First Examination Study Guide

1. The "anatomy" of data (i.e., observations and variables, quantitative and categorical variables).
2. Understand *samples* versus *populations*.
3. Understand *statistics* versus *parameters*.
4. Understand *descriptive* versus *inferential* statistics.
5. What is meant by a *distribution*?
6. Be able to compute *frequency*, *relative frequency*, and *cumulative relative frequency* given a small set of observations.
7. Understand how a *dot plot* and a *histogram* are constructed from data.
8. Be able to compute a *mean*, *median*, and *mode* given a small set of observations. Note that you should also know how to compute a mean using a distribution that gives the values of the variable and their relative frequencies.
9. Be able to compute a *variance* and *standard deviation* given a small set of observations, and the *interquartile range* (if given Q_3 and Q_1) and *range* given the five-number summary.
10. Understand how to construct and plot a *cumulative distribution*.
11. Know how to find percentiles (approximately) from a plot of the cumulative distribution.
12. Know how a *box plot* is constructed from a *five number summary*.
13. Know the terms for the *shape* of the distribution of a quantitative variable.
14. Know how the shape of normal distribution is related to its *mean* and *standard deviation*.
15. Be able to apply the *empirical rule* to a normal distribution.
16. Know how to compute and interpret z-scores.
17. Know how to identify outliers using percentiles.
18. Know how to identify outliers in normal distributions using the mean and standard deviation.
19. Know how to identify outliers using the five number summary (specifically, Q_1 and Q_3).
20. Understand what it means to say that a summary measure is resistant, and which summary measures we have discussed that are resistant and which are not.
21. Understand what is meant by the *margin of error*.
22. Understand what is meant by *statistically significant*.
23. Be able to identify the *explanatory* and *response* variables in a study.
24. Understand the three basic kinds of studies: a *survey*, an *experiment*, and an *observational study*.
25. Be sure you understand the notation (i.e., symbols) we have used so far (e.g., n, $\bar{x}$, s, s^2, Q_1, Q_2, Q_3).

Formulas/expressions you should understand when and how to use.

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}, \quad \bar{x} = \sum_{x} xr(x), \quad s^2 = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}, \quad s = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}}$$

$$z = \frac{x - \bar{x}}{s}$$

$$\text{range} = \max - \min, \quad \text{IQR} = Q_3 - Q_1$$

$$x < \bar{x} - 2s, \quad x > \bar{x} + 2s$$

$$x < Q_1 - 1.5 \times (Q_3 - Q_1), \quad x > Q_3 + 1.5 \times (Q_3 - Q_1)$$