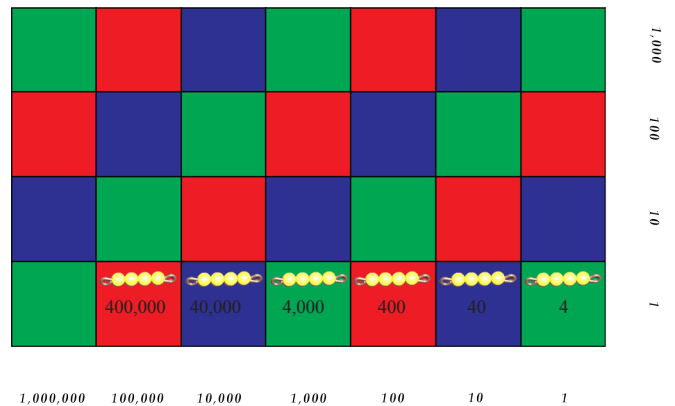
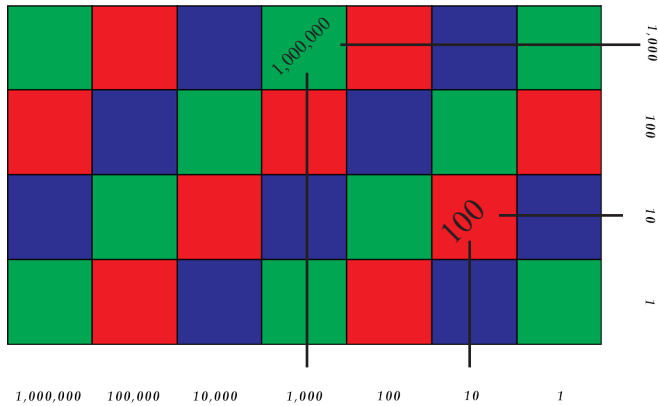
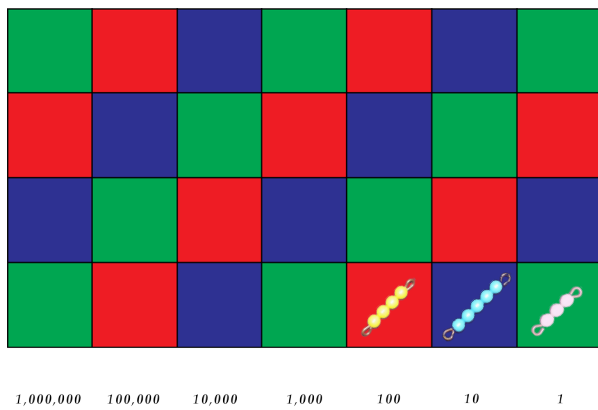


Checkerboard:

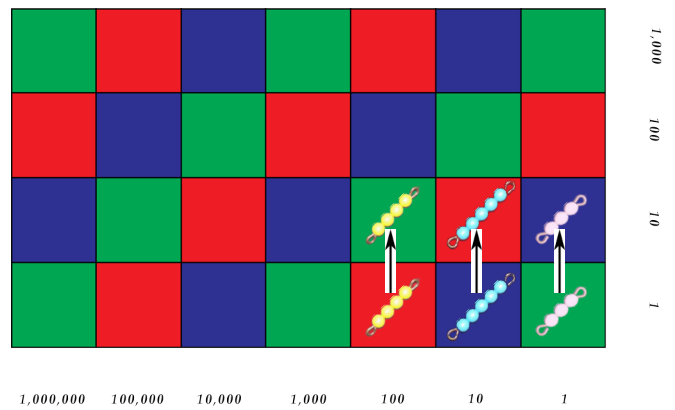
- Must have checkerboard and material box with the beads and numbers.
- The hierarchy colors apply. (going horizontal and vertical)
  - Green for units, units of thousands, units of millions, etc.
  - Blue for 10s, 10s of thousands, 10s of millions, etc.
  - Red for 100s, 100s of thousands, 100s of millions, etc.
- To obtain the values of the different squares, you multiply the numbers around the checker board.



