



# MAK

MATHEMATICS ASSOCIATION OF KENYA

## Kenya Mathematical Olympiad

# KMO 9-1

## Kenya Mathematical Olympiad 9-Round I

### JUNIOR KENYA MATHEMATICS OLYMPIAD

### SCHOOL OF MATHEMATICS, UNIVERSITY OF NAIROBI

#### INSTRUCTIONS

**TIME ALLOWED: 2 HOURS**

**SEPTEMBER 21, 2018**

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.

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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.

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**TURN OVER**

1. What is the value of  $x$  that satisfies

$$3^{2018} + 3^{2018} + 3^{2018} + 3^{2018} + 3^{2018} + 3^{2018} + 3^{2018} + 3^{2018} + 3^{2018} = 3^x$$

- A. 2017    B. 2020    C. 2018    D. 2021    E. 2022
2. The simplest expression of  $\frac{3^{40}}{9^{20}}$  is
- A. 1    B. 3    C.  $\left(\frac{1}{3}\right)^{20}$     D.  $2^{20}$     E.  $2^{18}$
3. If the side of a square is increased by 30%, the area of the square will increase by
- A. 30%    B. 60%    C. 69%    D. 900%    E. None of the above
4. What is the sum of the digits of  $\frac{4^{1357}5^{357}}{2^{2357}}$ ?
- A. 1    B. 10    C. 15    D. 357    E. 4
5. In figure 1, the centers of all three circles lie on the same straight line.

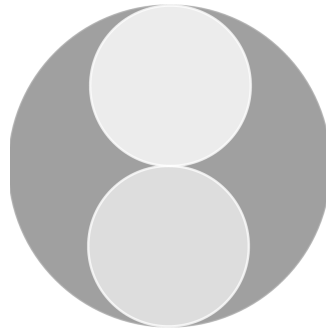


Figure 1: Figure for Problem 5

- The two small circles are identical. The ratio of the area of the shaded region to the total area of the two identical circles is
- A. 1 : 1    B. 1 : 2    C. 1 : 3    D. 2 : 3    E. 3 : 4
6. A company's sales increased by 20% in 1993 followed by another 25% increase in 1994. The the sales decreased by 25% in 1995 followed by a further 20% decrease in 1996. By what percent did the company's sales increase or decrease over this four year period.
- A. 5% decrease    B. 5% increase    C. 10% increase    D. 10% decrease  
E. No increase or decrease
7. What is the value of  $\sqrt{17 + 4\sqrt{13}} - \sqrt{17 - 4\sqrt{13}}$ ?
- A. 4    B.  $\sqrt{13}$     C.  $2\sqrt{13}$     D.  $\sqrt{17}$     E.  $\sqrt{2}$
8. If  $10^{2018} - 2018$  is expressed as an integer, the sum of its digits is
- A. 152    B. 161    C. 218    D. 11    E. 36

9. Onyiso has two integers that add up to **26**. Wambui adds two more integers to it and gets **41**. Mutisya adds another two integers and gets **58**. At least how many of the six integers that were added up are even?  
 A. **0**      B. **1**      C. **2**      D. **3**      E. **4**
10. What is the number of digits in the number  $4^6 \times 5^9 \times 3$ ?  
 A. **8**      B. **9**      C. **10**      D. **11**      E. **12**
11. Fatuma writes down in her notebook the list of all positive integers from 1 to **1000** inclusive. Amani then erases all even numbers from the list and replaces them with their halves. How many different numbers are written in Fatuma's notebook once Amani is finished?  
 A. **650**      B. **900**      C. **500**      D. **600**      E. **750**
12. The product of two natural numbers is **14000**. What is their largest possible greatest common divisor?  
 A. **10**      B. **20**      C. **400**      D. **70**      E. **140**
13. A positive integer is called fully divisible if it is divisible by each of its digits and each digit must be distinct. For example 162 is fully divisible because it is divisible by 1, 6 and 2. How many fully divisible two digit integers are there?  
 A. **4**      B. **5**      C. **6**      D. **7**      E. **8**
14. The value of  $11 + 22 + 33 + \dots + 1100$  is  
 A. **5550**      B. **55550**      C. **10500**      D. **5500**      E. **45550**
15. If  $8.0743^3 = 521.077119823$ , the the value of  $0.8047^3$  is equal to  
 A. **0.521077119823**      B. **52.1077119823**      C. **521077.119823**      D. **0.00521077119823**  
 E. **0.0521077119823**
16. If  $a < 0$ , find  $\sqrt{a^2} + \sqrt{(1-a)^2}$  in terms of  $a$ .  
 A. **1**      B. **-1**      C.  **$2a - 1$**       D.  **$1 - 2a$**       E. **None of the above**
17. Originally  $\frac{2}{3}$  of the students in a class failed in an examination. After taking a reexamination, **40%** of the failed students passed. Find the total percentage of students who passed.  
 A.  **$26\frac{2}{3}\%$**       B.  **$33\frac{1}{3}\%$**       C. **40%**      D. **60%**      E.  **$73\frac{1}{3}\%$**
18. Find the value of  

$$\frac{1000^2 \times (252^2 + 248^2) \times (252^4 + 248^4)}{252^8 - 248^8}$$
  
 A. **500**      B. **1000**      C. **1,000,000**      D. **252**      E. **248**

19. Figure below shows three semi circles whose centers all lie on the same straight line  $AC$ . Suppose  $AB = 2BC$ .

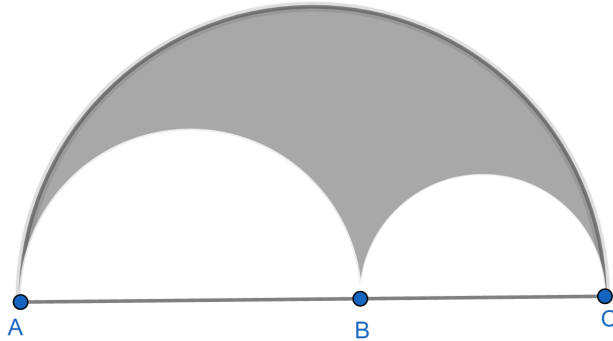


Figure 2: Figure for Problem 19

- The ratio of the shaded area to the area of the largest semi circle is
- A. 1 : 2      B. 4 : 9      C. 1 : 3      D. 2 : 3      E. 2 : 5
20. Students from Olympiad School went to a restaurant for lunch. They realize that if each of them sit on a separate table, one student will not have a table. They decided to sit two to a table and one table was left free. How many tables were there?
- A. 2      B. 3      C. 4      D. 5      E. 6

**END**