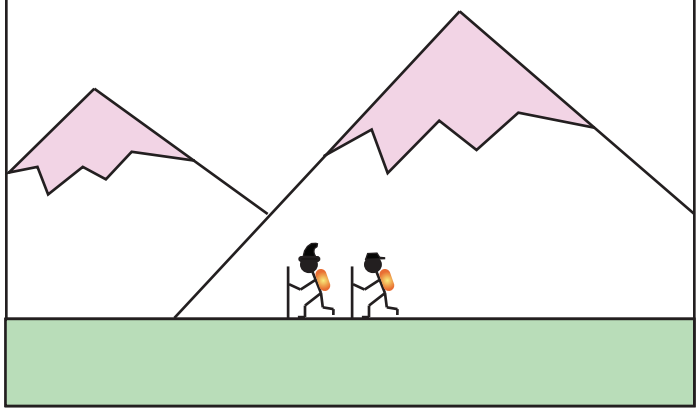
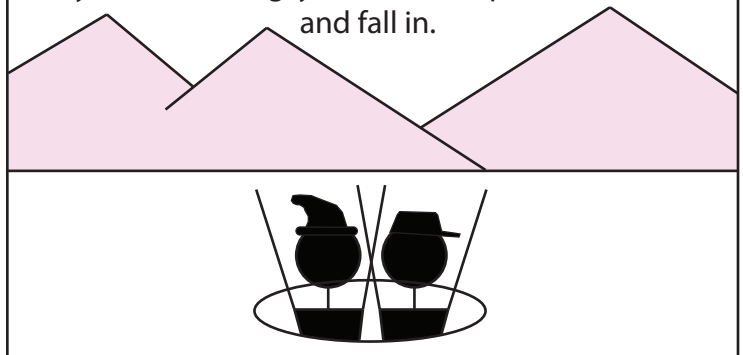
Name _____ Class _____

IN THE HALL OF THE MOUNTAIN GNOMES

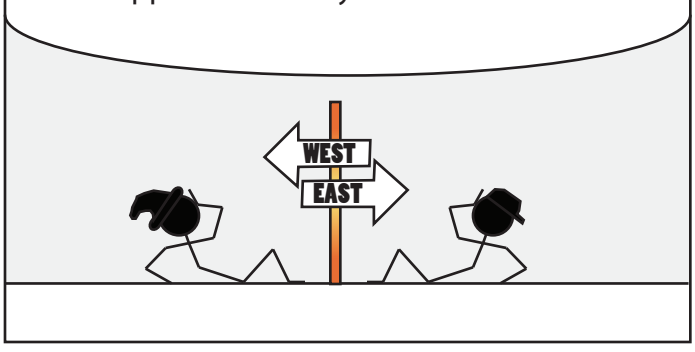
You and your friend went hiking in the mountains.



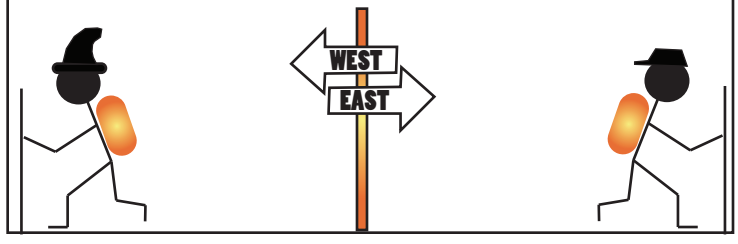
As you are walking, you stumble upon a sink-hole, and fall in.



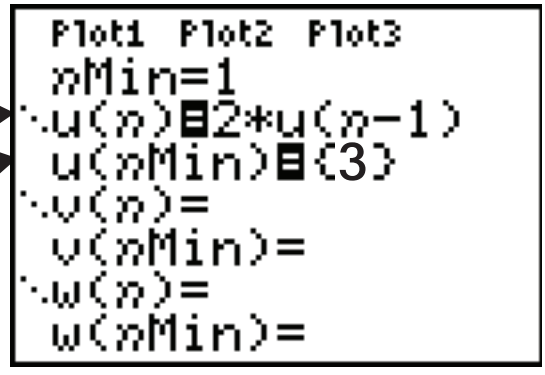
You find yourselves in a long tunnel that disappears both ways into the darkness.



