

MATHEMATICS OLYMPIAD

FINAL ROUND – LEVEL THREE (GRADES 10, 11 AND 12) – 15th AUGUST 2025

Time: 60 Minutes (Q1 to Q10: 3 Marks each and Q11 to Q15: 5 marks each) Total Marks: 45

1. Ten quarters of an hour correspond to how many hours?

- (A) 40 (B) $5\frac{1}{2}$ (C) 4 (D) 3 (E) $2\frac{1}{2}$

2. What is the value of $\sqrt{\frac{2025}{(1+2^2)5}}$

- (A) 5 (B) 7 (C) 8 (D) 9 (E) 15

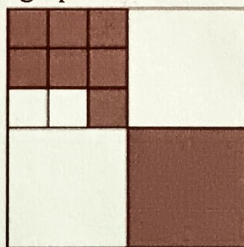
3. What is the sum of all the solutions of the equation $6x = \frac{150}{x}$?

- (A) 0 (B) 5 (C) 6 (D) 25 (E) 156

4. Given that $4^x = 9$ and $9^y = 256$, what is the value of xy ?

- (A) 2 (B) 3 (C) 4 (D) 6 (E) 8

5. big square is divided up into smaller squares of different sizes as shown. Some of the smaller squares are shaded in gray. Which fraction of the big square is shaded in gray?



- (A) $\frac{2}{3}$ (B) $\frac{2}{5}$ (C) $\frac{4}{7}$ (D) $\frac{4}{9}$ (E) $\frac{5}{12}$

6. The size of the increase from each term to the next in the list a ; $225\frac{1}{2}$; c ; d ; 284 is always the same.

What is the value of a ?

- (A) 201 (B) 203 (C) 206 (D) $206\frac{1}{2}$ (E) 208

7. Two of the numbers 6, 7, 8, 9 and 10 are factors of the sum $2^{2025} + 2^{2024} + 2^{2023}$. What are they?

- (A) 6 and 8 (B) 7 and 8 (C) 6 and 10 (D) 8 and 9 (E) 8 and 10

8. The points $P(d, -d)$ and $Q(12-d, 2d-6)$ are both points on the circumference of the same circle whose

center is the origin. What is the sum of the two possible values of d ?

- (A) -16 (B) -4 (C) 4 (D) 8 (E) 16

9. A square has the vertices at $(0 ; 0)$, $(1 ; 0)$, $(1 ; 1)$ and $(0 ; 1)$. Graphs of the following equations are drawn on the same set of axes as the square.

$$x^2 + y^2 = 1, \quad y = x + 1, \quad y = -x^2 + 1, \quad y = x \quad \text{and} \quad y = \frac{1}{x}$$

How many of the graphs pass through exactly two of the vertices of the square?

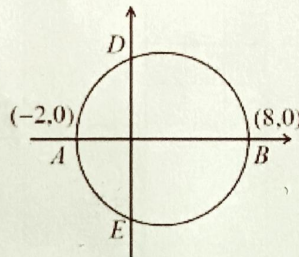
- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5

10. Mpho has to choose a three-digit code for his bike lock. The digits can be chosen from the numbers 1 to 9. To help him remember them, Mpho chooses three different digits in increasing order, for example 278. How many such codes can be chosen?

- (A) 504 (B) 200 (C) 168 (D) 84 (E) 9

(WRITE DOWN THE CORRECT ANSWER AND SHOW ALL WORKINGS. EACH QUESTION IS WORTH 5 MARKS. It is expected that all calculations and answers will be expressed as exact numbers such as 4π , $2 + \sqrt{7}$, etc., except where otherwise indicated.)

11. The diagram shows the a circle with diameter AB. The coordinates of A are $(-2;0)$ and the coordinates of B are $(8;0)$. The circle cuts the y-axis at points D and E. Determine the lengths of DE



12. The lengths of the sides of a triangle are integers 13, x , y . It is given that $xy = 105$. What is the perimeter of the triangle

13. Given that $\left(a + \frac{1}{a}\right)^2 = 6$ and $a^3 + \frac{1}{a^3} = N\sqrt{6}$ and $a > 0$, what is the value of N ?

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MATHEMATICS OLYMPIAD

THIRD & FINAL ROUND – ANSWER SHEET 15 August 2023

Name:..... Male or Female..... Grade:.....

School:..... District:.....

MARKS 45 (3 marks per question 1 to 10 and 5 marks per question 11, 12 and 13)

FOR QUESTIONS 1 TO 10 PUT AN 'X' IN THE CORRECT BOX

FOR QUESTION 11, 12 and 13 **SHOW** your workings (steps) – Use the back of this sheet

Question					
1.	A	B	C	D	E
2.	A	B	C	D	E
3.	A	B	C	D	E
4.	A	B	C	D	E
5.	A	B	C	D	E
6.	A	B	C	D	E
7.	A	B	C	D	E
8.	A	B	C	D	E
9.	A	B	C	D	E
10.	A	B	C	D	E

FOR OFFICE USE ONLY

MARKS - 1: (Multiple Choice)

-----x3 = _____

Marks – 2 (Question 11, 12 and 13)

-----x 5 = _____