# Course Description

Introduction to descriptive and inferential statistics with applications to educational and psychological research: frequency distributions, probability, binomial and normal distributions, graphic comparisons, correlation, chi square, analysis of variance, and distribution.

# University Learning Outcomes (ULO)

* **ULO1:** Knowledge of Human Cultures and the Physical and Natural World
* **ULO2:** Intellectual and Practical Skills
* **ULO3:** Personal and Social Responsibility
* **ULO4:** Integrative and Applied Learning­
* **ULO5:** Immersed in the Critical Concerns of the Sisters of Mercy of the Americas

# Program Learning Outcomes (PLO)

* **PLO1**: Express an appreciation and understanding of a variety of aesthetic, literary, cultural and ideological traditions.(ULO 2, 3)
* **PLO2**: Engage meaningfully in a community of scholarship through inquiry, research and the communication of ideas. (ULO 2, 4)
* **PLO3**: Evaluate historical, political, economic and scientific data while recognizing the interrelatedness of events and processes. (ULO 1, 2, 3, 4)
* **PLO5**: Reflect upon the relationship of the Divine to the human experience. (ULO 2, 3, 4)
* **PLO6**: Examine and understand the dynamics of individual and group behavior. (ULO 2, 4)
* **PLO7**: Demonstrate an understanding of quantitative reasoning. (ULO 1, 2, 4)
* **PLO8**: Engage in constructive activities of service to the community in light of the Gospel tradition as experienced through the Mercy charism that shapes the College. (ULO 2, 3, 4)

# Course Learning Outcomes (CLO)

* **CLO1**: Describe the basic concepts of statistics.
* **CLO2**: Differentiate between types of statistical methods and data.
* **CLO3:** Work with a variety of statistical methods to interpret data.
* **CLO4**: Analyze statistical data in real-life and medical environments.
* **CLO5**: Perform statistical tests and analyses in nursing contexts.

# Student Expectations

Students are expected to:

* Ask probing and insightful questions related to course content.
* Make meaningful and relevant connections and application to their own learning process.
* Be productive and contributing members of class discussions.

# Academic Integrity

Academic integrity is fundamental to the activities and principles of a university. All members of the academic community must be confident that each person’s work has been reasonably and honorably acquired, developed, and presented. Any effort to gain an advantage not given to all students is dishonest, whether or not the effort is successful. The academic community regards breaches of the academic integrity rules as extremely serious matters. Sanctions for such a breach may include academic sanctions from the instructor, including failing the course for any violation, disciplinary sanctions ranging from probation to expulsion. When in doubt about plagiarism, paraphrasing, quoting, collaboration, or any other form of cheating, consult the course instructor.

# Required Course Materials

Gravetter, F. J., & Wallnau L. B. (2013). *Statistics for the behavioral sciences* (9th ed.). Boston, MA: Cengage Learning.

ISBN: 978-1-111-83099-1.

# Student Accessibility Services

Gwynedd Mercy University is committed to providing reasonable accommodations for all persons with disabilities.  If you have a disability-related need for modifications or reasonable accommodations in this course, please contact the office of Student Accessibility Services located in Counseling Services, The Griffin Complex; call [215-646-7300](tel:215-646-7300)ext. 427, or visit the Student Accessibility Services web page [www.gmercyu.edu/student-life/campus-resources/student-accessibility-services](http://www.gmercyu.edu/student-life/campus-resources/student-accessibility-services) .  If the documentation supports your request for reasonable accommodations, the Student Accessibility services office will provide you with an accommodation letter. Please share this letter with me as early in the course as possible so that we may discuss the accommodations.

If you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please inform me immediately.

# Suggested Point Values

|  |  |  |
| --- | --- | --- |
| **Assessment** | **Point Value** | **Due** |
| **Week 1** |  |  |
| Discussion: General Knowledge | 20 |  |
| Case Study: A Case for Each | 20 |  |
| Case Study: Symmetry Versus Skewed: A Mini Experiment | 40 |  |
| An Introduction to Statistics | 60 |  |
| Frequency Distributions | 60 |  |
| **Week 2** |  |  |
| Blog: Standard Deviation Video Critique | 20 |  |
| Blog: Standard Deviation and *Z*-Scores | 20 |  |
| The Basics of Statistics | 60 |  |
| Standard Deviation and *Z*-Scores | 60 |  |
| Final Project Preparation: Research Question and Dataset | 20 |  |
| **Week 3** |  |  |
| Wiki: M&M Probability and the Central Limit Theorem | 60 |  |
| Probability and Hypothesis Tests | 90 |  |
| Final Project Preparation: Statistical Analysis | 10 |  |
| **Week 4** |  |  |
| Wiki: Hypothesis Testing: M&M Experiment | 20 |  |
| Hypothesis Tests With Multiple Samples and Estimation | 90 |  |
| Correlation and Regression | 80 |  |
| Final Project Preparation: Graphical Analysis | 20 |  |
| **Week 5** |  |  |
| Wiki: Chi-Square Analysis: M&M Experiment | 40 |  |
| ANOVA, Chi-Square, and Binomial Tests | 90 |  |
| Blog: Final Project Synopsis | 20 |  |
| Final Project | 100 |  |
|  | **1000** |  |

