$$p(E) = \frac{n(E)}{n(S)} \begin{array}{l} \leftarrow \text{FAVORABLE OUTCOMES} \\ \leftarrow \text{TOTAL OUTCOMES} \end{array}$$

AP Statistics Formula Sheet

(I) Descriptive Statistics

MEAN $\bar{x} = \frac{\sum x_i}{n}$

VARIANCE $s_x = \sqrt{\frac{1}{n-1}\sum (x_i - \bar{x})^2}$

$$s_p = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{(n_1 - 1) + (n_2 - 1)}}$$

$$\hat{y} = b_o + b_1 x$$

$$b_1 = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sum (x_i - \bar{x})^2}$$

$$b_o = \bar{y} - b_1 \bar{x}$$

$$r = \frac{1}{n-1}\sum \left(\frac{x_i - \bar{x}}{s_x}\right)\left(\frac{y_i - \bar{y}}{s_y}\right)$$

$$b_1 = r\frac{s_y}{s_x}$$

$$s_{b_1} = \frac{\sqrt{\frac{\sum (y_i - \hat{y}_i)^2}{n-2}}}{\sqrt{\sum (x_i - \bar{x})^2}}$$

$$p(n, k) = \frac{n!}{(n-k)!}$$

(II) Probability

$$p(A) \cdot p(B) = p(A \text{ "THEN" } B)$$

$$p(A \text{ or } B) = P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)}$$

$$E(X) = \mu_x = \sum x_i p_i$$

$$\mathrm{Var}(X) = \sigma_x^2 = \sum (x_i - \mu_x)^2 p_i$$

$$p(A \cap B) = p(A \mid B) \cdot p(B) \quad \text{or} \quad p(B \mid A) \cdot p(A)$$

If X has a binomial distribution with Parameters n and p, then:

$$P(X = k) = \binom{n}{k} p^k (1-p)^{n-k}$$

$$\mu_x = np$$

$$\sigma_x = \sqrt{np(1-p)}$$

$$\mu_{\hat{p}} = p$$

$$\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}}$$

If $\bar{x}$ is the mean of a random sample of size n from an infinite population with mean μ and standard deviation σ, then:

$$\mu_{\bar{x}} = \mu$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} \quad \text{STANDARD ERROR}$$

$$Mean = \overline{X} = \frac{1}{N}\sum_{i=1}^{N} X_i$$

$$Median = X_{med} = \begin{cases} X_{(N+1)/2} & When \quad N \text{ is } odd. \\ \left(X_{N/2} + X_{(N/2)+1}\right)/2 & When \quad N \text{ is } even. \end{cases}$$

$$S_x = Variance = \frac{1}{N-1}\sum_{i=1}^{N}\left(X_i - \overline{X}\right)^2$$

$$Std.Dev = \sigma = \sqrt{Variance}$$

$$Avg.Dev. = \frac{1}{N}\sum_{i=1}^{N}\left|X_i - \overline{X}\right|$$

$$Std.Err = \frac{\sigma}{\sqrt{N}}$$

$$RMS_{draft} = \sqrt{\frac{\sum_{i=1}^{N} X_i^2}{N}}$$

$$Skewness = \frac{1}{N}\sum_{i=1}^{N}\left[\frac{X_i - \overline{X}}{\sigma}\right]^3$$

$$Kurtosis = \left\{\frac{1}{N}\sum_{i=1}^{N}\left[\frac{X_i - \overline{X}}{\sigma}\right]^4\right\} - 3$$