Duke Math Meet 2016
Tiebreaker Round

1. How many ordered triples of integers (a, b, c) where $1 \leq a, b, c \leq 10$ are such that for every natural number, the equation $(a + n)x^2 + (b + 2n)x + c + n = 0$ has at least one real root?

2. Find the smallest integer n such that we can cut a $n \times n$ grid into 5 rectangles with distinct side lengths in $\{1, 2, 3..., 10\}$. Every value is used exactly once.

3. A plane is flying at constant altitude along a circle of radius 12 miles with center at a point A. The speed of the aircraft is v. At some moment in time, a missile is fired at the aircraft from the point A, which has speed v and is guided so that its velocity vector always points towards the aircraft. How far does the missile travel before colliding with the aircraft?