

Biometry – STAT 02.280 - Science 332
TR 9:25-10:40am (class), F 9:25am-12:05pm (lab)
 Rowan University – Fall 2007

| Topics Covered | | | | |
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| Date | Day | Topics & Midterms | Sections | Pages |
| T, S4 | L1 | Introduction to Lecture part of course, collect <i>First Day Survey</i> data, overview of types of data, bar charts and dotplots. Find your TI-83/84 or TI-89 calculator. | 1.1-1.2, 2.8a; 2.1, 2.2a. | 1-8, 57-61; 9-11, 12- 14. |
| R, S6 | L2 | Stem-and-leaf plots (a graph for quantitative data 'by hand'). | 2.2b. | 18-20. |
| F, S7 | B1 | Topics: Introduction to Lab part of course. Pre-test, questions and class discussion. Introduction to JMP and using it to make qualitative graphs (bar, pie & segmented bar charts), interpreting them, and using JMP to make histograms. Exercises: guided questions w.r.t. <i>First Day Survey</i> data, our data. Assignment: <ul style="list-style-type: none"> • Answers to lab questions & textbook problems. • Collect <i>The Survey</i> data from 5 other people. Due 9/13. • Collect 50 pennies (two sets of 25) and record their ages for Lab #3. Due 9/21. • Collect cupholders (holds 4 cups) for Lab #9. | 2.2, 2.3. | JMP notes, 12, 14-18. |
| T, S11 | L3 | Interpreting quantitative graphs w.r.t. center, spread, shape, etc. (dotplots, stem-and-leaf plots, histograms). | 2.3. | 21-24. |
| R, S13 | L4 | Basic probability (complements, trees diagrams, additive rule). | 3.3, 3.4. | 78-87. |
| F, S14 | B2 | Topics: Measures of center and variability for numerical data, coefficient of variation, Empirical Rule, z-score, the boxplot. Exercises: guided questions using "Survey Data". Assignment: Answers to lab questions & textbook problems. | 2.4-2.6, 4.3. | 26-48, 125- 126. |
| T, S18 | L5 | Additive rule, conditional probability. | 3.5. | 87-92. |
| R, S20 | L6 | Independence, density curves (& the normal distribution). | 3.6, 4.1-3a, notes. | 93-95, 119- 124. |
| F, S21 | B3 | Topics: Random sampling using data and <i>JMP</i> . Scatterplot and time plots (was in Lab 2). [Reinforce skills: data graphing & interpretation, & presentation.] Exercises: Random rectangles (egg clusters!), sampling error & estimation. Data from the literature to demonstrate bimodality. <ul style="list-style-type: none"> • Assignment: Answers to lab questions & textbook problems. Sample from your pennies: 5, 10 & 25 at a time; for each set of 25. Data and calculations due Thur. 9/27! (Tues 9/25 if possible) | 3.2, 5.1, 5.3, 12.1, notes. | 71-77, 149-151, 157-163, 525-527. |
| T, S25 | L7 | Areas and percentiles for the general normal distribution with calculator. | ≈4.3b. | <i>Notes.</i> |
| R, S27 | L8 | The Central Limit Theorem (C.L.T) for the sample mean. | 5.1, 5.3&4. | 149-151, 157-169. |
| F, S28 | B4 | Topics: <i>C.L.T. continued from lecture.</i> <u>Experimental design:</u> general terminology & discussion on types | 5.4, 8.1-5. | 167-169, 309-337. |

