WAMC Lab Template

Math Concept(s): Line of Best Fit

Source / Text:

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Attach the following documents:

- Lab Instructions
- Student Handout(s)
- Rubric and/or Assessment Tool

Short Description (Be sure to include where in your instruction this lab takes place):

Lab Plan

Lab Title: Throwing Baseballs

Prerequisite skills:

- Graphing data in a coordinate plane.
- Drawing a line of best fit.
- Identifying the type of function graphed (linear, quadratic, exponential, etc.).
- Creating a linear function that represents a given graph.
- Calculating and applying slope concepts to real world applications.

Lab objective:

After collecting data related to throwing baseballs, students will be able to graph their data, draw a line of best fit for their data, create a function for the line of best fit, and interpret the data to be able to determine their own pitching speed.

Standards: *(Note SPECIFIC relationship to Science, Technology, and/or Engineering)*

Mathematics K–12 Learning Standards:

- S.ID.B.6 Represent data on two quantitative variables on a scatter plot and describe how the variables are related.
  - 6a Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.
  - 6c Fit a linear function for a scatter plot that suggests a linear association.

- S.ID.C.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

Standards for Mathematical Practice:

- Practice 1: Make sense of problems and persevere in solving them.
- Practice 2: Reason abstractly and quantitatively.
- Practice 3: Construct viable arguments and critique the reasoning of others.
- Practice 4: Model with mathematics.
- Practice 5: Use appropriate tools strategically.

- Practice 6: Attend to precision.
- Practice 7: Look for and make use of structure.
- Practice 8: Look for and express regularity in repeated reasoning.

K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):

- SL4. Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
- RST4. Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social studies.
- RST7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- WHST1. Write arguments focused on discipline-specific content.
- WHST4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

K-12 Science Standards

- 3-PS2-2. Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

Technology

- 5.b. Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
- 6.a. Students choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.

Leadership/21st Century Skills:

21st Century Interdisciplinary themes (Check those that apply to the above activity.)

☐ Global Awareness ☐ Financial/Economic/Business/Entrepreneurial Literacy ☐ Civic Literacy
☐ Health/Safety Literacy ☐ Environmental Literacy

21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION
Creativity and Innovation
☐ Think Creatively
☐ Work Creatively with Others
☐ Implement Innovations
Critical Thinking and Problem Solving
☒ Reason Effectively
☐ Use Systems Thinking
☒ Make Judgments and Decisions
☒ Solve Problems
Communication and Collaboration
☒ Communicate Clearly
☒ Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS
Information Literacy
☒ Access and Evaluate Information
☒ Use and manage Information
Media Literacy
☐ Analyze Media
☐ Create Media Products
Information, Communications and Technology (ICT Literacy)
☒ Apply Technology Effectively

LIFE & CAREER SKILLS
Flexibility and Adaptability
☒ Adapt to Change
☒ Be Flexible
Initiative and Self-Direction
☒ Manage Goals and Time
☒ Work Independently
☒ Be Self-Directed Learners
Social and Cross-Cultural
☒ Interact Effectively with Others
☒ Work Effectively in Diverse Teams

Productivity and Accountability
☒ Manage Projects
☒ Produce Results
Leadership and Responsibility
☒ Guide and Lead Others
☒ Be Responsible to Others

Teacher Preparation: (What materials and set-up are required for this lab?)

Materials

- Baseballs
- Tape Measure
- Stopwatch (or app on phone)

Set-Up Required:

- Make copies of the lab worksheet.

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

21st Century Interdisciplinary themes (Check those that apply to the above activity.)

☐ Global Awareness ☐ Financial/Economic/Business/Entrepreneurial Literacy ☐ Civic Literacy
☐ Health/Safety Literacy ☐ Environmental Literacy

21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION

Creativity and Innovation
☐ Think Creatively
☐ Work Creatively with Others
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Critical Thinking and Problem Solving
☒ Reason Effectively
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☒ Communicate Clearly
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INFORMATION, MEDIA & TECHNOLOGY SKILLS

Information Literacy
☒ Access and Evaluate Information
☒ Use and manage Information

Media Literacy
☐ Analyze Media
☐ Create Media Products

Information, Communications and Technology (ICT Literacy)
☒ Apply Technology Effectively

LIFE & CAREER SKILLS

Flexibility and Adaptability
☒ Adapt to Change
☒ Be Flexible

Initiative and Self-Direction
☒ Manage Goals and Time
☒ Work Independently
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Social and Cross-Cultural
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Cooperative Learning:

- Students will take turns working in groups of 2 or 3: one throwing, one measuring time of throws, and one recording times.

Expectations:

- Students will work in groups of 2or 3 collaborating to collect all needed data in a timely manner with precision. Students will then work independently on completing the rest of the lab components. Each student will turn in their own lab with their individual data.

Timeline:

- This lab should take about 30-45 minutes for data collecting and 30 minutes to complete the student worksheet and computations. Two days should be planned for completing this lab, one day for data collection and a second day for the completing the rest of it.

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab:

- Career Applications
- Economist
- Research Analyst
- Business Manager
- Financial Analyst
- Research Scientist
- Health Care Professional

Optional or Extension Activities:

- Instead of looking at individual information, students could use data as a whole class to find the classes pitching speed.
- Students could research different professional baseball players' pitching speed and the distance a professional pitch travels during a game and determine how long it takes to throw a pitch.
- Students convert their pitching speed to miles per hour.

