Lab Framework

Text: Financial Algebra
Volume: __1_____ **Chapter:** __5_____
Unit number __8__ **Title of unit:** Graph Frequency Distributions
Developed by: Jacqueline Brewster **jbrewster@psd1.org**
Date: 6/26/2012

Students will be figuring out braking distances and total stopping distances in feet at their chosen speeds of mi/h. With this information they will then go outside or to the gym to place their distance markers. This will help the students get a hands on and visual representation of braking distance, total stopping distance, and the difference between the two.

Exploring the Difference Between Braking Distance and Total Stopping Distance

LAB PLAN

TEACHER:

- **Lab Objective**
  To use the knowledge of reaction time, reaction distance, and braking distance to find the total stopping distance. Use the braking distance and total stopping distance to create a visual representation.

- **Statement of prerequisite skills needed**
  Understand the formula $\frac{s^2}{20}$ and $s + \frac{s^2}{20}$, how to take data and create a line graph, how to measure distance using a measuring tape, and how to place markers at distances. Prior workings of the braking distance formula and total stopping distance formula whether as a class or individually.

- **Vocabulary**
  Reaction time, thinking time, reaction distance, braking distance, total stopping distance, difference, and line graph.

- **State Standards addressed:** *(Highlight "Green" Standards, you may use your District's Power Standards if applicable)*
  - **Math:**
    A1.8.E –Read and interpret diagrams, graphs, and text containing the symbols, language, and conventions of mathematics
    8.3.B-Select, construct, and analyze data displays
  - **Reading:**
    1.2.2-Use vocabulary strategies to understand new words and concepts
    2.3.2 -Select appropriate resources for locating information for a specific purpose.
  - **Writing:**

3.1 — Develops ideas and organizes writing.
3.2 — Uses appropriate style.

- **Leadership:**
  10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
  10.B.1.a Work positively and ethically
  10.B.1.b Manage time and projects effectively
  10.B.1.c Multi-task
  10.B.1.f Collaborate and cooperate effectively with teams
  10.B.1.g Respect and appreciate team

- **SCAN Skills/Workplace Skills:**
  1.2 -The student can acquire and evaluate data, organize and maintain files, interpret and communicate, and use computers to process information.

- **Teacher Preparation:** *(What materials and set-up are required for this lesson?)*
  - Materials:
    - 100m measuring tape for each group
    - Student worksheet
    - 20 Distance markers (a pair of each color-10 different colors or number pairs) per group
      - In grass-wooden dowels, wire markers (think of what schools use to mark sprinklers or holes in the ground), etc
      - In gym/indoors-paper circles, pieces of fabric, etc
      - On sidewalk-bean bags, safety cones, etc
    - Access to computers-1 per group or 1 and each group takes turns
    - Access to internet
    - Access to this website: http://nces.ed.gov/nceskids/createagraph/

  - Set-Up Required:
    Identify activity location, identify number of groups, enough measuring tapes for each group, enough student worksheets for each student, distance markers, go over vocabulary, and set up access to computers. Before you have students create a line graph from the website make sure you have created one so that you can help guide the students through the activity and check access through school internet.

- **Lab Organizational Strategies:**
  - Grouping/Leadership/Presentation Opportunities:
    Students can pick groups or you can place them in groups, this will require some math skills but those that are not strong in math can help place targets or find measurements. Everyone should have a role. Students can also present results to the class as well as have class discussion, see post lab follow-up.

  - Cooperative Learning:
    Students will need to each fill out their own paper but they are to work in a group. They will need to have the worksheet done before you go outside to measure, therefore they will need to support each other. Everyone must have a job when they go outside so they need to divvy up their responsibilities which will include all students.

- Expectations:
  All students will have a part in the lab. Those with lower math skills will be able to participate and participate in a hands-on lesson of total stopping distance for everyone.

- Each Page of the student worksheet can be given one day at a time, in sections, or all at once depending on teacher preference.

- Time-line: 2- 3 days

- **Post Lab Follow-Up/Conclusions** *(to be covered after student completes lab)*
  - Discuss real world application of learning from lab:
    -Discuss with students how this has helped them understand real world applications for each of them. Example: will that car be able to stop if you decide to cross the street.
    -Discuss how this will help when they start driving OR how they will change how they think when they are driving, for those who are already driving).

