

Pi Math Contest Euler Division

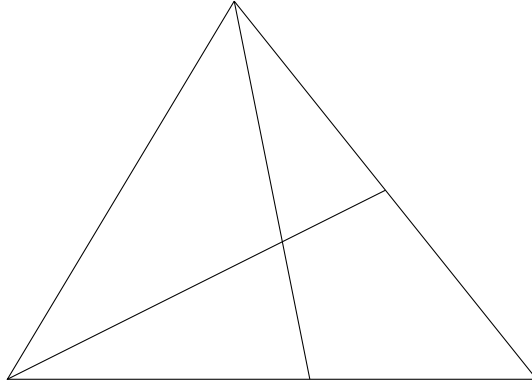
2024

INSTRUCTIONS

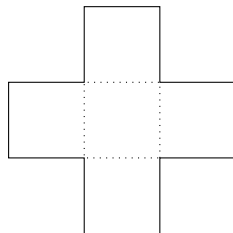
1. DO NOT OPEN THIS BOOKLET UNTIL YOUR PROCTOR TELLS YOU!
2. This is a 25 question test. Each question has a *single digit* answer: 0, 1, 2, 3, 4, 5, 6, 7, 8, or 9.
3. Mark your answer to each question on the Answer Form with a #2 pencil. Check the blackened circles for accuracy and erase errors and stray marks completely. Only answers properly marked on the answer form will be graded.
4. SCORING: You will receive 10 points for each correct answer, 1 point for each problem left unanswered, and 0 points for each incorrect answer.
5. Only pencils, pencil sharpeners, erasers, and blank scratch papers are allowed. All other aids, including but not limited to calculators and notes, are not allowed.
6. Figures are not necessarily drawn to scale.
7. When your proctor gives the signal, begin working on the problems. You will have **40 minutes** to complete the test.
8. After the exam, return your **Answer Form, Test Booklet and scratch papers** to your proctor.
9. Do NOT discuss any exam questions until **March 18th**, after which problems and solutions will be available on the contest website.

1. Evaluate $6 \div 3 \times 2 - 2$.
2. Simplify $\frac{2024 + 2024 + 2024 + 2024}{2024 + 2024}$.
3. When Amy's favorite whole number is increased by 2 and then squared, the result is 81. What is her favorite number?
4. Tom 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. Lonzo 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?
6. Lily adds $5\frac{2}{5}$ gallons of water to her empty fish tank, filling up three fifths of the tank. What is the total capacity of her fish tank, in gallons?
7. Rita squares a positive two-digit number, resulting in a three-digit number that is divisible by 3. How many different two-digit numbers could she have started with?
8. What percent of a 24-hour day did Tiger spend on homework if he started at 7:53 PM and finished at 9:05 PM?
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 Helen 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 5 identical squares, as shown below. If the area of the flag is 1.25 square feet, what is its perimeter, in feet?



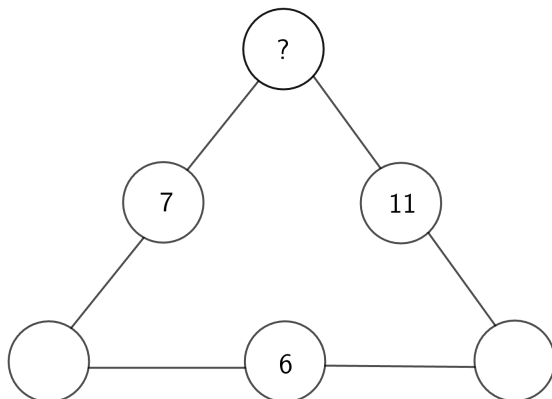
15. Forty stickers are distributed among a group of students. Each student receives at least one sticker, and no two students receive the same number of stickers. What is the largest possible number of students in the group?

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.

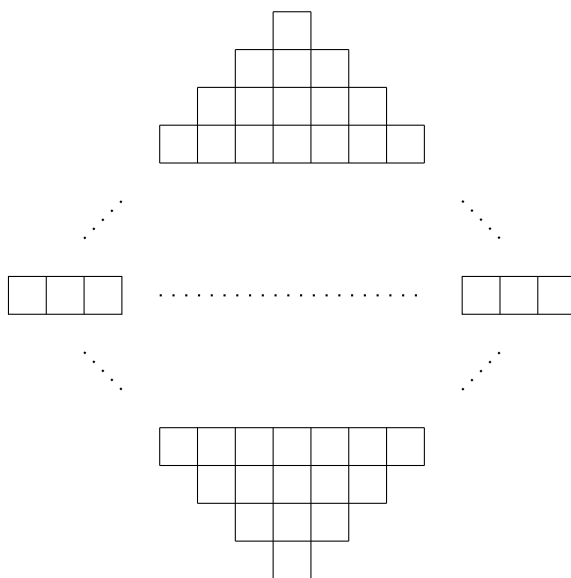
What place did Carmelo finish in?

19. Teacher Anders has between 20 and 40 students in his class. When he divides the students in groups of three, 2 students are left over. Similarly, when he divides the students in groups of five, 2 students are left over. How many students will be left over if he divides the class into groups of eight?
20. The product of all positive factors of 128 is equal to 128 raised to which power?
21. A *geometric* sequence is a sequence where every term is equal to the previous term multiplied by a constant, called the *common ratio*. For example, the sequence 3, 6, 12, 24, ... is a geometric sequence whose common ratio is 2. A geometric sequence with 20 terms has a common ratio of $\frac{2}{5}$. If the 10th term is 200, how many terms of the sequence are whole numbers?

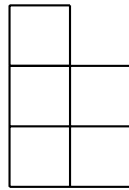
22. The diagram below contains six circles, and each circle is to contain one number. The sum of the three numbers on each side of the triangle is 30. What number must occupy the top circle?



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. 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 fifth term in Vera's sequence is 30. Determine the total number of distinct sequences Vera could have generated under these conditions.
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.)

