Formula Sheet

$$P(A) = P(A \mid B_1)P(B_1) + \cdots + P(A \mid B_n)P(B_n)$$

$$P(B_i \mid A) = \frac{P(A \mid B_i)P(B_i)}{\sum_i P(A \mid B_i)P(B_i)}$$

$$P(A \cup B) = P(A) + P(B) - P(AB)$$

$$P\left[\left(\bigcup_i A\right)^c\right] = P\left(\bigcap_i A_i^c\right)$$
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Binomial distribution: $P(X = x) = \binom{n}{x} p^x (1-p)^{n-x}$, $\binom{n}{x} = \frac{n!}{x!(n-x)!}$
Poisson distribution with rate λ: $P(X = x) = e^{-\lambda}\lambda^x / x!$

$$E(g(X)) = \int_{-\infty}^{\infty} g(x)f(x)\,dx, \quad Var(X) = E(X^2) - (E(X))^2$$

$$E(g(X)) = \sum_i g(x_i)P(X = x_i)$$

$$E(aX + bY) = aE(X) + bE(Y)$$

If X and Y are independent, then

$$Var(aX + bY + c) = a^2 Var(X) + b^2 Var(Y)$$