Super Mental Addition 3D

Tower Totals

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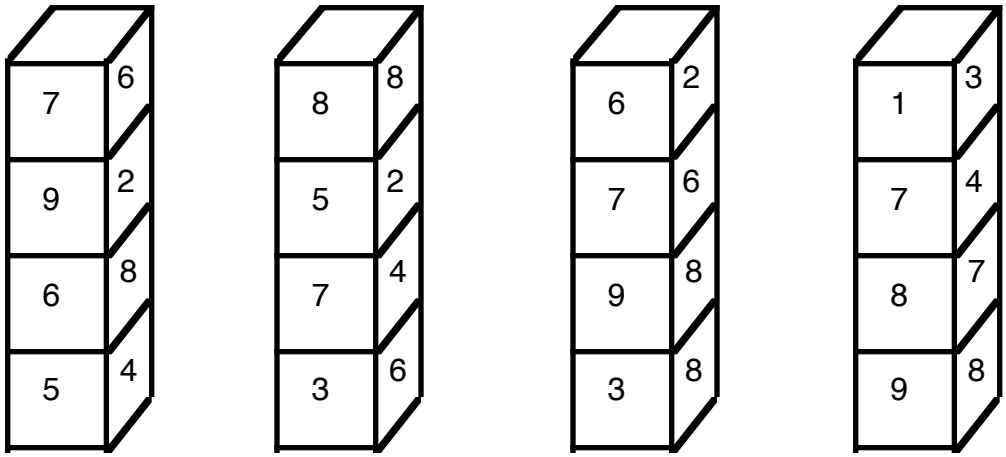
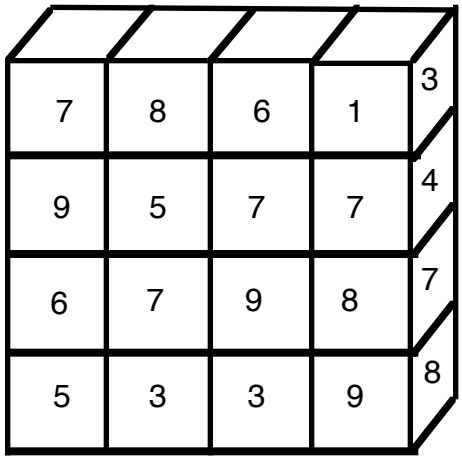
The teacher puts 4 rectangular prisms like the ones shown below on the desk.





TOTAL = 2 9 5 7 5

A student is asked to place the 4 prisms standing upright and next to each other to form 4 rows of numbers. The 4 prisms can be placed in any order and any of the 4 faces can be placed facing forward. Each horizontal row represents a 4 digit number. Find the sum of the 4 numbers.

The prisms are placed standing upon the desk next to each other. The student can use all or some of the prisms. The technique to find the total works for 1, 2, 3 or all 4 prisms but it is more impressive the more prisms are used.

Procedure

Put the 4 prisms on a desk standing up. . Show the student that you can stack the 4 prisms standing up and placed next to each other to form 4 numbers in 4 rows, After you have demonstrated this, hand the prisms to the student. and ask them to place the 4 prisms in any order and turn them around to form any combination they like. They just need to keep the numbers facing up. After you verify they have placed the prisms as requested have the student write down the numbers on a sheet of paper and then add up the four 4 digit numbers. If you want them to use a calculator that would be fine also. As soon as they start to add the numbers write the sum of the front faces on a small piece of paper and label that number the total of front numbers. Than write down the sum of the back faces on the piece of paper and label that number the total of back numbers. Fold the paper and put it on the desk. When the student has found the sum of the numbers on the front check to be sure they are correct. Turn the prisms around and ask them to find the sum of those four 4 digit numbers. When they are done check to be sure they are correct. Tell the student you have written the sum of the numbers on the front and the sum of the numbers on the back as soon as they started to add the numbers. Emphasize that you did not see the numbers on that back before you wrote done your answers. Have them open the paper on the desk and verify that you were able to find that correct sums faster then they did and without see the back side of the prisms.