  - Career Applications:
    Individuals who will be dealing with car accidents such as police officers, crime scene investigators, and insurance agents can benefit from this information.

  - Optional or Extension Activities:
    -As a class or individually convert results to metric system (see page 271 in Financial Algebra book)
    -Slope intercept

Name:_____ Date:_____ Hour/Class:_____

Group Members:_____

Exploring the Difference Between Braking Distance and Total Stopping Distance

Directions: Follow the directions throughout the worksheet as you complete the lab. Everyone must turn in a worksheet to obtain credit for this lab; however you will use the group results.

1. As a group select 10 different mi/h ranging between 0 and 90, write what the group chose in the table below. **Make sure you put them in order of least mi/h in number one to the greatest mi/h in number 10!**

2. In the braking distance column use the formula for braking distance to calculate how many feet it will take for a car to stop at each distance.

3. In the total braking distance column use the formula for total braking distance to calculate how many feet it will take for a car to stop at each distance.

Results Table

	Mi/h	Braking Distance $\frac{s^2}{20}$ (in feet)	Total Stopping Distance $s + \frac{s^2}{20}$ (in feet)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

4. Next, as a group, everyone will be participating in the visual representation of your results. On the chart below everyone must sign up for a job, once everyone is signed up for a job then each person can pick a second job if needed. Basically, all the spots must be filled!

Job Title	Name
Tape measure reader for braking distance	
Tape measure reader for total braking distance	
Tape measure holder	
Tape measure holder	
Results table reader braking distance	
Braking distance marker placer	
Results table reader total braking distance	
Total braking distance marker placer	
Observations note taker	
Other:	
Other:	

5. Draw a picture of the group visual representation that was created.

6. What are two interesting pieces of information you notice from the visual representation your group created?

7. What would you do differently to construct the visual next time?

8. Complete a line graph.
    a. Go to the following website: http://nces.ed.gov/nceskids/createagraph/
    b. Click on Line Graph.
    c. Use the data from the Results Table to complete a line graph.
    d. Print out one copy of the graph to attach to the group packet.
    e. Draw a copy of the graph in the space below. Make sure to label!

Lesson Plan

Text: Financial Algebra
Volume: __1_____ **Chapter:** __5_____
Unit number __8__ **Title of unit:** Graph Frequency Distributions
Developed by: Jacqueline Brewster **jbrewster@psd1.org**
Date: 6/26/2012

This lesson is a classroom lesson that will take one day of instruction. Topics covered will be driving safety data and the formulas that go with this unit.

LESSON PLAN

TEACHER:

- **Lesson Objectives:**
  - **Students will be able to:**
    - **Calculate reaction time and distance in the English Standard System.**
    - **Calculate and use the braking distance in both the English Standard and Metric Systems.**
    - **Calculate and use the total stopping distance in both the English Standard and Metric System.**

- **List of prerequisite skills needed: Riding in a car while it stops, multiplication using a calculator, and a general understanding or order of operations.**

- **Vocabulary:**

Reaction time	**Thinking time**	**Reaction Distance**
Braking Distance	**Total Stopping Distance**	**Metric system**
Kilometer	**Meters**	**Difference**

- **State Standards addressed:**
  Math:
  A-SSE1b
  A-SSE3
  Reading:
  1.2.2 - Apply strategies to comprehend words and ideas.
  Writing:
  2.2 — Writes for different purposes
  Leadership:
  4.B.1 Use information accurately and creatively for the issue or problem at hand

- **Teacher Preparation:** Financial Algebra text pages 268-273, examples for class practice of formulas, assigned practice problems set, and quiz FA 5-8. Spend time on the following website and assign a student problem where they have to use it to graph the results or set of data: http://nces.ed.gov/nceskids/createagraph/

- **Content Delivery:** Content will be delivered as a whole class discussion, teacher presentation on information, class practice of formulas, and individual practice of formulas and concepts.

