Ex: n chips manufactured, d of them defective. k chips selected randomly from the n for testing. What is P(k selected chips contain some defective chip)?

Let \( \Omega \) be all the ways of choosing a set of k chips from the n chips.

Let \( E \) be all ways of choosing a set of k chips with none of them defective. (Complement)

\[
P(\text{none of } k \text{ defective}) = P(E) = \frac{n-d}{n}^{k}
\]

\[
P(\geq 1 \text{ of } k \text{ defective}) = P(\bar{E}) = 1 - P(E) = 1 - \frac{n-d}{n}^{k}
\]

Conditional Probability of E given F, written P(\( E | F \)), where F \( \neq \emptyset \), is the probability that E occurs, given that F was observed.

Sample space reduced to F, event is reduced to \( E \cap F \).

With equally likely outcomes,

\[
P(E|F) = \frac{|E \cap F|}{|F|} = \frac{|E \cap F|/|F|}{|F|/|\Omega|} = \frac{P(E \cap F)}{P(F)}
\]

Ex: Roll a fair die. What is P(5 | odd)?

From counting: P(E|F) = \( |E \cap F|/|F| \) = \( |5|/|\text{odd}| \) = \( 1/3 

From prob: P(E|F) = P(E \cap F)/P(F) = P(5)/P(\text{odd}) = \( 1/6 \) \( 1/3 \) = \( 1/2 \)
Ex. Let $I$ be all ways of dealing a Schafhaut hand, $Y$ = you are dealt 0 trumps, and $O$ = opponent is dealt 0 trumps.

$$P(O | Y) = \frac{10 \times Y | Y}{Y} = \frac{\binom{10}{5} \binom{4}{0}}{\binom{14}{5}} = \frac{20160}{20020} \approx 0.126$$

Compare to $P(O) \approx 0.258$

Ex. $P(0 \text{ off dealt } = 1 \text{ trump } | Y) = P(O | Y) = 1 - P(O | Y) \approx 0.87$

$$P(O | Y) \neq 1 - P(O | Y)$$