Introduction to Statistics, Spring 2019

Course Syllabus

Note: the instructor may make changes to this syllabus throughout the semester.

Course	Introduction to Statistics (MA-005-1), 2:00–3:05 p.m., MWF, 4 units
Class Web	http://www.westmont.edu/~howell/courses/ma-005
Instructor	Dr. Russell W. Howell
Office	Winter Hall for Science and Mathematics, Room 307
LOCATION:	Refer to the campus map: http://www.westmont.edu/_visitors/pdf/map.pdf
PHONE:	(805) 565-6178 (from on-campus, just dial 6178)
HOURS:	Monday: 2:30–4:00 p.m., Wednesday: 3:30–5:00 p.m., Thursday: 1:30–2:30 p.m., Friday: 1:30–3:00 p.m.; and any time you happen to find me in and available.
E-mail	howell 'at' westmont 'dot' edu
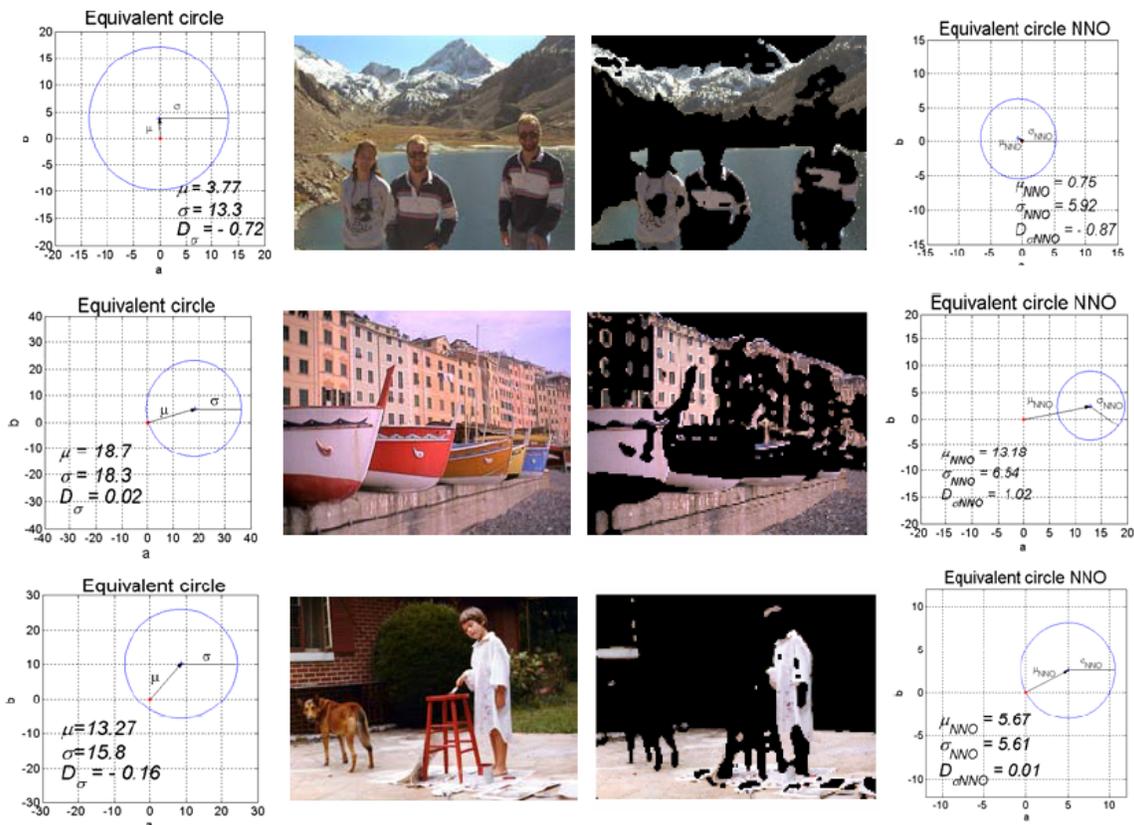
Color Balancing of Digital Photos Using Simple Image Statistics
(See http://www.ivl.disco.unimib.it/papers2003/Color%20BalancingPR.pdf)

Required Resource: *Statistics Workbook* (available only from the bookstore)

Overview and Objectives
These days the case can easily be made that knowledge of statistics is essential for a liberally educated person. More than ever effective members of society need the ability to use mathematical models, and interpret data via statistical methods. Thus, even if you never use statistics "on the job" after you leave Westmont, you will be equipped to make informed judgments on the myriad of issues you are likely to encounter. This course also will adequately prepare those who need a knowledge of statistics for more advanced work. The daily schedule is on .

Statistics and Westmont's GE
This course satisfies Westmont's Common Inquiries Abstract Reasoning (AR) requirement because it focuses on critical and analytical reasoning about non-empirical, abstract concepts, objects and structures. By successfully completing this course you will have learned to understand and evaluate abstract arguments and explanations, analyze abstract concepts, and solve abstract problems.