**Grading Scale**

|  |  |
| --- | --- |
| **Grade** | **Range** |
| A | 93-100 |
| A- | 90-92 |
| B+ | 87-89 |
| B | 83-86 |
| B- | 82-80 |
| C+ | 77-79 |
| C | 73-76 |
| C- | 70-72 |
| D+ | 67-69 |
| D | 63-66 |
| D- | 60-62 |
| F | 59 |

# Course Schedule

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| --- | --- | --- |
| **Week** | **Start** | **End** |
| One | <insert start date> | <insert end date> |
| Two |  |  |
| Three |  |  |
| Four |  |  |
| Five |  |  |
| Six |  |  |
| Seven |  |  |

# Weekly Learning Modules

|  |  |  |
| --- | --- | --- |
| **Week One: Introduction to Statistics** | | |
| ***Learning Objectives*** | ***Alignment*** | |
| * 1. Recall basic mathematics practices and terminology. | CLO1 | |
| * 1. Describe typical statistical jargon and notation. | CLO1 | |
| * 1. Utilize rudimentary statistical equations. | CLO1, CLO2, CLO3 | |
| * 1. Evaluate simple frequency distributions. | CLO1, CLO3 | |
| * 1. Create a frequency distribution in Excel or a similar program. | CLO3, CLO5 | |
| * 1. Describe central tendency. | CLO1, CLO2 | |
| ***Resources, Activities, and Preparation***  *Utilize these resources and complete these activities in preparation for your graded assignments.* | ***Alignment*** | ***AIE*** |
| **Tutorials**  During this course, you will be asked to use and participate in various technologies to complete activities and assignments.  **Review** the tutorials available on Blackboard as needed.  **Click** the **Student Resources** button from the menu on the left. | N/A | N/A |
| **Weekly Participation and Discussion**  The purpose of the weekly discussions is to provide you with a way to synthesize the concepts presented in this course. Each week, you will respond to the discussion questions with a substantive post of 200 to 250 words that addresses all the prompts for the question by 11:59 p.m. EST of the listed due date. By the conclusion of each week, Sunday at 11:59 p.m. EST, you will make at least one substantive comment of 100 to 150 words to three of your classmates’ posts for each assigned discussion question. Your comments must further the discussion by following the RISE Model for meaningful feedback. It is recommended that you check in periodically throughout the week to ensure that you are meeting the participation requirement.  **Review** the RISE Model for Peer Feedback, located on Blackboard. | N/A | N/A |

