

Name: _____

Directions: **Work only on this sheet** (on both sides, if needed); do not turn in any supplementary sheets of paper. There is actually plenty of room for your answers, as long as you organize yourself BEFORE starting writing.

AT THE END OF THE EXAM: E-mail me your code, in a single file named **ID1.ID2...R**, where the ID values are the student ID numbers of the members of your group (only those present, of course).

Suppose we sample q people at random from a population consisting of m individuals, numbered $1, \dots, m$. There are three subpopulations: Those numbered $1, \dots, c$; those numbered $c+1, \dots, c+d$, and those numbered $c+d+1, \dots, m$. Let X , Y and Z denote the numbers of people who fall into the three subpopulations.

- (a) () Suppose the sampling is *with* replacement. Find the exact value of $p_{X,Y,Z}(i, j, k)$. Express your answer as an R function, **rplcsamp(m,q,c,d,i,j,k)**.
- (b) () Same as (a), except that sampling is *without* replacement. Your R function will be **norplcsamp(m,q,c,d,i,j,k)**.
- (c) () Same as (b), except that the probability is found via simulation. The call is **simnorplcsamp(m,q,c,d,i,j,k,nreps)**, with a default value of 10000 for **nreps**.

Do NOT include any error-checking code.