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Formula Sheet

Definition 1.1: Mean (p.9)

The mean of a sample of n measured responses y1, y2,..., yn is given by

$$\bar{y} = \frac{1}{n}\sum_{i=1}^{n} y_i$$

The corresponding population mean is denoted μ.

Definition 1.2: Variance (p.10)

The variance of a sample of measurements y1, y2,..., yn is the sum of the square of the differences between the measurements and their mean, divided by n − 1. Symbolically, the sample variance is

$$s^2 = \frac{1}{n-1} \sum_{i=1}^{n}(y_i - \bar{y})^2$$

Definition 1.3: Standard Deviation (p.10)

The standard deviation of a sample of measurements is the positive square root of the variance; that is,

$$s = \sqrt{s^2}$$

Definition 2.7 And Theorem 2.2 : Permutation (p.43)

An ordered arrangement of r distinct objects is called a permutation. The number of ways of ordering n distinct objects taken r at a time will be designated by the symbol P n r

$$P_r^n = n(n-1)(n-2)\ldots(n-r+1) = \frac{n!}{(n-r)!}$$

Theorem 2.3:

The number of ways of partitioning n distinct objects into k distinct groups containing n1, n2,..., nk objects, respectively

$$\boldsymbol{N} = \binom{\boldsymbol{n}}{\boldsymbol{n_1 n_2 \dots n_k}} = \frac{\boldsymbol{n}!}{\boldsymbol{n_1}!\,\boldsymbol{n_2}! \dots \boldsymbol{n_k}!}$$

Definition 2.8 (p.46) Combinations

The number of combinations of n objects taken r at a time is the number of subsets, each of size r, that can be formed from the n objects. This number will be denoted by C n r

$$\binom{\boldsymbol{n}}{\boldsymbol{r}} = \boldsymbol{C}\,{}^{\boldsymbol{n}}_{\boldsymbol{r}} = \frac{\boldsymbol{P}\,{}^{\boldsymbol{n}}_{\boldsymbol{r}}}{\boldsymbol{r}!} = \frac{\boldsymbol{n}!}{\boldsymbol{r}!\,(\boldsymbol{n}-\boldsymbol{r})!}$$

Definition 2.9 (p.52) :

The conditional probability of an event A, given that event B has occurred, is equal to

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

provided P(B) > 0, the symbol P$(A|B)$ means probability of A given B

Definition 2.10 (p.53)

Two events A and B are said to be independent if any one of the following holds:

$$\boldsymbol{P(A|B) = P(A)}$$

$$\boldsymbol{P(B|A) = P(B)}$$

$$\boldsymbol{P(A \cap B) = P(A)P(B)}$$

Otherwise, the events are said to be *dependent*

Theorem 2.9: Bayes Theorem (p.71)

For 2 events A and B in sample space S, with $P(A) > 0$ and $P(B) > 0$

$$P(B|A) = \frac{P(A|B)\,P(B)}{P(A)}$$

Definition 3.4: Expected Value (p.91)

Let Y be a discrete random variable with the probability function p(y). Then the expected value of Y, E(Y), is defined to be

$$E(Y) = \sum_{y} yp(y)$$

Definition 3.7: Binomial Distribution (p.103)

A random variable Y is said to have a binomial distribution based on n trials with success probability p if and only if

$$p(y) = \binom{n}{y} p^{y} q^{n-y}$$

Where: $y = 0, 1, 2, \ldots. n$ and $0 \le p \le 1$

Definition 3.8: Geometric Distribution (p.115)

A random variable Y is said to have a geometric probability distribution if and only if

$$p(y) = q^{y-1} p$$

Where: $y = 1, 2, 3, \ldots$ $0 \le p \le 1$