Name:_____ School:_____

1. In a convex quadrilateral $ABCD$ the sides are: $AB = 10$, $BC = 14$, $CD = 11$, $AD = 5$.

   Show that the diagonals are perpendicular to each other.

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2. Determine all pairs of non-negative integers (*m, n*) which are solutions to the equation

$$3 \cdot 2^m + 1 = n^2.$$

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3. Several guests sit at a round table and eat berries from a basket containing 2011 berries. Each guest has eaten either twice as many berries or six berries less than his neighbour from the right. Prove that not all berries have been eaten.

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4. For how many values of n are both n and $\frac{n+3}{n-1}$ integers?

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5. Ahmed has 11 large boxes, each of which is either empty or contains 8 small boxes. Likewise, each of these small boxes is either empty or contains 8 even smaller empty boxes. If there are 102 empty boxes in all, how many boxes does Ahmed have altogether?