California State University
SAN MARCOS

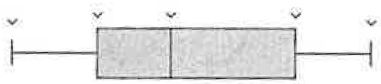
STATISTICS

FREQUENTLY USED FORMULAS

n = sample size

CHAPTER 2
(Describing Distributions with Numbers)

min Q1 median Q3 max



Sample mean

$$\overline{x} = \frac{x_1 + x_2 + \cdots + x_n}{n} = \frac{1}{n}\sum x_i$$

First Quartile $Q_1 = \dfrac{n+1}{4}$

Third Quartile $Q_3 = \dfrac{3(n+1)}{4}$

Interquartile range $IQR = Q_3 - Q_1$

Variance

$$s^2 = \frac{1}{n-1}\sum (x_i - \overline{x})^2$$

Standard deviation

$$s = \sqrt{\frac{1}{n-1}\sum (x_i - \overline{x})^2}$$

CHAPTER 3
(Scatterplots and Correlation)

Correlation

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

CHAPTER 4
(Regression)

Least squares regression line $\widehat{y} = a + bx$

Slope $b = r\dfrac{s_y}{s_x}$,

where s_x and s_y are the standard deviations in x and y respectively

Intercept $a = \overline{y} - b\overline{x}$

CHAPTER 9
(Introducing Probability)

Addition Rule: If A and B are disjoint,

$P(A \text{ or } B) = P(A) + P(B)$

For any event A,

$P(\text{A does not occur}) = 1 - P(A)$

$\text{risk}(A) = p$

$\text{odds}(A) = p/(1-p)$

CHAPTER 10
(General Rules of Probability)

If A and B are independent,

$P(A \text{ and } B) = P(A) \cdot P(B)$

Conditional probability of B, given A is

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

General addition rule:

For any two events A and B,

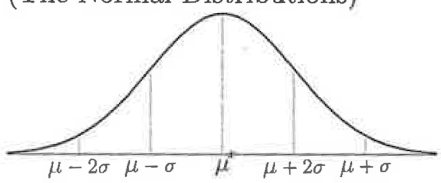
$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

General multiplication rule:

For any two events A and B,

$P(A \text{ and } B) = P(A)P(B|A)$

CHAPTER 11
(The Normal Distributions)



Standardized value $z = \dfrac{x - \mu}{\sigma}$

Raw score $x = \mu + z\sigma$

CHAPTER 12
(Discrete Probability Distributions)

Factorial

$n! = n \times (n-1) \times \cdots \times 3 \times 2 \times 1$

Binomial coefficient $\dbinom{n}{k} = \dfrac{n!}{k!(n-k)!}$

Binomial probability

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

Binomial mean $\mu = np$

Binomial std. $\sigma = \sqrt{np(1-p)}$

Poisson probability

$$P(X = k) = \frac{e^{-\mu}\mu^k}{k!}$$

Poisson mean

μ = mean number of occurrences per interval

Poisson std. $\sigma = \sqrt{\mu}$

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STATISTICS

FREQUENTLY USED FORMULAS

CHAPTER 13

(Sampling Distributions)

Sample proportion $\widehat{p} = \frac{\text{count of successes in sample}}{\text{size of sample}} = \frac{X}{n}$

Sampling distribution mean $\mu = p$

Sampling distribution std. $\sigma = \sqrt{\frac{p(1-p)}{n}}$

CHAPTER 14

(Introduction to Inference)

z Confidence interval for μ

$$\overline{x} \pm z^* \frac{\sigma}{\sqrt{n}}$$

where z^* is the critical value corresponding to the level of confidence C.

One-sample z test statistic

$$z = \frac{\overline{x} - \mu_0}{\sigma/\sqrt{n}}$$

where μ_0 is the population mean stated by the null hypothesis.

CHAPTER 15

(Inference in Practice)

Margin of error $m = z^* \frac{\sigma}{\sqrt{n}}$

Sample size for a desired margin of error:

$$n = \left(\frac{z^*\sigma}{m}\right)^2$$

CHAPTER 17

(Inference about a Population Mean)

Sample standard deviation s

Standard error $s/\sqrt{n}$

One-sample t test statistic

$$t = \frac{\overline{x} - \mu}{s/\sqrt{n}}$$

with $n-1$ degrees of freedom.

t Confidence interval for μ

$$\overline{x} \pm t^* \frac{s}{\sqrt{n}}$$

where t^* is the critical value corresponding to the confidence interval C.

CHAPTER 19

(Inference about a Population Proportion)

Confidence interval for p

$$\widehat{p} \pm z^* \sqrt{\frac{\widehat{p}(1-\widehat{p})}{n}}$$

Plus four estimate of p

$$\widetilde{p} = \frac{\text{number of successes in the sample } + 2}{n+4}$$

Sample size for desired margin of error

$$n = \left(\frac{z^*}{m}\right)^2 p^*(1-p^*)$$

z Test statistic for proportions

$$z = \frac{\widehat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$$

where p_0 is the population proportion stated by the null hypothesis.

CHAPTER 21

(The Chi-Square Test for Goodness of Fit)

Expected count of outcome $i = n \times p_{i0}$

Chi-square statistic

$$X^2 = \sum \frac{(\text{observed count}_i - \text{expected count}_i)^2}{\text{expected count}_i}$$

Chi-square ith component

$$\frac{(\text{observed count}_i - \text{expected count}_i)^2}{\text{expected count}_i}$$