**Harold’s Probability**

**Cheat Sheet**

11 December 2024

**Probability**

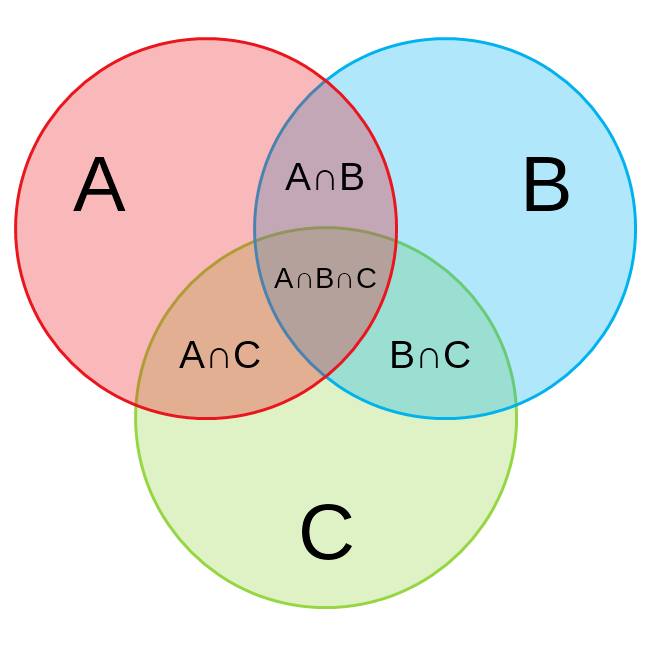
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| --- | --- | --- |
| **Rule** | **Formula** | **Definition** |
| **Notation** | = “and”, Intersection, “”  = “or”, Union, “”  “not”, negation, “” | “and” implies multiplication.  “or” implies addition.  “not” implies negation. |
| **Independent** | If | The occurrence of one event does not affect the probability of the other, or vice versa. |
| **Dependent** | If | The occurrence of one event affects the probability of the other event. |
| **Disjoint**  (“mutually exclusive”) | If  Then | The events can never occur together. |
| **Probability**  (“likelihood”) |  | |
| **Addition Rule**  (“or”) |  | http://upload.wikimedia.org/wikipedia/commons/thumb/7/7b/Venn_A_intersect_B_alt.svg/235px-Venn_A_intersect_B_alt.svg.pngS |
| **Multiplication Rule**  (“and”) | if independent or disjoint:  if dependent: |
| **Complement Rule / Subtraction Rule**  (“not”) |  | The complement of event A (denoted means “**not A**”; it consists of all simple outcomes that are not in A. |
| **Conditional Probability**  (“given that”) | if independent or disjoint: | Means the probability of event A given that event B occurred. Is a rephrasing of the Multiplication Rule. P(A|B) is the proportion of elements in B that are ALSO in A. |
| **Total Probability Rule** |  | To find the probability of event A, partition the sample space into several disjoint events. A must occur along with one and only one of the disjoint events. |
| **Bayes’ Theorem** |  | Allows P(A|B) to be calculated from P(B|A).  Meaning it allows us to reverse the order of a conditional probability statement, and is the only generally valid method! |
| **De Morgan’s Law** |  | Uses negation to convert an “or” to an “and”.  Uses negation to convert an “and” to an “or”. |

**Venn Diagrams**

Shape

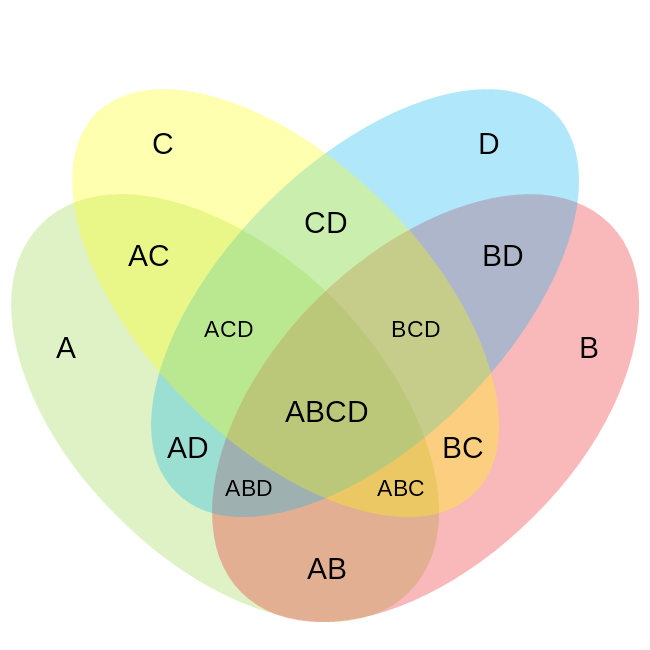
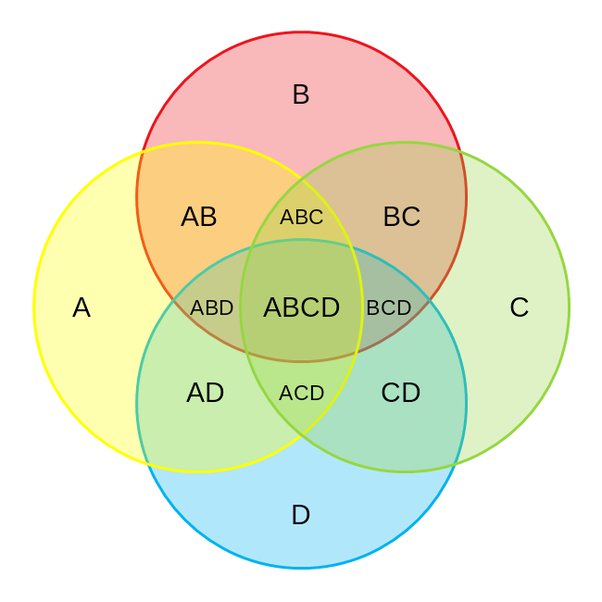
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**B**

Diagram, venn diagram

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**Diagram, venn diagram

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**Sources**:

* [SNHU MAT 229](https://www.snhu.edu/admission/academic-catalogs/coce-catalog#/courses/4188IbUYl) - Mathematical Proof and Problem Solving, [How To Prove It - A Structured Approach](https://www.amazon.com/How-Prove-Structured-Daniel-Velleman/dp/1108439535/ref=sr_1_fkmr0_2?crid=3DLEIZI1MQFFK&keywords=How+To+Prove+It+-+A+Structured+Approach+3rd+Edition+-+Daniel+J.+Vellman&qid=1666431460&qu=eyJxc2MiOiIwLjgxIiwicXNhIjoiMC4wMCIsInFzcCI6IjAuMDAifQ%3D%3D&sprefix=how+to+prove+it+-+a+structured+approach+3rd+edition+-+daniel+j.+vellman%2Caps%2C131&sr=8-2-fkmr0&ufe=app_do%3Aamzn1.fos.18ed3cb5-28d5-4975-8bc7-93deae8f9840), 3rd Edition - Daniel J. Vellman, Cambridge University Press, 2019.
* [SNHU MAT 230](https://www.snhu.edu/admission/academic-catalogs/coce-catalog#/courses/4kVhSZLtg) - Discrete Mathematics, zyBooks.
* Learn more about probability distributions here: <http://blog.cloudera.com/blog/2015/12/common-probability-distributions-the-data-scientists-crib-sheet/>