Name: ______________ **Score:** ______/______/50 **Grade:** ______

The accuracy round is 40 minutes long. Questions are weighted by difficulty.

1. ____________

6. ____________

2. ____________

7. ____________

3. ____________

8. ____________

4. ____________

9. ____________

5. ____________

10. ____________

11. ____________

Special Thanks to:

1. Find $2^{\left(0^{\left(2^3\right)}\right)}$.

2. Amy likes to spin pencils. She has an $n\%$ probability of dropping the nth pencil. If she makes 100 attempts, the expected number of pencils Amy will drop is $\frac{p}{q}$, where p and q are relatively prime positive integers. Find $p+q$.

3. Determine the units digit of $3+3^2+3^3+3^4+\cdots 3^{2022}+3^{2023}$.

4. Cyclic quadrilateral $ABCD$ is inscribed in circle ω with center O and radius 20. Let the intersection of AC and BD be E, and let the inradius of $\triangle AEB$ and $\triangle CED$ both be equal to 7. Find AE^2-BE^2.

5. An isosceles right triangle is inscribed in a circle which is inscribed in an isosceles right triangle that is inscribed in another circle. This larger circle is inscribed in another isosceles right triangle. If the ratio of the area of the largest triangle to the area of the smallest triangle can be expressed as $a+b\sqrt{c}$, such that a, b and c are positive integers and no square divides c except 1, find $a+b+c$.

6. Jonny has three days to solve as many ISL problems as he can. If the amount of problems he solves is equal to the maximum possible value of $\gcd\big(f(x), f(x+1)\big)$ for $f(x)=x^3+2$ over all positive integer values of x, then find the amount of problems Jonny solves.

7. Three points X, Y, and Z are randomly placed on the sides of a square such that X and Y are always on the same side of the square. The probability that non-degenerate triangle $\triangle XYZ$ contains the center of the square can be written as $\frac{a}{b}$, where a and b are relatively prime positive integers. Find $a+b$.

8. Compute the largest integer less than $\left(\sqrt{7}+\sqrt{3}\right)^6$.

9. Find the minimum value of the expression $\frac{(x+y)^2}{x-y}$ given $x>y>0$ are real numbers and $xy=2209$.

10. Find the number of nonnegative integers $n \leq 6561$ such that the sum of the digits of n in base 9 is exactly 4 greater than the sum of the digits of n in base 3.

11. **Estimation (Tiebreaker):** Estimate the product of the number of people who took the December contest, the sum of all scores in the November contest, and the number of incorrect responses for Problem 1 and Problem 2 on the October Contest.