An Average Sequence
ID: 13609

Time required
45 minutes

Activity Overview
In this activity, students will solve the average sequence problem and share what they find.

Topic: Number and Operations
- *Sequences*
- *Limits*
- *Arithmetic mean*

Teacher Preparation and Notes
- *TI-Navigator is not required for this activity, but an extension is given for those teachers that would like to use it.*
- *Provided lists L_1 and L_2 are to be used in conjunction with TI-Navigator.*
- ***To download the student worksheet and list files, go to education.ti.com/exchange and enter "13609" in the quick search box.***

Associated Materials
- *MGAct20_AvgSequence_worksheet_TI73.doc*
- *L1.73l*
- *L2.73l*

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

- *Let's Do Summagic (TI-73 Explorer) — 4485*

Problem 1 – Finding the Sequence

Students will investigate the sequence {16, 80, 48, 64, __, __, __} and determine the next numbers in the sequence. This sequence is generated using the arithmetic sequence of the first two numbers. Students will then look for a pattern and generalize what they are observing in the investigation.

Questions 1–3

```
(16+80)/2        48
```

Students begin by finding the mean between two numbers without using the list feature of the TI-73. This can be done using the TI-73 if desired. To find the average of two numbers, simply add the two numbers and divide by 2.
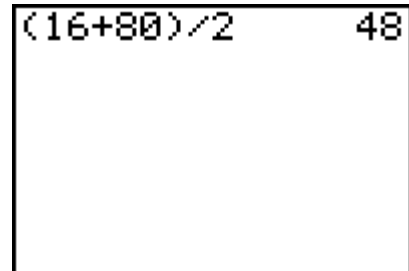
Question 4

To investigate the patterns, students will use the list feature of the TI-73. Students will first need to store the first two values of the sequence to **ans(1)** and **ans(2)**—these are the variables used by the calculator to temporarily store the first two items in a list. To enter the initial list, press [2nd] [PRGM] (to access Ctlg) and press the [▲] to find {. Put the arrow beside { and press [ENTER]. Then press [1] [6] [,] [8] [0] [2nd] [PRGM] and the [▲] again to }. Press [ENTER] [ENTER] to store the first two elements.

Next, create an entry based on the previous answer. Press [2nd] [PRGM] (to access Ctlg) and press the [▲] to {. Then press [2nd] [(-)] to access [ANS]. Press [(] [2] [)] [,] [.] [5] [×] [(] [2nd] [(-)] [(] [1] [)] [+] [2nd] [(-)] [(] [2] [)] [)], and [2nd] [PRGM] and press the [▲] to }. Then press [ENTER] [ENTER] to execute the command.

```
{16,80}
                {16 80}
{Ans(2),.5*(Ans(
1)+Ans(2))}
                {80 48}
```
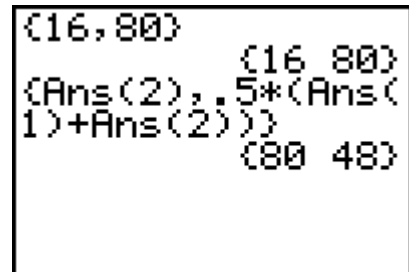
To generate each additional element in the list, you can now simply press [ENTER].

Questions 5–8

Students can continue to press [ENTER] to generate additional elements in the list. This will work for the 10th item but will likely become cumbersome for the 20th and 100th elements. This will encourage students to look at the pattern and generalize what is happening to find the larger terms.

Problem 2 – More Sequences

<u>Questions 9–13</u>

After students have worked with the first sequence, they will repeat with different starting values for element 1 and 2 in the sequence. They will use the same keystrokes as before, storing the initial list and then using ans(1) and ans(2) to generate subsequent elements in the sequence.

Again, press 2nd PRGM (to access Ctlg) and press the ▲ to find {. Put the arrow beside { and press ENTER. Then press 2 0 , 6 2 2nd PRGM and the ▲ again to }. Press ENTER ENTER to store the first two elements. Then press 2nd (–) to access [ANS]. Press (2) , . 5 × (2nd (–) (1) + 2nd (–) (2)), and 2nd PRGM and press the ▲ to }. Then press ENTER ENTER to execute the command.

<u>Questions 14–20</u>

In the final set of questions, students repeat the same procedure using a decreasing sequence of numbers to explore if the same pattern exists.

```
{Ans(2),.5*(Ans(
1)+Ans(2))}
{39.421875 39.7…
{Ans(2),.5*(Ans(
1)+Ans(2))}
{39.7890625 39.…
```
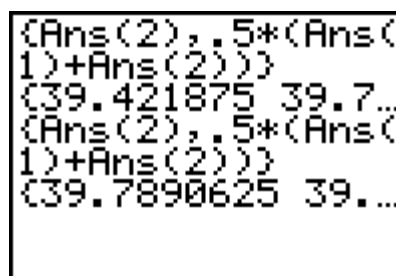
Extension – TI-Navigator™

1. After Question 13, use **Quick Poll** to ask students about the value of the 100th term of various sequences. For example, give them {2, 50} and have them give their estimated value of the 100th term. (34)

   Use a variety of sequences to test their understanding of the concept.

2. Use **Screen Capture** throughout to monitor student progress.

3. As an extension, create a list which is supposed to be an arithmetic sequence. Send the list to the class and have pairs or small groups discuss the list. Ask them to determine if the list is or is not an arithmetic sequence and to justify their answer. Use **L1** and **L2** provided or generate your own lists.

Solutions – student worksheet

Problem 1

1. 48

2. 64

3. 56

4. 56, 60, 58

5. 58.75

6. 58.6

7. 58.6

8. Answers will vary. Students should see that the terms in the sequence are getting closer and closer to a specific number.

Problem 2

9. 41, 51.5, 46.25, 48.875, 47.5625

10. 48.055

11. 48.00005

12. 48

13. See Question 8.

14. 47.5, 35.75, 41.625, 38.6875, 40.156

15. The first number is greater than the second number in the beginning of the sequence.

16. 39.605

17. 39.6666

18. 39.6666

19. See Question 8.

20. No, it did not make a difference. The sequence still goes toward one specific number.