

§ 5.4 HYPERGEOMETRIC PROBABILITY DISTRIBUTION

ex. SUPPOSE YOU HAVE AN URN WITH 1000 (10) MARBLES,
800 (8) RED AND 200 (2) WHITE, AND YOU
SELECT 5 MARBLES. LET $X = \#$ RED MARBLES.

IS THIS BINOMIAL?

RECALL RULE OF THUMB: IF $\frac{n}{N} < .05$ THEN EXPERIMENT IS
CLOSE ENOUGH TO BINOMIAL

HERE, $\frac{5}{1000} = .005$ SO YES ✓

BUT $\frac{5}{10} = .5$, SO IN THIS CASE NO. (FIND $p(4)$ BY HAND)

↓

HYPERGEOMETRIC PROBABILITY DISTRIBUTION

POPULATION: N

SUCCESSES IN POPULATION: M

(# FAILURES IN POPULATION: $N - M$)

PROBABILITY OF k SUCCESSES IN SAMPLE OF SIZE n

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

$$\mu = n \left(\frac{M}{N} \right)$$

$$\sigma = \sqrt{\sigma^2}$$

$$\sigma^2 = n \left(\frac{M}{N} \right) \left(\frac{N-M}{N} \right) \left(\frac{N-n}{N-1} \right)$$