hypergeometric random variable

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Entry type	Definition
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Synonym	hypergeometric distribution

X is a **hypergeometric random variable** with parameters M, K, n if

$$f_X(x) = \frac{\binom{K}{x}\binom{M-K}{n-x}}{\binom{M}{n}}, \; x = \{0, 1, ..., n\}$$

Parameters:

★ $M \in \{1, 2, ...\}$

★ $K \in \{0, 1, ..., M\}$

★ $n \in \{1, 2, ..., M\}$

Syntax:

$X \sim Hypergeo(M, K, n)$

Notes:

1. X represents the number of "special" items (from the K special items) present on a sample of n from a population with M items.

2. The expected value of X is noted as $E[X] = n\frac{K}{M}$

3. The variance of X is noted as $Var[X] = n\frac{K}{M}\frac{M-K}{M}\frac{M-n}{M-1}$

Approximation techniques:
If $\binom{K}{2} << n, M - K + 1 - n$ then X can be approximated as a **binomial random variable** with parameters $n = K$ and $p = \frac{M-K+1-n}{M-K+1}$. This approximation simplifies the distribution by looking at a system with replacement for large values of M and K.