You can allow the student to choose as many of the prisms as they want to use. The technique to find the total works for 1, 2, 3 or all 4 prisms bit it is more impressive the more prisms you use.

NOTE: Some students will see some patterns right away. Others may be able to state some facts about the sums after seeing a few repetitions of the trick. Most magicians do not repeat tricks because they do not want the audience to get any idea how a trick works. You, on the other hand, are a teacher. You want students to observe an effect several times and begin to make conjectures. If a student can figure out how an effect works and tell you that is great. If they can write out the procedure for finding the sum that is even better. If they can explain how the numbers were chosen that would be the even better. If they could then create a new set of numbers that also work that would be a crowning achievement. The only way these things can happen is by having them see the effect several times and record their observations, They also need to look at the numbers on the towers and note any observations. I do not do tricks to amaze or entertain. I do them as a starting point to motivate students to observe, record and organize data. I hope to lead them part way to the solution by asking leading questions that help them build on their initial conclusions.

Almost every student can make a few initial observations and many will find the way the sum is found. If any student wants to dig deeper I am happy to give them a printout of the numbers and let them make their one towers and keep working to see if they can explain how the numbers were chosen and maybe even make a new set with different numbers. Only a very few will go that far but for any that do they will remember that moment they found the key idea for the rest of their lives. Everybody will get something from the activity and some students may get a great deal more.

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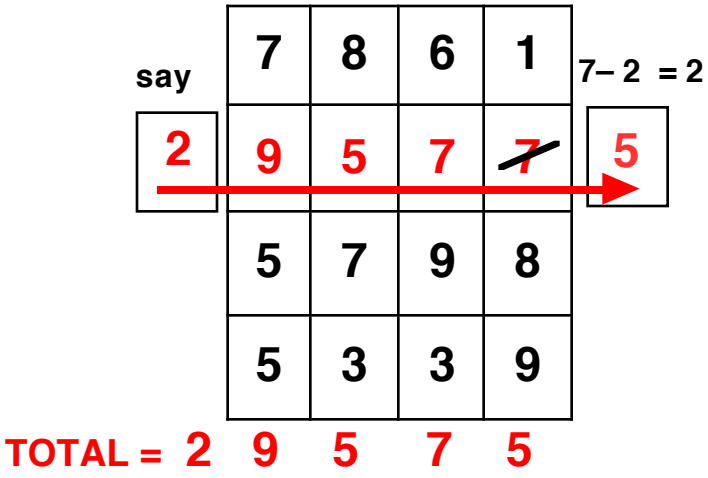
Find the total of the numbers on the FRONT FACES of 4 towers.

The **Second ROW of the front** is used to find the sum of the numbers on the **FRONT FACES.**

A. Say the number 2

B. Read the next 3 numbers on the **Second Row** from **LEFT TO RiGHT.**

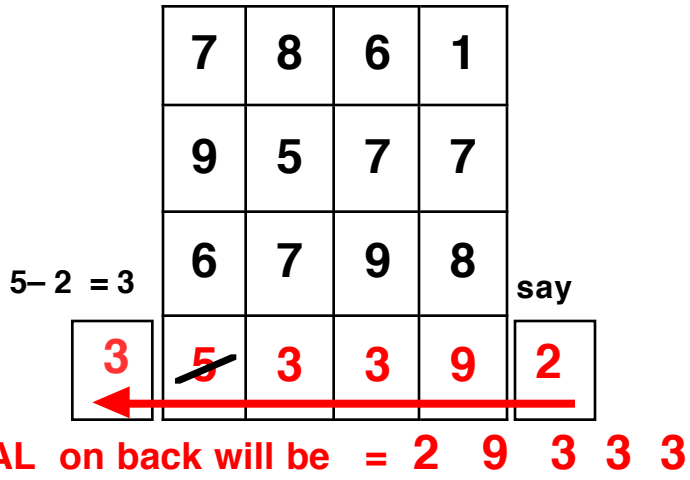
C. The last digit of the sum will be **2 less than the number on the RIGHT END** of the row.



