Weekly Homework II
Survey Methodology I
Due date: **January 11, 2022**

1. Design effects are used to evaluate the precision of statistics for different sample designs. Based on the readings assigned to this class (Sections 4.4, Survey Methodology book by Groves et al.):

   a. Is the design effect of a clustered element sample likely to be larger or smaller than one?
   b. Is the design effect of a stratified element sample likely to be bigger or smaller than one?
   c. In a single-stage clustered sample, if within a cluster, a variable has nearly the same value for all elements within the cluster, what value will the intraclass correlation be close to?
   d. For a single-staged clustered sample, the intraclass correlation for a key variable is 0.016, and the cluster size is 10. Calculate the design effect for the mean of that key variable.
   e. What does the design effect in part d mean?

2. An organization asks you to design a sample to estimate the proportion of engaged employees. There are four types of workers (A, B, C, D). They only provide the number of employees by type (data from 2022) and previous estimates of the proportion of engaged workers (from a survey conducted in 2020 with 50 interviews per employee type, 200 employees in total). The organization has a list of all employees with their type identification and a budget to interview 300 employees. Executives are concerned about the low engagement in group C (operation managers), and they want to maximize the precision for that group (e.g., perform additional analysis to understand better what is going on in that group).

	Number of employees (2022)	Proportion Engaged
A	123	0.84
B	534	0.71
C	321	0.55
D	2842	0.36

   Propose and justify a sample design for this problem specifying:

   a. How many employees to interview by type.
   b. Compute design weights if necessary.
   c. MOE.
   d. MOE for group C.