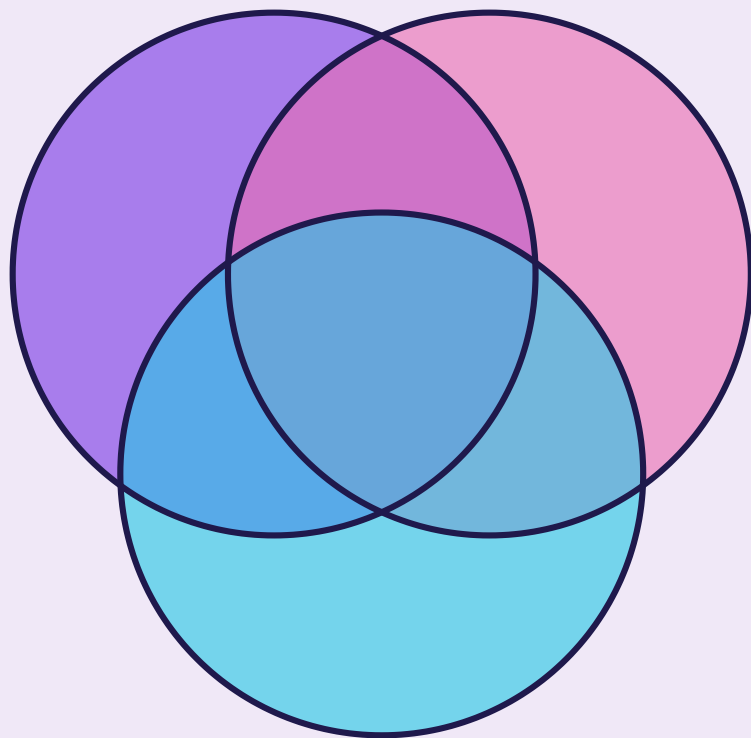


Probability

**Conditional**

$$P(E | F) = \frac{P(E \cap F)}{P(F)}, \quad P(F) \neq 0$$

Properties

$$P(S | F) = 1, \quad P(E' | F) = 1 - P(E | F)$$

Multiplication rule

$$P(E \cap F) = P(E)P(F | E) = P(F)P(E | F)$$

Independent

$$P(E \cap F) = P(E)P(F)$$

Union

$$P(E \cup F) = P(E) + P(F) - P(E \cap F)$$

**Total probability
(partition
 $E_1, \dots, E_n$)**

$$P(A) = \sum_{j=1}^n P(E_j)P(A | E_j)$$

Bayes' theorem

$$P(E_i | A) = \frac{P(E_i)P(A|E_i)}{\sum_{j=1}^n P(E_j)P(A|E_j)}$$

Random variable

$$p_i \geq 0, \quad \sum p_i = 1, \quad E(X) = \mu = \sum x_i p_i$$