Round 1, UNM-PNM Statewide High School Mathematics Contest 2025-2026

Participant information and responses should be entered online at

`https://esurvey.unm.edu/opinio/s?s=158554`

Instructions (please read carefully)

- Over a **continuous three-hour period**, please attempt as many of the following **ten** problems as possible.
- All boxed answers should be integers. Write `2`, not `2.0` or `two`. Do not include commas; write `100421`, not `100,421`.
- **No calculators or external sources permitted**.

Thank you for participating!

Student (LAST name, FIRST name): _____

Student or teacher email address: _____

Grade level: _____

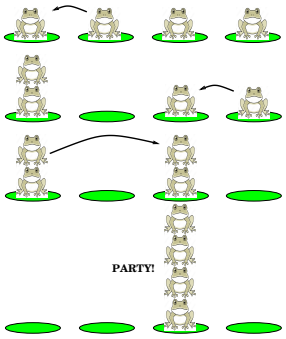
School or club: _____

Teacher or coach: _____

1. How many digits are there in the integer $2^{2029} \times 5^{2022}$?

ANSWER: ☐

2. A single frog sits on each of four lily pads in a row. One of the frogs then jumps onto the back of a neighbor, either to the left or right. This leaves a configuration with one empty pad, and one pad supporting a group of two frogs. The jumping continues subject to the rules that one frog must jump to a neighboring pad, two frogs must jump two pads as a group, and three frogs must jump three pads as a group. Frogs will not jump onto an empty pad, nor will a group split up once formed. The frogs all seek to occupy a single lily pad, a frog party! The figure shows one sequence of valid jumps resulting in a party. How many different jumping sequences result in a party?



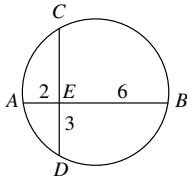
ANSWER: ☐

3. In the following equation a, b, c, and d are positive integers. Find $a+b+c+d$.

$$a+\cfrac{1}{b+\cfrac{1}{c+\cfrac{1}{d}}}=\frac{2025}{671}$$

ANSWER: ☐

4. Chords AB and CD across the shown circle intersect at E and are perpendicular to each other. If the segments AE, EB, and ED have lengths 2, 6, and 3, respectively, then what is the square of the circle's diameter?



ANSWER: ☐

5. Based on the following *logic table*, with entries T (True) and F (False), what is the probability that the nested statement $\big((p \to q) \to r\big)$ is T? Here each of p, q, and r are either T or F. Express this probability as a whole fraction in lowest terms, and as your answer report the sum of this fraction's numerator and denominator.

p	q	$p \to q$
T	T	T
T	F	F
F	T	T
F	F	T

ANSWER: ☐

6. Five ducks are swimming around the UNM duck pond which (for the purposes of this problem) has a circumference of 36 meters. The ducks begin a race around the whole circumference of the duck pond at the same time. Suppose that Daud the duck swims at 9 meters per minute, Dewi the duck swims at 6 meters per minute, Dino the duck swims at 4 meters per minute, and Duru the duck swims at 3 meters per minute. Dyan the duck starts at 1 meter per minute, but Dyan's speed doubles every time another duck crosses the finish line. How many minutes does Dyan the duck take to finish the race?

ANSWER: ☐

7. Given two positive integers a and b, their greatest common divisor $\texttt{gcd}(a, b)$ is the largest positive integer which divides them both. For example, $\texttt{gcd}(4, 21) = 1$, whereas $\texttt{gcd}(6, 21) = 3$. Find the product ab, assuming that $\texttt{gcd}(a, b) = 5$ and in the expansion of $(a + bx)^4$ it turns out that the coefficient of x^2 equals the coefficient of x^3.

ANSWER: ☐

8. A circular disk is divided by 362 equally spaced radii. What is the maximum number of non-overlapping areas into which the disk can be divided by the addition of a chord drawn across the bounding circle?

ANSWER: ☐

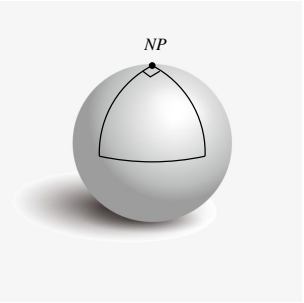
9. If R is expressed in lowest terms, what is the denominator of R?

$$R = \frac{1 + 3 + 5 + 7 + \cdots + 999}{2 + 4 + 6 + \cdots + 1000}$$

ANSWER: ☐

10. Relative to the center of the unit circle, a *radian* can be defined as the angle subtended by a unit-length arc on the unit circle. Likewise, relative to the center of the unit sphere, a *steradian* can be defined as the solid angle subtended by a unit-area portion (of any shape) on the unit sphere. The solid angle subtended by the unit sphere itself is 4π steradians.

Consider a round sphere, with radius $r = \sqrt{\frac{8\sqrt{3}}{\pi}}$, and two great circles which emanate from its north pole NP. At NP they intersect at a right angle, and together with a portion of the equator form an equilateral spherical triangle; see the figure. What is the side length of an equilateral triangle with the same area as this spherical triangle?



ANSWER: ☐