Your friend thinks you should head west, while you think east is the proper direction. You can't agree, so each of you head out in opposite directions.



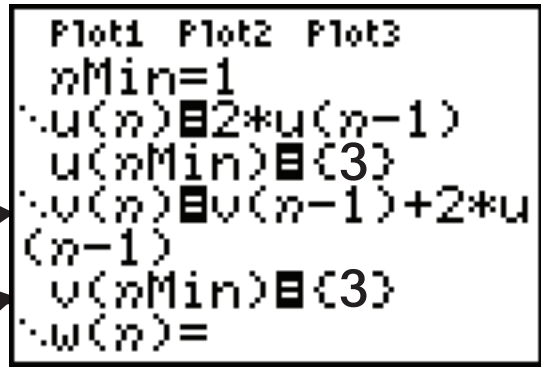
As you walk along, you remind yourself how to put sequences in the calculator.
For example, to graph the sequence defined by the recursive formula: $a_1 = 3$, $a_n = 2*a_n - 1$
which is (3), 6, 12, 24, ...



you do the following:

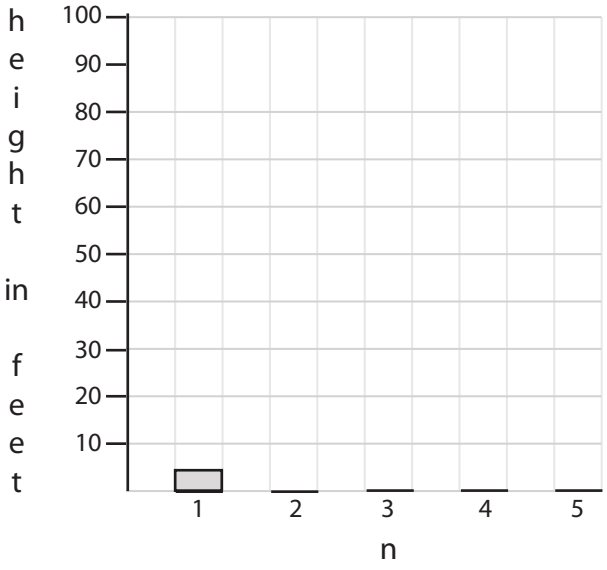
1. Press MODE. Change the fourth line to SEQ.
2. Press Y=.
3. nMin is the initial n value.
   u(n) is the formula for the sequence.
   u(nMin) is the initial value (a_1).
4. Graph or press 2nd Table to view a table of values.

To graph the series , Sn, defined by this sequence,
which is $S_n = S_1, S_2, S_3, \ldots$
which is $S_n = a_1, S_1 + a_2, S_2 + a_3, \ldots$
which is 3, 3+6, 3+6+12, ... or (3), 9, 21, ...



add the following to v(n).

Your friend walks until he enters the salt mine of the Westside Gnomes.
The Gnomes say that the surface is only 100 feet above the floor.
They are willing to cut some salt blocks so your friend can climb out.
They will cut blocks with heights according to the sequence:
$a_1 = 4$, $a_n = 2*a_n-1$.

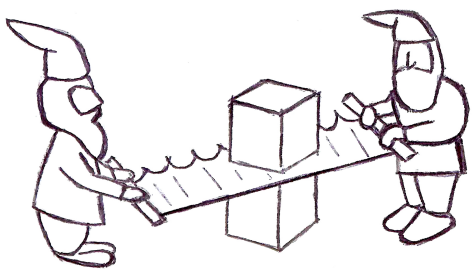


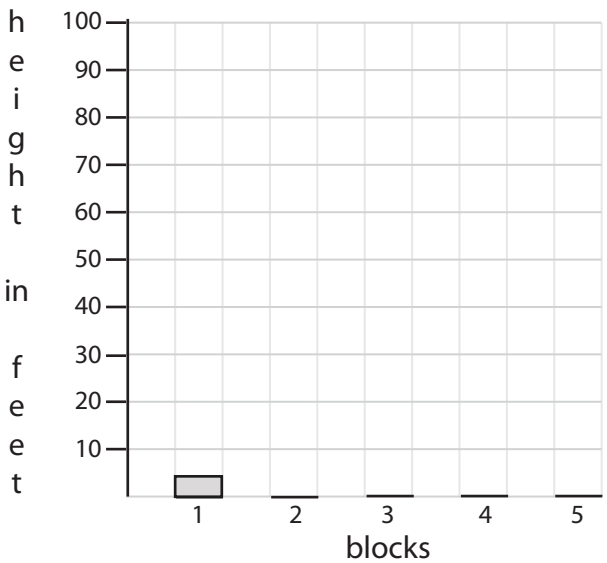
1. Find the first 5 terms of the sequence. Draw the first 5 salt blocks on the graph.

