



MAK

MATHEMATICS ASSOCIATION OF KENYA

Kenya Mathematical Olympiad

KMO 10-I

Kenya Mathematical Olympiad 10-Round I

JUNIOR KENYA MATHEMATICS OLYMPIAD

SCHOOL OF MATHEMATICS, UNIVERSITY OF NAIROBI

INSTRUCTIONS

TIME ALLOWED: 2 HOURS

JUNE 27, 2019

1. This question paper consists of **4 printed pages**, including this cover. There are **20 questions**.
2. This is a multiple choice paper with each labeled A, B, C, D, and E. Only **ONE** of these is correct.
3. Each correct answer is **WORTH** 5 marks.
4. For each **INCORRECT** answer, 1 mark will be **DEDUCTED**. There is **NO PENALTY** for unanswered questions.
5. Attempt **ALL** Questions. You **MUST** use a pencil.
6. Rulers, pair of compasses, rough paper and erasers are **ALLOWED**.
7. Calculators, Formula Tables and other Geometrical Instruments are **NOT** permitted.
8. Diagrams are **NOT** necessarily drawn to scale.

The Committee on the Kenyan Mathematical Olympiads (CKMO) reserves the right to disqualify all scores from a school if it determines that the required security procedures were not followed.

© KENYA MATHEMATICAL OLYMPIAD, 2019

TURN OVER

- If we increase the length and width of a rectangle by 10cm each, the area of the rectangle will increase by 300cm^2 . The perimeter of the original rectangle in cm is
A. 28 B. 30 C. 36 D. 40 E. 20
- If $a = 2^{48}, b = 3^{36}, c = 5^{24}$, then
A. $a < b < c$ B. $c < b < a$ C. $b < c < a$ D. $b < a < c$ E. $a < c < b$
- The number of positive integers from 1 to 500 that can be expressed in the form a^b with a and b being integers greater than 1 is
A. 25 B. 27 C. 29 D. 33 E. 35
- If a and b are positive integers and $a^2 - b^2 = 15$, the number of possible ordered pairs (a, b) is
A. 0 B. 1 C. 2 D. 3 E. 4
- Given that $2\sqrt{x} - \sqrt{4x - 11} = 1$, what is the value of $x^2 + x + 1$?
A. 71 B. 81 C. 91 D. 47 E. 63
- Which of the following is the closest value to
$$\frac{487,000 \times 12,027,300 + 9,622,001 \times 487,000}{19,367 \times 0.05}$$
?
A. 10,000,000 B. 100,000,000 C. 1,000,000,000 D. 10,000,000,000 E. 100,000,000,000
- Find the value of
$$\frac{100^2 \times (252^2 + 248^2) + (252^4 + 248^4)}{252^8 - 248^8}$$
.
A. 500 B. 1000 C. 252 D. 248 E. 450
- Find the positive integer n such that
$$60,000 < n^3 < 180,000$$

and the unit digit of n^3 is 3.
A. 57 B. 33 C. 67 D. 47 E. 53
- The fifth root of 5^{5^5} is
A. 5^5 B. 5^{5^5-1} C. 5^{4^5} D. 5^{5^4} E. $(\sqrt{5})^{5^5}$
- The number of digits in the number $4^{12} \times 5^{20}$ is
A. 20 B. 21 C. 22 D. 24 E. 26

11. Five identical rectangles of area 8cm^2 are arranged into a large rectangle as shown below.

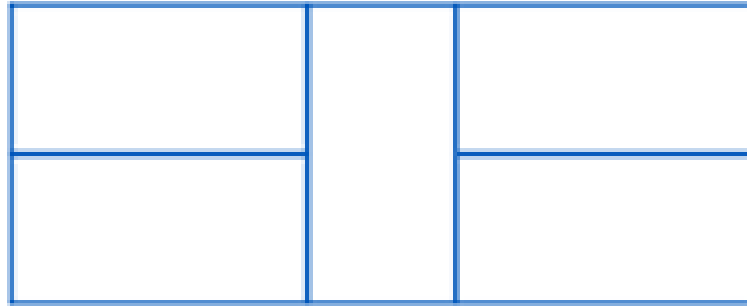


Figure 1: Figure for Problem 16

Find the perimeter the large rectangle?

- A. 28 B. 24 C. 32 D. 44 E. 36
12. The card board in the diagram below can be folded to make a cube.

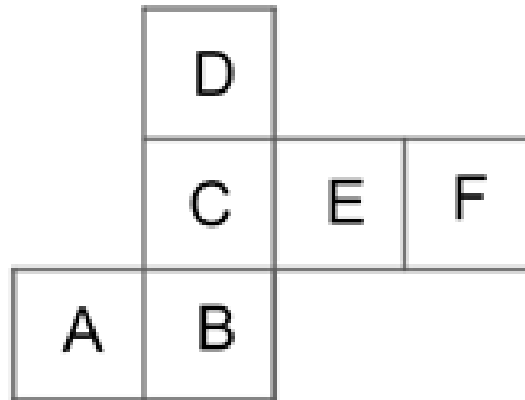


Figure 2: Figure for Problem 12

Which face will then be opposite the face marked A.

- A. B B. C C. D D. E E. F
13. In the following sum O represents the digit 0 . The letters A, B, X and Y each represents a distinct digit. How many possible digits can A be?

$$\begin{array}{r}
 A \ O \ O \ B \ A \ O \ O \ B \\
 + \ B \ O \ O \ A \ B \ O \ O \ A \\
 \hline
 X \ X \ O \ X \ Y \ X \ O \ X \ X
 \end{array}$$

- A. 6 B. 7 C. 8 D. 9 E. 10

14. If $\frac{139}{22} = a + \frac{1}{b + \frac{1}{c}}$ where a, b and c are positive integers, find the value of $a + b + c$.

A. 16 B. 14 C. 22 D. 13 E. 15

15. Find the value of

$$x = \sqrt{21 + 12\sqrt{3}} - \sqrt{21 - 12\sqrt{3}}.$$

A. 6 B. 12 C. $2\sqrt{6}$ D. $\sqrt{21}$ E. $3\sqrt{4}$

16. Let p be a real number such that the equation

$$2y^2 - 8y = p$$

has only one solution. Then

A. $p < 8$ B. $p = 8$ C. $p > -8$ D. $p = -8$ E. $p < -8$

17. Find the value of

$$\frac{1 + 3 + 5 + \cdots + 97 + 99}{2 + 4 + 6 + \cdots + 98 + 100}$$

A. $\frac{48}{49}$ B. $\frac{49}{50}$ C. $\frac{50}{51}$ D. $\frac{98}{99}$ E. $\frac{100}{101}$

18. Which of the following is not a perfect square?

A. 3196944 B. 6431296 C. 14326225 D. 28313041 E. 431490910

19. One of the integers among $1, 2, 3, \dots, n$ is deleted and the average of the remaining $n - 1$ numbers is $\frac{602}{17}$. Which number was deleted?

A. 69 B. 7 C. 8 D. 70 E. 9

20. A four digit integer is the square of the number formed by its last two digits. What is the sum of the digits of the integer.

A. 25. B. 32 C. 13 D. 18 E. 27

END