Find the total of the numbers on the BACK FACES of 4 towers.

The **Last Row** of the front is used to find the sum of the numbers on the **BACK FACES.**

These are the number on the front faces.
To verify the sum of the numbers on the back flip the towers over as a group form right to left



A. Say the number 2.

B. Read the next 3 numbers from the **Last ROW** from **RIGHT TO LEFT.**

C. The last digit of the sum will be **2 less than the number on the LEFT END** of the row.

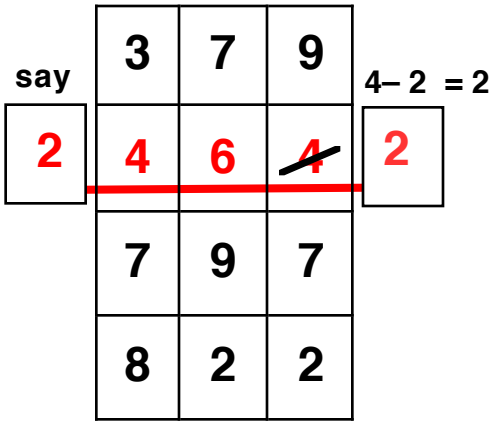
Find the total of the numbers on the FRONT FACES of 3 prisms.

The **Second ROW of the front** is used to find the sum of the numbers on the **FRONT FACES.**

A. Say the number 2

B. Read the next 2 numbers on the **Second Row** from **LEFT TO RiGHT.**

C. The last digit of the sum will be **2 less than the number on the RIGHT END** of the row.

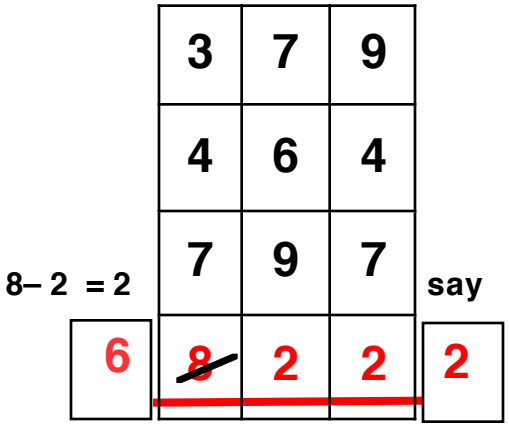


TOTAL = 2 4 6 2

Find the total of the numbers on the BACK FACES of 3 towers.

The **Last Row** of the front is used to find the sum of the numbers on the **BACK FACES.**

These are the number on the front faces
to verify the sum of the numbers on the back flip the towers over
as a group form right to left



TOTAL on back will be = 2 2 2 6

A. Say the number 2.

B. Read the next 2 numbers from the **Last ROW** from **RIGHT TO LEFT.**

C. The last digit of the sum will be **2 less than the number on the LEFT END** of the row.

Find the total of the numbers on the BACK FACES of 4 prisms.

Patterns for the 4 Towers with 4 rows for 3/ 4 in square sticks

Carry and Difference are 2 , Front Second Row, Back Last Row

Set A

Prism A1

7	6	2	9
9	2	5	4
6	8	7	7
5	4	9	2
27	20	23	22

Prism A2

8	8	4	7
5	2	3	6
7	4	9	9
3	6	5	2
23	20	21	24

Prism A3

6	2	4	8
7	6	3	8
9	8	7	4
3	8	7	6
25	24	21	26

Prism A4

1	3	8	9
7	4	9	8
8	7	3	5
9	8	7	4
25	22	27	26

How I made 4 sets of the prisms.