Name: _____ Date: _____

LAB: Throwing Baseballs

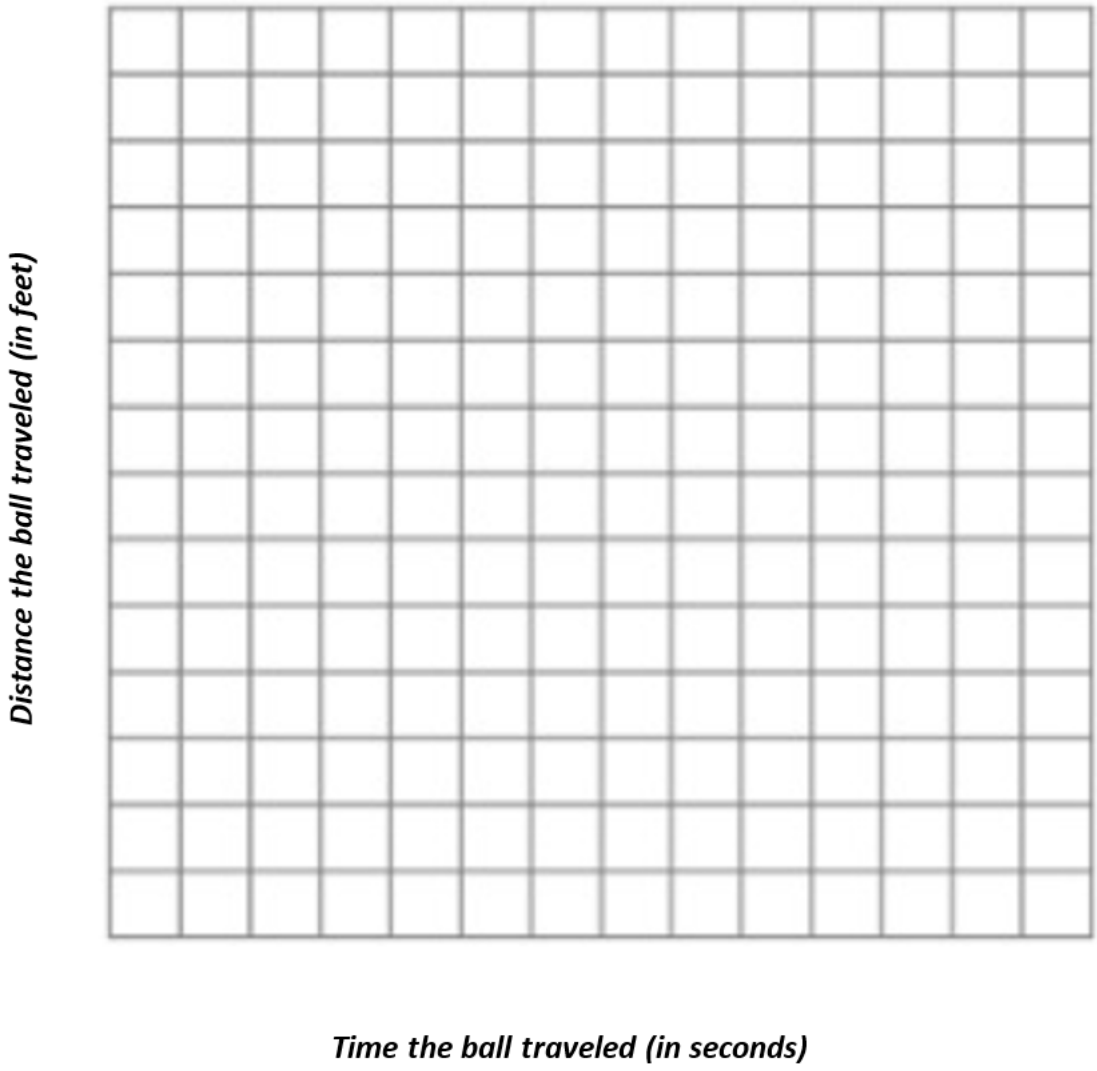
Supplies:
Baseball
Tape Measure
Lab worksheet
Stopwatch (or app on phone)

Directions: You will work in groups of 2 or 3 to record the time it takes to throw a baseball a set number of distances. You will then work individually to complete the remaining part of the lab where you will determine your own pitching speed.

1. Working with your partner or group, take turns throwing a baseball and recording the time it takes the ball to travel all 6 distances listed in the table. Fill in the table below with your throwing times. Although I have created columns for you to put your teammates' times in, I am only focusing on ***your*** times for grading your lab.

Distance thrown (in feet)	My Times (in seconds)	Teammate 1:	Teammate 2:
10			
20			
30			
40			
50			
60			

2. Use the table below to plot ***your*** times from part 1. I labeled the axis for you, but you need to determine the best intervals to use.



3. Draw a line of best fist for your graphed data and determine the equation of that line.

4. What is the slope of the line?

5. What does the slope represent for this situation? (HINT: $Velocity = \frac{Distance}{Time}$)

6. Research the average professional baseball player's pitching speed. What is the average pitching speed of a professional baseball player? How do you compare to a professional?

7. Will this line go on forever? Explain your reasoning.

8. Do you think the distance affects the speed at which the ball is thrown? Should the line of best fit be linear? Explain your reasoning.