(1) **Common Initials.**
   (a) How many people need to be members of a group before we can be certain that two people have the same first and last initials in English?
   (b) What if we require that they have the same first, middle and last initials? Some people may have no middle name, in which case we count "Blank" as a permitted middle initial.

(2) **Types of Fruit.** Suppose a bag contains unlimited numbers of 1) apples, 2) bananas, 3) oranges, and 4) strawberries.
   (a) How many fruit must you draw at random from the bag before you know that you have 4 fruit of the same type?
   (b) Suppose you drew 5 apples, 2 bananas, 4 oranges, and 2 strawberries. In how many different orders could you have picked those fruit?
   (c) Suppose I want 4 of the same type OR 4 of all different types (i.e. at least one of each type) How many fruit do I need to pick?

(3) **Euler's phi function.** Recall that $\varphi(n)$ = the number of integers m such that $1 \leq m \leq n$ and the greatest common divisor of m and n is 1.
   (a) $\varphi(120)$
   (b) $\varphi(p)$ for p prime.
   (c) $\varphi(2^n)$ for n an integer.
   (d) $\varphi(10^n)$ for n an integer.