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Overview:

This project will use the NCAA Basketball Tournament (*March Madness)* to teach students valuable lessons about probability, simulation, randomness, normal distributions, modeling, and expected value. Students will use data and visualization techniques to discover a mathematically optimal solution to the presented challenge.

The project is divided into three distinct lessons. Each lesson is demonstrated in a video. We have also provided links to slide decks, raw data, and premade visualizations. There are options to scale the rigor of each lesson to meet the needs of your students. In various forms, these lessons have been used in grades 8-12. A class with experience in data science should download the raw data and work out the optimal solution themselves, whereas a class being introduced to data science might use the premade visualizations to spur discussion and demonstrate the power of data analysis. Some instructors may use the lesson to delve deeper into mathematical topics such as means, standard deviations, normal distributions, expected value, modeling, and simulation. Other instructors will choose to simply mention these ideas as needed to move the lesson forward.

The data analysis can be done using many tools. We chose to use Google Sheets and Tableau Public, both of which are free to the public.

While the following videos discuss the 2023 tournament, instructions are provided for dealing with future tournaments. Also, premade visualizations for future tournaments will be available at Arty Smith's Tableau Public site.

Lesson 1: Simulating the PAC12 Tournament

To be done the week before the March Madness Tournament, when most teams are playing in a Conference Tournament. This occurred the week of March 6 in 2023. We recommend doing the project on Monday or Tuesday of the week. We chose the PAC12 tournament because of our geographic location, but any conference tournament will work.

Mathematical Topics:
Means
Standard Deviations
Normal Distributions
Mathematical Modeling
Probability
Simulation

Lesson 1: Slides
Lesson 1: Video

Lesson 2: A Search for Bias in Bracketology

Ideally done just before the March Madness Tournament begins, on Monday, Tuesday, or Wednesday.

Mathematical Topics:
Bias
Simulation
Probability
Data Processing
Relative Frequency
Mathematical modeling
Data Visualization

Lesson 2: Slides
Video: Wrangling Data
Lesson 2: Video
Premade visualization depicting bias in the opening round of the 2023 brackets.
The New York Times article What Your NCAA Brackets Teach About Investing and Bias is a must-read resource for Lesson 2. Our AP Econ teacher has participated in this class, adding depth and context to the discussion of bias in investing.

Lesson 3: Bracket Contest

Ideally done just before the March Madness Tournament, on Monday, Tuesday, or Wednesday.

Mathematical Topics:
Probability
Expected Value
Data Visualization
Rates

Contest Rules:
These rules were adapted from the *American Statistical Association's Statsketball Challenge* (*link.*)

Each student has $224 to assemble their cohort of teams. A team's cost is determined by their seeding:
#1 seeds cost $75
#2 seeds cost $40
#3 seeds cost $25
#4 seeds cost $20
#5 seeds cost $17
#6 seeds cost $15
#7 seeds cost $12
#8 seeds cost $10
#9 seeds cost $9
#10 seeds cost $8
#11 seeds cost $7
#12 seeds cost $6
#13 seeds cost $5
#14 seeds cost $4
#15 seeds cost $3
#16 seeds cost $1

You will earn points whenever one of your teams wins a game. More specifically, first round wins are worth 1 point, second round wins are worth 2 points, third round wins are worth 3 points, fourth round wins are worth 5 points, fifth round wins are worth 8 points, and the winning the championship is worth 13 points.
Premade visualization on Tableau Public
Lesson 3: Video

Thanks for taking the time to check out our lesson. We hope you will add your own unique flair to it and can't wait to hear how it goes.

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