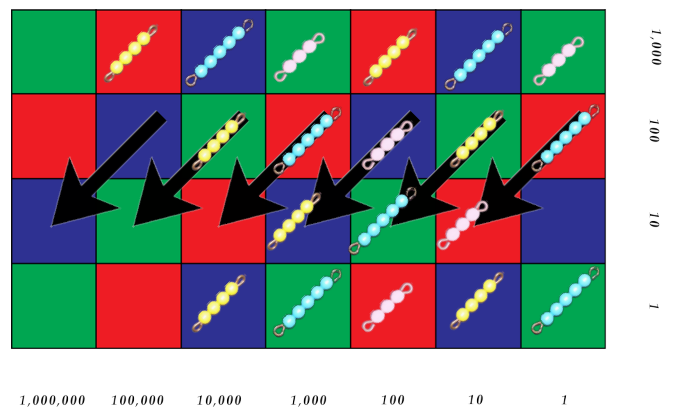
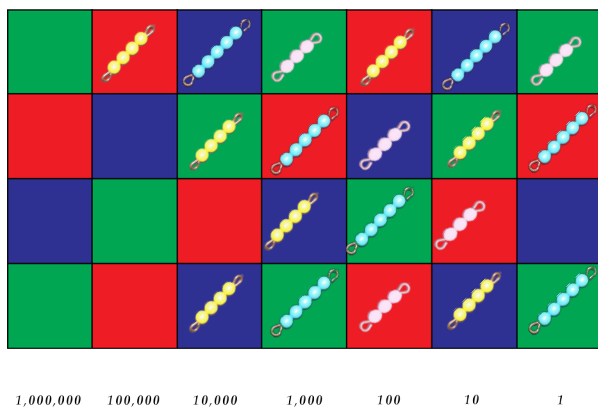
With the numbers 4, 5, 3 we can create different numbers by moving them around.



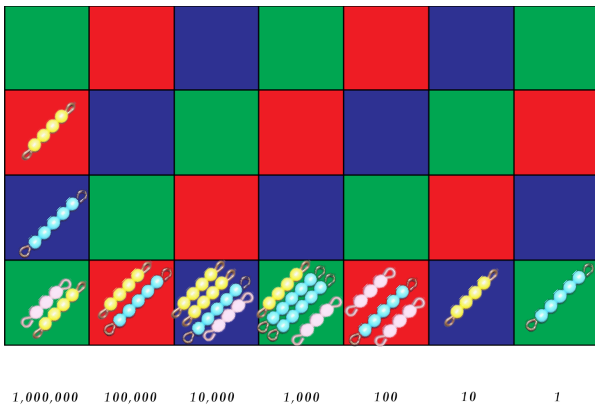
This number is four hundred fifty three.



This number is four thousand five hundred thirty.

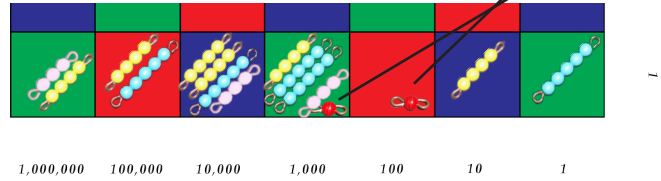


Slide all the beads down to the bottom row on a diagonal



1,000  
100  
10  
1

- Now we need to simplify. Since we know that both & are by themselves they stay as they are.
- But + + = 11 or .
- Now we place them back on the board with in the original spot of the beads and the second in the square to the left

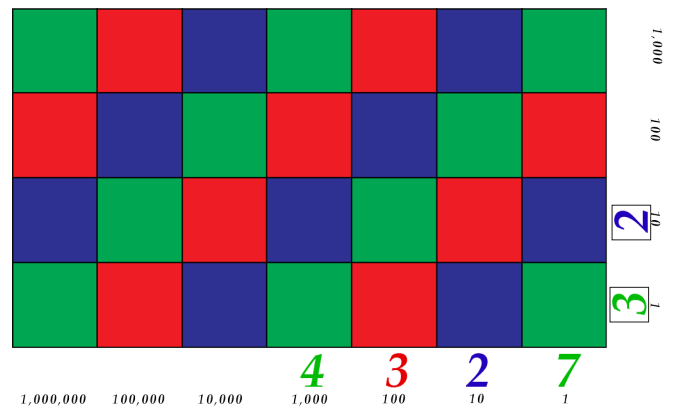


Double digit multiplication(value expressed in beads):

