

Equally likely outcomes, continued

If S has equally likely outcomes, and $S = \{x_1, \dots, x_n\}$, and if A is an event, say $A = \{v_1, \dots, v_k\}$, then what is the probability of A ?

We can write

$$A = \{v_1\} \cup \{v_2\} \cup \dots \cup \{v_k\}$$

Notice that A is now written as a union of disjoint events, so

$$P(A) = P(\{v_1\}) + \dots + P(\{v_k\})$$

and since the outcomes were assumed to be equally likely at the start, we have $P(\{v_j\}) = 1/n$ for each j , so we get

$$P(A) = 1/n + 1/n + \dots + 1/n$$

or more simply

$$P(A) = k/n$$

If we write $|A| = k$, this means that, if all of the outcomes in S are equally likely, and $|S| = n$, then when event A has equally k of the outcomes, we have $P(A) = k/n$. Alternatively, $P(A) = |A|/|S|$.