

REACTION / BRAKING TIME (FORCES IN MOTION)

Suppose a dog runs in front of a car traveling at a given rate of speed in meters per second. The car continues to cover distance while the driver reacts, and while he/she applies the brakes to stop the car. The following chart gives the original speed at which the driver was traveling, and then the reaction, braking, and total distance covered before the car comes to a stop.

Original Speed meters/sec	Reaction Distance meters	Braking Distance meters	Total Distance meters
11	8	10	18
16	12	20	32
20	15	34	49
25	18	50	68
29	22	70	92

(Note: 29 meters/second is about 64 miles/hour and 92 meters is about 299 feet.)

Using Your TI-83/84+ Graphing Calculator

1. Enter the given data in lists L1, L2, L3, and L4 respectively.
2. Using Plots 1, 2, and 3, and a different "mark" for each, draw scatterplots for the following:
 - L1 vs. L2
 - L1 vs. L3
 - L1 vs. L4
3. Using $\boxed{\text{STAT}}$ CALC, find the line of best fit for the L1 vs. L2 graph, and the quadratic functions of best fit for the curves of L1 vs. L3 and L1 vs. L4.

Original Speed vs. Reaction Distance (L1 vs. L2)

1. What is the equation of the regression line that you found?
2. What does the slope mean in terms of the problem given?
3. What is the x-intercept of the regression line? Explain what it means in terms of the context of the problem.

4. At what speed was the driver traveling (km/hr), if stopping the vehicle requires a reaction distance of 14 meters.
5. If a car was traveling 85 km/hr, what is the total reaction distance needed by the driver?

Original Speed vs. Braking Distance (L1 vs. L3)

1. What is the quadratic function that best fits the curve?
2. What is the domain and range of this function, in the context of the problem?
3. What is the y-intercept of the graph of this function? What does this mean in terms of the context of the problem? Does it make sense?
4. What is the speed of a vehicle in (km/hr), if the braking distance needed to stop the vehicle is 40 meters?
5. What is the braking distance needed to stop a vehicle traveling at 85 km/hr?

Original Speed vs. Total Distance (L1 vs. L4)

1. What is the quadratic function that best fits the curve?
2. What is the domain and range of this function, in the context of the problem?
3. What is the total distance needed to stop a vehicle moving at 85 km/hr?
4. If the vehicle is traveling 13 m/s, what is the total distance needed to stop the vehicle?

5. A minivan starts traveling down a pier to catch a ferry for Martha's Vineyard. The pier is 150 meters long. However, the driver was running late, and is speeding at 60 km/hr to board the ferry. However, the ferry pulls away from the dock, as the driver is half way down the pier. The driver reacts and applies the brakes to stop the vehicle. Based on the data above, will the vehicle stop on the pier, or land in the water? Use the equations you found above to help solve this problem. Show all your work.