Arithmetic Sequences and Series

Student Activity

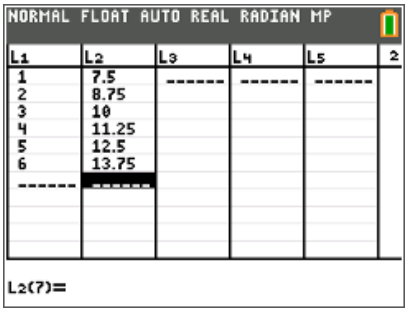
Name _____

Class _____

Part 1 – Sequences and Scatter Plots

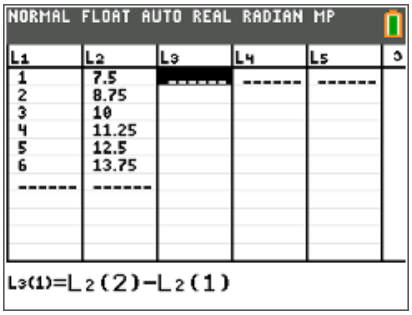
Press [stat] [enter] and enter the data shown at the right into L1 and L2.

- L2 shows a finite sequence with six terms.
- L1 shows the term numbers.



Find the differences between consecutive terms of the sequence in L2 and record them in L3.

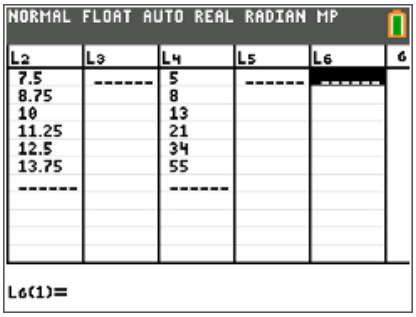
- For the first difference, in the first row of L3, subtract the second term of L2 from the first by typing **L2(2)–L2(1)**. Do this for the next four rows: **L2(3)–L2(2), L2(4)–L2(3),** etc.



Now enter the data shown at the right into L4.

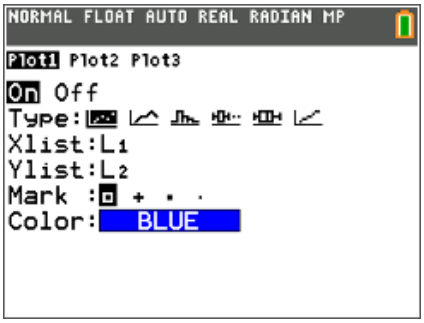
- L4 shows a finite sequence with six terms.
- L1 shows the term numbers for this sequence.

Find the consecutive differences for L4 sequence and record them in L5.



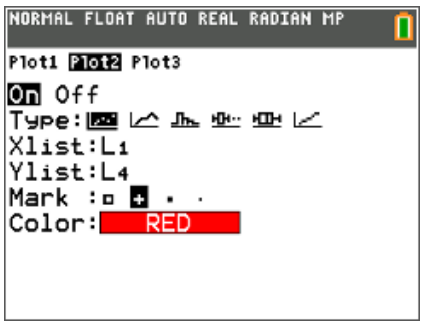
Graph the sequences in L2 and L4.

Press [2nd] [y=] [stat plot][STAT PLOT] and select **Plot1**. Change the settings to those shown at the right.



Press [2nd] [y=] [stat plot][STAT PLOT] and select **Plot2**. Change the settings to those shown at the right.

Press [zoom] and select **9:ZoomStat**.



1. For each sequence, write the differences between the consecutive terms and give a description of the scatter plot.

a. Sequence L_2

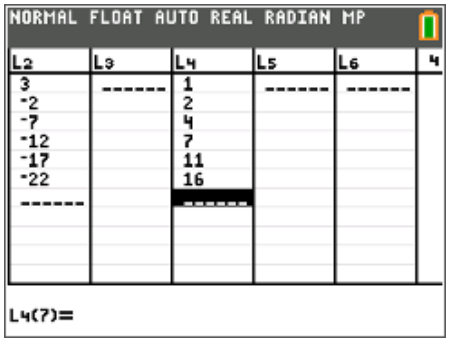
b. Sequence L_4

c. Study the graphs and the differences you found in L_3 and L_5. Make a conjecture.

Clear the data from L_2, L_3, L_4, and L_5. Leave the natural numbers in L_1.

- Enter the two new sequences shown at the right into L_2 and L_4.
- Recalculate the differences between consecutive terms and record them in L_3 and L_5.

Press zoom and select **9:ZoomStat**.



2. For each sequence, write the differences between the consecutive terms and give a description of the scatter plot.

a. Sequence L_2

b. Sequence L_4

c. How do your observations affect your conjecture about the scatter plot of a sequence and the differences between the consecutive terms? Explain.

Part 2 – Explicit Formulas and Sums

An **arithmetic sequence** is formed by adding a fixed number, called a **common difference**, to each previous term (this number can be positive or negative).

The explicit formula for the *n*th term in an arithmetic sequence is

$$u_n = u_1 + (n - 1)d,$$

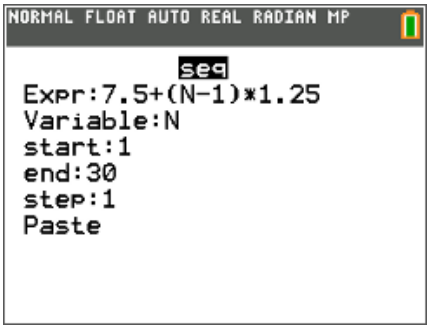
- u_n is any term of a sequence
- n is the term number
- u_1 is the first term
- d is the common difference

You can use this formula to calculate any term in an arithmetic sequence.

Generate a sequence in L_2 to display the first 30 terms of

$u_n = 7.5 + (n - 1) * 1.25$.

- Clear the data from L1, L3, L4, and L5. Leave the natural numbers in L1.
- Arrow to the top of L2 and type and press 2nd stat [list]. Arrow over to the OPS menu and select **seq(**.
- Enter **7.5 + (N–1)·1.25**. Press enter. Once in the List Editor, Press enter again.



Note: N is selected by using the alpha key.

3. Simplify the formula $u_n = 7.5 + (n - 1) * 1.25$ by distributing and combining like terms. Use this formula in the sequence command to generate 30 terms of this sequence in L3.

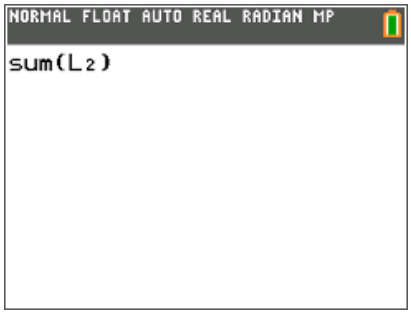
What do you notice about the terms in L2 and L3?

Part 3 – Practice Finding the Sum of a Series

Now find the sum of the first 30 terms of this sequence. The expression consisting of summing the terms in a sequence is called a ***series***.

On the Home screen enter **sum(L2)**.

The Sum command can be found by pressing 2nd stat [list], moving to the MATH menu and selecting **sum(**.



4. What is the sum of the series in L2?

5. Now, let's look at another sequence. Find the sum of the first 80 terms of the sequence below, using the **Lists** feature and the **sum()** command.

62, 67, 72, 77, 82…

a. Find the explicit formula for this sequence in simplified form.

b. What is the sum of the first 80 terms?