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| **Final Project Overview**  **Resource:**   * Final Project Overview PowerPoint * Final Project Rubric   **Watch** [PSY 111: Final Project](https://vimeo.com/90909964) (3:48) and **review** the Final Project Overview PowerPoint.  Feel free to post questions, comments, or observations to share with the class in the General Q & A discussion forum. | | 5.7 | Reviews project overview & posts response = 1 hour |
| **Required Readings**  **Read** the following in *Statistics for the Behavioral Sciences*:   * Ch. 2 “Frequency Distributions” sections 2.1 to 2.4 * Ch. 3 “Central Tendency”   **Watch** “[Distribution and Skewness](http://www.educator.com/mathematics/statistics/yates/raw-data-dotplots-stemplots.php?ss=88)” (1:28)  **Fee**l free to post questions, comments, or observations to share with the class in the General Q & A discussion forum. | | 1.2, 1.3, 1.4, 1.6 | Video = 0.25 hours |
| **Assignment Preparation**  **Resource:** Week 1 Practice Homework Worksheet  In preparation for this week’s assignments, you will complete homework problems about measures of central tendency and frequency distribution. This activity will help you practice the concepts covered in your homework assignment.  **Complete** the Week 1 Practice Homework Worksheet.  **Attend** the Adobe Connect Live Session to review the problems and ask questions. | | 1.1, 1.2, 1.3, 1.4, 1.6 | Compute Math problems = 1 hours |
| ***Supplemental Resources and Activities***  *Explore these optional resources to deepen your understanding.* | | ***Alignment*** | ***AIE*** |
| **Adobe Connect Live Discussion**  **Review** [Adobe Connect Resources](https://sites.gmercyu.edu/student-resources/adobe-connect-resources/).  **Participate** in the scheduled live session with the course instructor. This session will provide an overview of the class and discuss the major assignments in the course.  **Prepare** to ask questions concerning the content of the week and the course as a whole.  *Note:* A recorded lecture will be made available to those who are unable to attend the live session. | |  | Live Discussion: lecture and discussion = 1 hour |
| **Introduction to Statistics Supplemental Resources**  **Read** the following in *Statistics for the Behavioral Sciences*:   * Appendix A * Ch. 1 “Introduction to Statistics” Sections 1.3 and 1.4   **Watch** “[Statistics intro: Mean, median, & mode](https://www.khanacademy.org/math/cc-sixth-grade-math/cc-6th-data-statistics/cc-6th-statistics/v/statistics-intro--mean--median-and-mode)” from Khan Academy. (26:06)  Feel free to post questions, comments, or observations to share with the class in the General Q & A discussion forum. | | 1.1, 1.2, 1.3, 1.4 | Video = 1 hour |
| ***Graded Assignments***  *Complete these graded assessments by the end of the week unless specified otherwise.* | | ***Alignment*** | ***AIE*** |
| **Discussion: Math Experience**  **Respond** to the following question by Thursday 11:59 p.m. (EST). Provide specific examples to support your answers:     * Welcome to PSY/111! Writea short paragraph about your experience in mathematics. Consider the following:   + When was the last time you took a math course?   + What was the highest-level math class you completed?   + What role does math play in your personal life?   + What reservations or anxieties do you have about math?     **Post** constructive criticism, clarification, additional questions, or your own relevant thoughts to three of your classmates' posts by Sunday 11:59 p.m. (EST) on Sunday. | | 1.1 | Discussion: one post and replies to three other posts = 1 hour |
| **Case Study: A Case for Each**  **Explore** the Internet or create your own examples for each central tendency below:   * An example when the mean is the most appropriate * An example when the median is the most appropriate * An example when the mode is the most appropriate   **Create** a presentation using Microsoft® PowerPoint®, Google Slides, or a similar technology that addresses the appropriate use of central tendency.   * In each of the examples you provided, why is the measure of central tendency used the most appropriate? * Why would the other two measures not be appropriate to use? * Include any sources used to find examples of central tendencies or content used in your presentation.   **Post** your presentation in the discussion forum by 11:59 p.m. (Eastern time) on Thursday. | | 1.1, 1.6 | Case study analysis & response = 3 hours  instruction |
| **Case Study: Symmetry Versus Skewness: A Mini Experiment**  **Develop** a health-related question you are comfortable asking participants in your family, circle of friends, or at work. Your question needs to include choices that are easily scored on a scale of 1 to 10.  **Ask** 20 participants the health-related question.  **Record** the answers from your participants in an Excel table.  **Create** a frequency chart of the answers from your participants using Excel. **Watch** the Excel Frequency Chart: Mini Experiment tutorial.  **Write** a 350-word response that includes the following:   * Explain the type of distribution your data has and how you know. * Explain in detail how changes to a few responses could affect your distribution.   **Submit** your summary with the attached article or a link to the article by 11:59 p.m. (Eastern time) on Sunday. | | 1.1, 1.2, 1.3, 1.6 | Case study: creation, analysis & posting = 3 hours |
| **An Introduction to Statistics**  **Resource:** Introduction to Statistics Worksheet  **Complete** the Introduction to Statistics Worksheet.  **Submit** your worksheet by 11:59 p.m. (Eastern time) on Sunday. | | 1.1, 1.2, 1.3, 1.4, 1.6 | Compute mathematical problem sets = 1 hour |
| **Frequency Distributions**  **Resource:** Frequency Distributions Excel worksheet  **Watch** “Frequency Distribution” prior to completing your assignment.  **Complete** the Frequency Distributions Excel worksheet.  **Submit** your Excel file and worksheet by 11:59 p.m. (Eastern time) on Sunday. | | 1.1, 1.4, 1.5 | Compute mathematical problem sets = 1 hour |
| **Total** |  |  | **13.25** |

# Faculty Notes

The Discussion: Math Experience should be used to understand what skills and limitations students are bringing to this course. Some students will have long periods of time since they last have taken a math course and others will have severe anxiety over the challenging material. Please utilize this information to work with students and to monitor their work more effectively. If students provide concerning information, let them know of the resources the school has to offer them to help them complete the course.

**Course Setup**

**General Questions and Discussion Forum:** This course includes a discussion forum for general questions, comments, and concerns. This forum is intended for any course-related commentary not found within a specific weekly discussion. This forum is not graded. Make sure to monitor this forum for student posts. You are encouraged to make an announcement advertising this forum and monitor and post regularly to build engagement.

**Adobe Connect:** Consider posting an announcement asking students to submit any questions or topics they'd like addressed ahead of time. The instructor can then utilize those questions that come up in the first part of the week to tailor the live Adobe Connect class session that would be scheduled toward the later part of the week. That 1-hour synchronous session will allow students the opportunity to go over any questions they had with the homework and clarify any misconceptions they have about the course content. All Adobe Connect sessions should be recorded and a link to the recording be posted to the course page so any student who misses the session can review it later in the week.

*Note:* It is the instructor’s choice as to what day they will schedule the Adobe Connect Live Session, but it is recommended that they schedule this session for Wednesday of the week so students have plenty of time to review their homework prior to the deadline on Sunday.

