

**Selected Problems from the Pi Math Contest (Euler), 2024**

Instructions: write your answer in the blank to the left of the question number; each answer is a single-digit number, either 0, 1, 2, 3, 4, 5, 6, 7, 8, or 9.

_____ 1. Evaluate $6 \div 3 \times 2 - 2$.

_____ 2. Simplify $\frac{2024 + 2024 + 2024 + 2024}{2024 + 2024}$.

_____ 3. When Maggie's favorite whole number is increased by 2 and then squared, the result is 81. What is her favorite number?

_____ 4. Leo has a sequence of numbers starting with -5 and increasing by 2 each time: $-5, -3, -1, \dots$. If the total sum of these numbers is 16, what is the final number in the sequence?

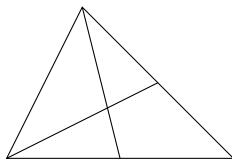
_____ 5. Lorenzo plans to purchase 12 bottles of water and 12 bottles of soda. The water is sold in packs of 4, while the soda is available in packs of 6. What is the total number of packs he needs to buy?

_____ 9. For how many whole numbers n is the fraction $\frac{n}{12}$ between the fractions $\frac{1}{6}$ and $\frac{5}{8}$?

_____ 10. What is the units digit of the product $2022 \times 2023 \times 2024$?

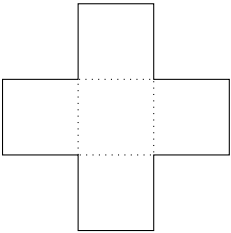
_____ 11. The movie “Adventure Swamp” originally cost \$8 but its price increased by 50%. If Jihyun uses a coupon for 50% off, how many dollars will she pay for the movie?

_____ 12. How many triangles of any size are in the figure below?



_____ 13. A class has 10 students, including Freya, Bennett, and Ashley. Freya gives 5 of the students one apple each. Then Bennett gives 5 of the students one orange each. Everyone received at least one fruit except Ashley, who did not receive any fruit. How many students received both an apple and an orange?

____ 14. A country has a cross-shaped flag consisting of five identical squares, as shown below. If the area of the flag is 1.25 square feet, what is its perimeter, in feet?



____ 15. Forty stickers are distributed among a group of students. Each student receives at least one sticker, and no two students receive the same number of stickers. What is the largest possible number of students in the group?

____ 16. Alice and Bob, two frogs, alternate turns hopping. Alice hops once on her first turn. On his turn, Bob hops three times the number Alice hopped on her last turn. On her turn, Alice hops twice the number Bob hopped on his last turn. They continue until they have collectively hopped at least 100 times. How many turns did Alice take?

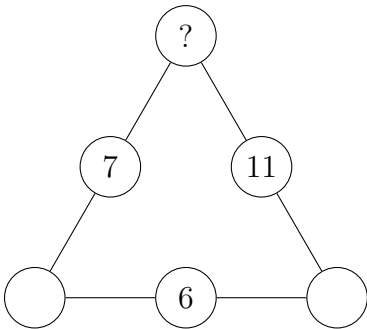
____ 17. A rectangle has a length of 16 units. An equilateral triangle has a side length of 16 units as well. Given that both the rectangle and the triangle have the same perimeter, what is the width of the rectangle, measured in units?

____ **18.** LeBron, James, Carmelo, Anthony, and Kyrie participated in a race. All of the following statements are true:

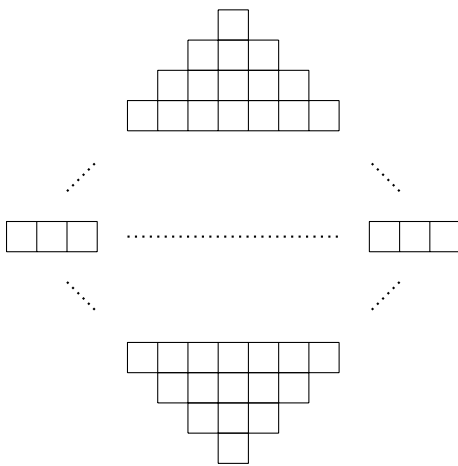
- James finished in 7th place.
- LeBron finished two places ahead of James.
- Kyrie and LeBron finished four places apart.
- Carmelo and Anthony finished 2 places apart.
- Kyrie finished seven places behind Anthony.

What place did Carmelo finish in?

____ **22.** The diagram below contains six circles, and each circle is to contain one number. The sum of the three numbers on each side of the triangle is 30. What number must occupy the top circle?

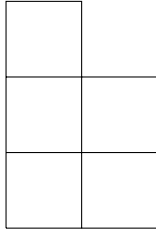


_____ **23.** The following figure contains 25 rows: one unit square in the top and bottom rows, 3 unit squares in the second and second-to-last rows, and so on. If there are N unit squares in total, what is the sum of the digits of N ?



_____ **24.** (Modified) Vera constructs a sequence as follows. She initiates the sequence with two positive integers, not necessarily distinct. Every term thereafter is obtained by adding the two immediately preceding terms. For example, if the initial pair of numbers were 1 and 3, the resulting sequence would be 1, 3, 4, 7, 11, and so on. It is given that the fourth term in Vera's sequence is 11. Determine the total number of distinct sequences Vera could have generated under these conditions. (Bonus: the original version is the same except that the fifth term is 30.)

_____ 25. Consider the following pentomino created by adjoining a unit square to a 2×2 square:



How many ways are there to tile a 5×4 grid with four of these pentominoes without overlap, including the example below? (The pentominoes may be rotated or flipped.)

