Exploring Olympic 200-Meter Records: Are Women Faster Than Men?

1 Introduction

This activity uses GeoGebra to explore the trends in Olympic 200-meter sprint records for men and women. Students will input historical data, generate linear regression models, and analyze future predictions. In addition, we will update the data to include new data points: Usain Bolt's fastest 200-meter time and the winners of the 2024 races for both men and women. Students are encouraged to question the reliability of simple linear models and to consider the impact of outliers.

2 Part 1: Analyzing Historical Data

2.1 Data Entry and Setup

1. Open GeoGebra and switch to the Spreadsheet view (via **View ¿ Spreadsheet** or by pressing `Ctrl+Shift+S`).

2. Enter the historical data from Table 1 into the spreadsheet. For the x-axis, convert each year to "years after 1900" (e.g., 1988 becomes 88).

2.2 Plotting and Linear Regression

1. Create separate lists of points for the men's and women's record times. For example, a point for the men's record in 1988 would be represented as $(88, 19.75)$.

2. Use GeoGebra's regression tools (either the Best Fit Line tool or by entering `FitLine[list1]` in the input field) to generate a linear regression model for each dataset.

Questions:

- What do the regression lines indicate about the trends in record times for men and women?

- How does converting the year into "years after 1900" help in graphing the data?

Table 1: Olympic 200-Meter Sprint Winners (Selected Data)

Year	Men (s)	Women (s)
1988	19.75	21.34
1984	19.80	21.81
1980	20.19	22.03
1976	20.23	22.37
1972	20.00	22.40
1968	19.83	22.50
1964	20.30	23.00
1960	20.50	24.00
1956	20.60	23.40
1952	20.70	23.70
1948	21.10	24.40
1936	20.7	
1932	21.1	
1928	21.8	
1924	21.6	
1920	22.0	
1912	21.7	
1908	22.6	
1904	21.6	
1900	22.2	

2.3 Intersection and Predictions

1. Use GeoGebra's Intersect Tool to determine the point where the men's and women's regression lines intersect.

Questions:

- What does the intersection point represent in the context of future predictions?
- Based on your model, around what year are the predicted times for men and women expected to be equal?

3 Part 2: Updating the Graph with New Data

3.1 Adding New Data Points

1. **Usain Bolt's Record:** Add an additional data point representing Usain Bolt's fastest 200-meter record time to the men's dataset. The point is (109,19.19)

2. **2024 Winners:** Add the winning times for both the men's and women's 200-meter races from 2024 to your dataset.
   mens's Letsile Tobogo (124,19.46)
   womens's Gabby Thomas (124, 21.83)

Questions:

- How does Usain Bolt's record compare with the historical trend for men's sprint times? Does his performance align with the predicted trend?

- After adding the 2024 winners' data, what immediate differences do you notice in the regression lines for both men and women?

3.2 Analyzing the Impact on Regression Models

Questions:

- With the updated data, how have the regression lines for men and women changed?

- Does the inclusion of Usain Bolt's record significantly shift the men's regression line? What might this indicate about the consistency of past trends?

- How do the new 2024 records compare to previous data, and what do they suggest about future predictions?

3.3 Reflection on Model Limitations

Questions:

- What limitations can you identify in using a simple linear regression model to predict future record times over many decades?

- How might factors such as advancements in training, technology, or changes in competition conditions affect these trends?

- Considering potential outliers like Bolt's record, would you consider modifying the model or using an alternative regression approach? Why or why not?