07 Data Science - Shuffling Songs

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **3 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

This course combines the study of Statistics and Probability with Data Science. The goal is to have students think critically about data in today's data-driven world and understand its role in the 21st Century economy. Furthermore, students will become familiar with the concepts, topics, and techniques used by data scientists and statisticians in their day-to-day work.

Throughout this course, students will engage in project-based observational studies and experiments to develop their understanding of data analysis, sampling, correlation/causation, bias and uncertainty, probability, modeling with data, as well as making and evaluating data-based arguments. Students will also learn about the roles of data scientists, the power of data in society, machine learning, and how data scientists extract knowledge and insights from real-world data.

In this unit students will consider the modeling process and the role played by variation, reflecting on the data collected from simulations and the ways data can help answer probabilistic questions and leverage this power for decision-making. In the process of creating powerful simulations, students will learn the basics of programming, which will continue to be a powerful tool for data analysis. During this unit, students will use Python in Edu-Blocks and Colab.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Essential Questions

- Do the genres you hear played on shuffle represent the genres of the songs in a playlist?

Enduring Understandings

- The difference between theoretical and experimental probability
- Coding can be used to solve problems

CONTENT AREA STANDARDS

S.ID

A. Summarize, represent, and interpret data on a single count or measurement variable

B. Summarize, represent, and interpret data on two categorical and quantitative variables

C. Interpret linear models

S.IC

A. Understand and evaluate random processes underlying statistical experiments

B. Make inferences and justify conclusions from sample surveys, experiments, and observational studies

S.CP

A. Understand independence and conditional probability and use them to interpret data

B. Use the rules of probability to compute probabilities of compound events in a uniform probability model

S.MD

A. Calculate expected values and use them to solve problems

B. Use probability to evaluate outcomes of decisions

MA.S-CP.A	Understand independence and conditional probability and use them to interpret data
MA.S-CP.A.1	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).
MA.S-MD.A	Calculate expected values and use them to solve problems
MA.S-MD.A.3	Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

9.1.12.PB.4: Explain how you would revise your budget to accommodate changing circumstances. • 9.1.12.PB.5: Analyze how changes in taxes, inflation, and personal circumstances can affect a personal budget.

LA.RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or

	formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
LA.11-12.SL.11-12.2	Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP11	Use technology to enhance productivity.
TECH.8.1.12.A.4	Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.
TECH.8.1.12.A.5	Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results.
TECH.8.1.12.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
TECH.8.1.12.C.CS4	Contribute to project teams to produce original works or solve problems.
TECH.8.1.12.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
TECH.8.1.12.E.CS4	Process data and report results.
TECH.8.1.12.F.CS3	Collect and analyze data to identify solutions and/or make informed decisions.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- Examining theoretical and experimental probabilities enables us to make decisions relating to products and forecast productivity
- Programming allows us to explore aspects of our data

Procedural Knowledge

Students will be able to:

- Calculate the theoretical probability of playing each of the genres in the class playlist

and discuss their meaning.
- Use a random number generator to simulate playing songs from their playlist and compare the theoretical probability of playing each genre to the experimental probability.
- Investigate and compare programs that appear very similar to learn about important features of coding.
- Program a song shuffle simulation in EduBlocks.
- Students implement the move from EduBlocks to Colab.
- Students visualize and calculate conditional probabilities of shuffle using tree diagrams.

EVIDENCE OF LEARNING

Alternate Assessments

- Portfolios
- Verbal Assessment (instead of written)
- Multiple choice
- Modified Rubrics
- Performance Based Assessments

Formative Assessments

Observations

Task completion

Student journals and notebooks

Cooperative team work

Summative Assessments

PBL Assessment

Unit assessments

RESOURCES (Instructional, Supplemental, Intervention Materials)

You cubed curriculum

Unit 4 resources: https://hsdatascience.youcubed.org/curriculum/

INTERDISCIPLINARY CONNECTIONS

Educational tech applications

Current Events

Experimentation

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.