

“Equally likely outcomes”

We consider $S = \{x_1, x_2, \dots, x_n\}$, and such that $P(\{x_j\})$ are all the same. What is $P(\{x_j\})$ in these cases?

The sample space S can be decomposed into n different events, each with one outcome

$$S = \{x_1\} \cup \{x_2\} \cup \dots \cup \{x_n\}$$

and we emphasize that these events are disjoint. So

$$1 = P(S) = P(\{x_1\}) + P(\{x_2\}) + \dots + P(\{x_n\})$$

Now fix j between 1 and n , since all of these probabilities are assumed to be the same in this situation, we could rewrite this equation as

$$1 = nP(\{x_j\}),$$

so $P(\{x_j\}) = 1/n$. To conclude, if S has n outcomes that are all equally likely, the probability of an event with just one outcome in it must be $1/n$.