HYPERGEOMETRIC DISTRIBUTION

A set contains N items, M of which are "successes" and the rest are "failures." A sample of n items is selected <u>without</u> replacement (each subset of size n is equally likely to be chosen). Let X be the number of successes in the sample. Then $X \sim \text{Hypergeometric}(n, M, N)$.

pmf: $$P(X = x) = \frac{\binom{M}{x}\binom{N-M}{n-x}}{\binom{N}{n}}$$

QUESTION: What values of x have nonzero probability?

- Integer values
  - Certainly $\boxed{0 \le x}$
  - Num. Successes bound: $\boxed{x \le M}$
- Sample size bound $\boxed{x \le n}$
  - Num failures bound: $n - x \le N - M$
    $$\boxed{n - N + M \le x}$$

$$\boxed{x \le \min(M, n)}$$

$$\boxed{\max(0, n - N + M) \le x}$$

R: $\text{dhyper}(x, M, N-M, n)$

value → x, successes → M, failures → $N-M$, sample size → n

pmf: $P(X = x)$

Mathematica: $\text{PDF}[\text{Hypergeometric Distribution}[n, M, N], x]$