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| Week Two: Basics of Statistics | |  |  |
| ***Learning Objectives*** | | ***Alignment*** | |
| * 1. Calculate variance and standard deviation. | | CLO1, CLO3, CLO5 | |
| * 1. Calculate *z*-scores and standardize a distribution. | | CLO1, CLO3, CLO5 | |
| * 1. Calculate data points from a standard distribution using *z*-scores. | | CLO1, CLO3, CLO5 | |
| * 1. Evaluate data using statistical concepts like variance, standard deviation, *z*-scores, and central tendency. | | CLO3, CLO4, CLO5 | |
| * 1. Design a statistical research question that uses medical data. | | CLO1, CLO2 | |
| ***Resources, Activities, and Preparation***  *Utilize these resources and complete these activities in preparation for your graded assignments.* | | ***Alignment*** | ***AIE*** |
| **Required Readings**  **Read** the following in *Statistics for the Behavioral Sciences*:   * Ch. 1 “Introduction to Statistics” Section 1.3 * Ch. 4 “Variability” * Ch. 5“*z*-Scores: Location of Scores and Standardized Distributions” * Ch. 6 “Probability” Section 6.2   **Read** “[Research Study Design](http://www4.uwsp.edu/psych/stat/1/expdes.htm)” from Psychological Statistics at University of Wisconsin.  **Review** the “[Understanding Statistics: Statistical Language](http://www.abs.gov.au/websitedbs/a3121120.nsf/home/statistical+language)” concept articles from the Australian Bureau of Statistics.  Feel free to post questions, comments, or observations to share with the class in the General Q & A discussion forum. | | 2.1, 2.2, 2.3, 2.4, 2.5 |  |
| **Assignment Preparation**  **Resource:** Week 2 Practice Homework Worksheet  In preparation for this week’s assignments, you will complete homework problems about basic statistical concepts. This activity will help you practice the concepts covered in your homework assignment.  **Complete** the Week 2 Practice Homework Worksheet.  **Attend** the Adobe Connect Live Session to review the problems and ask questions. | | 2.1, 2.2, 2.3, 2.4, 2.5 | Live Discussion: lecture and discussion = 1 hour |
| ***Supplemental Resources and Activities***  *Explore these optional resources to deepen your understanding.* | | ***Alignment*** | ***AIE*** |
| **Variability Supplemental Resources**  **Read** “[Calculating Standard Deviation Step by Step](https://www.khanacademy.org/math/probability/data-distributions-a1/summarizing-spread-distributions/a/calculating-standard-deviation-step-by-step)” from Khan Academy.  **Watch** the following videos from the Khan Academy:   * “[Variance of a population](http://www.khanacademy.org/math/probability/descriptive-statistics/variance_std_deviation/v/variance-of-a-population)” (8:05) * “[Sample variance](http://www.khanacademy.org/math/probability/descriptive-statistics/variance_std_deviation/v/sample-variance)” (10:38) * “[Review and intuition why we divide by n-1 for the unbiased sample variance](http://www.khanacademy.org/math/probability/descriptive-statistics/variance_std_deviation/v/review-and-intuition-why-we-divide-by-n-1-for-the-unbiased-sample-variance)” (9:44) | | 2.1 | Videos = 0.5 hours |
| **Normal Distribution Supplemental Resources**    **Watch** “[Normal Distribution](http://www.khanacademy.org/math/probability/statistics-inferential/normal_distribution/v/introduction-to-the-normal-distribution)” from Khan Academy. (95:47)  **Complete** all activities in the Khan Academy module. | | 2.3, 2.4 | Video = 1.5 hours |
| **Research Study Design Supplemental Resources**  **Read** the following sections in *Statistics for the Behavioral Sciences.*   * Ch. 3 “Central Tendency” Section 3.5 * Ch. 4 “Variability” Section 4.5 | | 2.6 |  |