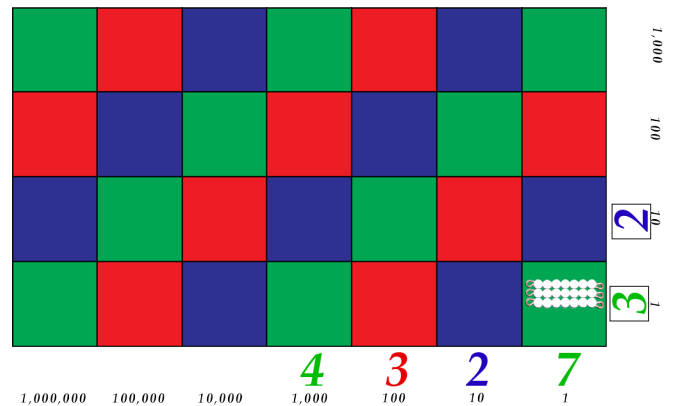
Equation:  $4327 \times 23$

Step 1: Lay out the numbers.

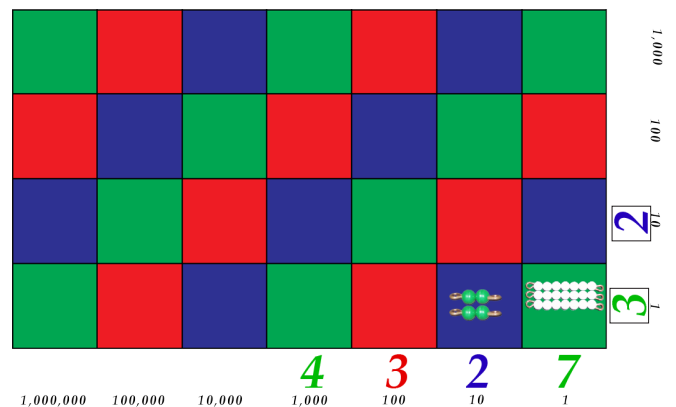
- The multiplacand are made on horizontal bottom with white squares.
- Multiplier is on right hand side with gray tiles.



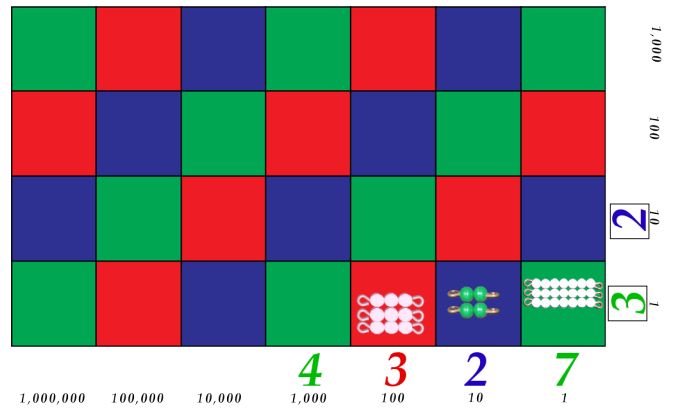
Step 2: Multiply the 1s (  $7 \times 3$  ). When doing it concrete you reach into the 7s bin 3 times.



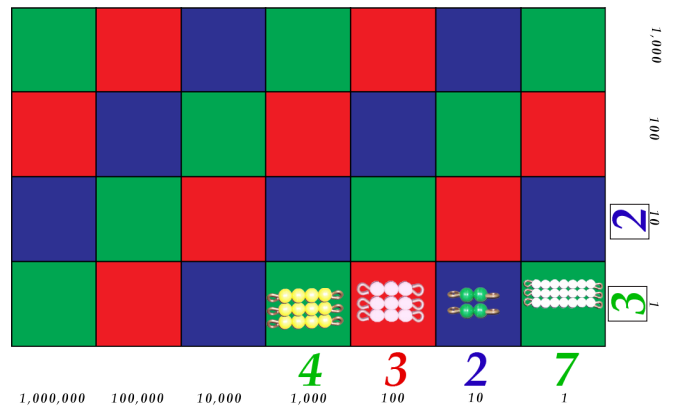
Step 3: Multiply the first level (3) by the 10s (2)



