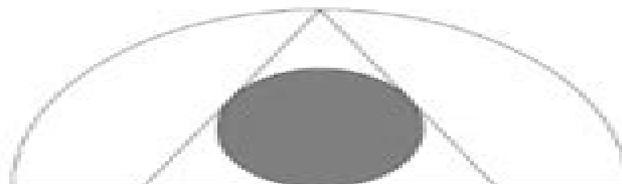# 22nd Philippine Mathematical Olympiad

Area Stage, 16 November 2019

PART I. Give the answer in the simplest form that is reasonable. No solution is needed. Figures are not drawn to scale. Each correct answer is worth three points.

1. If the sum of the first 22 terms of an arithmetic progression is 1045 and the sum of the next 22 terms is 2013, find the first term.

2. How many positive divisors do 50,400 and 567,000 have in common?

3. In the figure below, an equilateral triangle of height 1 is inscribed in a semicircle of radius 1. A circle is then inscribed in the triangle. Find the fraction of the semicircle that is shaded.

4. Determine the number of ordered quadruples (a, b, c, d) of odd positive integers that satisfy the equation $a + b + c + d = 30$.

5. Suppose a real number $x > 1$ satisfies

$$\log_{\frac{2}{3}}(\log_3 x) + \log_3(\log_{27} x) + \log_{27}(\log_{\frac{2}{3}} x) = 1.$$

Compute $\log_3(\log_3 x)$.

6. Let $f(x) = x^2 + 3$. How many positive integers x are there such that x divides $f(f(f(x)))$?

7. In $\triangle XYZ$, let A be a point on (segment) YZ such that XA is perpendicular to YZ. Let M and N be the incenters of triangles XYA and XZA, respectively. If $YZ = 28$, $XA = 24$, and $YA = 10$, what is the length of MN?

8. Find the largest three-digit integer for which the product of its digits is 3 times the sum of its digits.

9. A wooden rectangular brick with dimensions 3 units by a units by b units is painted blue on all six faces and then cut into $3ab$ unit cubes. Exactly 1/8 of these unit cubes have all their faces unpainted. Given that a and b are positive integers, what is the volume of the brick?

10. In square $ABCD$ with side length 1, E is the midpoint of AB and F is the midpoint of BC. The line segment EC intersects AF and DF at G and H, respectively. Find the area of quadrilateral $AGHD$.

[Elementary Math Olympiad 2 Triangle Problem](#)

Marco Cascella

Elementary Math Olympiad 2 Triangle Problem:

Decoding **Elementary Math Olympiad 2 Triangle Problem**: Revealing the Captivating Potential of Verbal Expression

In a period characterized by interconnectedness and an insatiable thirst for knowledge, the captivating potential of verbal expression has emerged as a formidable force. Its power to evoke sentiments, stimulate introspection, and incite profound transformations is genuinely awe-inspiring. Within the pages of "**Elementary Math Olympiad 2 Triangle Problem**," a mesmerizing literary creation penned by a celebrated wordsmith, readers set about an enlightening odyssey, unraveling the intricate significance of language and its enduring affect our lives. In this appraisal, we shall explore the book is central themes, evaluate its distinctive writing style, and gauge its pervasive influence on the hearts and minds of its readership.

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