Math 103B: Statistics B Spring 1 2023
Guttman Community College
50 W 40th Street, New York, NY

Course Number/Section: MATH 103B – 002 (6953)
Days/Times: MWTh 9:45-11:00 am

Course Location: MThF Rm. 504
Office Email: Luis.Zambrano@guttman.cuny.edu
Mentor Email: XXX@guttmanmail.cuny.edu
Course e-Port/Website: Blackboard course site.

Instructor Name: Luis Zambrano
Office Hours: Th 10:30-11:30 am
M 3:30-4:30pm
Office: 818 F
Office Phone: 646-313-8282
Peer Mentor: N/A

Catalogue Description and Overview
MATH 103A and MATH 103B are a year-long version, offered in two sequential parts, of MATH 103 Statistics. Successful completion of MATH 103A Statistics A and MATH 103B Statistics B satisfies the CUNY Pathways requirement in Mathematics and Quantitative Reasoning.

This course will provide students with an in-depth understanding of the fundamental concepts and computational methods of statistics. These concepts will be developed through the question of how to estimate an unknown quantity using sample data. Students will learn to incorporate the foundational concepts of mathematics with statistical analysis to describe and solve real-life problems and questions. Students will be taught to use estimation and precision and will learn the math study skills to assess and enhance their learning, their processes and their results. Students will use statistical software, graphing calculators, or Microsoft Excel to carry out a semester-long project involving data description and analysis. Students will work collaboratively and write using appropriate mathematical and non-mathematical language in order to successfully complete their project.

The topics addressed include: displaying categorical data using tables, bar graphs, and circle graphs; drawing conclusions about categorical data; displaying quantitative data using dot plots, stem-and-leaf plots, histograms and box-and-whisker plots; describing data distributions using measures of center (mode, mean, and median) and measures of spread (standard deviation, range and IQR); Displaying bivariate data using scatterplots; analyzing bivariate data using linear regression; elementary probability; normal probability distributions, sampling distributions; confidence intervals and hypothesis testing of the proportion and the mean.

Co-requisites or Pre-requisites: None

Credits/Contact Hours: 1.5 credits/4.5 contact hours

CUNY Pathways Category: Completion of both MATH 103A and MATH 103B satisfies the category Mathematics and Quantitative Reasoning

Learning Outcomes:
Upon successful completion of this course, you will be able to do the following:

1. Correctly and efficiently carry out statistical calculations both with and without electronic devices. (MATH 103A and MATH 103B)
2. Accurately depict data (with and without electronic devices) in an assortment of appropriate graphical forms. (MATH 103A)
3. Accurately read information from a graphical depiction of a data set, then interpret and make predictions from their readings. (MATH 103A)
4. Demonstrate an understanding of how statistical inference is based in probability. (MATH 103B)
5. Correctly calculate probabilities according to empirical and theoretical models of probability. (MATH 103A and MATH 103B)
6. Correctly construct and accurately interpret confidence intervals. (MATH 103B)
7. Properly set up hypothesis tests and accurately interpret the results. (MATH 103B)
8. Successfully design and carry out a project involving sample data and statistical data analysis. Employing appropriate statistical language, correct Standard English, and illustrative graphical depictions, they will report in writing on their project in a manner understandable to their peers. (MATH 103A and MATH 103B)

Guttman Learning Outcomes

Upon successful completion of this course, you will be able to do the following:

Broad, Integrative Knowledge:

b. Exhibits an understanding of how different disciplines create knowledge and approach problem-solving

Intellectual Skills for Life-Long Learning

c. Presents accurate mathematical calculations and operations, and explains how they are used to solve problems and to interpret data.
d. Utilizes both quantitative and qualitative data to explore and understand important issues.
e. Locates, evaluates and cites multiple information resources in projects, papers and presentations.
f. Demonstrates ability to use appropriate technologies, acquire new ones and to resolve technology problems to meet academic, professional and personal goals
g. Displays ability to assess own work and its relative value

Required Texts/Readings

Illowsky, B., Dean, Susan. *Introductory Statistics.* Texas, Houston: OpenStax. Download for free at https://openstax.org/details/books/introductory-statistics

Required Materials

A student account to MyOpenMath: https://www.myopenmath.com/
Access to the Internet (either on-campus and/or at home).

Expectations for Participation & Engagement:

Preparation

- You are expected to complete independent online work to the best of your ability, to read the required materials before class, and to bring your work, including notebook and current work, to class.

- Your notebook should be neat and organized. It is recommended that you make your own brief chapter outlines to complement your notes. Online assignments should be completed by the due date for full credit. Late work will be usually incur some loss of points.

Participation

- Arrive on time to class!
- You will be expected to collaborate with your classmates when working in groups. Throughout this work, it is important to be supportive and non-judgmental to provide a professional and safe space for learning.

