Task Fast as a Lightning Bolt

Strand
Data Management

Student Text Pages
194–195

Suggested Timing
80 min

Tools
- graphing calculators
  computers with spreadsheet software

Related Resources
BLM 3-16 Chapter 3 Task Rubric

Specific Expectations

Working With Two-Variable Data

DM1.01 create a graphical summary of two-variable data using a scatter plot (e.g., by identifying and justifying the dependent and independent variables; by drawing the line of best fit, when appropriate), with and without technology

DM1.05 determine an algebraic summary of the relationship between two variables that appear to be linearly related (i.e., the equation of the line of best fit of the scatter plot), using a variety of tools (e.g., graphing calculators, graphing software) and strategies (e.g., using systematic trials to determine the slope and *y*-intercept of the line of best fit; using the regression capabilities of a graphing calculator), and solve related problems (e.g., use the equation of the line of best fit to interpolate or extrapolate from the given data set)

DM1.06 describe possible interpretations of the line of best fit of a scatter plot (e.g., the variables are linearly related) and reasons for misinterpretations (e.g., using too small a sample; failing to consider the effect of outliers; interpolating from a weak correlation; extrapolating non-linearly related data)

DM1.07 determine whether a linear model (i.e., a line of best fit) is appropriate given a set of two-variable data, by assessing the correlation between the two variables (i.e., by describing the type of correlation as positive, negative, or none; by describing the strength as strong or weak; by examining the context to determine whether a linear relationship is reasonable)

DM1.08 make conclusions from the analysis of two-variable data (e.g., by using a correlation to suggest a possible cause-and-effect relationship) and judge the reasonableness of the conclusions (e.g., by assessing the strength of the correlation; by considering if there are enough data)

Teaching Suggestions

- Have students read the Task and ensure they understand what they are being asked to do.
- Have students work in groups to brainstorm strategies for completing the Task. Discuss the strategies and review necessary skills and concepts for completing the problem.
- Circulate as students complete the Task and assist them as necessary.

Prompts for Getting Started

Ask students the following questions:

- What is the Task asking you to do?
- Is the given information complete enough to answer the questions?
- Where can you find information about creating a scatter plot or performing regression analysis?

Hints for Evaluating a Response

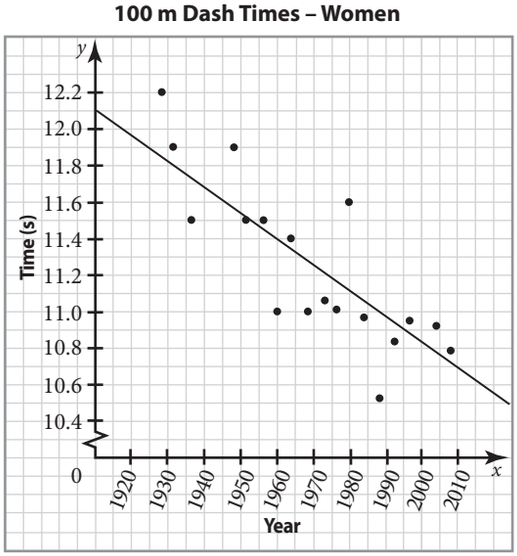
Student responses are being assessed for the level of mathematical understanding they represent. As you assess each response, consider the following questions:

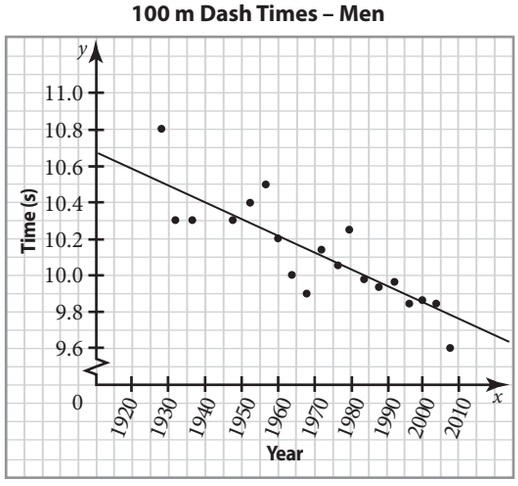
- How much assistance did the student need to understand what information was required?
- How much assistance did the student need to recall how to create scatter plots or regression models?
- How much assistance did the student need to complete the Task?
- What parts of the Task did the student complete or not complete?
- Did the student identify the assumptions made in the solution?

- Did the student present work that is clear and easy to follow and understand?
- Did the student demonstrate an understanding of the process for creating a conclusion about future Olympic running performance?
- Did the student support conclusions with logical or mathematical justification?

Level 3 Sample Response

1.





2. Both models seem to be linear.

3. a) Women: $y = -0.016\,18x + 43.08$
Men: $y = -0.009\,59x + 29.02$

b) Women: $r^2 = 0.767\,09$, $r = -0.88$
Men: $r^2 = 0.7348$, $r = -0.857$

c) Both have a strong negative correlation.

4. Trace 2012: Men: 9.72 s, Women: 10.53 s

5. (2134, 8.55). In the year 2134, both men and women might run the 100 m dash in 8.55 s.

6. Over the years, both men and women are finding ways to improve their 100 m times. Maybe they train harder, or are taller than the previous generations of runners, or have improved equipment, or have a tailwind in the race. It is uncertain how long this trend can continue for both graphs. There is a limit to how fast a person can run. The winning times will certainly never be 0 s, even if the linear regression model predicts this time in the future.

Level 3 Notes

Look for the following:

- scatter plots and regression lines created correctly using technology
- correct choice of regression model with some justification
- some discussion of future trends based on data
- explanation of most steps in the solution
- answer is organized and clearly presented

What Distinguishes Level 2

Look for the following:

- scatter plots and regression lines created using technology but with some errors or omissions
- linear regression used but without explanation
- some discussion of future trends with little or no justification
- little or no explanation of steps in the solution
- answer is not organized and not clearly presented

What Distinguishes Level 4

Look for the following:

- scatter plots and regression lines created correctly using technology and clearly presented
- correct choice of regression model with justification and discussion of alternatives; may include data such as *r*-values to support decision
- thorough discussion of future trends with detailed justification and plausible conclusions
- detailed explanation of all steps in the solution
- answer is very organized and very clearly presented

Summative Assessment

- Use **BLM 3-16 Chapter 3 Task Rubric** to assess student achievement.