Step 4: Multiply the first level (3) by the 100s (3)

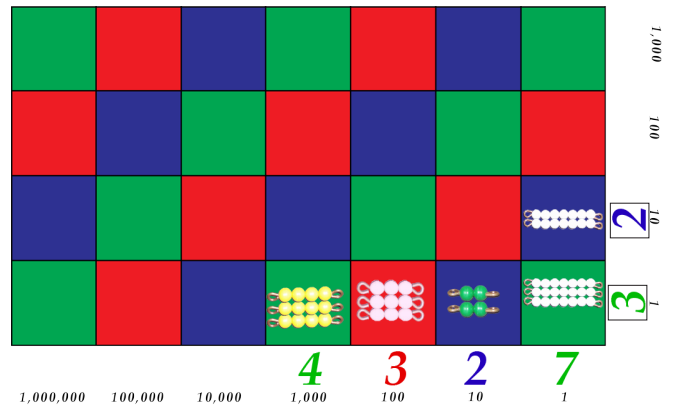


Step 5: Multiply the first level (3) by the 1000s (4)



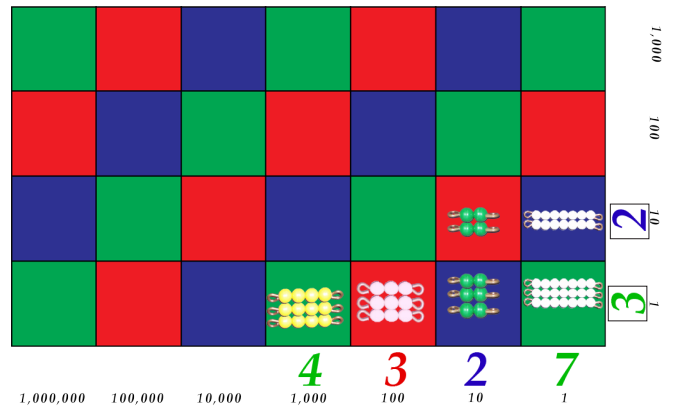
Step 6: Now we begin the second level or 10s area of the multiplier. We would trace the 7 and the 2 until they meet in the blue square. Multiply them together and get 14.

Say “7 units taken 2 tens time”



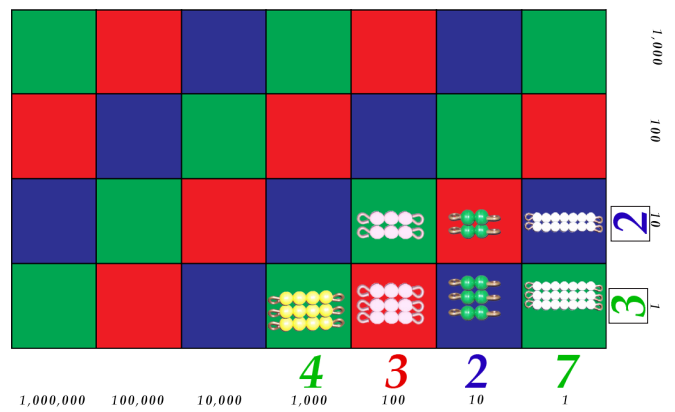
Step 7: Multiply 2 10s taken 2 times.

Say “2 tens taken 2 tens time”



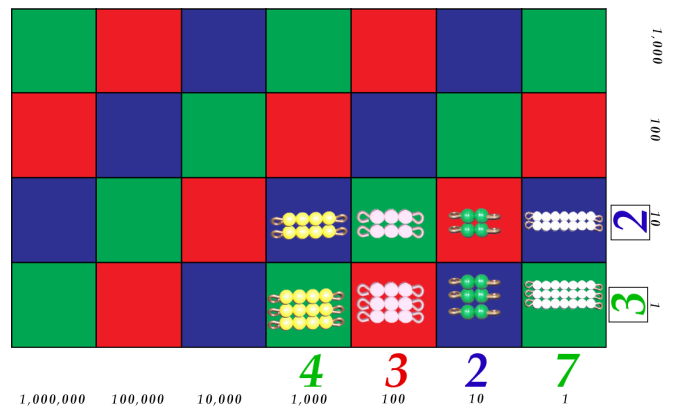
Step 8: Multiply 3 100s taken 2 times.