Food and Drink Policy

- If you carry something to drink it should be in a covered container. We will be making extensive use of computers and this policy is to ensure that that equipment does not get damaged from food or drink.

Absence Policy:

- I take attendance. Please be on time. Attendance is one of the most important factors that correlate with academic success, especially in this type of class. Further, students are in danger of receiving an unofficial withdrawal status with excessive absences (excessive is usually 3-4 absences). If you encounter extenuating circumstances, please send me an email in advance, when possible, letting me know if you must miss class. (You are still responsible for the work due on the day you return and for securing as many of the notes from classmates as you can.)

Conferences

- You will have a mid-semester conference with the instructor and/or SSA to discuss your progress.
- Individual conferences may be scheduled as needed. I encourage you to be in touch at any time *as soon as you know you need additional help or support.*

Respect

- This is a core value.
- In an active, respectful class environment, participation is as much about listening to and engaging the ideas of others as it is about expressing one's mind.
- Please be on time. It is always the first gesture of respect.

Deadlines

- Assignments are ordinarily expected to be completed online, submitted electronically or emailed, by the time that they are due.
- If the assignment is meant to be in hard copy, it must be handed in on paper at the beginning of the class at which it is due, unless otherwise instructed.

Appropriate use of technology

- Be respectful and attentive to your own time and concentration!
- You will be encouraged to make appropriate use of technology throughout this course. We will use both Excel and Statistics software that will help streamline needed computations. Phones, MP3 players, laptops, tablets, PCs and other electronic tools are cool, but can also be big

distractions to your learning. Note that during tests and quizzes any technology that is used should be used for computational purposes only. Access to other people and/or the internet is not allowed during tests and quizzes.

In rare instances that you need to take a phone call, and if it cannot wait until after class, please take the call by briefly and quietly stepping out of the classroom. The instructor will let you back into the room at the appropriate moment.

College-wide Policies

Policy on Academic Honesty

Guttman Community College considers intellectual honesty to be the cornerstone of all academic and scholarly work. GCC views any form of academic dishonesty as a serious matter and requires all instructors to report every case of academic dishonesty to its Academic Integrity Officer, who keeps records of all cases. All work submitted or posted by students in this course must be their own. Submission of writing or ideas which are not the original work of the student, or which is not adequately referenced, is considered plagiarism. Unintentional plagiarism is still plagiarism, so if you have any question about whether or not to acknowledge a source, acknowledge it. And if you are still uncertain, be sure to ask. Refer to Article II of your Student Grievance Procedures for further details on academic honesty and Guttman's academic integrity procedures, at [Academic Policies url link] Penalties for academic dishonesty include academic sanctions, such as failing or otherwise reduced grades, and/or disciplinary sanctions, including suspension or expulsion.

Disability Support Services

In compliance with the American Disability Act of 1990 (ADA) and with Section 504 of the Rehabilitation Act of 1973, Guttman Community College is committed to ensuring educational parity and accommodations for all students with documented disabilities and/or medical conditions. It is recommended that all students with documented disabilities (Emotional, Medical, Physical and/ or Learning) consult the Office of AccessABILITY located in Room 506 to secure necessary academic accommodations. For further information and assistance please call 646-313-8061 or speak to your Student Success Advocate or Career Strategist.

Critical Incident Management

Guttman expects students to respect the rights, privileges and property of other people. Faculty are required to report disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment or inhibits students' ability to learn.

Viewpoint Tolerance

Some of the issues covered during the seminar may evoke strong emotions. Students, faculty and staff must be able to disagree respectfully with others on topics that are personally very important to them. **Civility is essential to all scholarly discourse.**

Expectations for Out-of-Class Time

For every one instructional credit hour in class, a Guttman student is expected to spend at least two hours out-of-class studying, reading, writing, researching and working on projects, and preparing for tests. E.g. for a 3 credit course that meets for 3 hours each week, a student is expected to spend at least

6 hours outside of class time doing related course work. If a course provides more time in class than one hour for one credit, the additional time may offset out- of- class time expectations.

Assignments:

Means of Formative and Summative Assessment

1. In-class assignments, and online MyOpenMath site homework problems.
2. Assessments: includes weekly quizzes, and chapter exams.
3. A semester-long, group mini-project and/or presentation to be submitted in phases, including:
    a. Formulation of a research question and appropriate design for data collection and sampling
    b. Perform descriptive analysis: representing data graphically, mathematically, and in text,
    c. Perform inferential analysis: computing and interpreting confidence intervals and results of a hypothesis test.
4. A final examination, which is cumulative, and may include a small take-home component.

(Missing work ordinarily CANNOT be made up at the end of the course for credit).

Project/Signature Assignment: The signature assignment for this course requires you to organize and analyze data using the statistical techniques that you have learned during the course. You will pose a research question, gather or identify data that can be used to help answer your question, analyze the data, and write a paper or give a presentation (depending on the choice of the instructor) that describes your data analysis and conclusions. Specific details about this assignment will be distributed by your instructor.