This course also satisfies two Common Skills GE Requirements: Quantitative and Analytical Reasoning (QAR), and Writing-Intensive (WI). QAR emphasizes the understanding and communication of numerical data. This emphasis includes the computation and interpretation of summative statistics, and the presentation and interpretation of graphical representations of data. Writing intensely is the means by which the ideas of statistics can be mastered. You will have a series of eight comprehensive assignments that will be evaluated, returned, reworked (by you), and regraded. The total output will depend on your writing style, but will likely be in the range of 32–48 pages (4–6 pages per assignment). For details of outcomes expected from courses satisfying these GE requirements, as well as how these requirements align with the program learning outcomes of the Department of Mathematics and Computer Science, see .

Writing Assignment Details
Each writing assignment is due at the beginning of class. Assignments 1 and 10 will be graded in a traditional manner, but Assignments 2 through 9 and will be graded as follows: each problem is worth 10 points and will receive a score of either 10 (perfect), 9 (some trivial errors), 5 (some mistakes), or 0 (no credit, resulting from a very poor attempt). Those problems with a score of 5 may be turned in for re-grading. Problems submitted for re-grading must be completed on a separate sheet of paper and turned in attached to the original homework paper. Correctly redone problems will receive a score of either 9 points (perfect) or 8 points (some slight errors). If the re-graded assignment still has significant errors, the score will remain at 5. If a problem has parts (a, b, etc.), only those parts that have errors need be redone, but the entire part must be rewritten. Problems receiving a score of 0 may not be redone, so you should give your best effort on each assignment the first time around.

As college students you are expected to turn in careful work that is neat and well-organized. It is unacceptable to scribble answers around a computer printout. Such printouts may be used freely, but any graphs, charts, etc., from them that you wish to include in your assignment should be pasted into it in an appropriate way. Homework papers must be stapled together, with each problem done in order, and with at least three lines of space between problems. The paper you use should be standard-sized (8.5×11 inches). Paper torn out of a spiral notebook looks ragged, and is not acceptable. In college mathematics courses it is not sufficient merely to have "the correct answer." Points will be deducted from your final score if your work is unclear, or if you use improper notation. So, a student taking a similar course at another institution would be able to understand your work. Late homework assignments will not be accepted with the exception that

special consideration may be given to one suffering from a prolonged illness or other hardship.

Exams
There will be three in-class exams during the course. Each one will cover topics from the workbook, class lectures, and assignments for the given period of time. The workbook contains formula sheets appropriate for each exam. If you wish, you may bring the relevant pages with you to the exam. All exams are to be taken either on their scheduled dates or earlier. If you are to miss an exam for an academic reason you must make arrangements ahead of time if you wish to take it. No exam may be taken after the scheduled date unless a compelling reason resulted in advanced permission to do so. There is a comprehensive two-hour final scheduled on Monday, May 1, 12:00–2:00 p.m. Please note the date of the final exam, and that students are not allowed to take exams early to accommodate travel schedules. To view a complete final schedule as well as Westmont's final exam policies visit the following link: http://www.westmont.edu/_offices/registrar/exam-schedule.html.

Academic Accommodations
Students who have been diagnosed with a disability (learning, physical/medical, or psychological) are strongly encouraged to contact the Disability Services office as early as possible to discuss appropriate accommodations for this course. Formal accommodations will only be granted for students whose disabilities have been verified by the Disability Services office. These accommodations may be necessary to ensure your full participation and the successful completion of this course. For more information contact Sheri Noble, Director of Disability Services (565-6186, snoble@westmont.edu), or visit the website http://www.westmont.edu/_offices/disability.

Academic Dishonesty
You are *encouraged* to work together on assignments. The mere copying of another's work, however, is dishonest. Homework papers judged to be too nearly identical will result in a grade of zero for that assignment with no possibility for makeup. Any form of dishonesty on the exams will result in a failing grade for the course, whether for giving information or for taking it. For further information concerning Westmont's policies on academic dishonesty visit the following link:
http://www.westmont.edu/_offices/registrar/academic_policies/academic-dishonesty.html.

Attendance and Class Participation
You are expected to attend every class. More than three unexcused absences throughout the semester will be considered as a poor performance. Attendance will interact with your class participation either to positively or negatively affect your grade. In assessing class participation questions such as the following will be asked. Did you come prepared for class by reviewing previous lectures? Did you actively participate in class by using the workbook when requested, and by performing calculations when requested? Were you attentive and mentally alert?

Final Grade
Your final grade will be weighted in accordance with the following percentages.

Writing Assignments	20%
Exams	60%
Final	20%
Attendance and participation	Refer to the following example

Example: Suppose you had a low **A** for your homework average, a middle **C** on tests, and a high **D** on the final. Considering the weightings of each category your final grade would likely be a **C+**. But if you had perfect attendance and excellent class participation your grade could be raised to a **B−**, or in exceptional cases to a **B**. The reverse applies to poor attendance or poor participation.

