

The sum rule of probability - Contribution 3

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January 2020

Stating the rule

$$P(A / I) + P(\bar{A} / I) = 1 \quad (1)$$

Qualitatively, equation (1) asserts that the probability that A is true given the known background information $[P(A / I)]$ plus the probability that A is false given the known background information $[P(\bar{A} / I)]$ is equal to 1.

Another form of the rule

For two independent events A and B , we have:

$$P(A \cup B) = P(A) + P(B) \quad (2)$$

An application of the rule

The sum rule of probability is important in many subjects, such as genetics. An example of its use in this branch of biology relies on a situation in which it is necessary to know the probability that either an event or another will happen. For instance, suppose that in a certain species the probability of having a long tail is given by $\frac{1}{6}$ and the chances of having a striped fur correspond to $\frac{2}{3}$. Then, considering that these events are independent, the probability that an individual will have either a long tail or a striped fur may be given by:

$$\frac{1}{6} + \frac{2}{3} = \frac{5}{6}$$

References

1. D. S. Sivia, J. Skilling. *Data Analysis - a Bayesian Tutorial*. Page 5. 2nd Edition. Oxford Science Publications.
2. <https://www.khanacademy.org/science/high-school-biology/hs-classical-genetics/hs-introduction-to-heredity/a/probabilities-in-genetics>