

**degrees of freedom** ( $\nu$  (nu), d.f.)

The number of values that may vary in the computation of a *statistic*. For example, the computation of the *expectation* of rolling a six-sided die involves 5 degrees of freedom, because there are 6 possible *outcomes*  $s_1, \dots, s_6$ , but only the frequencies of 5 of them are free to vary, because in order to compute the expectation, the number of trials ( $n$ ) has to be fixed, and

$$n = s_1 + s_2 + s_3 + s_4 + s_5 + s_6$$

Varying all 6 frequencies would not necessarily add up to  $n$ , so only 5 of the parameters contribute a degree of freedom.

Another, more precise way to express the degrees of freedom is the number of outcomes minus the number of necessary relations between the outcomes. Degrees of freedom are often required in combination with certain *probability distributions*, like the  $\chi^2$ -distribution ( $\rightarrow$  *chi-square distribution*) or the *t-distribution*. The required number of degrees of freedom is explained in the entry about the corresponding distribution.