| ***Graded Assignments***  *Complete these graded assessments by the end of the week unless specified otherwise.* | | ***Alignment*** | ***AIE*** |
| **Blog: Standard Deviation Video Critique**  **Research** andselect three videos that explain how to calculate standard deviation. Consider the following as you select your videos.   * The explanation is either hand computation or computer program (Excel, Google Sheets). Make sure that all three videos use one of the two methods above (i.e., all three videos use a computer program or all three videos use hand computation). * You may select videos using YouTube or other video sites. * The videos need to be under 7 minutes in duration.   **Watch** and critiqueeach video.  **Write** a short critique of your videos. Include the following:   * Discuss which video you liked the best and why. Which video did you like the least? Why? * Discuss whether or not you think the person in the is knowledgeable about statistics. * Provide a link to all three videos.   **Submit** your critique with the video links by 11:59 p.m. (Eastern time) on Sunday. | | 2.1 | Reviews 3 videos & posts response = 1 hour |
| **Blog: Standard Deviation and *Z*-Scores**  **Resource:** “Who Performed Better?”  **Read** the scenario “Who Performed Better?”  **Write** a short response to each of the following prompts:   * Perform the calculation requested in the scenario. * Determine who performed better in the scenario. * Look at how the standard deviation can affect the results. * Provide an additional example of how to use this information in medicine/nursing.   **Submit** your response by 11:59 p.m. (Eastern time) on Sunday. | | 2.1, 2.5 | Case study analysis and response = 1 hour |
| **The Basics of Statistics**  **Resource:** Basics of Statistics Worksheet  **Complete** the Basics of Statistics Worksheet.  **Submit** your worksheet by 11:59 p.m. (Eastern time) on Sunday. | | 2.1, 2.2, 2.3, 2.4, 2.5 | Compute mathematical problem sets = 1 hour |
| **Standard Deviation and *Z*-Scores**  **Resource:**   * Example Excel Data * Standard Deviation and Z-Scores Excel Worksheet   **Watch** “Standard Deviation and *Z*-Scores” and review the accompanying Excel data prior to completing your worksheet.  **Complete** the Standard Deviation and Z-Scores Excel Worksheet.  **Submit** your Excel file and worksheet by 11:59 p.m. (Eastern time) on Sunday. | | 2.1, 2.3, 2.5 | Compute mathematical problem sets = 1 hour |
| **Final Project Preparation: Research Question and Dataset**  **Resource:** Final Project Rubric  **Select** a research question from the following choices:   * A correlation between a medical condition and the percentage of poverty in each state * A t-test of paired differences (repeated measures) with before and after data * A binomial test to determine if a certain procedure, medication, or rehabilitation has improved the patient * Another type of analysis as approved by the instructor   **Select** a dataset that meets the following conditions:   * The dataset must be raw, meaning little to no analysis of the data has been conducted. * The dataset should have between 50 to 200 data points.   *Note*: You may select any academically appropriate dataset. Although you are not restricted to the Internet to find your dataset, the Internet is the easiest place to find this sort of information. Two websites that could be helpful are the [Centers for Disease Control and Prevention](http://www.cdc.gov/) and [U.S. National Library of Medicine](http://www.nlm.nih.gov/).  **Submit** your research question and selected dataset to your instructor by 11:59 p.m. (Eastern time) on Thursday. | | 2.6 | Guided project, research, question creation, and dataset selection=  1.5 hours |
| **Total** |  |  | **8.5 hours** |