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| | | of designs. Exercises: <i>Cents and the C.L.T.</i> (<u>ABS</u>) continued; application of C.L.T. to young tomato plants; recognizing experimental designs. Assignment: Answers to lab questions, textbook problems, find a research paper & discuss the experimental design. | | |
| T, O2 | L9 | Midterm Exam 1. | | |
| R, O4 | L10 | Confidence intervals (CIs) for a mean (for unknown s.d.). | 6.1-6.3. | 179-193. |
| F, O5 | B5 | Topics: Collecting and plotting data from different distributions common in biology (including when you tend to find each kind of distribution). Exercises: Variability and Natural Selection in Populations of Wood Lice; collect data from outdoors related to trees and/or seeds. Distributions: Bernoulli, binomial, Poisson; uniform, normal, lognormal, exponential. Assignment: <ul style="list-style-type: none"> • Readings for next lab discussion (posted on Bb-CE/WebCT) • Collect 20 oak leaves for next lab. • Answers to lab questions. | <i>Notes.</i> | <i>Notes</i> |
| T, O9 | L11 | CIs for a mean: finding the sample size for a given SE, conditions for validity, testing for normality (& normal probability plot). | 6.4-6.5, 4.4. | 197-204, 133-139. |
| R, O11 | L12 | Sampling distribution for the sample proportion (exercise to illustrate), CI for the population proportion, $p \dots$ | 5.2, 6.6. | 151-155, 206-211. |
| F, O12 | B6 | Topics: One-sample t CIs for the population mean & population proportion, finding sample sizes needed for the desired SE. Linear transformations. <u>Experimental design</u> : random block designs & and discussion of examples in the primary literature (see last lab). Exercises: Measurements on acorns. Assignment: Answers to lab questions & answers to questions about the reading on block designs. | 6.2-6.4, 6.6, 2.7, 8.3-8.4. | 185-198, 206-211, 50-55, 317-332. |
| T, O16 | L13 | CI for p & finding the sample size for desired SE.. Testing for normality (& normal probability plot). | 6.6, 4.4. | 206-211, 133-139. |
| R, O18 | L14 | Hypothesis tests for the mean, developed with known s.d. (z -test) | <i>Notes.</i> | <i>Notes.</i> |
| F, O19 | B7 | Topics: Two-sample t -confidence intervals for the difference between two means, with <i>JMP</i> . Concepts of hypotheses. Writing formal biological lab reports. <u>Experimental design</u> : discussion of confounding factors in data. Exercise: Heart & pulmonary functions. Assignment: Full lab report (due in two weeks). | 7.1-7.3. | 219-231. |
| T, O23 | L15 | \dots P -value, Type I and Type II error. | Notes, 7.5. | 252-254. |
| R, O25 | L16 | Midterm Exam 2. | | |
| F, O26 | B8 | Topics: One-sample t -tests and two-sample t -tests. P -values, Type I and II errors. Exercises: One-sample t -test, two-sample t -test: Dermatoglyphics. Assignment: Answers to lab questions. | <i>Notes,</i> 7.4-7. | <i>Notes,</i> 234-271. |

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| T, O30 | L17 | Chi-square test for goodness of fit (Poisson and penny ages) & hypothesis test for one proportion (using chi square g.o.f.). | 10.1. | 391-399. |
| R, N1 | L18 | Chi-square test for independence vs. homogeneity, and HT for two population proportions. | 10.2-10.3, 10.5. | 402-419, 428-432. |
| F, N2 | B9 | Topics: Blocking in the paired design. The paired <i>t</i> -test. Experimental design: recognition of confounding factors in experiments. Exercises: Ruler drop, thermochrons, set up duckweed (Lab 12). Assignment: <ul style="list-style-type: none"> • Take home duckweed and begin daily data collection • Readings for next lab on WebCT • Answers to lab questions & textbook problems. | 9.1-9.3, 9.6-9.7, 8.2. | 347-362, 377-384, 313-314. |
| T, N6 | | No classes, Election Day | | |
| R, N8 | L19 | Confidence intervals for the difference between two population proportions. | 10.7. | 439-440. |
| F, N9 | B10 | Topics: Chi-square tests (goodness of fit and tests of independence). Fisher's exact test (small sample size, doesn't meet assumptions). Exercises: Pretest for next lab (on biomagnifications), collect data on eye-color, <i>Survey Data</i> (e.g. favorite type of music vs. gender). Assignment: <ul style="list-style-type: none"> • Continue collecting data from duckweed. • Answers to lab questions & textbook problems. | 10.1-10.5. | 391-432. |
| T, N13 | L20 | Scatterplots & Correlation. | 12.1, notes, 12.5. | 525-527, 555-560. |
| R, N15 | L21 | Least squares line and descriptive simple linear regression (SLR). | 12.2-12.3. | 527-547. |
| F, N16 | B11 | Topics: Interpretation of graphs in the primary literature; biomagnification as an example. Scatterplots and line plots. Exercises: Biomagnification exercise. Assignment: <ul style="list-style-type: none"> • Continue collecting data from duckweed. • Short write-up on biomagnification data & interpretation. | Notes. 12.1. | Notes. |
| T, N20 | L22 | Midterm Exam 3 | | |
| R, N22 | | No Classes, Thanksgiving vacation | | |
| F, N23 | | No Lab, Thanksgiving vacation | | |
| T, N27 | L23 | Inference in simple linear regression (slope, $\mu_{Y X}$, $Y X$). | 12.4. | 548-552. |
| R, N29 | L24 | One-way ANOVA. | 11.1-11.4. | 463-481. |
| F, N30 | B12 | Topics: One-way and/or two-way analysis of variance (ANOVA). Graphs, analyzing, interpreting and presenting data and results, verifying conditions. Exercise: Duckweed. Point out this is actually blocked over student (randomized block design). Assignment: Full lab report on the duckweed experiment (<i>due Fri Dec 14</i>). | 11.1-11.6. | 463-497. |
| T, D4 | L25 | Multiple comparisons: Tukey Kramer HSD. | ≈11.8. | Notes. |