I went to the local hardware store and bought a length or wood that was 3/ 4 in square. I cut the stick into several short 3 inch lengths. That gave me enough short sticks to make 3 sets of prisms. I then printed out and cut out copies of the 4 prism patterns on page 5. I then taped the 4 prism patterns onto the short sticks. I used a marker to color the ends of one set of 4 sticks red. I colored the second set blue and the third set yellow. That way I can have 3 or 4 sets in the room without getting them mixed up. The red set and the blue set can be easily seen as two different sets

Note: If you have sets with different rules (the number carried is 1 not 2) you can color one end and mark A on the sets with a carry of 1 and a B on the sets that use a carry of 2.

How do you determine the numbers to put on the prism faces?

I provided complete instructions on how to determine the numbers for the faces with the 2D version of the trick, Super Mental Addition 2 Tower Totals Refer to that effect to find out how the numbers were created.

Take any tower form that set and put those numbers on the front and back of one prism. Then take the numbers for another tower and put these numbers on the other 2 opposite sides to complete the prism. Do that for 3 other towers and you will have a complete set of prisms. They work just like the two sided towers but each prism has 2 towers on one prime. Each separate tower is put on 2 opposite sides of the prism.

Paper Patterns for the prisms.

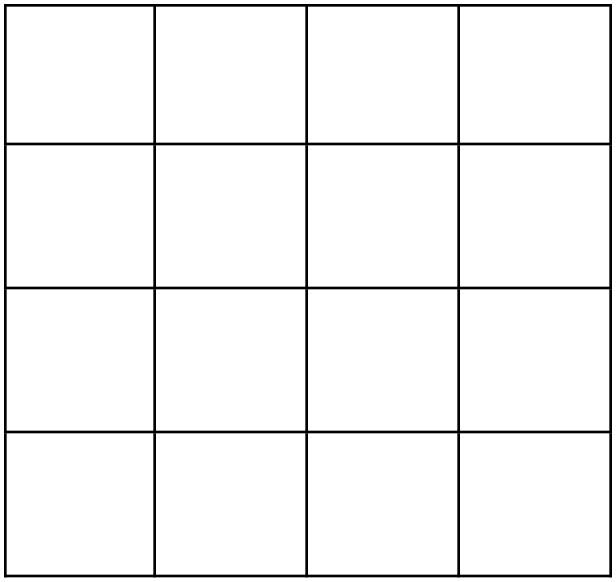
The following 4 pages are a set of prisms you could print on heavy paper or card stock, cut out , fold and tape. This will not be as durable as the wooden sticks but will save you cutting sticks.

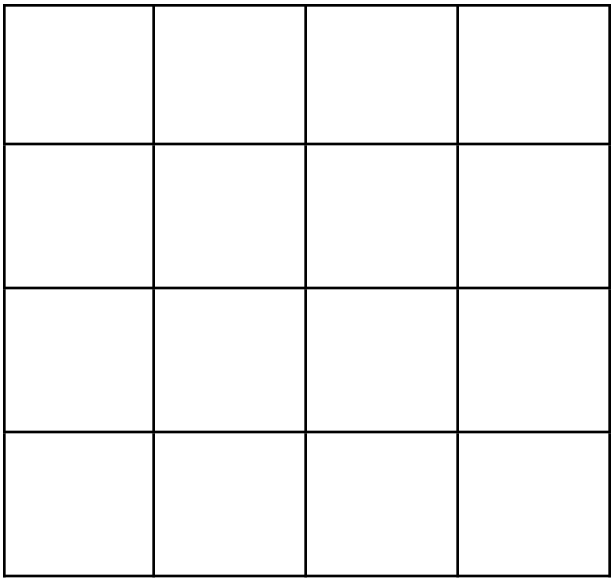
cut off	cut off	cut off	tab 1
7	6	2	9
9	2	5	4
6	8	7	7
5	4	9	2
cut off	cut off	cut off	tab 1