# Faculty Notes

The first blog is designed to help students seek out additional resources for help understanding material. They should also begin to learn about themselves and what methods best help them understand concepts. The second blog is for them to take a deeper look into how we use analysis to make decisions: a concept that will be revisited throughout the course. Professors are encouraged to really look at the topic that students are choosing for the Final Project. A poorly thought out project will have significant impact later on in this course. Understanding of their knowledge level and their topic choice will help reduce these issues. Please distributed the Rubric and directions for the Project so that students know what they will be graded on.

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| --- | --- | --- | --- |
| Week Three: Probability and Hypothesis Tests | |  |  |
| ***Learning Objectives*** | | ***Alignment*** | |
| * 1. Describe the Central Limit Theorem. | | CLO1 | |
| * 1. Calculate probabilities. | | CLO1, CLO3, CLO4 | |
| * 1. Calculate the standard error of a population. | | CLO1, CLO3, CLO5 | |
| * 1. Determine the null hypothesis and alternative hypothesis for a hypothesis test. | | CLO1, CLO3 | |
| * 1. Perform a hypothesis test to evaluate a dataset. | | CLO1, CLO3, CLO4, CLO5 | |
| * 1. Calculate a *t*-statistic. | | CLO1, CLO3 | |
| * 1. Describe the importance of sample size in a *t*-distribution. | | CLO1, CLO3, CLO4, CLO5 | |
| ***Resources, Activities, and Preparation***  *Utilize these resources and complete these activities in preparation for your graded assignments.* | | ***Alignment*** | ***AIE*** |
| **Required Readings**  **Read** the following in *Statistics for the Behavioral Sciences*:   * Ch. 6 “Probability” Sections 6.1 to 6.2 * Ch. 7 “Probability and Samples: The Distribution of Sample Means” * Ch. 8 “Introduction to Hypothesis Testing” * Ch. 9 “Introduction to the *t* Statistic” Sections 9.1 to 9.2   Feel free to post questions, comments, or observations to share with the class in the General Q & A discussion forum. | | 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7 |  |
| **Assignment Preparation**  **Resource:** Week 3 Practice Homework Worksheet  In preparation for this week’s assignment, you will complete homework problems about probability and hypothesis testing. This activity will help you practice the concepts covered in your homework assignment.  **Complete** the Week 3 Practice Homework Worksheet.  **Attend** the Adobe Connect Live Session to review the problems and ask questions. | | 3.3, 3.4, 3.5, 3.6 | Live Discussion: lecture and discussion = 1 hour |
| ***Supplemental Resources and Activities***  *Explore these optional resources to deepen your understanding.* | | ***Alignment*** | ***AIE*** |
| **Probability Supplemental Resources**  **Watch** the following from Khan Academy:   * “[Sample Variance](https://www.khanacademy.org/math/ap-statistics/summarizing-quantitative-data-ap/measuring-spread-quantitative/v/sample-variance)” (10:37) * “[Basic Theoretical Probability](https://www.khanacademy.org/math/statistics-probability/probability-library/basic-theoretical-probability/v/basic-probability)”(87:26) * “[Sampling Distribution](http://www.khanacademy.org/math/probability/statistics-inferential/sampling_distribution/v/central-limit-theorem)” (63:44)   **Watch** and **complete** all activities from the following Khan Academy modules:   * “[Compound Probability of Independent Events](http://www.khanacademy.org/math/probability/independent-dependent-probability/independent_events/v/compound-probability-of-independent-events)” (51:46) * “[Random Variables](http://www.khanacademy.org/math/probability/random-variables-topic/random_variables_prob_dist/v/random-variables)” (62:34) | | 3.1, 3.2 | Video = 3.5 hours |
| ***Graded Assignments***  *Complete these graded assessments by the end of the week unless specified otherwise.* | | ***Alignment*** | ***AIE*** |
| **Wiki: M&M Probability and the Central Limit Theorem**  **Resource:**   * M&M Activity worksheet * M&M Excel Spreadsheet   **Complete** the M&M Activity worksheet and M&M Excel Spreadsheet.    **Respond** to the following question by Thursday 11:59 p.m. (EST). Provide specific examples to support your answers:     * In a simplified and concise manner, explain what the Central Limit Theorem is. * Provide an illustration of an example distribution.   + Vary the sample size values in the M&M Activity worksheet to demonstrate the Central Limit Theorem. * What is the most confusing part of the Central Limit Theorem for you?   + After this exercise, is there any part of it that you still do not understand? If so, what is it and what about it is difficult for you?     **Post** constructive criticism, clarification, additional questions, or your own relevant thoughts to three of your classmates' posts by Sunday 11:59 p.m. (EST) on Sunday. | | 3.1, 3.7 | Discussion-one post and reply to three other posts =  1 hour |
| **Probability and Hypothesis Tests**  **Complete** the Probability and Hypothesis Tests Worksheet.  **Submit** your worksheet by 11:59 p.m. (Eastern time) on Sunday. | | 3.2, 3.3, 3.4, 3.5, 3.6 | Compute mathematical problem sets = 1 hour |
| **Final Project Preparation: Statistical Analysis**  **Resource:** Probability and Hypothesis Tests Worksheet  **Select** one or more methods of statistical analysis appropriate to the dataset you selected in Week 2 that fits the following criteria:   * Your selected method of statistical analysis must be discussed in the content within the course. * The method of statistical analysis must help you answer your research question. * If the method you would like to use has not yet been covered in the course, e-mail your professor for permission by 11:59 p.m. (Eastern Time) on Thursday.   + If the request is approved, you may perform your analysis after that method has been addressed in the course to ensure you understand how to use this analysis properly.   **Perform** a statistical analysis of your selected dataset.  **Record** all calculations and work performed during this analysis using Excel or similar program.  **Submit** your method and statistical analysis by 11:59 p.m. (Eastern time) on Sunday. | | 5.7 | Guided project, method and analysis=  1 hour |
| **Total** |  |  | **7.5 hours** |

