

Consider an event  $A$  that we want to study, and an event  $B$  that we know occurs. The conditional probability of event  $A$ , given that event  $B$  occurs, is written as

$$P(A | B)$$

in other words,

$$P(\text{an event we are interested in} | \text{an event that we know occurs})$$

We define, for event  $B$  with  $P(B) > 0$ , we the conditional probability  $P(A | B)$  as

$$P(A | B) = \frac{P(A \cap B)}{P(B)}.$$

This makes intuitive sense if we think about  $B$  being the new world that we live in. This is like treating  $B$  as a new sample space that we work in.

Equivalently,

$$P(A | B)P(B) = P(A \cap B).$$