KENYA MATHEMATICS OLYMPIAD, 2017

ROUND I

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**Allowed Time: 2 hour**   **October 5, 2017**


DO NOT OPEN THIS EXAM UNTIL TOLD TO DO SO

The instructions below must be followed strictly.

- This is a multiple choice paper with a total of **20 Questions**.
- Each question is followed by answers labeled A, B, C, D, and E. Only **ONE** of these is correct.
- Attempt **ALL** Questions.
- Each correct answer is **WORTH** 5 marks.
- For each **INCORRECT** answer, 1 mark will be **DEDUCTED**. There is **NO PENALTY** for unanswered questions.
- Calculators and Geometry instruments are **NOT** permitted.
- Formula tables, rulers, rough paper and erasers are **ALLOWED**.
- Diagrams are **NOT** necessarily drawn to scale.
- **ANSWERS** and **SOLUTIONS** will be available at **www.mathskenya.org**

1. How many zeros does the number $50 \times 49 \times 48 \times 47 \times \cdots \times 3 \times 2 \times 1$ end with?

   (A) 8   (B) 9   (C) 10   (D) 11   (E) 12

2. Supppose $a \neq 0, b \neq 0$ and $\dfrac{b}{a} = \dfrac{c}{b} = 2017$. Find the value of $\dfrac{b+c}{a+b}$.

   (A) 2015   (B) 2016   (C) 2017   (D) 2018   (E) 2019

3. Kimani calculated the sum of the first n positive integers and finds that the sum is 5053. If he has counted one integer twice which one is it?

   (A) 1   (B) 3   (C) 4   (D) 5   (E) 7

4. Three circles each of radius 20 are arranged with their respective centers A, B and C on a stright line. If the line WZ is tangent to the third circle, find the length of XY.
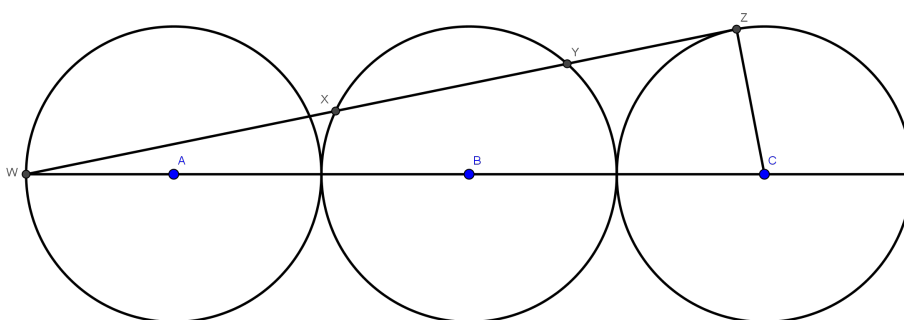
   (A) 30   (B) 32   (C) 34   (D) 36   (E) 38

5. Suppose p and q are prime numbers and are roots of the equation

   $$x^2 - 99x + m = 0$$

   for some number m. What is the value of $\dfrac{p}{q} + \dfrac{q}{p}$

   (A) 9413   (B) $\dfrac{9413}{194}$ (C) $\dfrac{9413}{99}$ (D) $\dfrac{9413}{99}$ (E) None of the above

6. In the diagram below the radius of the quadrant OAD is 4cm and the radius of the quadrant OBC is 8cm. Given that $\angle COD = 30°$, $\angle COB = 90°$ and $\angle DOA = 90°$. Find the area of the shaded region $ABCD$.

   (A) 12π (B) 8   (C) 16π (D) 24π (E) 9π
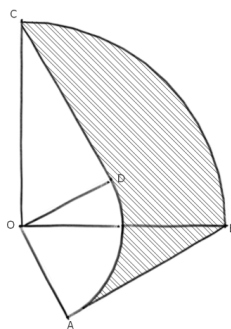
7. Given that $\sqrt{2x+y}+\sqrt{x^2-9}=0$. Find the value of $y-x$.

   (A) −9 (B) −6 (C) −9 or 9 (D) −3 or 3 (E) None

8. Two trains are traveling toward each other at a $180km/h$. A passenger in one train notices that it takes 5 seconds for the other train to pass him. How long is the second train?

