Notes on Statistics

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Chapter 1

Propobility

1.1 Prerequisite

Statistics applied to

- Goverment: IQSS
- life
- Finance
- Gambling: origin of probability, i.e Fermat and Pascal (1650)

Definition 1.1. These are some definitions.

- A *Sample Space* is the set of all possible outcomes of an experiment.
- An *Event* is the subset of the sample space.
- The probability of event A, denoted as

$$P(A) = \frac{\#\text{want}}{\#\text{possibility}}$$

Here, we assume that all outcomes are equally likely, and finite sample space. What's the probability that there is life in Neptune?

Couting

Theorem 1 (Multiplication Rule)**.** *If there is an experiment with n_1 possible outcomes, and the second experiment has n_2 possible outcomes, and so on. Then the overall outcomes are*

$$n_1 n_2 n_3 \dots n_r.$$

Theorem 2. *The numbers of way to choose r items from the total of n items is*

$$\binom{n}{r} := \frac{n!}{(n-k)!k!}$$