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2021

### MATH 111: Introduction to Statistics and Probability

Yu Wang

*CUNY York College*

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# MATH 111: Introduction to Statistics and Probability (Online)

Winter 2021

Section: 24BC

**Instructor:** Dr. Yu Wang

**Location:** Blackboard Collaborate Ultra

**Time:** M-F 12:00 – 3:50 pm

**Phone:** Zoom

**Email:** vwang AT York.cuny.edu

**Office Hours:** Thursday 9:30-11:00 (Zoom) or by appointment

Responding Email Time: Within 24 - 48 hours

**Teaching Philosophy/Portfolio:** <https://commons.gc.cuny.edu/members/vwang/>

**Prerequisites:** MATH 102, the equivalent, or placement exam. Not credited toward fulfillment of Mathematics major requirements. Not open to students with credit in MATH 180, MATH 210, or MATH 221.

**Course Description:** Introduce the different linear statistical models and develop critical thinking for statistical modeling in scientific and policy contexts; Apply statistical computer software tools to develop useful data analysis skills based on the use of linear regression models. Topics to be covered: simple linear regression, multiple regression, nonlinear regression and logistic regression models; Random and mixed effects models; The application of statistical software tools.

**Credits:** This is a 4-credit class.

## Course Narrative:

This is an **Open Education Resource (OER)/ Zero Textbook Cost (ZTC)** course. The textbook can be downloaded online free. The lecture notes, homework assignments, and project reports will be added to OER websites for similar courses use. Moreover, we will apply **Active Learning and OER** Pedagogy in this class, as the following:

1. The active learning pedagogy application to class: Partial class notes will be provided EXCEPT examples and Q & A on the free online platform MyMathOpen.com / CUNY Commons. You can focus on working examples instead of copying notes of definitions and methods. Some examples can be completed before class independently or with discussion, while some advanced examples will be discussed in class. Each student will have opportunity to present your OWN solution of examples and problems in class. As a result, class notes with all examples completed in class will be **shared** and **editable** on MyMathOpen / CUNY Commons for future students who will have more open examples to learn with any OER course.

2. All the problems of assignments are from OER, which will be posted and graded through MyMathOpen / CUNY Commons. There are two categories of the assignments, one is individual, and the other is group part. You need finish the problems in the individual part first based on the examples we have discussed in class and then work on a challenging one in the group part, which can be **discussed** and **shared** using active learning pedagogy. Finally, you can **CREATE** one or two bonus worked examples for sharing and downloading on MyMathOpen.com, so that we can contribute materials to the Open Education Resources.

**Blackboard:** Math111 – Collaborate Ultra (All Online Class Meetings)

**MyOpenMath:** Course ID: 96410

Course Name: Math 111 Introductory to Statistics / Enrollment Key: Math111York

### **Textbook: Introductory Statistics**

OpenStax (openly licensed free textbook) **ISBN-10: 1-947172-05-0**

<https://openstax.org/details/books/introductory-statistics>

[https://d3bxy9euw4e147.cloudfront.net/oscms-prodcms/media/documents/IntroductoryStatistics-OP\\_i6tAl7e.pdf](https://d3bxy9euw4e147.cloudfront.net/oscms-prodcms/media/documents/IntroductoryStatistics-OP_i6tAl7e.pdf)

### **Learning Objectives:**

1. Explain the meaning of statistics, experiments, and outcomes;
2. Recognize the difference of sample and population, frequency distribution and probability;
3. Graph frequency distribution with given data; calculate relative frequency, mean, mode, and median;
4. Use formulas to calculate probability and odds; apply different methods to compute permutation and combination;
5. Identify discrete probability distributions; calculate binomial distributions, means, and variance;
6. Use the standard normal distribution table to calculate probability and z value of normal distribution; understand and graph bell-shape normal distribution plot;
7. Apply the Central Limit Theorem to compute sampling distribution problems;
8. Define confidence interval of mean, variance, and proportion; explain the importance of significance level; and construct confidence intervals with different situations.

