Let's Do Summagic

ID: 13461

Time required
45 minutes

Activity Overview

In this activity, students will learn to quickly add lists of numbers by adding like terms and using the distributive property.

Topic: Numbers

- *Distributive Property*
- *Greatest Common Factor*
- *Making conjectures*

Teacher Preparation and Notes

- *Prior knowledge of working with lists is helpful but not necessary.*
- *TI-Navigator is not required for this activity, but an extension is given for those teachers that would like to use it.*
- ***To download the student worksheet, list files, and TI-Navigator files, go to education.ti.com/exchange and enter "13461" in the quick search box.***

Associated Materials

- *MGAct12_Summagic_worksheet_TI73.doc*
- *L1.73l and L2.73l (lists)*

Suggested Related Activities

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

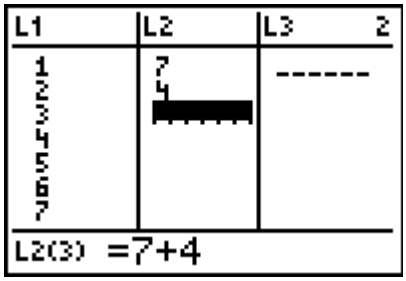
- *Let's Do Summagic (TI-73 Explorer) — 4485*
- *The Target is 10! (TI-73 Explorer) — 8460*
- *Magic Nines (TI-73 Explorer) — 5249*

Problem 1 – Magic Sum Part 1

In this problem, students will discover the rule for the "*summagic*" problem by adding like terms and using the distributive property. They will use factoring to uncover the magic and explain the mathematics.

Questions 1–3

To complete the table in Question 1, have one student randomly select a number (between 1 and 10) for the first element. Have another student select a number for the second element. Then, each number after that is determined by adding the two previous numbers.



First, they will need to first enter the lists into **L1** and **L2**. Press [LIST] to access the lists. If there are currently items in L1 and L2, move the cursor to the top of each list and press [CLEAR] [ENTER]. Then, enter the elements into the lists pressing [ENTER] between each number.

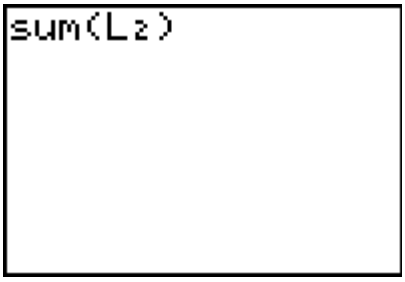
Once the random numbers are selected for elements 1 and 2 in L2, students can use addition to find the subsequent numbers. In this example, 7 and 4 are used. Element 3 can be found by adding 7 and 4 in the third position.

Right after entering all the numbers, *magically*, tell the students the sum by mentally multiplying the 7th number by 11. Here's a brief reminder of the multiply by 11 trick.

$32 \times 11 =$ 3 2 → 3 5 2

$109 \times 11 =$ 1 0 9 → 1 1 9 9

$67 \times 11 =$ 6 7 → 6 13 7 → 7 3 7



Then, have students find the sum of the list to verify your answer. On the Home screen, press [2nd] [LIST] [▶] [▶] [7] to select **sum**. Press [2nd] [LIST] [2] [)] [ENTER] to select **L2** and execute the command and show that the sum is equal to the sum you quickly gave.

Ask, "How was I able to find the sum so quickly?" Give students a chance to explore L2 and make conjectures. "Do you think I could do it again?" Have two other students choose two new numbers and repeat the process.

Problem 2 – Magic Sum Part 2

Question 4

After you have stunned your class by correctly finding the sum, develop the following on the table in Question 4 to investigate the teacher's magic. Have the students complete the table along with you. Use the two numbers 7 and 5 to numerically find the next eight terms. Ask, "What pattern can you see? Can we write these in a briefer form?" Help the students find the next two columns.

Questions 5–12

After the table is completed, have the students answer the questions following the table. Before working on Question 12, make sure that all students fully understand the *summagic* rule (multiplying the 7th element by 11).

Extension

Develop the "magic" rule using variables and generalize the rule.

1	a	$= a$
2	b	$= b$
3	$b + a$	$= b + a$
4	$(b + a) + b$	$= a + 2b$
5	$(b + a + b) + (b + a)$	$= 2a + 3b$
6	$(b + a + b + b + a) + (b + a + b)$	$= 3a + 5b$
7	….	….

How can we find the sum of list two in terms of *a* and *b*? How many *a*'s are there? How many *b*'s are there? Find the sum of all ten elements in **L2** by combining the number of *a*'s and number of *b*'s to get the sum. ($55a + 88b$)

What do you notice about the numbers in front of the variables? Lead the discussion to find that the numbers 55 and 88 are multiples of 11. Ask: How could we write this expression in an equivalent form? Using the distributive property the expression can be rewritten as:

$$55a + 88b = 11(5a) + 11(8b) = 11(5a + 8b)$$

- Do you notice the expression $5a + 8b$ in the list above? (It is the 7th element in **L2**.)
- How does the sum of the list compare to this term? (It is eleven times the term.)

Therefore, if you find the 7th element and multiply it by eleven you will have the sum of the list. Will this work for other numbers?

Have the students work in pairs to choose their own two numbers and repeat the activity. Ask them to find the sum using the *summagic* rule. Have them go to the Home screen and check their sum using **sum (L2)**. Check with each of the pairs to see if they were able to find the correct sum.

To wrap up, have a few of the groups explain to the class how they found their sum. Ask students to write the rule in their own words.

Extension – TI-Navigator™

1. For Question 4, to avoid students needing to input list values, send **L1** and **L2** via TI-Navigator. This can save time in class and avoid mistakes as students input the lists.
2. Before Question 11, use **Quick Poll** to gather students' guesses at the sum of the list in Question 4. Challenge students to see who can get the closest or if anyone gets it exactly right.

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

4. For Question 12, gather lists from various groups and share with the class if desired. This will give them more practice with different sets of data without the time of creating them all.

Solutions – student worksheet

Problem 1

1–3. Answers will vary based on numbers selected by students.

Problem 2

4.

L1	Each Element	Distributive Property	L2
1	7	= 7	7
2	5	= 5	5
3	7 + 5	= 7 + 5	12
4	(7 + 5) + 5	= 7 + 2(5)	17
5	(7 + 5 + 5) + (7 + 5)	= 2(7) + 3(5)	29
6	(7 + 5 + 5 + 7 + 5) + (7 + 5 + 5)	= 3(7) + 5(5)	46
7	etc. …	= 5(7) + 8(5)	75
8		= 8(7) + 13(5)	121
9		= 13(7) + 21(5)	196
10		= 21(7) + 34(5)	317

5. 55

6. 88

7. 55 × 7 + 88 × 5

8. 11

9. yes

10. 7th

11. 825; multiply the 7th element by 11

12. See students' work. Answers will depend on tables generated by students.