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| | | Two-way ANOVA ... | 11.6. | 487-497. |
| R, D6 | L26 | ... Two-way ANOVA. Wilcoxon-Mann-Whitney test. | 11.6. 7.11. | 487-497, 288-296. |
| F, D7 | B13 | Topics: Nonparametric statistics: when these tests are necessary, and when parametric statistics cannot be used. Wilcoxon-Mann-Whitney test & Kruskal-Wallis test. Exercises: Wilcoxon-Mann-Whitney test on jumping frogs data (<i>ABS</i>) and Kruskal-Wallis test on duckweed data. Assignment: Answers to lab questions. | 7.11, Notes. | 288-296, notes. |
| T, D11 | L27 | Kruskal-Wallis test & <i>Student evaluations</i> . | <i>Notes</i> . | <i>Notes</i> . |
| R, D13 | L28 | R^2 . | 12.5. | 553-555. |
| F, D14 | B14 | Topics: Review of hypothesis tests (HTs) covered in the course, and constructing a flow chart for when to use which HT. <i>Student evaluations</i> . Exercises: Applying the flow chart to 3 situations. Assignment: none. | | |
| T, D18 | | Exam 4 & Replacement Exam (TBA) | 10:15am – 12:15am | |

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| Stat Instructor: (≈ lectures) | Dex Whittinghill Mathematics | Phone: (856) 256-4500 x3879 e-mail: whittinghill@rowan.edu | Office: ROB 228G (2 nd floor, Math Suite) |
| Bio Instructor: (≈ labs) | Courtney Richmond Biological Sciences | Phone: (856) 256-4500 x3555 e-mail: richmond@rowan.edu | Office: Science Hall 256D |

Required Text: *Statistics for the Life Sciences*, 3rd edition with CD-ROM. By Myra L. Samuels and Jeffrey A. Witmer (2003). Pearson/Prentice Hall, Upper Saddle River, NJ. ISBN 0-13-243784-8. This package includes the Student Solutions Manual by Jeffrey Witmer (2006) for free!

| Overall Grading Scheme | | | |
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| | Full Lab Reports (2 @ 15 & 25) | 40 pts | 6.7% |
| | Other Lab Assignments (11 labs) | 110 pts | 18.3% |
| | Lab total: | 150pts | 25% |
| | Lecture Attendance & Participation (LA&P) Grade | | +/- 1% |
| | Homework | 50pts | 8.3% |
| | Exams 1, 2 & 3 @ 100 ea. (or a Replacement Exam?) | 300pts | 50.0% |
| | Fourth exam | 100pts | 16.7% |
| | Lecture total: | 450 pts | 75% |
| | Grand Total | 600pts | 100% |

Target Grading Scale: A 90-100; B 80-89; C 70-79; D 60-69; F 59 and below. I also give '+' and '-'.

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