LESSON 4.9

Rules of the Road

You will need:

graph paper

UNIT CONVERSION

When you talk about the speed you are traveling, you usually give the speed in *miles per hour.* In this lesson it will be useful to give speed in *feet per second.* Use the fact that 100 miles per hour (mph) is about 147 feet per second (fps).

1. How many fps is 50 mph?

2. Complete the table to show the relationship of miles per hour to feet per second. Extend the table up to 80 miles per hour.

mph	fps
10	14.7
20	

3. If you made a graph from your table with *mph* on the x-axis and *fps* on the y-axis, what would the graph look like? (If you are not sure, draw it.)

4. If you were traveling at 1 mph, how fast would you be going in fps?

STOPPING DISTANCE

To stop a car in an emergency, you first react and then put on the brakes.

stopping distance =
reaction distance + braking distance

5. What kinds of things do you think would affect reaction time and distance? Braking time and distance?

Reaction time is often considered to be about 3/4 of a second, but how far you travel during this time depends on how fast you are going.

6. Reaction distance:

a. Figure out how many feet you would travel in 3/4 of a second if you were going at various speeds (10 mph, 20 mph, etc.). Make a table to display your data.

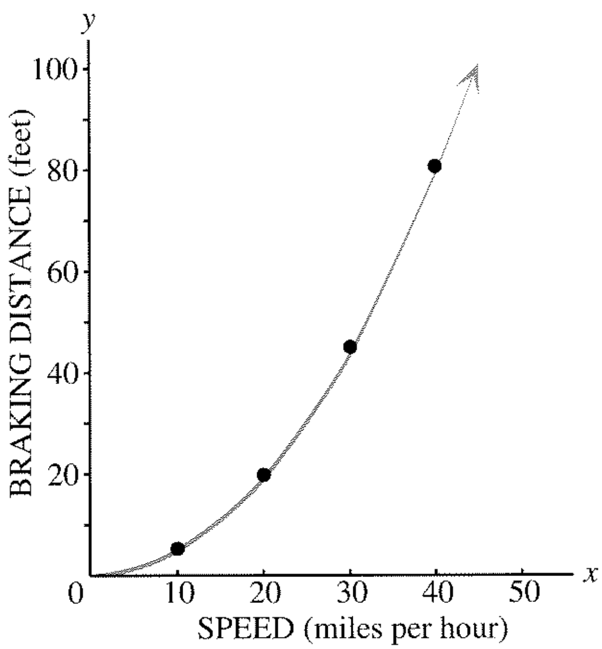
b. Graph your data. Put *reaction distance in feet* on the y-axis and *speed in miles per hour* on the x-axis.

c. Describe the relationship between the two variables on your graph.

7. Braking distance: A formula for finding braking distance in feet is to take the speed in miles per hour, square it, and divide the result by 20. For example, if the speed were 10 mph, the braking distance would be $(10)^2/20 = 100/20 = 5$ feet.

a. The graph on the next page shows the relationship between the braking distance (in feet) and the speed (in miles per hour). All the points on the graph were found by using the formula. Make a table showing the coordinates of at least five points on the graph.

b. According to the table and graph, if you double your speed, will you double your braking distance? Explain, giving examples.



8. Total stopping distance: Use your tables and graphs from problems 6 and 7 to make a table with the headings shown. Use at least five different speeds.

Speed (mph)	Reaction distance (feet)	Braking distance (feet)	Total stopping distance (feet)

SAFE DISTANCE

It is estimated that about 30 percent of all automobile accidents are caused by following too closely. Two rules of thumb for avoiding accidents follow.

Rule 1: The 3-Second Rule. Notice when the vehicle in front of you passes some object, such as a road sign. Then time approximately three seconds by counting, "One-thousand-one, one-thousand-two, one-thousand-three." If you pass the same object before you get to one-thousand-three, you are following too closely.

Rule 2: The 1-for-10 Rule. Leave one car length between you and the car in front of you for every 10 mph of driving speed.

9. **Exploration** Which rule do you think is safer? Taking into account what you found out about stopping distance, what do you think would make a good rule of thumb?

To compare the two rules, it helps to convert miles per hour to feet per second, so that all units are in feet and seconds.

10. a. Copy and complete the table to show the distance traveled in three seconds at the speeds given. Extend the table up to 100 miles per hour.

Speed (mph)	Speed (fps)	Distance (ft)
10	14.7	44.1
20		

b. According to the table, how many feet would a car traveling at 50 mph cover in three seconds?

c. If you were instructed to stay three seconds behind the car in front of you, how many feet would that be, if you were traveling at 70 mph?

d. If you slowed down to 35 mph, could you cut your following distance in half? Explain.

e. If you drew a graph with speed on the y-axis and *distance traveled in three seconds* on the x-axis, what would it look like? Explain. If you are not sure, sketch the graph.

11. Most cars are about 14 to 18 feet in length. Choose a car length in this interval and make a table showing safe following distances at certain speeds according to Rule 2.

Speed (mph)	Speed (fps)	Safe distance (car lengths)	Safe distance (feet)
10	14.7	1	
20		2	

12. Use your tables to compare Rule 1 and Rule 2. How are they different? Which one suggests greater caution? Explain.

13. Should one evaluate Rule 2 based on its implementation using a small-car length or a large-car length? Explain.

14. Report Use the information about total stopping distance to decide whether you agree with the advice given by Rule 1 or by Rule 2, or whether you would suggest a different rule. Write a paragraph explaining your opinion.

DISCOVERY *ROUNDING*

Because of measurement error, it is meaningless to say that someone weighs 157.2490368 pounds. No scale is that accurate, and even if it were, one does not need that level of accuracy. For most purposes, it is satisfactory to talk of someone's weight to the nearest pound, so this number should be rounded off to 157.

When dealing with amounts of money, one usually rounds off to the nearest cent. In some cases, one rounds up, or down. When doing work with *real* numbers, make sure you do not copy answers from your calculator without thinking of whether you should round off, round up, or round down.

15. If you buy one 95-cent pastry at the Columbia Street Bakery, you will be charged $1.00 even. But if you buy two pastries, you will be charged $2.01.

a. What is the sales tax in this town?

b. Does the cash register round off to the nearest cent, or does it round up or down? Explain.

16. In the same town, if you buy a 94-cent soda at Eddie's, you will be charged $1.00. If you buy two sodas, you will be charged $1.99. Does this cash register round off to the nearest cent? Does it round up or down? Explain.