WAMC Lab Template

Math Concept(s): Slope, y-intercept form of linear equations
Source / Text:
Developed by: N Betsy Kimmel E-Mail: nkimmel@cloverpark.k12.wa.us
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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):

- Students will develop a linear equation (best-fit line) for height of a race track vs. distance traveled for a matchbox car.

IB Components

Key Concepts: Relationships Related Concept: Equivalence and Approximation
Global Context: Scientific and Technical Innovation
SOI: Technical approximate relationships can be codified into equivalent equations.
ATL: Self-management, research
LPT: Principles, Open-minded, Inquirer
Inquiry Question:

Lab Plan

Lab Title: How far can the car travel?

Prerequisite skills: observation, measurement, collaboration,

Lab objective: graph data points, develop a linear equation, predict the distance based on height of track.

Standards: *(Note SPECIFIC relationship to Science, Technology, and/or Engineering)*
Mathematics K–12 Learning Standards:

- B. Understand the connections between proportional relationships, lines, and linear equations. 5. 8.EE.B.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.
- B. Solve equations and inequalities in one variable 3. HSA-REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters

Standards for Mathematical Practice:

- Model with mathematics.
- Construct viable arguments and critique the reasoning of others.

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

- Production and Distribution of Writing: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- Comprehension and Collaboration 2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally

K-12 Science Standards

- HS-PS2-2 Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

Technology

- 5. Computational Thinker - Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions. 5.a. Students practice defining problems to solve by computing for data analysis, modeling or algorithmic thinking

Engineering

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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
X☐ Think Creatively
X☐ Work Creatively with Others
☐ Implement Innovations
Critical Thinking and Problem Solving
X☐ Reason Effectively
☐ Use Systems Thinking
X☐ Make Judgments and Decisions
X☐ Solve Problems
Communication and Collaboration
X☐ Communicate Clearly
X☐ Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS
Information Literacy
X☐ Access and Evaluate Information
X☐ 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
X☐ Adapt to Change
X☐ 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
x☐ Manage Projects
x☐ 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

- Matchbox cars (1 per group of 3 students)
- Racetracks (1 per group of 3 students)
- Recording sheet
- Presentation sheet

- Materials to change height of track (ex: stacks of books)

Set-Up Required:

- Each group needs materials

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

- Students will work collaboratively to collect and evaluate information
- Students will manage their exploration phase and produce a linear equation

Cooperative Learning:

- Students will work together to explore height vs. distance, collecting data in an organized manner to produce an equation.

Expectations:

- Students will work with their group of 3.
- Students will maintain their space.

Timeline:

- Exploration time: 20 minutes
- Linear Equation: 15 minutes

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- Discussion: how does this apply to you? (ex: skateboarding, learning to drive, etc.)
- How can you use this in class? What connections can you make with vocabulary and assignments?

Career Applications

- Science Fields: Scientific process
- Data processing: collecting, displaying, and analyzing data

Optional or Extension Activities

-

Names in group_____ Class period_____

Lab instructions: How far can the car travel?

Research Question: What will affect the distance a matchbox car will travel?

Materials:

- 1 matchbox race car
- 1 racetrack strip
- 1 measuring tape or yard/meter stick
- Books or other things to raise your track
- Recording sheet

Hypothesis:

_____

_____

_____

Procedure:

1. Set up your racetrack strip with the top end at 6 inches.
2. Place your matchbox car at the top of the track and release.
3. Measure the horizontal distance from the start of your track to where the car stopped on its own
4. Record both the height and the distance in inches on the recording sheet.
5. Repeat steps 1-4 changing the height of the racetrack at least 10 times each trial.
6. Graph your data on Recording sheet.
7. Estimate a line of best fit
8. Calculate the slope.
9. Write the equation for the line of best fit.

Conclusion: Look at your hypothesis. Did your hypothesis and experimental data match? Or Not? What can you conclude now?

_____

_____

_____

Names in group_____ Class period___

Handout: How far can the car travel?