   (A) 100m (B) 200m (C) 250m (D) 400m (E) 500m

9. What is the value of x which satisfies the following equation

$$3^{2017}+3^{2017}+3^{2017}+3^{2017}+3^{2017}+3^{2017}+3^{2017}+3^{2017}+3^{2017}=3^x.$$

   (A) 2016 (B) 2017 (C) 2018 (D) 2019 (E) 2020

10. If $0<x<1$ and $y=x^x$ and $z=x^y$ what are the three numbers arranged in order of increasing magnitude?

    (A) x,y,z (B) x,z,y (C) y,z,x (D) $z,,x,y$ (E) z,y,x

11. Find the value of $\dfrac{(1987654)\times(1987654)-(1897645)\times(1897645)}{180018}$.

    (A) 1942649.5 (B) 1987654.5 (C) 180018.5 (D) 1897645.5 (E) 987654

12. Solve the equation $\sqrt{(x+1)\sqrt{(x+1)\sqrt{(x+1)}}}=3^{\frac{7}{2}}$
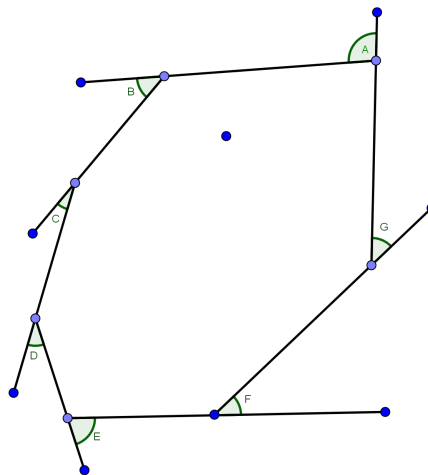
    (A) 81 (B) 75 (C) 80 (D) 89 (E) 82

13. If the value of $76x-19y$ is 114, what is the value of $36x-9y$?

    (A) 54 (B) 60 (C) 88 (D) 92 (E) 108

14. How many integer solutions does the following equation have?

$$\left(x^2-x-5\right)^{x^3+1}=1$$

    (A) 0 (B) 1 (C) 2 (D) 3 (E) 4

15. The sum of the angles $\angle A+\angle B+\angle C+\angle D+\angle E+\angle F+\angle G$ is

TURN OVER

$\boxed{A}$ 240° $\boxed{B}$ 280° $\boxed{C}$ 350° $\boxed{D}$ 360° $\boxed{E}$ 420°

16. In a quiz containing 10 questions, 4 points are awarded for each correct answer, 1 point is deducted for each incorrect answer, and no point is given for unanswered questions. The number of possible scores is

$\boxed{A}$ 25 $\boxed{B}$ 40 $\boxed{C}$ 10 $\boxed{D}$ 44 $\boxed{E}$ 45

17. Consider the following array of number

$$
\begin{array}{ccccc}
A & B & C & D & E \\
& 2 & 5 & 8 & \\
23 & 20 & 17 & 14 & 11 \\
& 26 & 29 & 32 & \\
47 & 44 & 41 & 38 & 35 \\
\vdots & \vdots & \vdots & \vdots & \vdots
\end{array}
$$

$\boxed{A}$ A $\boxed{B}$ B $\boxed{C}$ C $\boxed{D}$ D $\boxed{E}$ E

18. The number 1001997 is expressed as a sum of 999 consecutive odd positive integers. The largest possible such integer in the sum is

$\boxed{A}$ 1997 $\boxed{B}$ 1999 $\boxed{C}$ 2001 $\boxed{D}$ 2003 $\boxed{E}$ 2005

19. What is the product of

$$
1001 \times \left(1 - \frac{1}{1001^2}\right) \times \left(1 - \frac{1}{1002^2}\right) \times \left(1 - \frac{1}{1003^2}\right) \times \cdots \times \left(1 - \frac{1}{2000^2}\right) \times 2000
$$

$\boxed{A}$ 2001000 $\boxed{B}$ 1002000 $\boxed{C}$ 10012001 $\boxed{D}$ 2000 $\boxed{E}$ 1000

20. In the figure below $ABCD$ is a rectangle, and $ADEF, CDHG, BCLM, ABNO$ are four squares. Suppose the perimeter of $ABCD$ is $16cm$ and the total area of the four squares is $68cm^2$. Find the area of $ABCD$ in cm^2.

$\boxed{A}$ 15 $\boxed{B}$ 20 $\boxed{C}$ 25 $\boxed{D}$ 30 $\boxed{E}$ 40