JOHNS HOPKINS
CENTER *for* TALENTED YOUTH

CTY SUMMER PROGRAM FINAL EVALUATION

Student: Ethan Luh
Course: Data and Chance
Site: San Rafael, CA

Date: August 3, 2018
Instructor: Ralph Chikhany
Teaching Assistant: Sarah Cardenas

Congratulations, Ethan, on successfully completing Data and Chance. Please see the enclosed course description for more detailed information on the course.

Overall Performance
You demonstrated a mastery of the material presented to you in the class. You thoughtfully contributed to class discussion, consistently completed assignments with a high level of thoroughness, and actively engaged in software simulations and experiments both individually and in group settings.

Content Proficiency
Your performance exceeded the course expectations. You correctly deduced properties of time series plots after carefully examining their trends: "within short periods of time, there are large peaks and large dips which are very drastic and sudden, not gradual" were examples of terms that you correctly utilized. You correctly explained why 0! = 1 by stating that "there is only one way to order 0 people." By interpreting properties of regression lines, generalizing the process of finding the standard deviation into a summation formula, and translating probability word problems to tree diagrams, distribution tables and graphs, you developed your ability to transfer between different representations in mathematics.

Reasoning and Problem Solving
During our activities, you investigated each situation to make accurate and relevant conclusions. When presented with challenge problems involving multiple variables, such as the *10,000 meters problem*, you clearly identified which measures of central tendency, or spread, were better tools to answer the questions at hand. During the computer lab session on students' backpack weights, you successfully introduced a new logical-class attribute to the original data. This helped you identify which students carried backpacks that were heavier than the recommended weight. You successfully identified instances of binomial distributions and correctly applied the formula to find the required probabilities. You pondered the advantages and disadvantages of data representation methods by listing the appropriate instance of using each one: "I think it is important that the graphs are simple for the reader to understand".

Collaboration and Participation
Ethan, you were always excited to share your insights with the class and to work with classmates on team activities. Even when you did not agree with someone else's ideas, you kept an open mind and respectfully engaged in the discussion. You also made sure everyone was equally invested in effort and collaboration. This resulted in rigorous results during our correlation activities, game experiments and TinkerPlots simulations, thus allowing you to efficiently complete the probability modeling challenges.

Suggestions and Recommendations
I encourage you to explore topics in intersections of arts and mathematics such as combinatorics and geometry. A good reference is the book *Math and Art: An Introduction to Visual Mathematics* by S. Kalajdzievski. Since you have mastered the basics of TinkerPlots, I also encourage you to explore more sophisticated data analysis tools such as Fathom and Minitab.

Both Sarah and I really enjoyed having you in the class. We wish you the best for your future!

Johns Hopkins Center for Talented Youth
Course Description: Data and Chance

Course Code: 18Y.DACH.SRF.2A Instructor: RALPH CHIKHANY

Data and Chance was part of the 2018 Center for Talented Youth (CTY) Young Students Summer Residential Program held in San Rafael, California. The course met for five and a half hours per day, five days per week. There were approximately 80 contact hours with the discipline.

In this course, students developed a greater understanding of data and chance, two areas of mathematics that easily transfer from the classroom to the real world. Students conducted experiments and generated data which they displayed in graphs, charts, and tables in order to compare the effects of particular variables. For example, students analyzed data gathered from a variety of sources to look at sampling, distribution, and various ways to organize data. In addition, students considered other data sources, including newspapers and journals, and identified examples of incorrectly gathered or misrepresented data that have been used to mislead consumers or influence voters.

Students also explored probability, the study of chance, to learn how numerical data are used to predict future events. Students examined permutations and combinations; developed strategies for calculating the number of possible outcomes for various events; calculated probabilities of independent, dependent, and compound events; and learned to distinguish between theoretical and experimental probability.

In addition, students read and critically evaluated the book *How to lie with Statistics* by Darrell Huff through discussion questions and reflection tasks. Students used *TinkerPlots* to represent and analyze data, as well as to simulate probability experiments. Other topics covered include: bivariate data, correlation, linear regression, Venn diagrams and introduction to set theory, Pascal's triangle and its applications in probability, expected values, geometric probability, the binomial distribution, the normal distribution and Markov chains.

Text used: Materials compiled by instructor, mainly adapted from the textbook *How to lie with Statistics* by Darrell Huff