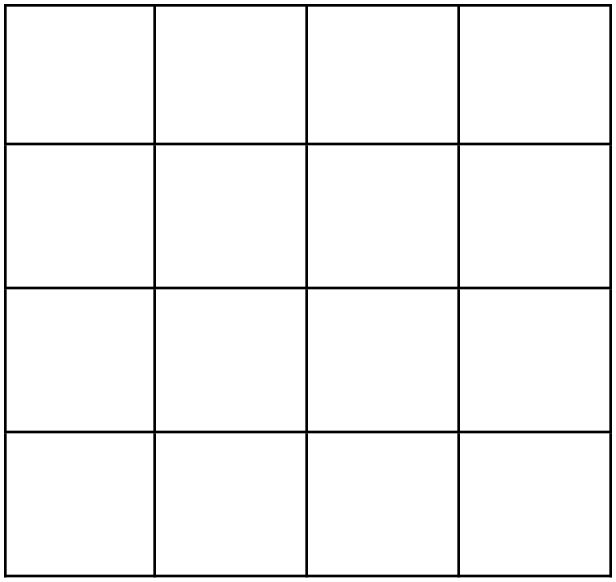
cut off	cut off	cut off	tab 2
8	8	4	7
5	2	3	6
7	4	9	9
3	6	5	2
cut off	cut off	cut off	tab 2

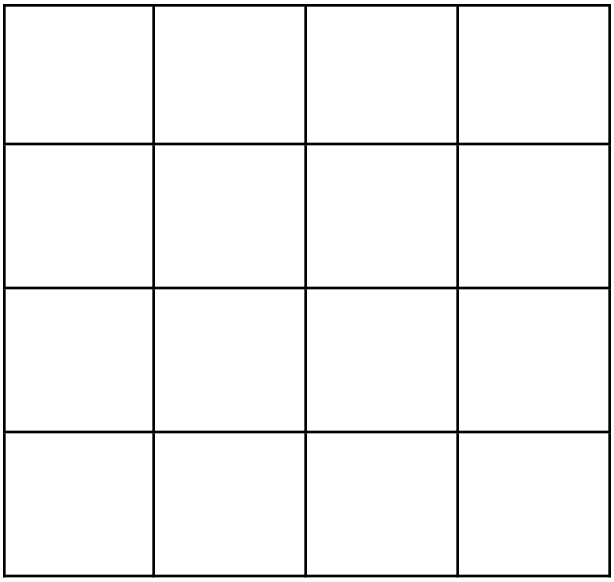
cut off	cut off	cut off	tab 3
6	2	4	8
7	6	3	8
9	8	7	4
3	8	7	6
cut off	cut off	cut off	tab 3

cut off	cut off	cut off	tab 4
1	4	8	9
7	3	9	8
8	7	3	5
9	8	7	4
cut off	cut off	cut off	tab 4