2. Describe the shape of the graph.

3. Write a function that models this sequence.

Your friend stacks the salt blocks on top of each other in order.
Adding the sequence of block heights makes a series.



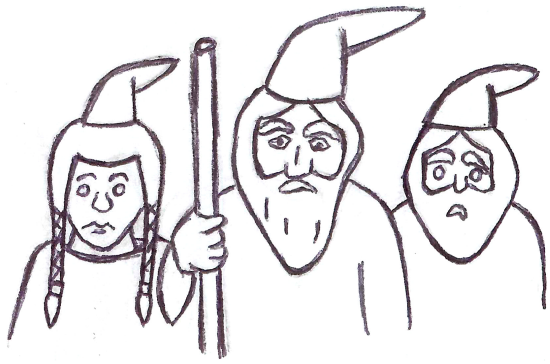


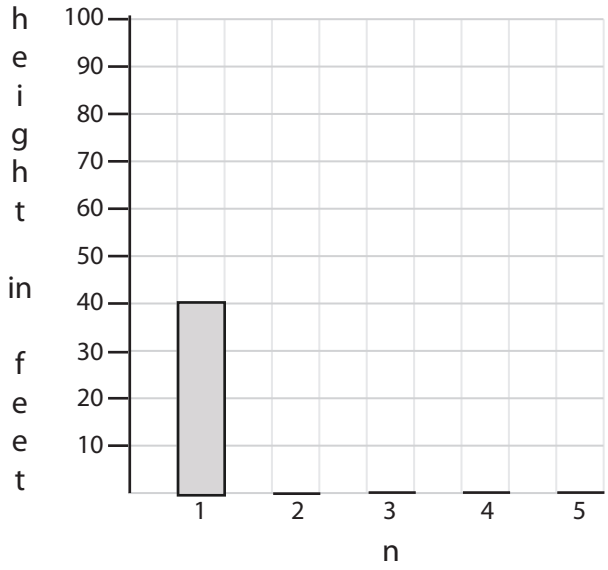
4. Find the first 5 terms of the series. Draw the first 5 sets of blocks (one stacked on the other).

5. Does the height of the stack seem to converge or diverge?

6. Does it look like your friend will be able to get out?

You walk until you enter the salt mine of the Eastside Gnomes.
Their mine is also 100 feet below the surface.
They will also cut salt blocks so you can get out.
They will cut blocks according to the sequence:
$a_1 = 40$, $a_n = 0.5*a_n - 1$.

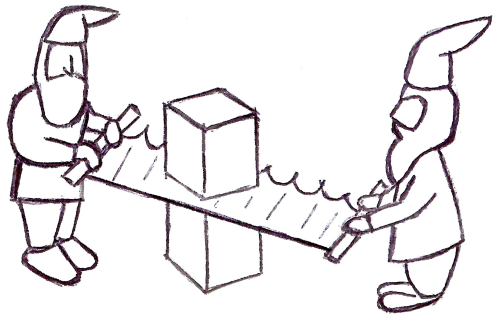




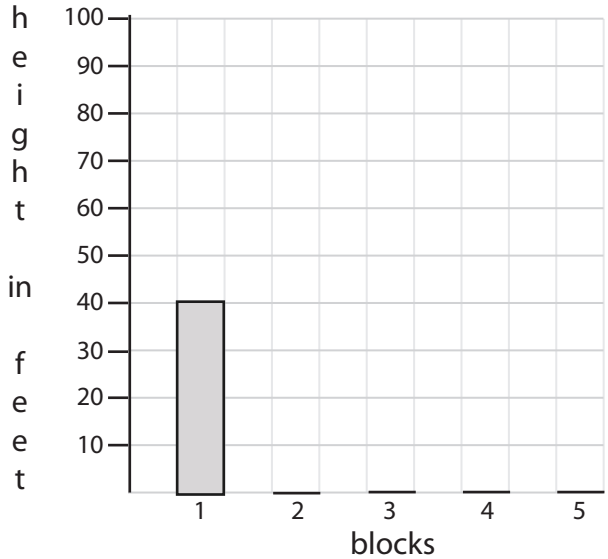
7. Find the first 5 terms of the sequence. Draw the first 5 salt blocks on the graph.