Say “3 hundreds taken 2 tens time”

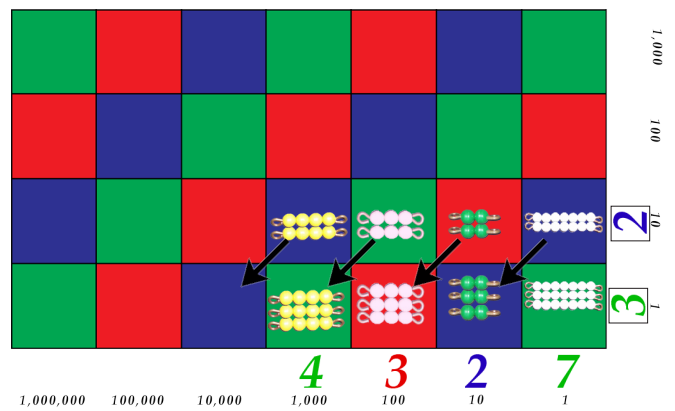


Step 9: Multiply 4 1000s taken 2 times.

Say “4 thousands taken 2 tens time”

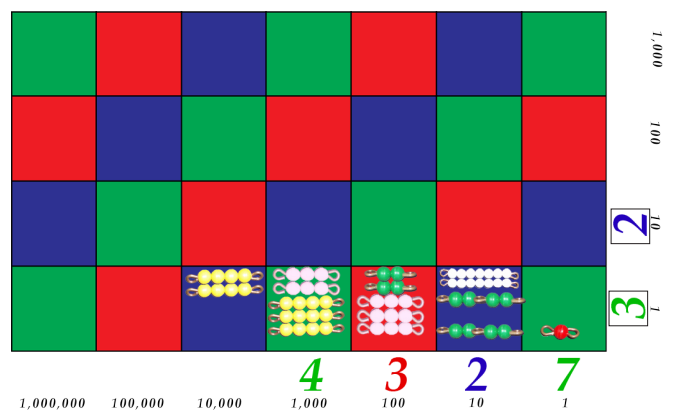


Step 10: Now we need to slide and simplify. Always slide on a diagonal.

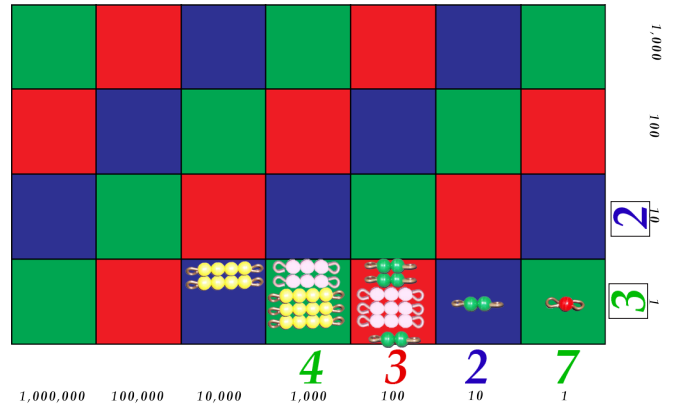


Step 11: Now we need to simplify. 3 7s bar are 21 and we need to put a bead in the tens and a bead in the ones.

