
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 L1 and L2 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*
- *L1.73I*
- *L2.73I*

Suggested Related Activities

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

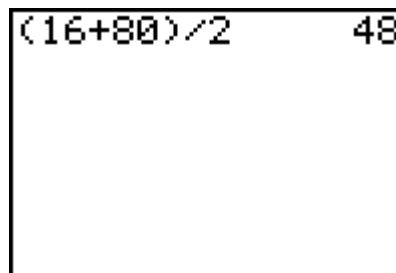
- *Let's Do Summagic (TI-73 Explorer) — 4485*

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

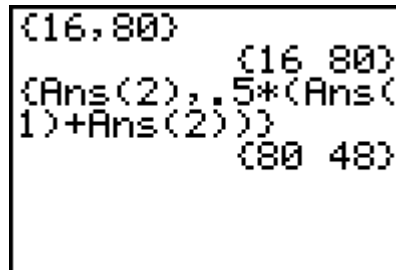
Students begin by finding the mean between two numbers without using the list feature of the TI-73. This can be done using the TI-73 if desired. To find the average of two numbers, simply add the two numbers and divide by 2.



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.



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

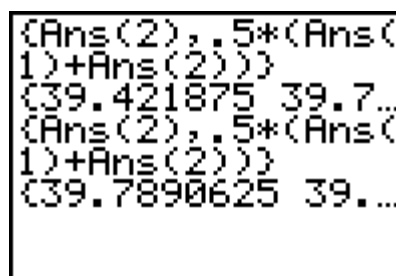
Questions 9–13

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.

Questions 14–20

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



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 worksheetProblem 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.



Problem 1 – Finding the Sequence

In this set of questions, you will find the sequence generated by finding the average of the first two numbers. Look for any patterns that you notice.

1. We will find the next three terms in the following sequence. {16, 80, 48, 64, __, __, __}

The third number is found by taking the arithmetic mean of the first two numbers. What is the mean of 16 and 80? _____

2. What is the mean of 80 and 48? _____
3. What is the mean of 48 and 64? _____

4. We can find the average of 16 and 80 on the TI-73 using the list feature.

To find the average of the first two list elements, press the following from a clear Home screen.

- ▶ For {16, 80}: [2nd] [CATALOG] and [▲] until { is reached. Press [ENTER], [1] [6] [,] [8] [0] [2nd] [CATALOG] and [▲] to }. Press [ENTER] [ENTER] to store the first two elements.

```
{16,80}
      (16 80)
{Ans(2),.5*(Ans(
1)+Ans(2))}
      (80 48)
```

- ▶ To create an entry based on the previous answer: [2nd] [CATALOG] and [▲] to {. Next, Press [2nd] [PRGM] and [▲] to {. Then press [2nd] [ANS] , followed by [(] [2] [)] [,] [.] [5] [x] [(] [2nd] [(-)] [(] [1] [)] [+] [2nd] [(-)] [(] [2] [)] [)] , and [2nd] [CATALOG] and [▲] to }. Press [ENTER] [ENTER] to execute the command.

```
{Ans(2),.5*(Ans(
1)+Ans(2))}
      (48 64)
```

- ▶ To generate each additional element in the list, you can now simply press [ENTER].

What are the next three elements in the sequence? {16, 80, 48, 64, __, __, __}

5. What is the 10th term in the sequence? _____
6. What is the 20th term in the sequence? _____
7. What is the 100th term in the sequence? _____
8. Describe any pattern that you see. _____



Problem 2 – More Sequences

Use what you learned in the previous problem in other situations.

9. What are the next five elements in the sequence?

{20, 62, _____, _____, _____, _____, _____}

Hint: Instead of keying the entire expression again, press [2nd] [ENTRY] to recall a previously entered expression and edit it.

```

{20, 62}
      (20 62)
{Ans(2), .5*(Ans(
1)+Ans(2))}

```

10. What is the 10th term in the sequence? _____

11. What is the 20th term in the sequence? _____

12. What is the 100th term in the sequence? _____

13. Describe any pattern that you see. _____

14. What are the next five elements in the sequence?

{71, 24, _____, _____, _____, _____, _____}

```

{71, 24}
      (71 24)
{Ans(2), .5*(Ans(
1)+Ans(2))}

```

15. How is this sequence different from the previous sequences? _____

16. What is the 10th term in the sequence? _____

17. What is the 20th term in the sequence? _____

18. What is the 100th term in the sequence? _____

19. Describe any pattern that you see. _____

20. Did this sequence being different make a difference in the pattern? _____
