Definition (1.3.7: Independence)**.** *Two events $A\&B$ are statistically independent IF AND ONLY IF $P(A \cap B) = P(A)P(B)$*

Definition (1.3.12)**.** *A collection of events $A_1, \cdots, A_k$ are mutually independent if for any subcollection $A_{i1}, \cdots, A_{ik}$*

$$P\left(\bigcap_{j=1}^{k} A_{ij}\right) = \prod_{i=1}^{k} P(A_{ii})$$

Definition (1.4.1: Random Variables)**.** *A random variable is a function from a sample space, S, into the real numbers. In other words, a random variable is your map.*

Takeaways:
- Outcomes or events must be quantifiable.
- A RV is a map.

0.1 Example:

$S = \{S_1, \cdots, S_n\}$ w/ associated $\sigma-$algebra.

Let X be a RV with range $X = \{x_1, \cdots, x_m\}$

Since we have a sample space and a valid sigma algebra, this allows us to define a valid probability function, called P.

Then the probability on X (or P_X) can be defined as we observe $X = x_i$ iff the outcome of the random experiment is an:

$$s_i \in S \ s.t. \ X(s_i) \tag{1}$$

$$P_X(X = x_i) = P(\{s_i \in S : X(s_i) = x_i\}) \tag{2}$$

Notes got super hard to read here. Board writing is WILD.