Outbreak!

ID: 10885

Time required
20 minutes

Activity Overview

In this activity, students will explore a geometric sequence related to an outbreak of the flu, extrapolate to make predictions based on given data, and apply summation notation to determine the sum of any number of terms, n, in a series.

Topic: Sequences, Series, and Summation

- *Summation Notation*
- *Finding nth term and sum of n terms*

Teacher Preparation and Notes

- *Load the TI-Nspire document Outbreak.tns onto student handhelds.*
- *Remind students to use ctrl + ► to move to the next page and ctrl + tab to move between parts of split screens.*
- ***To download the student TI-Nspire documents (.tns files) and student worksheet, go to education.ti.com/exchange and enter "10885" in the quick search box.***

Associated Materials

- *Outbreak_Student.doc*
- *Outbreak.tns*
- *Outbreak_Extension.tns*
- *Outbreak_Review.tns*

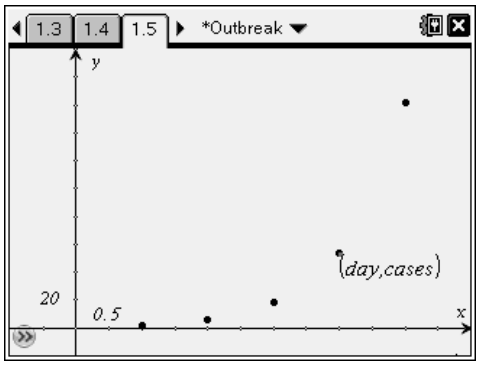
Suggested Related Activities

To download any activity listed, go to education.ti.com/exchange and enter the number in the quick search box.

- *Geometric Sequences and Series (TI-Nspire technology) — 8674*
- *Geometric Series (TI-Nspire CAS technology) — 102246*
- *Spreading Doom (TI-Nspire technology) — 10074*

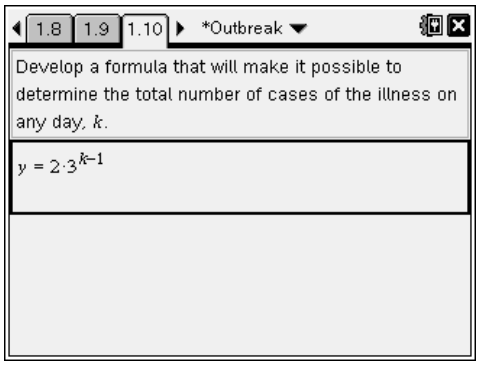
Exploring the Data

Introduce the problem on page 1.2 and the related spread sheet data on page 1.3. Students then proceed to page 1.5 and set up a scatter plot by selecting **MENU > Graph Type > Scatter Plot**. They should select **day** for *x* and **cases** for *y*. Students may hide the entry region at the bottom of the screen by pressing ctrl + G. Students can answer the associated questions in the TI-Nspire document or on the worksheet.



Extending the Data

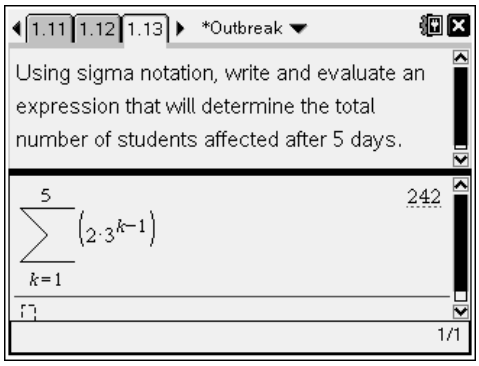
Beginning on page 1.9, students are to make an extrapolation and on 1.10 they are to come up with an equation to model the observed pattern. If students have difficulty realizing that the equation is exponential ($y = ab^x$), or have forgotten the meanings of *a* and *b*, it may be helpful to have students complete *Outbreak_Extension.tns* prior to completing this activity.



Summarizing the Data

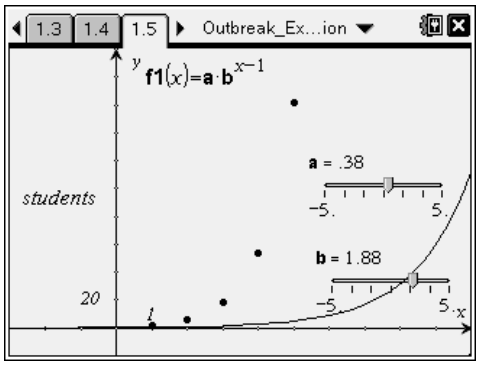
On page 1.11, students are to use the given data to determine a sum. On page 1.12, summation notation is introduced.

Pages 1.13 through 1.15 involve writing and applying summation notation to the given problem.

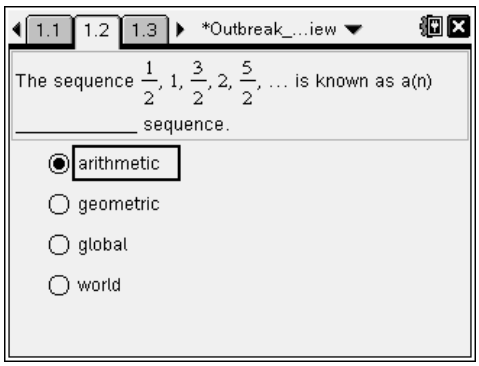


Extension – Equation Exploration

In this extension, students use sliders to identify key values in the exponential equation that represents the geometric sequence involved in the outbreak problem.



Use the file *Outbreak_Review.tns* as a quick review of sequences and series.



Student Solutions

Exploring the Data

- Increasing
- Sample answer: geometric because the number of new cases is increasing by a factor of 3 everyday.
- Sample answer: exponential

Extending the Data

- 486
- $y = 2 \bullet 3^{k-1}$

Summarizing the Data

- 242
- $$\sum_{k=1}^{5}\left(2\,g(3)^{k-1}\right) = 2\,g(3)^{1-1} + 2\,g(3)^{2-1} + 2\,g(3)^{3-1} + 2\,g(3)^{4-1} + 2\,g(3)^{5-1}$$
$$= 2 + 2\,g(3)^{1} + 2\,g(3)^{2} + 2\,g(3)^{3} + 2\,g(3)^{4}$$
$$= 2 + 6 + 18 + 54 + 162$$
$$= 242$$
- $\sum_{k=1}^{n}\left(2\,g(3)^{k-1}\right)$
- 2186