### **Ancillary Learning Objectives:**

- Acquire skills to write solutions of statistics problems step-by-step;
- Understand and complement the whole procedure of collecting, processing, analyzing, and summarizing data;
- Learn the collaboration skills by completing some computer projects of team work.

**Class Supplies:** Students are required to bring a notebook, pens/pencils and a scientific calculator or computer (not necessarily graphic calculator) to Online class each day.

## Course Requirements

**Homework Assignments:** Homework will be assigned on MyOpenMath/Blackboard each class. It is to be turned in, graded and returned to you (Online). Late homework is not accepted and a grade of zero is assigned for missing assignments. Each homework assignment will consist of problem sets: statistical problems related to the work discussed in class. Problems will be reviewed in class as needed. Problem sets will be graded on a scale of 0 - 100 points.

**Examinations / Makeups:** There will be ONE online Midterm exam and One online Final Exam on topics covered in class throughout the semester. Exams will consist of statistics problems of the type discussed in class sessions and through homework assignments. In general, there will be NO MAKEUP exams including final exam.

**Projects:** Each student is required to submit two review problems (one for each project) which will be used for future Open Education Resources. The two projects are a group project. 3 to 4 students can complete the project in one group and submit a problem set (3/4 problems) of each project with the original problem settings and complete solutions and necessary plots.

### *Sample Project*

The following is a sample of Project - a group work, which will be an application of combined knowledge we learn in the whole semester. Meanwhile, it is a testification of Active Learning Pedagogy of our class and it will count 20% of the overall grade (10% for each project). After you complete the project, the review problem set will be posted on MyMathOpen.com / CUNY Commons as an OPEN EDUCATION RESOURCE material which is one contribution to OER:

*Use the data your collect three times per day of time spent on social media for four days, then, construct a frequency table with 5 classes. Calculate the mean time spent on social media every day. What is the standard deviation of the time spent on social media?*

In this group project, 3-4 members will follow these active learning steps:

1. Discuss the goal of the project and allocate different tasks to each member, like collecting and organizing data (optional), creating problems, solving problems, and verifying solutions of problems;
2. Collect, classify, and organize a data set (optional);
3. Create a problem following each section in class;
4. Write the solutions of each problem step by step;
5. Verify the solutions using the knowledge you gain in class;

You can use all class notes, OER textbooks, and all methods we discuss in class and completed problems. Please notice that all the above procedures of this project will be provided as an OER material for future students to be generalized and completed if necessary.

All submitted examples, problems, and project reports will be shared with a Creative Commons license. A CC license allows users to copy, share, and build upon the work. In return, you will also have the chance to

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similarly copy, share and remix other submissions that are shared with a CC license. Please take a look at [Creative Commons](#) for more information about the types of license that we will consider as a class for this project.

## Grading Breakdown

The following will be used to determine a student's grade in the course. Percentagewise, the breakdown of the grade is as follows:

Homework Assignments	25%
Two OER Projects	20%
Midterm Exam	25%
Final Exam	25%
Class Participation	5%

## Course and Instructor Policies

Attendance will be recorded each class (Online) for final record. Class participation is very important. Each forum post will earn bonus points (up to 10 in total). Communication related to course in class (Online) is necessary and encouraged. All emails and online questions will be responded in 24 hours (weekdays) to 48 hours (weekends/holidays).