- **Instructional Documents** Go over pages 268-271 with class including examples. Assign application questions form pages 272 and 273. Quiz FA 5-8 (Applied Math Conference 2012)

- **Assessment Tool used in this Lesson** Assessing students during class discussion, practice problems, and quiz.

- **Reinforcement/Intervention/Extension Activities** –Reinforce with FA 5-8 Lab (Applied Math Conference 2012) and extension can be to have students create questions that created from the section that they would want to see on their final or comprehensive quiz. To help alleviate worthless questions let them know that their question is more likely to be used if it is quality, this will give them an advantage on the final or comprehensive quiz.

- **Career Applications -** Individuals who will be dealing with car accidents such as police officers, crime scene investigators, and insurance agents can benefit from this information.

Name:_____ Date:_____ Hour/Class:_____

Chapter 5-8 Quiz

Short Answer questions

1. What is reaction/thinking time?

2. What is reaction distance?

3. What is braking distance?

4. What is total stopping distance?

Math skill questions

5. If there are 5,280 feet in a mile, how many feet would you cover if you traveled 32 miles? Show your work.

6. A car traveling 70 mi/h covers how many miles in one hour?

7. If there are 5,280 feet in a mile and using the answer from number 6 you covered how many feet in one hour. Show your work.

8. Since 1 kilometer ≈ 0.6213712 miles, how would you express 110 km/h? Show your work.

Name:_____ Date:_____ Hour/Class:_____

Using the general formula for braking distance $\frac{S^2}{20}$ answer the following questions:

9. What is the approximate braking distance for a car traveling at 48 m/hr?

10. What is the approximate braking distance for a car traveling at 70 m/hr?

11. What is the approximate braking distance for a car traveling at 60 m/hr?

12. What is the approximate braking distance for a car traveling at 78 m/hr?

13. What is the approximate braking distance for a car traveling at 30 m/hr?

14. What is the approximate braking distance for a car traveling at 85 m/hr?

Completion

15. Using the information you discovered in numbers 8-13 create a chart to graph the stopping distance of a car at each m/hr listed. Make sure to label. *Think of the one we created after our lab.*

Name:_____ Date:_____ Hour/Class:_____

Chapter 5-8 Quiz

Answer Key

Short Answer questions

1. What is reaction/thinking time?

   The time the average, alert driver takes to switch from the gas pedal to the brake pedal.

2. What is reaction distance?

   The distance a car travels during a reaction thinking time.

3. What is braking distance?

   The distance a car travels while braking to a complete stop.

4. What is total stopping distance?

   The sum of the reaction distance and the braking distance

Math skill questions

5. If there are 5,280 feet in a mile, how many feet would you cover if you traveled 32 miles? Show your work.

   5,280 * 32= **168,960 feet**

6. A car traveling 70 mi/h covers how many miles in one hour?

   70 miles

7. If there are 5,280 feet in a mile and using the answer from number 6 you covered how many feet in one hour. Show your work.

   5,280 * 70= **369,600 feet**

8. Since 1 kilometer ≈ 0.6213712 miles, how would you express 110 km/h? Show your work.
   110 * 0.621371 = **68 mi/h**

Name:_____ Date:_____ Hour/Class:_____

Using the general formula for braking distance $\frac{s^2}{20}$ answer the following questions:

