we want our sampling method to be unbiased

simplest method: choose sampled individuals at random
random sampling does not (completely) achieve perfect similarity between sample & unsample every time, but

a) if we imagine repeating random sampling many times & averaging results, the average will move toward achieving perfect similarity as n of repetitions increases
b) as sample size increases, it becomes harder for (sample, unsample) to differ by a lot along relevant dimensions

different kinds of random
- at random with replacement
  (Independently and identically distributed (IID) sampling)
- at random without replacement
  (Simple random sampling)

P(sampling) if \( n \geq 1 \), \( IID \Rightarrow SRS \)

- if \( n \ll N \), \( IID \Rightarrow SRS \) is a good smaller thin

(2) IID = easy way
SRS is more informative

\[
P(\text{Sample}) = \frac{1}{n!} \]

\[
P(X > 3) = \frac{\binom{n}{3} \cdot 0.1^3 \cdot 0.9^7}{\binom{n}{3} \cdot 0.1^3} = \frac{0.1^3}{0.9^7}
\]

\[
P(\text{A or B}) = P(A) + P(B)
\]

\[
P(\text{not A}) = 1 - P(A)
\]

\[
P(\text{A and B}) = P(A) \cdot P(B)
\]