8. Describe the shape of the graph.

9. Write a function that models this sequence.



You stack your salt blocks on top of each other in order, making another series.



10. Find the first 5 terms of the series. Draw the first 5 sets of blocks (one stacked on the other).

11. Does the height of the stack seem to converge or diverge?

12. Does it look like your friend will be able to get out?

When you finally get out of the mine, you devote your free-time to learning about salt-mining gnomes.

13. Using the calculator, investigate 3 other geometric series, changing the common ratio.

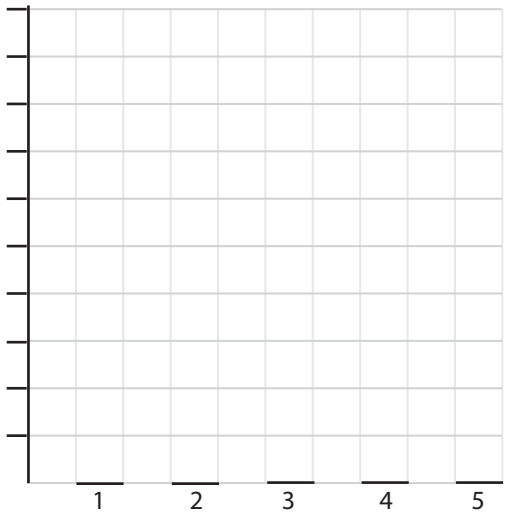
Sequence 1: The Northside Gnomes.

Sequence:

Common Ratio:

Converges or Diverges?

and Graph the series -->



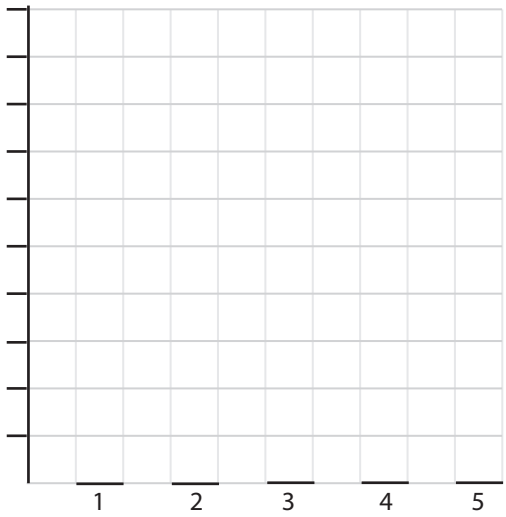
Sequence 2: The Southside Gnomes.

Sequence:

Common Ratio:

Converges or Diverges?

and Graph the series -->



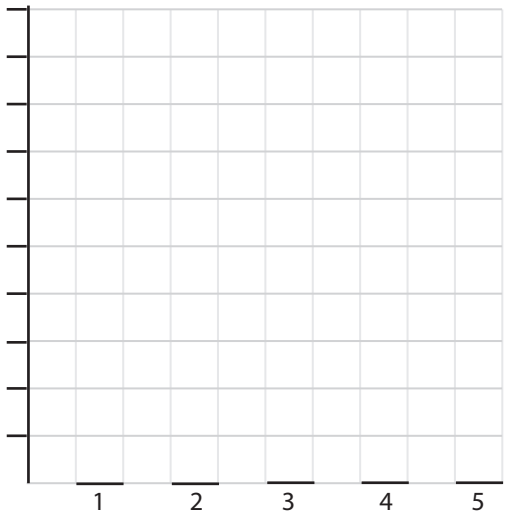
Sequence3: The Middleton Gnomes

Sequence:

Common Ratio:

Converges or Diverges?

and Graph the series -->



14. What conclusions can you make about the behavior of an infinite geometric series? Why?