Introduction to Geometric Sequences

ID: 13713

Time required
15 minutes

Activity Overview

In this activity, students will be introduced to geometric sequences. They will consider the effect of the value for the common ratio and first term using sliders. Students will graphically and numerically analyze geometric series using graphs and spreadsheets.

Topic: Sequences and Series

- *Explore geometric sequences*
- *Sum a geometric sequence*

Teacher Preparation and Notes

- *This activity serves as a nice introduction to geometric series. Students will need the IntrotoGeometricSequences.tns file on their TI-Nspire.*
- *To use the sliders, students can either grab and drag the ticker to change the number.*
- ***To download the student TI-Nspire document (.tns file) and student worksheet, go to education.ti.com/exchange and enter "13713" in the quick search box.***

Associated Materials

- *IntrotoGeometricSequences_Student.doc*
- *IntrotoGeometricSequences.tns*

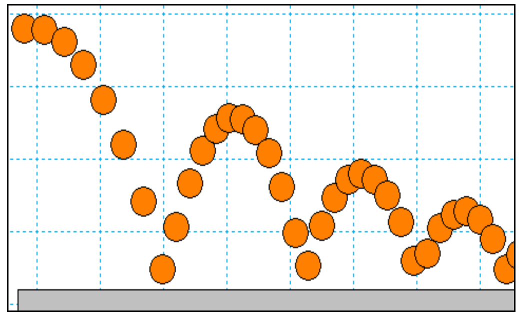
Suggested Related Activities

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

- *Geometric Sequence & Series (TI-Nspire technology) — 8674*
- *Exploring Infinite Series (TI-84 Plus) — 4374*
- *Serious Series (TI-89 Titanium) — 3466*
- *Applications of Finite and Infinite Series (TI-89 Titanium) — 3086*
- *Sequence and Series -- Introductory Quiz (TI-84 Plus) — 10486*

Example of a Geometric Sequence

Students are shown the path of a ball that is bouncing.

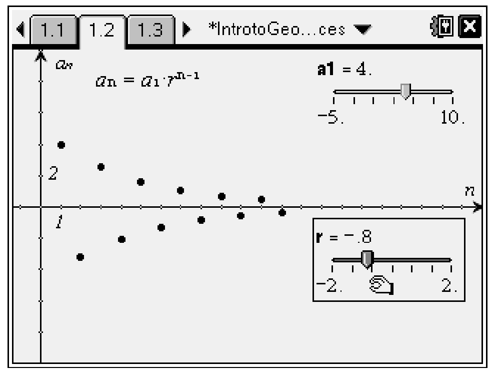


1. Show that the common ratio of the heights is approximately the same.

$\frac{2.8}{4.0} = 0.7 \qquad \frac{2.0}{2.8} \approx 0.71 \qquad \frac{1.4}{2.0} = 0.7$

Changing the Initial Value *and* the Common Ratio

On page 1.2 of this activity, students explore geometric sequences graphically and numerically by varying the values of a_1 and r of the series .$a_n = a_1 \cdot r^{n-1}$

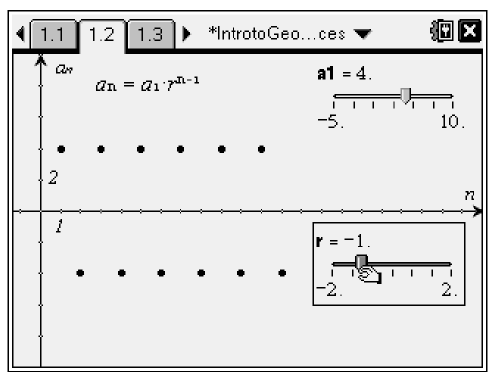


Students will start by using the slider to change the value of r, the common ratio. Discuss the consequences of a sequence with a negative common ratio, such as:

–50, 25, –12.5, 6.25, …

Students can see from the graph that the values in the sequence will alternate between positive and negative values.

Next, students are to grab and move both sliders and observe the effects. They should be sure to try negative and positive and values between –1 and 1 for both variables.

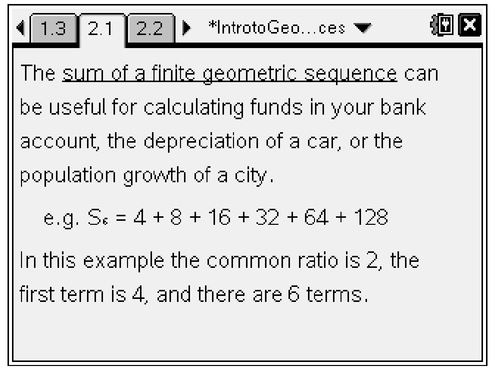


<u>Inquiry question:</u>

- Which variable seems to have a more profound effect on the sequence? Explain.

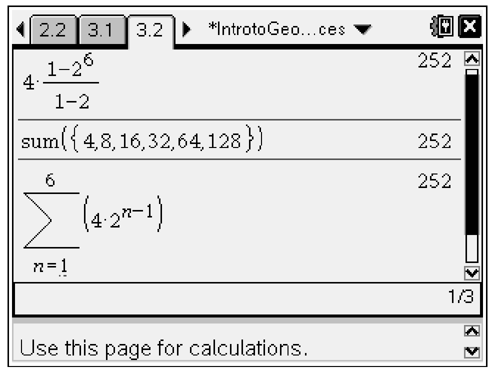
Sum of a Finite Geometric Sequence

Here, the students are to find the sum of a finite geometric series using the various methods: formula, sigma notation, and sum of a list.



Note: when using **sum()**, what is inside the parentheses must be a list. Therefore the sequence needs curly brackets around the terms, as pictured in the screenshot of page 3.2 below.

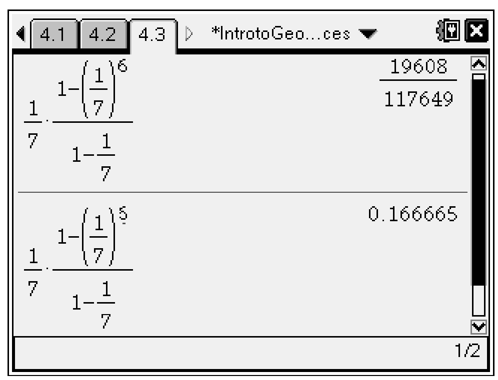
Students are also asked to use the sigma notation found with the templates (templates). Once the sigma appears, use (tab) to move to the next box. It should appear as $\sum_{n=1}^{6} 4(2)^{n-1}$.



Extension: Apply What Was Learned

This section includes three problems which can be used as homework or extra practice if there is time.

When necessary, use (ctrl) (enter) to find the decimal equivalent answer.



Student Worksheet Answers

1. Show that the common ratio of the heights is approximately the same.

$$\frac{2.8}{4.0} = 0.7 \qquad \frac{2.0}{2.8} \approx 0.71 \qquad \frac{1.4}{2.0} = 0.7$$

2. When r is negative, sequence values will alternate between positive and negative.

3. When r is greater than 1, the sequence is increasing.

4. Values between 0 and 1 could model the heights of a ball bounce.

5. The value of a_1 determines the starting value of the sequence.

6. If the common ratio is less than –1, the positive and negative values of the sequence diverge and go in opposite directions: positive values are increasing, negative values are decreasing.

7. $4\left(\frac{1-2^6}{1-2}\right) = 252$

Extension Answers

8. 0.166665 **9.** 42.668 10. 2.53947