9. What is the approximate braking distance for a car traveling at 48 m/hr?

$\frac{s^2}{20} = \frac{48^2}{20} =$ **115.2 feet**

10. What is the approximate braking distance for a car traveling at 70 m/hr?

$\frac{s^2}{20} = \frac{70^2}{20} =$ **245 feet**

11. What is the approximate braking distance for a car traveling at 60 m/hr?

$\frac{s^2}{20} = \frac{60^2}{20} =$ **180 feet**

12. What is the approximate braking distance for a car traveling at 78 m/hr?

$\frac{s^2}{20} = \frac{78^2}{20} =$ **304.2 feet**

13. What is the approximate braking distance for a car traveling at 30 m/hr?

$\frac{s^2}{20} = \frac{30^2}{20} =$ **45 feet**

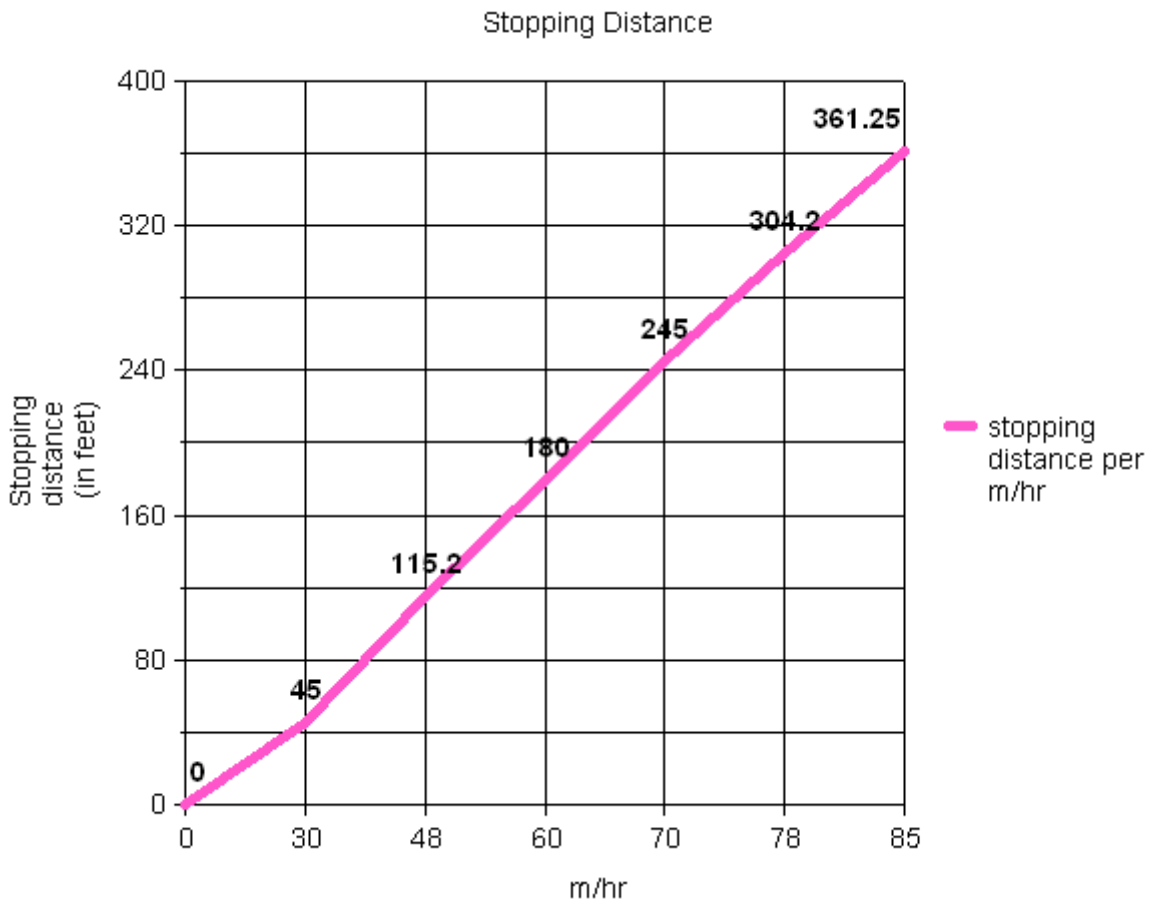
14. What is the approximate braking distance for a car traveling at 85 m/hr?

$\frac{s^2}{20} = \frac{85^2}{20} =$ **361.25 feet**

Completion

15. Using the information you discovered in numbers 8-13 create a chart to graph the stopping distance of a car at each m/hr listed. Make sure to label. *Think of the one we created after our lab.*

Name:_____ Date:_____ Hour/Class:_____



5-3 Websites

http://ellerbruch.nmu.edu/cs255/jnord/boxplot.html

http://www.internet4classrooms.com/

http://www.internet4classrooms.com/skill_builders/box_and_whisker_math_eighth_8th_grade.htm

5-8 Website

http://nces.ed.gov/nceskids/createagraph/