HMMT November

November 07, 2026

Team Round

1. **[20]** Jerry and Sophie are each given a number. They are both told the following information:

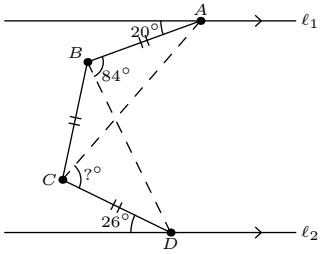
   - Their numbers are distinct integers between 2 and 50, inclusive.
   - Jerry's number is an integer power of Sophie's number.

   However, neither of them can determine the other's number given this information. Compute the sum of their numbers.

2. **[25]** Across all positive integers m and n, compute the least possible integer value of

$$(\sqrt{21}+\sqrt{55})^2+(\sqrt{m}-\sqrt{n})^2.$$

3. **[30]** Let points A and D lie on parallel lines ℓ_1 and ℓ_2, respectively, and let points B and C lie between ℓ_1 and ℓ_2 such that $AB = BC = CD$, and B, C are on the same side of AD. Suppose the angle between $\overline{AB}$ and ℓ_1 is $20°$, the angle between $\overline{CD}$ and ℓ_2 is $26°$, and $\angle ABD = 84°$. Compute the degree measure of $\angle ACD$.



4. **[35]** Let F_0, F_1, F_2, ... be a sequence of positive integers with $F_0 = F_1 = F_2 = \cdots = F_{2025} = 1$ and $F_i = F_{i-2025} + F_{i-2026}$ for all positive integers $i \geq 2026$. Compute the number of positive integers $n < 2026$ such that there exists a positive integer k satisfying $F_k = n$.

5. **[40]** A right circular cone with apex A has base radius 1 and height 7. Two perpendicular planes are tangent to the cone's lateral surface along segments $\overline{AP}$ and $\overline{AQ}$, where P and Q lie on the base of the cone. Compute PQ.

6. **[45]** Given that a and b are integers greater than 1 such that $\frac{a+b^2}{a^2}$ is an integer, compute the least possible value of b.

7. **[45]** Alice has 8 balls labeled 1, 2, 3, ..., 8 and 8 boxes labeled 1, 2, 3, ..., 8. Compute the number of ways for Alice to place exactly 1 ball in every box such that exactly 1 ball is labeled with a strictly higher number than its box.

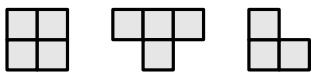
8. **[50]** Let ABC be a triangle with $AB = 13$, $BC = 14$, and $CA = 15$. Point D is chosen on segment BC. Points P and Q are such that $\angle PBC = 90°$, $\angle QCB = 90°$, and $APDQ$ is a kite with axis of symmetry PQ. Suppose that D is chosen such that $\angle PAQ$ is maximized. Compute AD.

9. **[50]** Let x, y, and z be real numbers satisfying

$$\begin{aligned} x+y-\sqrt{z^2+1} &= -5, \\ y+z-\sqrt{x^2+1} &= 0, \\ z+x-\sqrt{y^2+1} &= 5. \end{aligned}$$

   Compute $x+y+z$.

10. **[55]** Let N denote the number of ways to tile a 2×199 grid with O-tetrominoes, T-tetrominoes, and L-trominoes, shown below. Compute the remainder when N is divided by 128. (The tiles can be rotated, and tilings that differ by rotation or reflection are considered distinct.)



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