

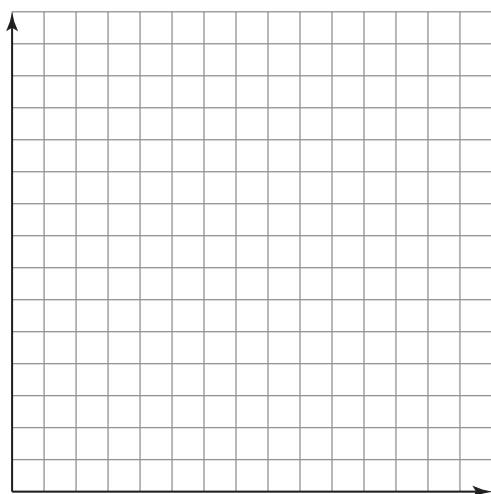
**Chapter
2****Performance Task** (continued)**Accident Reconstruction**

Was the driver of a car speeding when the brakes were applied? What do skid marks at the scene of an accident reveal about the moments before the collision?

Part 1: The Model

Few drivers know their true speed in the moments before an accident, but tire skid marks at the scene are a good clue. Skid marks occur when hard braking is applied, which causes tires to stop turning. The distance a car travels after brakes are applied until it comes to rest is called braking distance. Braking distance increases quadratically with respect to the speed of the vehicle.

1. Make a scatter plot of braking data. Be sure to label your axes. For our model, we will consider the basic conditions for braking distance and will assume an average-sized car is traveling on a dry, paved surface.



Velocity (miles per hour)	Braking distance (feet)
20	17.78
30	40
40	71.11
50	111.11
60	160
70	217.78

**Chapter
2****Performance Task** (continued)

2. Use quadratic regression to define an equation for braking distance in terms of velocity.

$$D_B = \underline{\hspace{2cm}}$$

How closely does your model match the data according to the R^2 value?

Compare this to a linear regression run on the same data. Which is the better fit?

Using your model, complete the table for common road speeds. Note that legal speed limits vary by state and municipality.

Road type	Velocity (miles per hour)	Braking distance (feet)
residential	25	
business district	35	
undivided highway	55	
divided highway	65	
freeway/interstate	75	

**Chapter
2****Performance Task** (continued)**Part 2: Using Your Results**

How could you estimate the minimum speed of the car that made the skid marks in this picture? What additional information do you need to know?

A helpful fact is that each dashed line on any road or highway is 10 feet long, with 30 feet in between dashes.

Why do the dashed road lines appear smaller near the top of the picture? How will you adjust for this in making your measurement?

Once you have determined a scale (or scales) for the picture, measure the skid marks.

Given the length of the skid marks, what was the approximate minimum speed of the vehicle when the brakes were applied? Was the driver speeding? Explain your answer.

