Outbreak!

6973

INTRODUCTION

Societies have always struggled with the spread of disease. Viruses cause some of the deadliest diseases known, such as HIV and hepatitis. They are also responsible for diseases such as the common cold, influenza, and chickenpox. The members of a population can spread viruses very quickly as infected individuals come in contact with those who are not infected. In this activity you will simulate the spread of a virus, produce a graph of the virus data, and analyze the data.

Activity Overview

In this activity we will

- use the Data Graphs Wizard to learn about how disease is spread
- brainstorm ways in which people can help stop an outbreak of disease

Approximate Total Time: 25 minutes

Science Objective

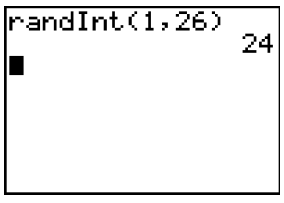
Calculations illustrate how quickly a virus can spread in a typical population. Virus-transmission data are graphed and analyzed.

PROCEDURE

Teachers: Assign students consecutive integers, starting with 1. A student will sit down when his or her number is called. This will indicate that the student is "infected." Generate random integers by doing the following:

1

Press MATH, ◀. Scroll down to 5:RAND INT(, and press ENTER. Press 1, ,. Enter the number of students in the class, and press). Then press ENTER. Your screen will show one random integer. Announce this number to the class, and ask the student assigned to this number to sit down. He or she will be the first to be "infected."



2

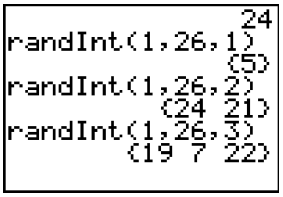
Continue "infecting" students. After the generation of the first random integer, press 2nd, ENTER to recall the last command. Press ◀ so that the) is highlighted.

3

Press ,, enter the number of students sitting down, and). Then press ENTER. This will produce another random integer, indicating a second infection. (During the first two trials, one student will be infected. From the third trial on, the number of students infected will increase with each trial.)

4

After each trial, repeat steps 2 and 3, but change the last number within parentheses to reflect the total number of infected students. Continue generating random integers until the entire class is infected.



Students: Your teacher will assign each of you an integer. You should sit down when your number is called. This means that you are "infected." The students who remain standing are "uninfected." After each trial, record the number of infected individuals in the second column of the data table.

DATA TABLE

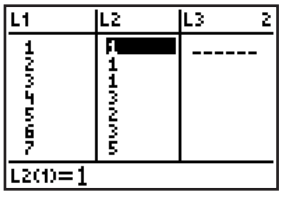
Trial number	Number of individuals infected in trial	Total individuals infected
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

5

Use your data table to graph the spread of the virus through the class. To get to the List Editor, press [STAT], [ENTER]. If there are existing data in the lists, clear them by pressing [CLEAR], [ENTER].

6

Enter the trial number in L1 and the number of individuals infected in L2. The screen here shows L1 and L2 with sample data. Your results may be different.

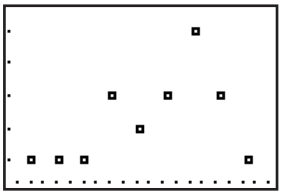


7

Press [APPS], scroll to highlight SCI TOOLS, and press [ENTER], [ENTER]. Highlight 3:DATA/GRAPHS WIZARD and press [ENTER].

8

Press [WINDOW] to plot data and [Y=] to choose a scatter plot. Press [ENTER] to select L1 as the independent variable. Select L2 as the dependent variable. Your graph may look similar to the one here. Make a sketch of your graph on a separate sheet of paper. Be sure to label the axes and give your graph a title.



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DATA ANALYSIS

1

Looking at your graph, describe the spread of the disease from start to finish.

2

Press [TRACE] and use the arrow keys to move along the data points. When does the virus appear to be spreading fastest? Between which two trials does this happen?

3

Complete the third column of the data table by simple addition. For example, for the sample data shown in Part II step 2, the number in the first row of L3 would be 1, and in the second row would be 3. The total number of individuals infected after each trial will help you to determine the rate at which the infection rate is changing.

4

The ratio of **change in total individuals infected** to **change in trial number** represents numerically the rate of change in the infection rate of the virus. Does the greatest rate of change shown in the data table match your answer to question 2? Explain why or why not. What does this tell you about the spread of the virus?

5

What are some possible reasons that, in the winter, more people are infected with cold and flu viruses in colder climates than in warmer climates?

This activity comes courtesy of Theta Technologies.
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