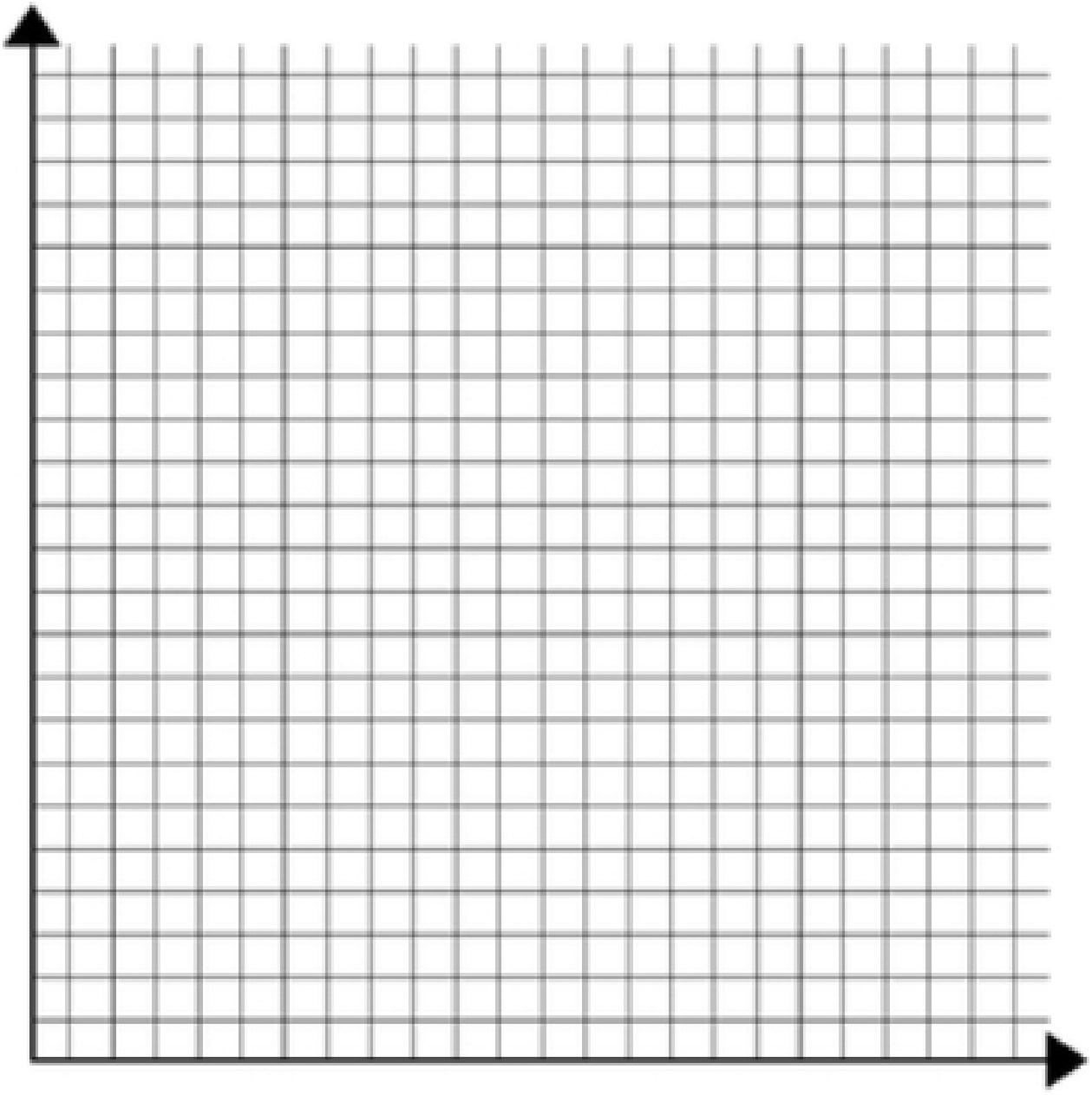
Record your track height and distance here.

Trial	Height (inches)	Distance (inches)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

Names in group_____ Class period___

Graph your data here. X-axis=height. Y-axis=distance

Measure in inches.



Slope: m=_____

Equation: y=_____

Names in group _____ Class period ___

Rubric: How far can the car travel?

	IB Math Crit D: Application Yr. 3	IB Science Crit C Processing and evaluating Yr. 3	Assessment Specific
	The student is able to:		
1-2 (60 or 65%)	i. identify some of the elements of the authentic real-life situation ii. apply mathematical strategies to find a solution to the authentic real-life situation, with limited success.	• collect and present data in numerical and/or visual forms • accurately interpret data • state the validity of a hypothesis with limited reference to a scientific investigation	• Collects less than 8 trials of data • inaccurate data collection • Inaccurate graph • no slope or equation • no or little conclusion
3-4 (73 or 78%)	i. identify the relevant elements of the authentic real-life situation ii. select, with some success, adequate mathematical strategies to model the authentic real-life situation iii. apply mathematical strategies to reach a solution to the authentic real-life situation	• correctly collect and present data in numerical and/or visual forms • accurately interpret data and describe results • state the validity of a hypothesis based on the outcome of a scientific investigation	• Accurately collects 10 trials of data • Some points correctly graphed • Slope or equation missing or inaccurate. • Conclusion difficult to understand
5-6 (83 or 88%)	i. identify the relevant elements of the authentic real-life situation ii. select adequate mathematical strategies to model the authentic reallife situation iii. apply the selected mathematical strategies to reach a valid solution to the authentic real-life situation	• correctly collect, organize and present data in numerical and/or visual forms • accurately interpret data and describe results using scientific reasoning • outline the validity of a hypothesis based on the outcome of a scientific investigation	• Accurately collects 10 trials of data • Most points correctly graphed • Slope and equation are accurate. • Conclusion is easy to understand
7-8 (93 or 100%)	i. identify the relevant elements of the authentic real-life situation ii. select appropriate mathematical strategies to model the authentic real-life situation iii. apply the selected mathematical strategies to reach a correct solution to the authentic real-life situation	• correctly collect, organize, transform and present data in numerical and/ or visual forms • accurately interpret data and describe results using correct scientific reasoning • discuss the validity of a hypothesis based on the outcome of a scientific investigation	• Accurately collects 10 trials of data • All points correctly graphed • Slope and equation are accurate. • Conclusion is easy to understand and thorough

Names in group _____ Class period ___

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