# Faculty Notes

The wiki is designed to allow students of all levels to participate in a discussion of the Central Limit Theorem. The questions allow for students to show their level of understanding and which students will need additional help as the course progresses. At this point, students need to have a very clear understanding of the work they will be completing on their Final Project. Students who are behind should be alerted to the level of difficulty that the final 2 weeks possess and the time challenges that will arise if they fall further behind.

**Wiki: M&M Probability and the Central Limit Theorem**

This week, students are required to complete the class data sheet for the Wiki: M&M Probability and Central Limit Theorem. Please ensure all students have added their data to the Excel sheet by Thursday 11:59 p.m. (EST) to ensure all classmates will have enough time to use the data to complete the assignment by Sunday 11:59 p.m. (EST).

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| --- | --- | --- | --- |
| Week Four: Hypothesis Tests, Correlation, and Regression | |  |  |
| ***Learning Objectives*** | | ***Alignment*** | |
| * 1. Perform a hypothesis test for two independent samples. | | CLO1, CLO3, CLO4, CLO5 | |
| * 1. Determine the *t*-statistic for related samples. | | CLO1, CLO3 | |
| * 1. Perform a repeated-measures *t*-test for a dataset. | | CLO1, CLO3, CLO4, CLO5 | |
| * 1. Evaluate data using estimation with varying confidence intervals. | | CLO1, CLO3, CLO4, CLO5 | |
| * 1. Describe the importance of the confidence interval chosen on the results of a study. | | CLO1, CLO4 | |
| * 1. Determine a Pearson correlation. | | CLO1, CLO3, CLO4 | |
| * 1. Analyze a scatterplot and evaluate the correlation of the data. | | CLO3, CLO4, CLO5 | |
| * 1. Use a regression to evaluate and make predictions for a dataset. | | CLO1, CLO3, CLO4 | |
| ***Resources, Activities, and Preparation***  *Utilize these resources and complete these activities in preparation for your graded assignments.* | | ***Alignment*** | ***AIE*** |
| **Required Readings**  **Read** the following in *Statistics for the Behavioral Sciences*:  Ch. 10 “The *t* Test for Two Independent Samples”  Ch. 11 “The *t* Test for Two Related Samples”   * Ch. 15 “Correlation” Sections 15.1, 15.2, & 15.3   Ch. 16 “Introduction to Regression” Sections 16.1 & 16.2  Feel free to post questions, comments, or observations to share with the class in the General Q & A discussion forum. | | 4.1, 4.2, 4.3, 4.6, 4.7, 4.8 |  |
| **Assignment Preparation**  **Resource:** Week 4 Practice Homework Worksheet  In preparation for this week’s assignment, you will complete homework problems about hypothesis tests with multiple samples and estimation. This activity will help you practice the concepts covered in your homework assignment.  **Complete** the Week 4 Practice Homework Worksheet.  **Attend** the Adobe Connect Live Session to review the problems and ask questions. | | 4.1, 4.2, 4.3, 4.4, 4.5 | Live Discussion: lecture and discussion = 1 hour |
| ***Supplemental Resources and Activities***  *Explore these optional resources to deepen your understanding.* | | ***Alignment*** | ***AIE*** |
| **Hypothesis Tests With Two Samples Supplemental Resources**  **Explore** the resources from Khan Academy:   * “[Two Sample *t*-Test](https://www.khanacademy.org/search?search_again=1&page_search_query=Two+Sample+t-Test)” * “[Confidence Intervals](https://www.khanacademy.org/math/statistics-probability/confidence-intervals-one-sample)” | | 4.1, 4.2, 4.3 |  |
| **Correlation and Regression Supplemental Resources**  **Read** “[Correlation and Regression](http://www.bmj.com/about-bmj/resources-readers/publications/statistics-square-one/11-correlation-and-regression)” from the British Medical Journal. | | 4.6, 4.7, 4.8 |  |
| ***Graded Assignments***  *Complete these graded assessments by the end of the week unless specified otherwise.* | | ***Alignment*** | ***AIE*** |
| **Wiki: Hypothesis Testing: M & M Experiment**  **Use** the class data posted by your instructor from the M&M Excel worksheet completed in Week 3 (Brown M&Ms) to complete this assignment.  **Write** aparagraph or two that discusses whether you believe the company has correctly estimated the percentage of brown M&Ms in a bag of candy.  **Calculate** the value of the hypothesis test for the brown M&Ms and include all appropriate calculations and work.  **Write** a brief conclusion.   * Does the conclusion of your statistical analysis agree or disagree with your original belief? Why or why not? * Do you think increasing the sample size (*n*) would help validate your belief?   **Submit**, within a single document, your initial response, calculation, and conclusion by 11:59 p.m. (Eastern time) on Sunday. | | 4.1, 4.3 | Guided project-calculations and conclusion =  1 hour |
| **Hypothesis Tests With Multiple Samples and Estimation**  **Resource:** Hypothesis Tests With Multiple Samples and Estimation  **Complete** the Hypothesis Tests With Multiple Samples and Estimation homework assignment.  **Submit** your worksheet by 11:59 p.m. (Eastern time) on Sunday. | | 4.1, 4.2, 4.3, 4.4, 4.5 | Compute mathematical problem sets = 1 hour |
| **Correlation and Regression**  **Resource:** Correlation and Regression Excel Worksheet  **Watch** [Excel: Scatterplot and Correlation](https://www.youtube.com/watch?v=Kk5GG6zi46Q) from YouTube prior to completing your Excel worksheet.  **Complete** the Correlation and Regression Excel Worksheet.  **Submit** your worksheet by 11:59 p.m. (Eastern time) on Sunday. | | 4.6, 4.7, 4.8 | Compute mathematical problem sets = 1 hour |
| **Final Project Preparation: Graphical Analysis**  **Perform** a graphical analysis of the dataset you selected in Week 2 using Microsoft® Excel. Make sure to use the information from your statistical analysis of the dataset you preformed in Week 3.  **Create** at minimum one graph during your graphical analysis.   * Label all axes and provide values for each axis.   *Note*: The graphical analysis should produce graphs that can be used to make conclusions and help answer the research question.  **Record** all calculations and work performed including any conclusions and results derived during this graphical analysis.  **Submit** your graphical analysis and any calculations, work conclusions, and results found during the analysis by 11:59 p.m. (Eastern time) on Sunday. | | 5.7 | Guided project, calculations and conclusions=  1 hour |
| **Total** |  |  | **5 hours** |

# Faculty Notes

The wiki for this week will have different answers for each class, depending upon their individual data set. Professors should make sure that they have all of the information necessary to complete the questions and that the equations embedded into the cells are working correctly. Students may or may not have enough information to complete the statistical analysis for their Final Project. If they do not, give them the additional time to complete before turning in. Those who do have the required information should be encouraged to have the project almost completed.