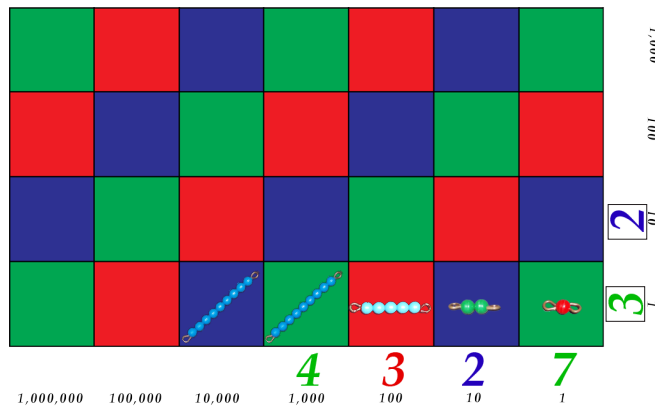
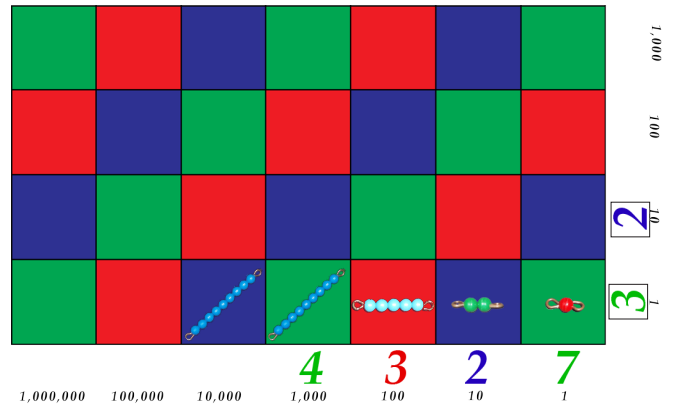
Looking at the 10s. we see  $7 + 7 + 2 + 2 + 2 + 2 = 22$ . We put a 2 in the 10s and a 2 in the 100s.



Step 12: Looking at the 10s. we see  $7 + 7 + 2 + 2 + 2 + 2 = 22$ . We put a 2 in the 10s and a 2 in the 100s.



Step 13: Continue on in this fashion until you have everything simplified and you have your answer of 99,521

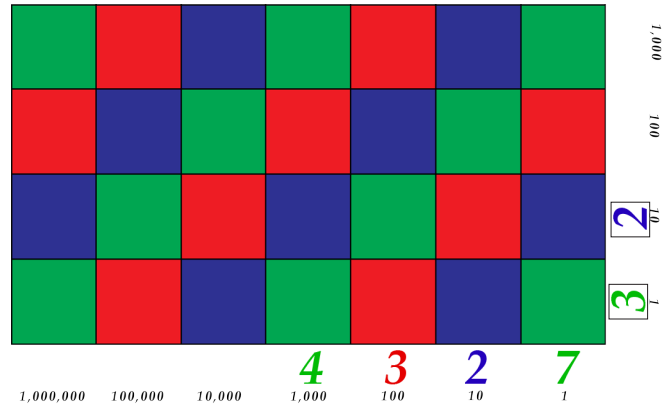


Double digit multiplication (mental calculations):

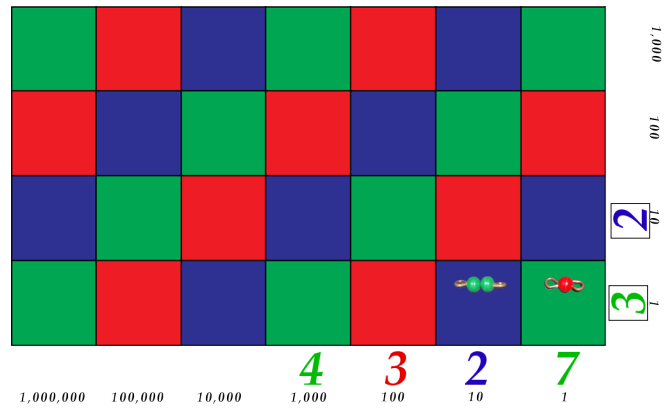
Equation:  $4327 \times 23$

Step 1: Lay out the numbers.

