

Hypergeometric Distributions

A hypergeometric probability distribution occurs when there are two outcomes, success and failure, and all trials are **dependent**. The random variable is the number of successes in a given number of trials.

The probability of a x successes in r dependent trials is given by:

$$P(X=x) = \frac{\binom{a}{x} \binom{n-a}{r-x}}{\binom{n}{r}}$$

where a is the number of successful outcomes available in a population of size n .

The expectation is given by:

$$E(X) = r \frac{a}{n}$$

Example 1:

A five-card hand is dealt from a standard deck of cards.

- a) Show the probability distribution for the number of hearts in the hand.

x_i	Number of hearts	Probability: $P(x_i)$

Calculations of $P(x)$:

b) Illustrate the distribution with a histogram.

c) Describe the shape of the graph.

d) What does $P(5)$ tell you?

e) Calculate the expectation and explain its meaning.

Example 2:

In a class of 30 students, 18 have a driver's licence. Ten students are chosen at random.

a) What is the probability that at least four have their driver's licence?

b) What is the expected number of students with their driver's licence?

Do Your Turn p 172, p 175 and p177 top. Check your answers at the back of the text book.