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Hyper-geometric Random Variable

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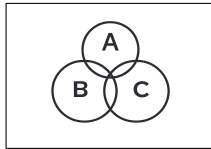


$$N = 5$$

$$K = 2$$

$$n = 2$$

$$k = 1$$



$$P(X = k) = \frac{\binom{K}{k} \binom{N-K}{n-k}}{\binom{N}{n}}$$

$$P(X = 1) = \frac{\binom{2}{1} \binom{3}{1}}{\binom{5}{2}} = \frac{2 \times 3}{10} = \frac{6}{10} = \boxed{0.6}$$

$$E[X] = n \frac{K}{N}$$

$$\text{Var}(X) = n \frac{K}{N} \left(1 - \frac{K}{N}\right) \frac{N-n}{N-1}$$



$$N = 20$$

$$K = 7$$

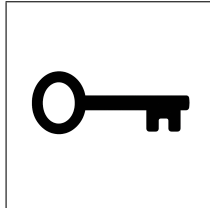
$$n = 5$$

$$P(X \leq 2) = ?$$

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$$\begin{aligned}N &= 20 \\K &= 7 \\n &= 5 \\P(X \leq 2) &= ?\end{aligned}$$

$$P(X = k) = \frac{\binom{K}{k} \binom{N - K}{n - k}}{\binom{N}{n}}$$

$$P(X = 0) = \frac{\binom{7}{0} \binom{13}{5}}{\binom{20}{5}} = \frac{1 \cdot 1287}{15504} \approx \boxed{0.0830}$$

$$P(X = 1) = \frac{\binom{7}{1} \binom{13}{4}}{\binom{20}{5}} = \frac{7 \cdot 715}{15504} \approx \boxed{0.3228}$$

$$P(X = 2) = \frac{\binom{7}{2} \binom{13}{3}}{\binom{20}{5}} = \frac{21 \cdot 286}{15504} \approx \boxed{0.3875}$$

$$P(X \leq 2) = 0.0830 + 0.3228 + 0.3875 \approx \boxed{0.7933}$$