Statistics formulas for STA 2023 and STA 2122

Z-Score for Sample Values and Population Values

$Z = \frac{x - \bar{x}}{s}$	$Z = \frac{X - \mu}{\sigma}$

Standard Deviation for Sample Values and Population Values

Sample Standard Deviation, $s = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}}$	Population Standard Deviation, $\sigma = \sqrt{\frac{\Sigma(x-\mu)^2}{N}}$

Sampling Distribution for a Sample Proportion

$\hat{p} = \frac{x}{n}$	$\mu_{\hat{p}} = p$	$\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}}$	$Z = \frac{\hat{p}-p}{\sqrt{\frac{p(1-p)}{n}}}$
Central Limit Theorem Conditions ($\hat{p} \sim normal$)	1. SRS	np ≥ 10; and n(1-p) ≥ 10	3. N ≥ 10n

Sampling Distribution for a Sample Mean

$\bar{x} = \frac{\Sigma x}{n}$	$\mu_{\bar{x}} = \mu$	$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$	$Z = \frac{\bar{x}-\mu}{\frac{\sigma}{\sqrt{n}}}$
Central Limit Theorem Conditions ($\bar{x} \sim normal$)	1. SRS	2. n ≥ 30 or x ~ normal	

Confidence Intervals and Test Statistics for Hypothesis Testing

CI for μ, σ known	**CI for μ, σ unknown**	**CI for p**
C.I. = $\bar{x} \pm Z\frac{\sigma}{\sqrt{n}}$	C.I. = $\bar{x} \pm t\frac{s}{\sqrt{n}}$	C.I. = $\hat{p} \pm Z_c\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$
HT for μ, σ known	**HT for μ, σ unknown**	**HT for p**
$Z = \frac{\bar{x}-\mu}{\frac{\sigma}{\sqrt{n}}}$	$t = \frac{\bar{x}-\mu}{\frac{s}{\sqrt{n}}}$	$Z = \frac{\hat{p}-p}{\sqrt{\frac{p(1-p)}{n}}}$

Confidence Interval Critical Values of Z

Confidence	**Z_c**	**Confidence**	**Z_c**
90%	1.645	98%	2.33
95%	1.96	99%	2.576 or 2.58

Regression line equation y = ax + b, a= slope of the line, b = the y-intercept, residual= y - $\hat{y}$; r= correlation coefficient ($-1 \leq r \leq 1$), r^2= coefficient of determination

Binomial Distribution: $\mu = np$; $\sigma = \sqrt{np(1-p)}$;

Discrete Probability Distribution: $\mu = \Sigma[X \cdot P(X)]$; $\sigma = \sqrt{\Sigma[(x-\mu)^2 p(x)]}$

Probability: nCr = $\frac{n!}{r!(n-r)!}$; nPr = $\frac{n!}{(n-r)!}$; P(A∪B) = P(A) + P(B) – P(A∩B); P(A|B) = $\frac{P(A \cap B)}{P(B)}$;

P(A) + P(A^C) = 1

Texas Instruments Calculator Shortcuts and Formulas

Descriptive Statistics: (Mean, Standard Deviation, Minimum, Q1, Median, Maximum):

- insert data in calculator STAT ❼ Edit
- Then: STAT❼ CALC❼1: 1-Vars Stat
- To clear a list: STAT❼ Edit❼ go up to the list name (L1, L2, L3...)--> CLEAR❼ Enter
- Restore missing list name: STAT❼ Edit ❼ go up❼ 2nd Del❼ type the name❼ enter

Linear Regression:

- Correlation coefficient (one-time set up): 2nd 0 ❼ DiagnosticOn❼Enter❼ Enter
- Insert values of X into List1 and values of Y into List2❼ STAT❼ Edit
- Then: STAT❼ CALC❼4: LinReg(ax + b) ❼ 2nd❼1❼ comma❼ 2nd❼ 2❼ enter • Or: STAT❼CALC❼8: linReg (a + bx)❼ 2nd ❼ comma❼2nd❼ 2❼ enter

Intervals:

- Stat❼ TESTS❼ 1: Z-Test
- Stat❼ TESTS❼ 2:T:Test
- STAT❼ TESTS❼ 4:2-SampT-Test

• STAT❼ TESTS❼ 5: 1propZ-Test

• STAT❼ TESTS❼ A: 1propZ-Interval

Hypothesis Test:

- STAT❼ TESTS❼ 1: Z-test
- STAT❼ TESTS❼ 2: T-Test
- STAT❼ TESTS❼ 4: 2-SampT-Test
- STAT❼ TESTS❼ 5: 1propZ-Test

Distributions:

- 2nd❼ VARS❼ 2: normalcdf (left bound, right bound, Mean, Standard Deviation)
- 2nd ❼ VARS❼ 3: invNorm (area to the left, Mean, Standard Deviation)
- 2nd❼ VARS❼ 5: tcdf (left bound, right bound, degrees of freedom)
- 2nd❼ VARS❼ 0: binomialpdf(number of trials, probability of success, number of successes)

- 2nd❼ VARS❼ A:Binomcdf(number of trials, probability of success, number of successes)