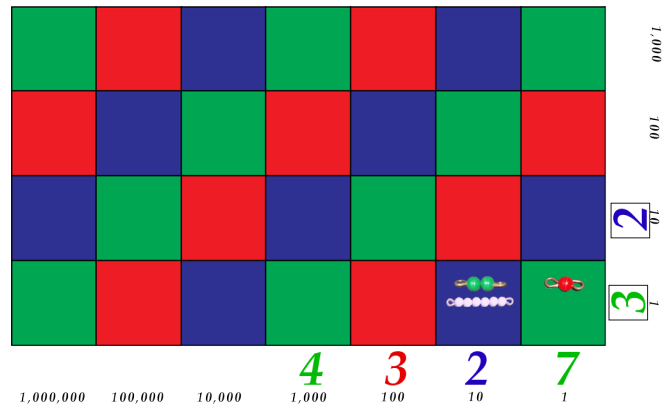
- The multiplacans are made on horizontal bottom with white squares.
- Multiplier is on right hand side with gray tiles.



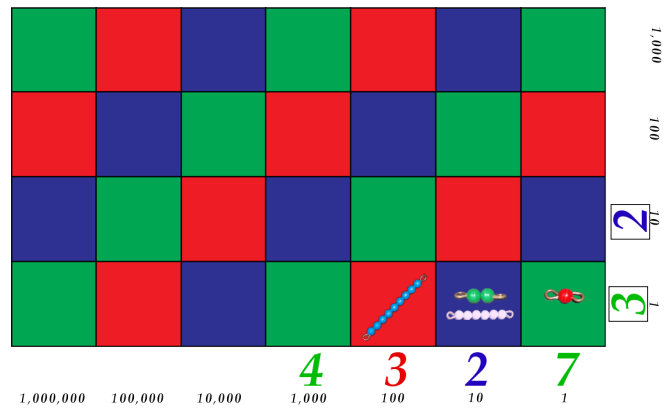
Step 2: Multiply the 1s columns ( $7 \times 3$ ) and we get 21. We know that the 1 goes in the 1s and the 2 goes in the 10s.



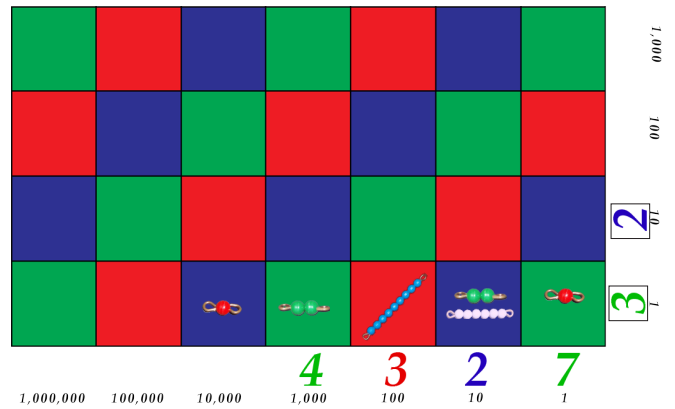
Step 3: Multiply the 1s column (3) with the 10s column (2) and we get 6. We know that the 6 goes in the 10s square.



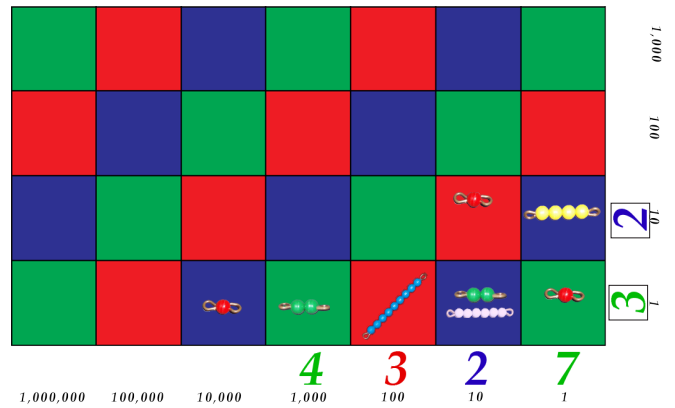
Step 4: Multiply the 1s column (3) with the 100s column (2) and we get 9. We know that the 9 goes in the 100s square.