Patterns for the 4 Towers with 5 rows for 3/ 4 in square sticks

Carry and Difference are 1 , Front Second Row, Back Last Row

Set B

Prism B1

1	1	2	2
3	4	1	3
5	1	3	1
2	4	1	2
1	3	3	4
12	13	10	12

Prism B2

2	1	3	2
3	3	4	1
2	2	1	3
1	5	2	1
4	1	3	3
12	12	13	10

Prism B3

1	3	1	2
5	4	2	1
1	4	2	1
5	1	1	2
2	1	5	4
14	13	11	10

Prism B4

1	2	1	3
2	3	2	5
5	1	4	2
1	1	2	1
2	5	2	3
11	12	11	14

Patterns for the 4 Towers with 5 rows for 3/ 4 in square sticks

Carry and Difference are 1 , Front Second Row, Back Last Row

Set B

Prism B1

1	1	2	2
3	4	1	3
5	1	3	1
2	4	1	2
1	3	3	4
12	13	10	12

Prism B2

2	1	3	2
3	3	4	1
2	2	1	3
1	5	2	1
4	1	3	3
12	12	13	10

Prism B3

1	3	1	2
5	4	2	1
1	4	2	1
5	1	1	2
2	1	5	4
14	13	11	10

Prism B4

1	2	1	3
2	3	2	5
5	1	4	2
1	1	2	1
2	5	2	3
11	12	11	14

A set of towers using a slightly different rule

Patterns for the 4 Towers with 5 rows for 3/ 4 in square sticks

Set C

Prism C1

2	6	2	1
3	2	1	3
6	5	4	1
1	2	4	5
2	2	1	3
14	17	12	13

Prism C2

5	1	2	4
1	3	3	2
4	3	3	5
2	4	1	3
3	2	5	1
15	13	14	15

Prism C3

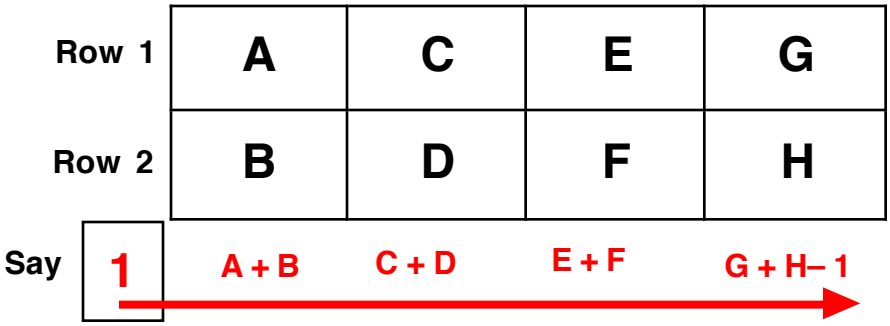
3	5	1	2
4	3	2	2
6	5	2	1
1	3	2	5
2	1	5	3
16	17	12	13

Prism C4

2	1	3	4
3	2	1	2
5	3	4	6
3	2	4	1
1	4	1	2
14	12	13	15

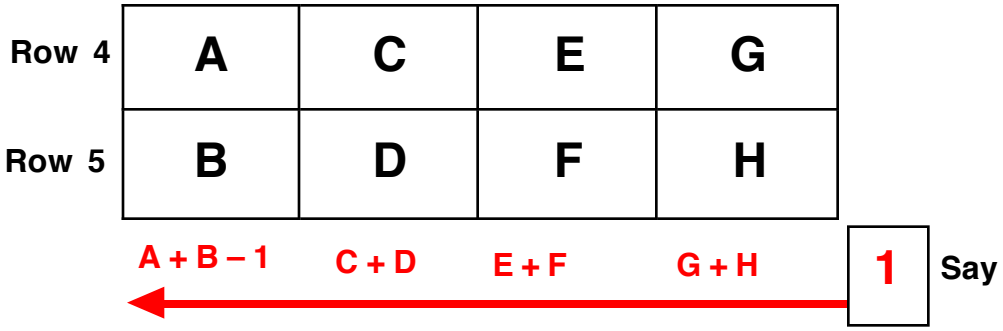
The total of the numbers on the front of the towers is found using the sums of the first two rows.

Total of the numbers on the front



The total of the numbers on the back of the towers is found using the sums of the last two rows.

Total of the numbers on the back



Example

4 towers put in this order

2	6	5	1
3	2	1	1
6	5	4	3
1	2	2	5
3	2	3	1

Total on front

Row 1	2	6	5	1
Row 2	3	2	1	1

Say 1 — 2 + 3 = 5 — 6 + 2 = 8 — 5 + 1 = 6 — 1 + 1 – 1 = 1

Total on front = 1 5 8 6 1

Total on back

Row 4	1	2	2	5
Row 5	3	2	3	1

1 + 3 – 1 = 3 — 2 + 2 = 4 — 3 + 2 = 5 — 5 + 1 = 6 — 1 — Say

Total on back= 1 6 5 4 3