1. Suppose $h \cdot a \cdot r \cdot v \cdot a \cdot r \cdot d = m \cdot i \cdot t = h \cdot m \cdot m \cdot t = 100$. Find $(r \cdot a \cdot d) \cdot (t \cdot r \cdot i \cdot v \cdot i \cdot a)$.

2. Dylan the cow stands on a point P_0 inside a unit equilateral triangle ABC. First, he moves to P_1, the midpoint of P_0 and A. Then, he moves to P_2, the midpoint of P_1 and B. Finally, he moves to P_3, the midpoint of P_2 and C. Surprisingly, P_0 and P_3 are the same point! Find $\overline{P_1P_3}^2$. Express your answer as a common fraction.

3. Allen and Yang want to share the numbers $1, 2, 3, 4, 5, 6, 7, 8, 9, 10$. How many ways are there to split all ten numbers among Allen and Yang so that each person gets at least one number, and either Allen's numbers or Yang's numbers sum to an even number?

4. Nine people sit down for dinner where there are three choices of meals. Three people order the beef meal, three order the chicken meal, and three order the fish meal. The waiter serves the nine meals in random order. Find the number of ways in which the waiter could serve the meal types to the nine people so that exactly one person receives the type of meal ordered by that person.

5. Let $ABCD$ be a convex quadrilateral with $AC = 7$ and $BD = 17$. Let M, P, N, Q be the midpoints of sides AB, BC, CD, DA respectively. Compute $MN^2 + PQ^2$.

6. Let $a_0 = 1$ and $a_1 = 1$. For $n \geq 1$, define a_{n+1} recursively to be $a_n + m$, where m is the smallest positive integer such that m is distinct from $a_1 - a_0$, $a_2 - a_1$, $a_3 - a_2, ...a_n - a_{n-1}$ and that m and a_n are relatively prime. Find a_{47}.

7. A triple of integers (a, b, c) satisfies $a + bc = 2017$ and $b + ca = 8$. Find the sum of all possible values of c.

8. Let $S_1 = (\frac{1}{2}, 1)$. For $n \geq 2$, the set S_n is defined as follows: if x and y are (possible equal) elements of S_{n-1}, then $\frac{2xy}{x+y}$ is an element of S_n. Find the 2019th smallest element of S_{12}. Express your answer as a common fraction.