I will provide these cheat sheets on the day of the final exam. Do not bring this copy to the final. Also, it is your responsibility to verify that the formulas are correct and notify me of any necessary corrections.

Formulas

<u>Data Distribution</u>

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

<u>Probability Distribution</u>

$\mu = \sum x \cdot p(x)$ $\sigma = \sqrt{\sum(x-\mu)^2 \cdot p(x)}$

$Z = \frac{x-\mu}{\sigma}$, $x = \mu + z \cdot \sigma$

Empirical Rule = 68-95-99.7 Rule

See also the common probability rules below.

<u>Regression</u>

$Predicted\, y = a + b \cdot x$

$b = r \cdot \frac{s_y}{s_x}$, $a = \bar{y} - b \cdot \bar{x}$

Residual (**predicted error**) = $y_{observed} - y_{predicted}$

$S_e = \sqrt{\frac{SSE}{n-2}}$

<u>Distribution of Sample Proportions</u>

Mean = P, SE $= \sqrt{\frac{P\cdot(1-P)}{n}}$, $z = \frac{\hat{p}-p}{SE}$

Normal if $np \geq 10$ and $(1-p)\cdot n \geq 10$

$\text{CI} = \hat{p} \pm Z_c \cdot \text{SE}$

<u>Hypothesis Testing</u>

$H_0: \leq, \geq, =$ (then change to =)

$H_a: <, >, \neq$ (< or > is a one-tailed test; ≠ is a two-tailed test)

Compare P-value to α

One-tailed test: $\alpha =$ significance level

Two-tailed test: $\alpha = \frac{\text{significance level}}{2}$

<u>Z-test</u>: SE $= \frac{\sigma}{\sqrt{n}}$, $z = \frac{\bar{x}-\mu_0}{SE}$

<u>1-sample T-test</u>: SE $= \frac{s}{\sqrt{n}}$, $T = \frac{\bar{x}-\mu_0}{SE}$

<u>2-sample T-test</u>: SE $= \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$

$T = \frac{(\bar{x}_1-\bar{x}_2)-(\mu_1-\mu_2)}{SE}$

<u>Paired T-test</u>: SE $= \frac{s}{\sqrt{n}}$, $T = \frac{\bar{x}-0}{SE}$

<u>Distribution of Sample Means</u>

Mean = μ, $z = \frac{\bar{x}-\mu}{SE}$

***σ* known** & population variable is normally distributed OR n > 30:

Use Z-test

SE $= \frac{\sigma}{\sqrt{n}}$, CI $= \bar{x} \pm Z_c \cdot \text{SE}$

σ **<u>not</u> known** & population variable is normally distributed OR n > 30:

Use T-test

<u>One sample</u>: SE $= \frac{s}{\sqrt{n}}$, $df = n-1$, CI $= \bar{x} \pm T_c \cdot SE$

<u>Two independent samples</u>: SE $= \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$, df (use technology)

CI $= (\bar{x}_1 - \bar{x}_2) \pm T_c \cdot SE$

<u>Chi-Square Tests</u>

All chi-square curves are skewed right; mean = df.

Test statistic for all Chi-Square tests: $\chi^2 = \frac{(observed-expected)^2}{expected}$

<u>One-way table</u>: $df = (r-1)$ where *r* = number of categories.

<u>Two-way table</u>: $df = (r-1)(c-1)$ where r = number of categories for one variable and c = number of categories for the other variable.

Probability Rules

a) For any event A, $0 \leq P(A) \leq 1$.
b) If *S* is a sample space, then P(*S*) = 1.
c) The sum of the probabilities of all possible disjoint events in a sample space is 1.
d) If A and B are disjoint events (no outcomes in common), then P(A or B) = P(A) + P(B).
e) If A and B are NOT disjoint events (share at least one outcome), then P(A or B) = P(A) + P(B) – P(A and B).
f) For any event A, P(not A) = 1 – P(A).
g) If P(B|A) ≈ P(B) , then A and B are independent events.
h) P(A and B) = P(A)·P(B|A).
i) When A and B are independent events then P(A and B) = P(A)·P(B)

General Calculator Directions (TI-83 or 84 Calculator)

Turn Diagnostics On

To turn diagnostics on, access the *catalog*. Press the **2nd** button, and then press the number 0. Scroll down to Diagnostics On. Press **ENTER**. Press **ENTER** again.

Enter Data into the STAT LIST Editor

To access the *list editor*, press the **STAT** button (just to the left of the arrow pad). With option 1 (EDIT) highlighted, press **ENTER**. If your lists already contain data, see *Clear Lists* below. Enter the data into one of the lists (e.g. L1).

Find the Descriptive Statistics for a Single Variable (one list)

Input the data into the STAT LIST Editor. Press the **STAT** button. Select the **CALC** menu. With option 1 (*1-Var Stats*) highlighted, press **ENTER**.

Find the Least Squares Regression Line

Enter the data into the STAT LIST editor (x data in L1 and y data in L2). Press the **STAT** button. Scroll right to the **CALC** menu. Select the **LinReg (a + b*x*)** option. Fill in the prompts on the screen.

Clear Lists

These instructions assume you need to clear data from L1. To access the *list editor*, press the **STAT** button. With option 1 (EDIT) highlighted, press **ENTER**. Scroll up until L1 is highlighted. Press the **CLEAR** button. Press **ENTER**.

Hypothesis Tests & Confidence Intervals Using a TI-83 or TI-84 Calculator

Press the **STAT** button and scroll right to the **TESTS** menu. Select the appropriate test. Fill in the prompts on the screen. **Hypothesis test hints**: select the appropriate μ option based on your alternative hypothesis, H_a, and highlight **Draw**. **Confidence interval hints:** From the TESTS menu, make sure you select an "Interval" or "Int" test. Enter the confidence interval as a decimal number (area) NOT a percentage. For the two-sample T interval, make sure NO is highlighted for the **Pooled:** option.

Finding the Standard Error: $S_e = \sqrt{\frac{\text{SSE}}{n-2}}$ (TI-83 or 84 Calculator)

Find the *least squares regression equation* (see directions above).

Populate L3 with the *predicted values* from your regression equation, go to L3 and scroll up until L3 is highlighted at the top. Enter your regression equation and substitute **L1** for x.

Populate L4 with the predicted errors, and populate L5 with the "squared errors" (also known as the "SE").

L1	L2	L3	L4	L5
Values of x.	The **observed** values of y.	The **predicted** values of y.	The predicted **errors** (a.k.a. the residuals).	The **SE**, i.e. the *squared errors*.

To sum the squared errors in L5; return to the home screen, press the **2nd** button and then **LIST** to access the list menu. Select the MATH submenu. Then **sum**(. To enter L5, press **2nd** and then the number 5. Close the parentheses and press ENTER. You now have SSE (the sum of the squared errors).

You are now ready to use the remainder of the formula, $S_e = \sqrt{\frac{\text{SSE}}{n-2}}$, to find the standard error, S_e.