

OFFICIAL MIDTERM 1 SYLLABUS

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Here's an "official" midterm syllabus that I dug up from Canvas. Naturally, we covered different content in class, and perhaps used different terminology.

Some critiques I have of the following list include:

- *it's written like a series of small recipes, and uses "pseudo-mathematics",*
- *it's outdated,*
- *it's totally dependent on the TI-84.*

However, I want y'all to ace the midterm, so let's have a "cautious" look at the material together. You should check the trello board <https://trello.com/c/j6y05cHj> if you want a midterm outline that you can actually read and study from.

*I do **NOT** want to see you write like this. -Colton*

1. CONTENT ON MIDTERM 1

1. Sampling Techniques
 - Stratified
 - Clustered
 - Simple random sample (SRS)
 - Systematic
2. Classifying Variables
 - Quantitative
 - Qualitative
3. Levels of Measurement
 - Nominal
 - Ordinal
 - Interval
 - Ratio
4. Statistics vs. Parameters
 - Samples vs. statistics
 - Populations vs. parameters
5. Experiments vs. Observational studies
 - Control vs. treatment groups
 - Variable = what we are measuring
 - Placebo

6. Histograms
 - Quantitative
 - Class width
 - Max – Min divided by number classes (round up to nearest whole number)
 - Midpoint = middle of class
 - Class boundaries
 - Subtract 0.5 from lower limit
 - Add 0.5 to upper limit
7. Other graphs/charts
 - Ogive vs. time series
 - Circle graph
 - Mutually exclusive portions of the pie ONLY
 - Bar graph vs. pareto
 - Stem & leaf
 - Box & whisker
8. Shapes of distributions
 - Mound/symmetric
 - Skewed
 - Uniform
 - Bimodal
9. Frequency tables
 - L1 = data points
 - L2 = frequency of each data point
10. 5% trimmed mean
 - Determine n (number of data points)
 - $N * 0.05$ (yields number to trim off of top and bottom)
 - Re-compute mean using 1-var stats
11. Weighted averages
12. Basic Stats
 - Mean
 - Median
 - Quartiles (Q1, Q3, IQR)
 - Min/Max
 - Mode
13. Coefficient of variation
 - σ / μ , then convert to % (aka x100)
 - What % of the mean is the standard deviation
14. Chebyshev's Theorem
 - $1 - 1/k^2 = \%$ of data that will lie between k standard deviations
 - at least 75% lies within 2 standard deviations

15. Probability

- Mutually exclusive events vs. independent events
 - Mutually exclusive = add to 1
 - Independent = one thing doesn't affect probability of another thing
- With vs. without replacement & how that affects 2-component probability problems
- Sample space $\{x, y, z\}$
- $P(A)$ vs. $P(A)^c$
- sum of probabilities always = 1
- Common examples:
 - 6 sided die
 - 52 deck of cards
 - Roulette
- “Given” probabilities & contingency tables
- $P(A \text{ or } B)$ vs. $P(A \& B)$
- Continuous vs. discrete random variables
- Probability distribution tables
 - Calculate average or expected value & st. dev. based on probability distribution

16. Odds

- odds for = ways to get what you want : ways to not get what you want
- Odds against = reverse
 - Also called “betting odds”
- Relation to probability
 - If odds are $X:Y$, $X + Y$ = denominator of probability expression

17. Binomials

- $N, P, R(X)$ notation
- Binompdf = EXACT number of outcomes
- Binomcdf = all other scenarios
 - Calculator counts from 0 to number you put in for x
 - Use binomcdf for following scenarios:
 - * “At most x ”
 - * “ X or less”
 - * “Fewer than x ”
 - Must do $1 - \text{binomcdf}$ for the following scenarios:
 - * “At least x ”
 - * “ X or more”
 - * “Greater than x ”
- Rules for using binomials
 - Independent events/trials
 - Only 2 outcomes (success or failure)
- Using table function
 - Y = binomial function ($X, p, r,$)
 - 2nd, table
 - Determine correct N for probability given

18. Normal Distributions

- Normal vs. Standard Normal
- Symmetrical properties
- Empirical rule
 - 68% within 1σ , 95% within 2σ , 99.7% within 3σ of μ
- Z-scores (Negative vs. positive z-scores and how they relate to μ)
 - $Z = \frac{x - \mu}{\sigma}$
- Find probability/area given Z-score or x-value (Normalcdf)
- Find Z-score given area (invNorm)

19. Control Signals

- 9 consecutive values are above mean or 9 consecutive values are below mean
- Any value is outside of 3σ (+/-)
- 2 of 3 consecutive values are between +/- $2-3\sigma$

20. Central Limit Theorem

- As n increases, \bar{x} distribution approaches x normal distribution
- Need $n \geq 30$ if we don't know our original distribution is normal

2. CALCULATOR FUNCTIONS

1. Inputting data into lists (L1, L2)
2. 1-var stats
3. Binompdf
4. Binomcdf
5. Table function to find N for binomials
6. Normalcdf
7. InvNorm