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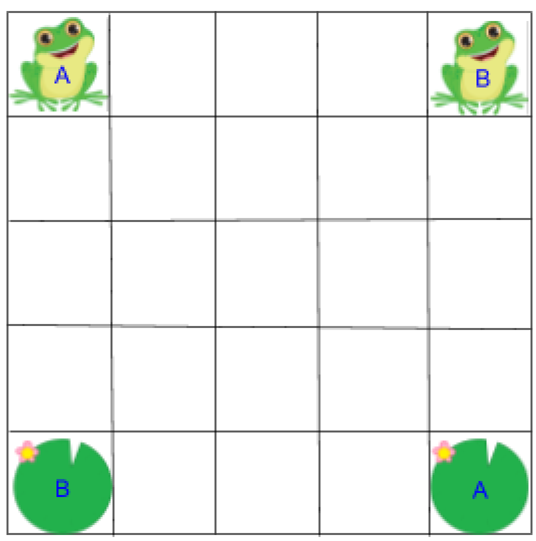
Aops Open Mathcounts National Target

1. ____________ Al, Bob, Carl, David each have non-negative sums of money. Al and Bob together have more money than Carl and David together, Al and Carl together have the same amount of money as Bob and David together, and Al has exactly half as much money as Carl and David together. Who has the most money of the four?

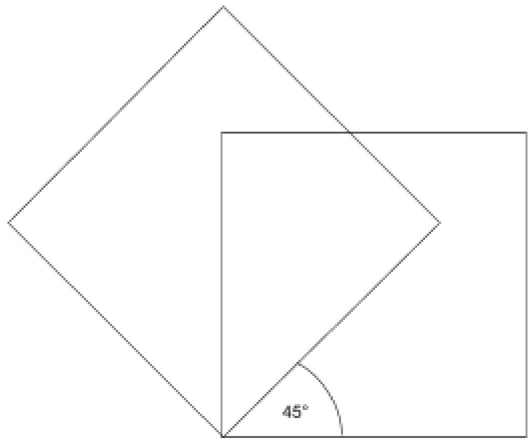
2. ___________chords $\triangle ABC$ with side lengths 39, 80, and 89 is inscribed in circle O. Let a triangular chord of circle O be a chord that passes through at least one vertex of $\triangle ABC$, and intersects at least one side of $\triangle ABC$ at at least one point other than a vertex. How many distinct triangular chords of circle O have integer lengths? (Assume AB, BC, and AC are all triangular chords.)

3. ____________ Three (not necessarily distinct) numbers are chosen at random from the set $\{2^0, 2^1, 2^2..., 2^{10}\}$. What is the probability that their sum is a multiple of eight? Express your answer as a common fraction.

4. ____________ways Two hoppy frogs, Annie and Brian, start in the upper left and upper right corners, respectively, of a 5 by 5 grid of squares. Annie's lily pad is located in the bottom right corner and Brian's is in the bottom left. Every second, Annie will hop either to the square below her or the square to her right and Brian will hop either to the square below him or the square to his left. The two frogs will stop when they reach their lily pads. How many ways can Annie and Brian hop to their lily pads such that they are never in the same square at the same time?



5. ____________ The figure below is made up of two unit squares that share a common vertex. What is the total area enclosed by the figure? Express your answer in simplest radical form.



6. ____________values Let k_1 , k_2, ..., , k_n be a sequence of n integers for some integer $1 \leq n \leq 10$. In this sequence $k_1 = 1$, and $|k_{i+1} - k_i| = (k_i)^2$ for all integers $1 \leq i \leq 9$. How many distinct possible values are there for k_n?

7. ___________inches Two spheres sit on a flat tabletop, their centers 13 feet apart. The spheres' radii are m inches and n inches, and the distance between their tops (the points on each sphere farthest from the tabletop) is x feet. Given that m, n, and x are all positive integers and $m \neq n$, what is the smallest possible value of $m+n$?

8. _________cemtimeters² In the figure below, $\angle ABC = 90^\circ$, $\angle BCD = 30^\circ$, $\angle CDE = 90^\circ$, and arc $AE = 120^\circ$. Furthermore, $\overline{AB} = \overline{CD} = \overline{DE} = 4$ centimeters and $\overline{BC} = 3$ centimeters. Compute the area of the figure. Express your answer as a decimal rounded to the nearest tenth.