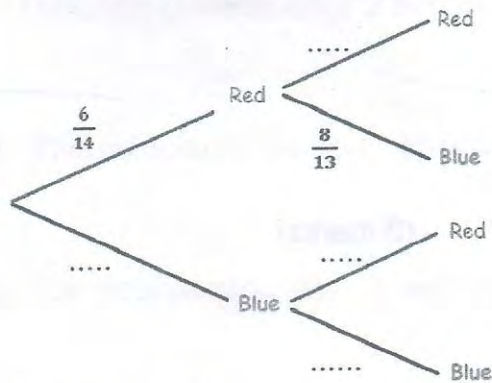
ii) Calculate the probability that the two pencils are of   different colours.   (3 marks)

D. A test contains 8 questions out of which a candidate can choose any 5. How many ways the candidate may answer?

(3 marks)

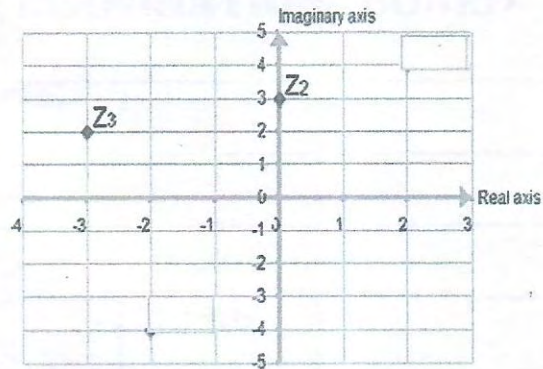E. Find the 4th term of $(a + 2b)^{10}$ **(3 marks)**

QUESTION 8: (COMPLEX NUMBERS)

A. Find the difference of $(8 + 7i) - (4 + i)$ (2 marks)

B. Write the complex numbers which represent each point on the argand diagram below   (2 marks)

i) $Z_2 = $ ....
ii) $Z_3 = $ ....

C. Express $2Cos120° + iSin120°$ In the form of $a + bi$

(Hint $Cos120° = -\frac{1}{2}$, $Sin120° = \frac{\sqrt{3}}{2}$)   (3 marks)

D. If $Z = (cos60° + isin60°)^3$ Find Z^3 (2 marks)

END