9 The Domino Effect

Purpose

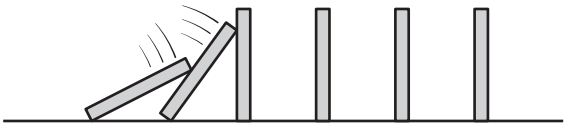
To maximize the speed of falling dominoes

Required Equipment/Supplies

approximately 50 dominoes
stopwatch
meterstick

Discussion

A central property of motion is *speed*—the rate at which distance is covered. By rate, we mean how much or how many of something per unit of time: how many kilometers traveled in an hour, how many feet moved in a second, how many raindrops hitting a roof in a minute, how much interest earned on a bank account in a year. When we measure the speed of an automobile, we measure the rate at which this easily seen physical thing moves over the ground—for instance, how many kilometers per hour. But when we measure the speed of sound or the speed of light, we measure the rate at which energy moves. We cannot see this energy. We can, however, see and measure the speed of the energy pulse that makes a row of dominoes fall.



Procedure

Set up string of dominoes.

Step 1: Set up 50 dominoes in a straight row, with equal spacing between them. The dominoes must be spaced at *least* the thickness of one domino apart. Your goal is to maximize the speed at which a row of dominoes falls down. Set the dominoes in a way you think will give the greatest speed.

Step 2: Measure the total length of your row of dominoes.

length = _____

Step 3: Compute the average spacing distance between dominoes by measuring the length from the middle of the first domino to the middle of the last one, and divide this by the number of domino spacings.

average distance between dominoes = _____

Step 4: Measure the length of a domino.

length of domino = _____

spacing distance = _____ domino lengths

Step 5: Measure the time it takes for your row of dominoes to fall down.

time = _____

Compute average toppling speed.

Step 6: Compute the average toppling speed for your row of dominoes.

average speed = _____

Repeat for different spacings.

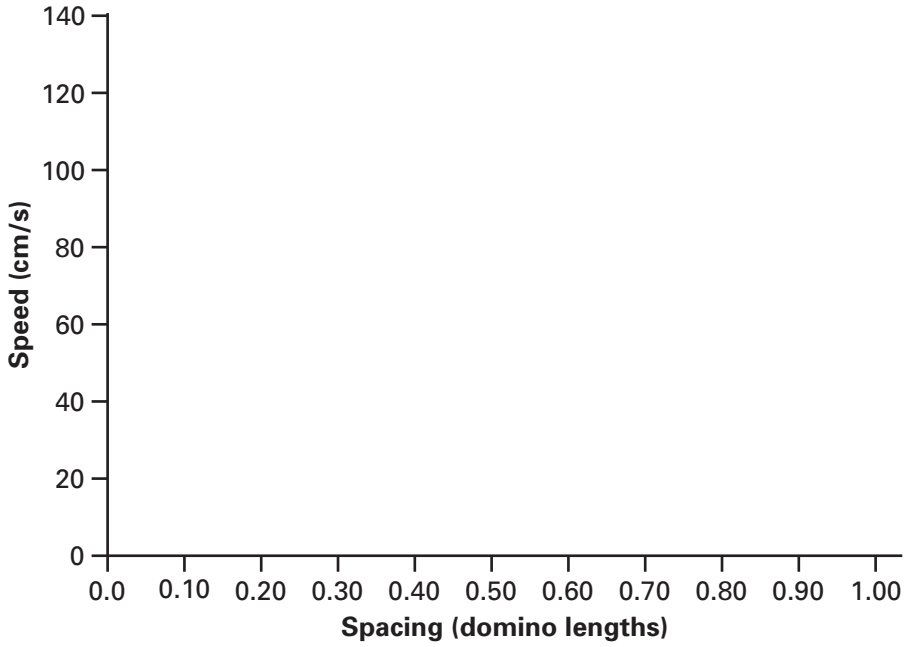
Step 7: Repeat Steps 5 and 6 for at least three more spacings. Include a spacing that is about as small as you can make it and still produce toppling and a spacing that is about as large as you can make it and still produce toppling. Record your data (including data for the first trial) in Data Table A.

Graph data.

Step 8: Using a separate piece of graph paper, make a graph of your data by sketching a smooth curve through your data points. Identify the point on the curve where the speed is maximum or minimum (this need not be exactly at one of your measured points).

Data Table A

Trial	Length	Average Spacing	Time	Speed



Analysis

1. What is a definition of average speed?

2. What are the factors that affect the speed of falling dominoes?

3. Why do we use *average speed* for the pulse running down the dominoes rather than *instantaneous speed*?

4. From your graph, what is the maximum or minimum toppling speed?

5. What spacing between dominoes do you predict would give the maximum or minimum speed? What is the ratio of this spacing to the length of a domino?

6. At the maximum or minimum toppling speed of the row of dominoes, how long should a row of dominoes be to make a string that takes one minute to fall?