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| --- | --- | --- | --- |
| Week Five: Advanced Statistical Analyses | |  |  |
| ***Learning Objectives*** | | ***Alignment*** | |
| * 1. Evaluate the variance of a dataset using ANOVA. | | CLO3, CLO4, CLO5 | |
| * 1. Perform *F*-ratio and sum of squares calculations. | | CLO3, CLO4, CLO5 | |
| * 1. Evaluate data using the *F* distribution. | | CLO1, CLO3, CLO4 | |
| * 1. Describe the difference between interactions and dependence of variables. | | CLO1, CLO3 | |
| * 1. Perform a chi-square analysis. | | CLO3, CLO4, CLO5 | |
| * 1. Perform a binomial test. | | CLO3, CLO4, CLO5 | |
| * 1. Evaluate which statistical test should be used based on the dataset and objectives of real-world research studies. | | CLO1, CLO2, CLO3, CLO4, CLO5 | |
| ***Resources, Activities, and Preparation***  *Utilize these resources and complete these activities in preparation for your graded assignments.* | | ***Alignment*** | ***AIE*** |
| **Required Readings**  **Read** the following sections and chapters of *Statistics for the Behavioral Sciences*:   * Ch. 12 “Introduction to Analysis of Variance” Sections 12.1 to 12.5 & 12.7 * Ch. 13 “Repeated-Measures Analysis of Variance (ANOVA)” * Ch. 14 “Two-Factor Analysis of Variance (Independent Measures)” * Ch. 17 “The Chi-Square Statistic: Tests for Goodness of Fit and Independence” Sections 17.2 to 17.5 * Ch. 18 “The Binomial Test” Sections 18.1, 18.2 & 18.4   **Read** the following from Richland Community College:   * “[Stats: Goodness-of-fit Test](https://people.richland.edu/james/lecture/m170/ch12-fit.html)” * “[Stats: Test for Independence](https://people.richland.edu/james/lecture/m170/ch12-ind.html)” | | 5.1, 5.2, 5.3, 5.4. 5.5, 5.6 |  |
| **Assignment Preparation**  **Resource:** Week 5 Practice Homework Worksheet  In preparation for this week’s assignment, you will complete homework problems about ANOVA, chi-square, and binomial tests. This activity will help you practice the concepts covered in your homework assignment.  **Complete** the Week 5 Practice Homework Worksheet.  **Attend** the Adobe Connect Live Session to review the problems and ask questions. | |  | Live Discussion: lecture and discussion = 1 hour |
| ***Supplemental Resources and Activities***  *Explore these optional resources to deepen your understanding.* | | ***Alignment*** | ***AIE*** |
| **Analysis of Variance Supplemental Resources**  **Watch** ”[Analysis of variance (ANOVA)](http://www.khanacademy.org/math/probability/statistics-inferential/anova/v/anova-1---calculating-sst--total-sum-of-squares)” from Khan Academy (31:03). | | 5.1, 5.2, 5.3 | Video = 0.75 hours |
| **Chi-Square Test Supplemental Resources**  **Read** Ch. 17, Sections 17.1 and 17.6 in *Statistics for the Behavioral Sciences*.  **Watch** “[Chi-square goodness-of-fit tests](http://www.khanacademy.org/math/probability/statistics-inferential/chi-square/v/chi-square-distribution-introduction)” from Khan Academy (39:49). | | 5.5 | Video = 0.75 hours |
| **Binomial Test Supplemental Resources**  **Read** Ch. 18, Section 18.3 in *Statistics for the Behavioral Sciences*.  **Watch** “[Binomial Distribution](https://www.khanacademy.org/math/statistics-probability/random-variables-stats-library/binomial-random-variables/v/binomial-distribution)” from Khan Academy (64:30). | | 5.6 | Video = 1 hour |
| ***Graded Assignments***  *Complete these graded assessments by the end of the week unless specified otherwise.* | | ***Alignment*** | ***AIE*** |
| **ANOVA, Chi-Square, and Binomial Tests**  **Resource:** ANOVA, Chi-Square and Binomial Tests worksheet  **Complete** the ANOVA, Chi-Square and Binomial Tests worksheet.  **Submit** your worksheet by 11:59 p.m. (Eastern time) on Sunday. | | 5.1, 5.2, 5.3, 5.4, 5.5, 5.6 | Compute mathematical problem sets = 1 hour |
| **Chi-Square Analysis: M&M Experiment**  **Use t**he class set of data for the M&M Excel worksheet from Week 3.  **Write** a short paragraph about whether you believe there is a difference in the percentage of each color in a bag of M&Ms.  **Calculate** a chi-square analysis and include all appropriate calculations and work.    **Write** a brief conclusion.   * Does the conclusion of your statistical analysis agree or disagree with your original belief? Why or why not? * Do you think the sample size you have is an appropriate amount to draw your conclusion from?   **Submit**, in a single document, your initial response, calculation, and conclusion by 11:59 p.m. (Eastern time) on Sunday. | |  | Compute mathematical problem set and analysis = 1.5 hours |
| **Blog: Final Project Synopsis**  **Present** a synopsis of your final project to the rest of the class:   * Introduce your dataset and research question. * Discuss what statistical analyses you decided to perform on your dataset and why. (You do not need to present your handwritten work.) * Present the graphs and/or plots that you created. * Briefly discuss what your analyses indicate about your sample * Reflect on what you learned from doing this final project and which part of the project was the most difficult or confusing.   Initial entries are due no later due by 11:59 p.m. (Eastern time) on Thursday.  **Read** the blogs of all other students.  **Comment** on at least three other students’ blog posts. The responses to three other student blog posts are due by 11:59 p.m. (Eastern time) on Sunday. | | 5.7 | Blog-  Shares work and posts response =  1 hour |
| **Final Project**  **Resource:** Final Project Rubric  **Review** the Final Project Rubric for instructions and required project components.  Using the Final Project Rubric as a guide, **write** and **compile** the all components you worked on in previous weeks for your final project.  **Submit** your Final Project by 11:59 p.m. (Eastern time) on Sunday. | | 5.7 | Guided project, final work=  1 hour |
| **Total** |  |  | **8 hours** |

# Faculty Notes

The wiki for chi-square analysis is a chance to look at how data can be used in multiple areas. Students are encouraged to try to make connections from previous weeks in their hypothesis. The Final Project completion should not be an issue if they have turned in previous updates and have been monitored throughout the course.

# Breakdown of Academic Instructional Equivalencies

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| --- | --- |
|  | **AIE Hours** |
| **Week 1** |  |
| Required | 11.25 |
| Supplemental | 2 |
| **Week 2** |  |
| Required | 6.5 |
| Supplemental | 2 |
| **Week 3** |  |
| Required | 4 |
| Supplemental | 3.5 |
| **Week 4** |  |
| Required | 5 |
| Supplemental | 0 |
| **Week5** |  |
| Required | 5.5 |
| Supplemental | 2.5 |
|  |  |
| **Total Required Hours** | 32.25 |
| **Total Supplemental Hours** | 10 |
| **Total Hours** | 42.25 |