STT2640 Formula Sheet

1. Descriptive Statistics

(a) Sample Mean: $\bar{x} = \frac{\sum x_i}{n}$

(b) Sample Variance:
$$s^2 = \frac{1}{n-1} \sum_i (x_i - \bar{x})^2 = \frac{\sum_i x_i^2 - \sum_i x_i^2}{n-1} = \frac{1}{n-1} \{ \sum_i x_i^2 - n \cdot \bar{x}^2 \}$$

(c) z-score: $z = \frac{x - \bar{x}}{s}$ or $z = \frac{x - \mu}{\sigma}$

(d) Interquartile Range: $IQR = Q_U - Q_L$

2. Probability Properties and Rules

(a) Addition Rule: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

(b) Complementary Rule: $P(A^c) = 1 - P(A)$

(c) Conditional Probability: $P(A|B) = \frac{P(A \cap B)}{P(B)}$

(d) Multiplication Rule: $P(A \cap B) = P(A|B) \cdot P(B) = P(B|A) \cdot P(A)$

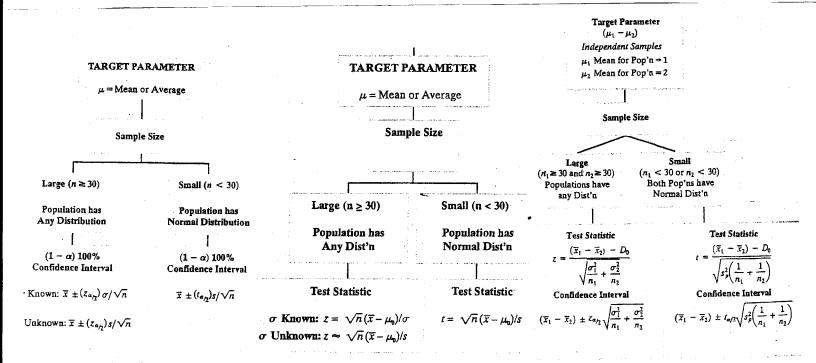
(e) Complementary Rule for Conditional Probability: $P(A^c|B) = 1 - P(A|B)$

3. Binomial Distribution: $p(x) = \binom{n}{x} p^x q^{n-x}$, $\binom{n}{x} = \frac{n!}{x!(n-x)!}$, $EX = n \cdot p$

4. Poisson Distribution: $p(x) = \frac{\lambda^x \exp^{-\lambda}}{x!}$

5. Properties of the sample mean \bar{X} from a population with mean μ and S.D. σ : $\mu_{\bar{x}} = \mu, \quad \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

6. Inferences based on one sample and two independent samples:



7. Analysis of Variance (ANOVA)

$$SST = \sum_{i=1}^{k} n_i (\bar{x}_i - \bar{x})^2, \quad SSE = \sum_{i=1}^{k} (n_i - 1)s_i^2$$

(b) Test Statistic: $F_{obs} = \frac{MST}{MSE} = MST/MSE$

8. Simple Linear Regression

(a) The least squares estimate of β_0 and β_1 are:

$$b_1 = \hat{eta}_1 = rac{SS_{xy}}{SS_{xx}} \,, \quad b_0 = \hat{eta}_0 = \bar{y} - b_1 \bar{x} \,,$$

where

$$SS_{xx} = \sum (x_i - \bar{x})^2 = \sum x_i^2 - n \cdot \bar{x}^2$$
, $SS_{xy} = \sum (x_i - \bar{x})(y_i - \bar{y}) = \sum x_i y_i - n \cdot \bar{x} \cdot \bar{y}$.

(b)
$$s^2 = \hat{\sigma^2} = SSE/(n-2)$$
 is an estimate of σ^2 with $SSE = \sum_{i=1}^n e_i^2$, $s = \sqrt{s^2}$ is the estimated standard deviation.

- (c) Inferences on β_1 , the slope of the regression line
 - i. $100(1-\alpha)\%$ confidence interval for β_1 is: $b_1 \mp t_{\alpha/2} \frac{s}{\sqrt{SS_{xx}}}$
 - ii. The test statistic for $H_0:\beta_1=0$ is $t_{obs}=\frac{b_1}{s/\sqrt{SS_{xx}}}.$