Grading:

Chapter Tests:	45%
Project(s):	15%
Quizzes:	10%
MyOpenMath HWork:	15%
Final Exam:	15%

There will be **3-4 in-class chapter tests; a final examination; weekly (or more frequent) quizzes; and daily online MyOpenMath homework**. Exams will be announced at least one week in advance and quizzes will be announced the class meeting before. Quizzes are largely based on homework and recent notes. (So if you miss, be sure to check in with me or with another student.) Unless otherwise noted, quizzes will be at the very beginning of class, and last for approximately 10-15 minutes.

Overall grades will be based on the following scale:

A+	97% and up	A	Between 93% and 97%	A-	Between 90% and 93%
B+	Between 87% and 90%	B	Between 83% and 87%	B-	Between 80% and 83%
C+	Between 77% and 80%	C	Between 73% and 77%	C-	Between 73% and 70%
D+	Between 67% and 70%	D	Between 60% and 67%	NC or F	Below 60%

Incompletes are rarely given and will only be considered under the following circumstance: The student has completed the majority of the work for the course, the student is passing the course based on the work completed at the time the incomplete is requested, and there are extenuating circumstances that prohibit the completion of the specific missing item(s), usually very few, for the course.

As learning from mistakes is one of the most productive ways to reflect and to learn, it is important to always carefully review all assessments handed back to you. Completing timely test (and quiz) corrections, regardless if assigned for credit by the instructor or not,

Please note: In general, there are no Make-up tests. If there are extenuating circumstances, justified by valid and approved documentation, then possible make-up work is resolved at the instructor's discretion. NO EXCEPTIONS.

***Conferences**:* Students will have one conference with the professor to discuss their progress. Students and the professor will work together in order to insure a comfortable and successful class.

Weekly Calendar:

Classes 1-5
Unit 5. Probability Distribution Functions and the Normal Distribution

Objectives
• Recognize and understand discrete probability distribution functions, in general. • State the properties of a normal probability distribution. • Use the Empirical Rule to find probabilities related to normal distributions. • Use technology to determine probabilities associated with normal distributions and interpret the probabilities. • Find and interpret *z*-scores related to normal distributions.

Reference: Chapters 4 and 6 of Introductory Statistics- OpenStax
Section 4.1. Probability Distribution Function (PDF) for a Discrete Random Variable
Section 6.1. The Standard Normal Distribution
Section 6.2. Using the Normal Distribution

Classes 6-9
Unit 6. The Central Limit Theorem

Objectives
• Apply and interpret the central limit theorem for sample proportions. • Apply and interpret the central limit theorem for sample means.

Reference: Chapter 7 of Introductory Statistics- OpenStax
Section 7.1. The Central Limit Theorem for Sample Means
Section 7.3. Using the Central Limit Theorem
Reference: See Attachment
Section 7.4 - Population and Sample Proportion

Classes 10-21

Unit 7. Confidence Intervals

Objectives
• Find, interpret and use confidence intervals for a single population mean. • Find, interpret and use confidence intervals for a single population proportion. • Discriminate between problems applying the normal and the Student's t distributions. • Calculate the sample size required to estimate a population mean and a population proportion given a desired confidence level and margin of error. • Use confidence intervals to compare two population means. • Use confidence intervals to compare two population proportions.

Reference: Chapter 8 of Introductory Statistics- OpenStax
Section 8.1. A Single Population Mean using the Normal Distribution
Section 8.2. A Single Population Mean using the Student t Distribution
Section 8.3. A Population Proportion
Reference: OpenIntro Statistics
5.3.1 Confidence interval for a difference of means
6.2.2 Confidence intervals for p1-p2

Classes 22-30

Unit 8. Hypothesis Testing With One Sample

Objectives
• Conduct and interpret hypothesis tests for a single population mean, σ unknown. • Conduct and interpret hypothesis tests for a single population proportion. • Understand the meaning of a p-value and how it is used. • Understand the meaning of significance level and how it is used. • Differentiate between Type I and Type II Errors.

Reference: Chapter 8 of Introductory Statistics- OpenStax
Section 9.1. Null and Alternative Hypotheses
Section 9.2. Outcomes and the Type I and Type II Errors
Section 9.3. Distribution Needed for Hypothesis Testing
Section 9.4. Rare Events, the Sample, Decision and Conclusion
Section 9.5. Additional Information and Full Hypothesis Test

Classes 31-36

Unit 9. Hypothesis Testing With Two Samples

Objectives
• Classify hypothesis tests by type. • Conduct and interpret hypothesis tests for two population means, σ unknown. • Conduct and interpret hypothesis tests for two population proportions.

Reference: Chapter 9 of Introductory Statistics- OpenStax
Section 10.1. Two Population Means with Unknown Standard Deviations
Section 10.3. Comparing Two Independent Population Proportions