Mathematical Biostatistics Boot Camp: Random Formulae

Brian Caffo

Department of Biostatistics
Johns Hopkins Bloomberg School of Public Health
Johns Hopkins University

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

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

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

$$
\begin{aligned}
E[X^2] &= \int_0^1 x^2 dx && (1) \\
&= \left.\frac{x^3}{3}\right|_0^1 = \frac{1}{3} && (2)
\end{aligned}
$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$P(A \cap B)$$

$$P(A)$$

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

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

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

In general

$$\left(\begin{array}{c} n \\ 2 \end{array} \right) = \frac{n \times (n-1)}{2}$$

$$\mu$$

$$\sigma^2$$

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

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

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

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