## Special Dates

Monday, January 18                      College is closed, no classes scheduled

## Important Policies

Policy on Academic Integrity York College's Academic Integrity Policy and Procedures, developed to conform to the CUNY policy on Academic Integrity, outline College protocol for (1) promoting academic integrity at the College; and (2) dealing with violations of academic integrity. Academic Dishonesty is prohibited in The City University of New York and is punishable by penalties, including failing grades, suspension, and expulsion. Academic dishonesty includes cheating and plagiarism. This policy will be strictly adhered to. Students can familiarize themselves with this policy by downloading a copy of it in pdf form at

<http://york.cuny.edu/president/legal-compliance/legalaffairs/cuny-legal-policies-procedures/Academic-Integrity-Policy.pdf>

Policy on INC grades York Colleges policy on INC grades will be adhered to. Students should familiarize themselves with the policy. Additionally, York Colleges grading scale will be used to determine final course grades. All of Yorks grading policies can be found at:

<http://york.cuny.edu/academics/policies/grading-policies>

Policy on accommodations for disabled students York Colleges policy on accommodations for disabled students will be strictly adhered to. Students with documented disabilities are entitled to receive accommodation, including in some cases extra time on exams, tests, projects and assignments. The Office of Services for Students with Disabilities located within the Counseling Center in AC/1G02 provides a wealth of support and services including accommodations such as: extended testing time, large print text, adjustable tables, and computers services provided for by OSD. To better ascertain if you are eligible for services please stop by and speak with a disability's specialist. The Office of Student Disabilities (Room AC-1G03) can evaluate students. More information is also available online at

<http://york.cuny.edu/student-development/ossd/>

Policy on Student Evaluations Department policy requires that the following statement must be included in all department syllabi. All student evaluations of teaching must be given online during the semester. Check the email for the access information.

## Student Support Resources

- IT Support: 718-262-5300
- Blackboard and Technologies support: Check Blackboard for more details
- Library Reference Desk: AC Floor 3 at the entrance of the library
- OER/ZTC Support: Katherine Tsan: [ktsan@york.cuny.edu](mailto:ktsan@york.cuny.edu)

Note Any change to this syllabus will be announced in class.

## Topics and Approximate Schedule

The following table outlines the topics that will be covered as part of the course and a timeline for their completion. Please note that the above schedule is approximate and is subject to change.

Date	Topics of Study	Reading	Notes
01/04	Course motivation; Definitions of Statistics; Data, Sampling, and Variation in Data and Sampling	1.1/1.2	
01/05	Frequency, Frequency Tables, and Levels of Measurement; Stem-and-Leaf Graphs, Line Graphs, and Bar Graphs; Histograms, Frequency Polygons	1.3/2.1/2.2	HW 1.1/1.2
01/06	Measures of the Location of the Data; Box Plots; Measures of the Center of the Data; Mean, Median, and Mode	2.3/2.4/2.5/2.6	HW 1.3/2.1
01/07	Measures of the Spread of the Data; Descriptive Statistics	2.7/2.8	HW 2.2/2.3/2.4
01/08	Introduction of Probability; Independent and Mutually Exclusive Events;	3.1/3.2	HW 2.5/2.6/2.7
01/11	Two Basic Rules of Probability; Contingency Tables	3.3/3.4	HW 3.1/3.2
01/12	Tree and Ven Diagrams; Probability Topics; Review for Midterm Exam	3.5/3.6	HW 3.3/3.4 Project 1 Due
01/13	Probability Distribution Function for a Discrete Random Variable; Mean or Expected Value and Standard Deviation	4.1/4.2	
01/14	Binomial Distribution; The Standard Normal Distribution;	4.3/6.1	Midterm Exam Due
01/15	Using the Normal Distribution; The Central Limit Theorem for Sample Means;	6.2/7.1	HW 4.1/4.2/4.3
01/19	The Central Limit Theorem for Sums; Using the Central Limit Theorem	7.2/7.3	HW 6.1/6.2
01/20	A Single Population Mean – Normal Distribution; Student t Distribution	8.1/8.2/8.3	HW 7.1/7.2/7.3
01/21	A Population Proportion; Sample Size	8.4/8.5/8.6	HW 8.1/8.2
01/22	Review for Final Exam		HW 8.3/8.4 Project 2 Due
01/25	Final Exam		