

Mathematical Biostatistics Boot Camp: Random Formulae

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1 About this document

This document contains random formulae images I used in the notes.

$$A = \{1, 2\}$$

$$B = \{1, 2, 3\}$$

$$E[X^2] = \int_0^1 x^2 dx \quad (1)$$

$$= \left. \frac{x^3}{3} \right|_0^1 = \frac{1}{3} \quad (2)$$

$$\frac{|x - \mu|}{k\sigma} > 1$$

Over the set $\{x : |x - \mu| > k\sigma\}$

$$\frac{(x - \mu)^2}{k^2\sigma^2} > 1$$

$$\frac{1}{k^2\sigma^2} \int_{-\infty}^{\infty} (x - \mu)^2 f(x) dx$$

$$\frac{1}{k^2\sigma^2} E[(X - \mu)^2] = \frac{1}{k^2\sigma^2} \text{Var}(X)$$

$$P(A_1 \cup A_2 \cup A_3) = P\{A_1 \cup (A_2 \cup A_3)\} = P(A_1) + P(A_2 \cup A_3)$$

$$P(A_1) + P(A_2 \cup A_3) = P(A_1) + P(A_2) + P(A_3)$$

$$P(\cup_{i=1}^n E_i) = P\{E_n \cup (\cup_{i=1}^{n-1} E_i)\}$$

$$(x_1, x_2, x_3, x_4) = (1, 0, 1, 1)$$

$$p^{(1+0+1+1)}(1-p)^{\{4-(1+0+1+1)\}} = p^3(1-p)^1$$

$$\text{SD}(X)\text{SD}(Y)$$

$$\text{Var}(X)$$

$$\text{Var}(X) = E[X^2] - E[X]^2 \rightarrow E[X^2] = \text{Var}(X) + E[X]^2 = \sigma^2 + \mu^2$$

$$\text{Var}(\bar{X}) = E[\bar{X}^2] - E[\bar{X}]^2 \rightarrow E[\bar{X}^2] = \text{Var}(\bar{X}) + E[\bar{X}]^2 = \sigma^2/n + \mu^2$$

$$f(x|y=5) = \frac{f_{xy}(x, 5)}{f_y(5)}$$

$$P(A \cap B)$$

$$P(A)$$

$$P(A \cap B^c)$$

$$\frac{10!}{1!9!} = \frac{10 \times 9 \times 8 \times \dots \times 1}{9 \times 8 \times \dots \times 1} = 10$$

$$\frac{10!}{2!8!} = \frac{10 \times 9 \times 8 \times \dots \times 1}{2 \times 1 \times 8 \times 7 \times \dots \times 1} = 45$$

In general

$$\binom{n}{2} = \frac{n \times (n-1)}{2}$$

μ

σ^2

$$E[Z] = E\left[\frac{X - \mu}{\sigma}\right] = \frac{E[X] - \mu}{\sigma} = 0$$

$$\text{Var}(Z) = \text{Var}\left(\frac{X - \mu}{\sigma}\right) = \frac{1}{\sigma^2} \text{Var}(X - \mu) = \frac{1}{\sigma^2} \text{Var}(X) = 1$$

$$E[X_i^2] = E[Y_i] = \sigma^2 + \mu^2$$

$$\sum_{i=1}^n (X_i - \bar{X})^2 = \sum_{i=1}^n X_i^2 - n\bar{X}^2$$

$$E[\chi_{df}^2] = df$$

$$E[S^2] = \sigma^2 \rightarrow E\left[\frac{(n-1)S^2}{\sigma^2}\right] = (n-1)$$

$$\text{Var}(\chi_{df}^2) = 2df$$