Assignment 1
Due on Friday, September 24, 2021 at 11:59pm

1. Write a short essay (300-400 words) on the life and work of Frank Ramsey.

2. Write a short essay (300-400 words) on the life and work of Paul Erdős.

3. Colour each point in the xy plane having integer coefficients Red or Blue. Then some rectangle has all its vertices the same colour.

4. Your are attending a "Happy New Schoo Year" party.

   At some point a person next to you says:"Do you know that at this party there must be at least two people with the exactly same number of friends among the party attendees?" You are puzzled: "How would you prove something like that?"

5. Prove that it is impossible to seat 10 people around a circular table with the diameter of 5 meters and keep the COVID imposed rule of the minimal distance of 2 meters between any two people.

6. Let A be a set of an odd number of consecutive positive integers. Say

   $$A = \{k, k+1, \ldots, k+2n\}$$

   for some $k, n \in \mathbb{N}$.

   Let B be any subset of the set A that contains at least n elements. Prove that there are must be $a, b \in B$ such that $a + b = 2k + 2n$.

7. Consider the set

   $$A = \{1, 11, 111, 1111, \ldots\},$$

   the set that contains all natural numbers whose decimal expression uses only the digit 1.

   Prove that the set A contains an element that is divisible by 2021.

8. Show that $R(3,3,3) \leq 17$. (This means: Every 3-colouring of the edges of K_{17} gives a monochromatic K_3.)