Course Outline

Date	Topic
Jan 7	Course introduction; Excel introduction; data classification
9	Becoming proficient with Excel (computer lab practice)
11	Excel review; stemplots
14	Measures of central tendency; 5-number summary; boxplots; **Assignment 1 due**
15	Data Collection with P3 support staff (Murchison Gym; 6:30–7:30 a.m.)
16	Histogram; frequency polygon;
18	Sigma notation; measures of dispersion
22	Review; percent change; expected value; **Assignment 2 due**
23	The normal distribution; z-scores
25	Ogive; transformations of data
28	Probability theory and its applications; **Assignment 3 due**
30	Review
Feb 1	**Exam 1**
4	The normal approximation to the binomial distribution
6	Central Limit Theorem, confidence intervals for means (known population variance)
8	Confidence intervals for proportions; **Assignment 4 due**
11	Confidence intervals for means (unknown population variance)
14	Review; One-sample t test
16	A primer on statistical designs; **Assignment 5 due**
18	Presidents Day Holiday
20	Two-sample t test (independent design)
22	Two-sample t test (correlated design)
25	Applying the t test
27	Correlation and the Pearson r; **Assignment 6 due**
Mar 1	Introduction to non-parametric tests: Mann-Whitney
4	Review
6	**Exam 2**
8	Test for significance of the Pearson r and Spearman rho
11–15	Spring Recess
18	Review; Chi-square test: goodness-of-fit
20	Chi-square test: independence **Assignment 7 due**
22	Introduction to regression analysis
25	Regression analysis
27	Regression analysis; **Assignment 8 due**
29	Regression analysis
Apr 1	Regression Analysis
3	The F-distribution; introduction to the analysis of variance
5	One-way analysis of variance, independent samples **Assignment 9 due**
8	Review
10	**Exam 3**
12	One-way analysis of variance, correlated samples
15	Tukey's HSD test
17	ANOVA Review; **Assignment 10 due**
19	Easter Recess
22	Easter Recess
24	Review and preparation for the final exam
26	Study Day
May 1	**Final Exam, Wednesday 12:00–2:00 p.m.**

Department of Mathematics and Computer Science
Program Learning Outcomes Outcomes, and Westmont's GE

We have many goals for students taking courses in the Department of Mathematics and Computer Science. Some of them are specific to particular courses, but almost all are examples of our department's Program Learning Outcomes (PLOs). Some are also connected to Westmont's General Education Requirements.

Mathematics and Computer Science Program Learning Outcomes

1. **Core Knowledge:** Students will demonstrate knowledge of the main concepts, skills, and facts of the discipline of mathematics.

2. **Communication:** Students will be able to communicate mathematical ideas following the standard conventions of writing or speaking in the discipline.

3. **Creativity:** Students will demonstrate the ability to formulate and make progress toward solving non-routine problems.

4. **Christian Connection:** Students will incorporate their mathematical skills and knowledge into their thinking about their vocations as followers of Christ.

Course Outcomes

1. Learn particular concepts and skills of statistics (PLO1);

2. Get experience writing clearly and solving problems creatively (PLO2, PLO3);

3. Acquire skills needed for working with a team (PLO2, PLO4);

4. Think about connections between your mathematical skills and the Christian faith (PLO4);

5. General Education: This course satisfies Westmont's Common Inquiries Abstract Reasoning (AR) GE requirement because it focuses on critical and analytical reasoning about non-empirical, abstract concepts, objects and structures. You will learn to understand and evaluate abstract arguments and explanations, analyze abstract concepts and solve abstract problems.

   This course also satisfies two Common Skills GE Requirements: Quantitative and Analytical Reasoning (QAR), and Writing-Intensive (WI). QAR emphasizes the understanding and communication of numerical data. This emphasis includes the computation and interpretation of summative statistics, and the presentation and interpretation of graphical representations of data. Writing intensely is the means by which the ideas of statistics can be mastered. You will have a series of eight comprehensive assignments that will be evaluated, returned, reworked (by you), and regraded. The total output will depend on your writing style, of course, but will likely in the range of 32–48 pages (4–6 pages per assignment). Students successfully completing this course will thus have demonstrated that they can:

   - analyze graphs (QAR);
   - manipulate algebraic expressions (QAR);
   - transform functions (QAR);
   - solve equations (QAR);
   - identify instances of abstract reasoning about abstract objects or concepts (in the form of arguments, explanations, proofs, analyses, modeling, or processes of problem solving) (AR);
   - construct an instance of valid reasoning about abstract objects or concepts (in the form of arguments, explanations, proofs, analyses, modeling, or processes of problem solving) (AR);
   - distinguish valid forms of reasoning about abstract objects or concepts (in the form of arguments, explanations, proofs, analyses, modeling, or processes of problem solving) from invalid and/or fallacious forms of reasoning (AR).
   - Write a clear central message with insightful arguments and supporting reasons to accept them (WI).