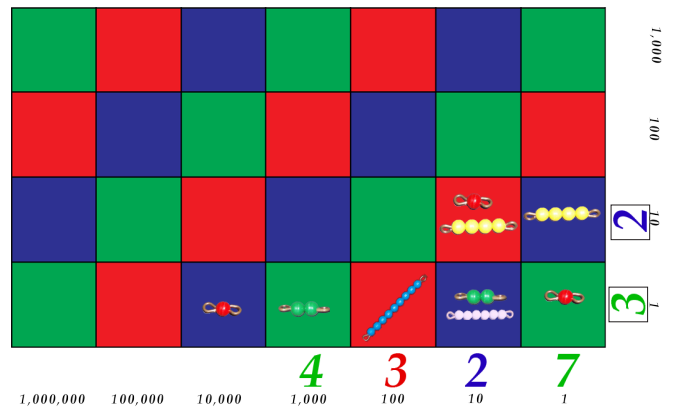
Step 5: Multiply the 1s column (3) with the 1000s column (4) and we get 12. We know that the 1 goes in the 10,000s square and the 2 goes in the 1,000s square.



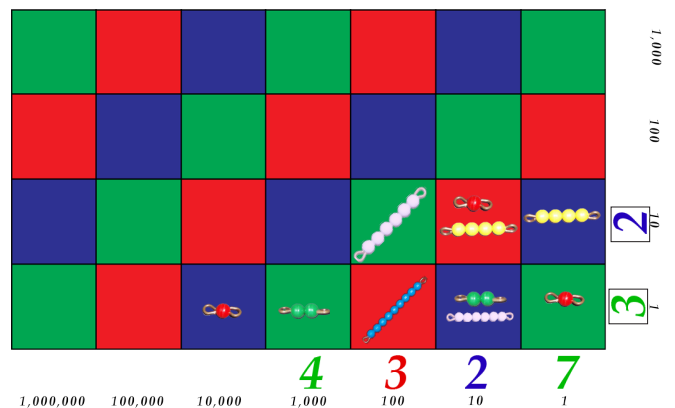
Step 6: Multiply the 10s column (2) with the 1s column (4) and we get 14. We know that the 1 goes in the 100s square and the 4 goes in the 10s square of the 2nd level.



Step 7: Multiply the 10s column (2) with the 10s column (2) and we get 4. We know that the 4 goes in the 100s square of the 2nd level.



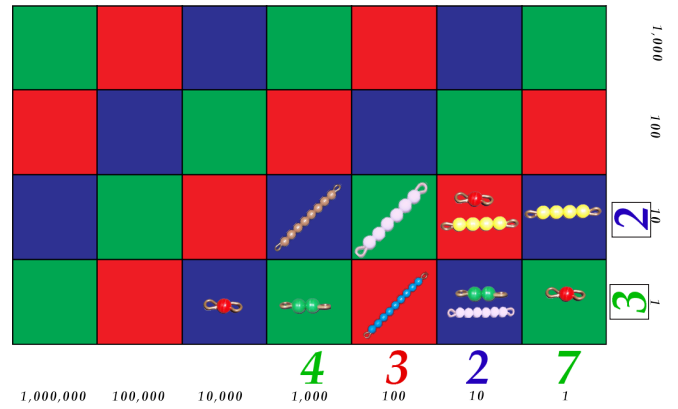
Step 8: Multiply the 10s column (2) with the 100s column (3) and we get 6. We know that the 6 goes in the 1000s square of the 2nd level.



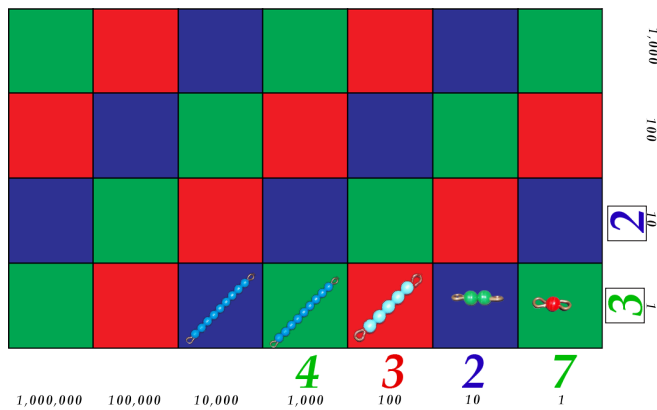
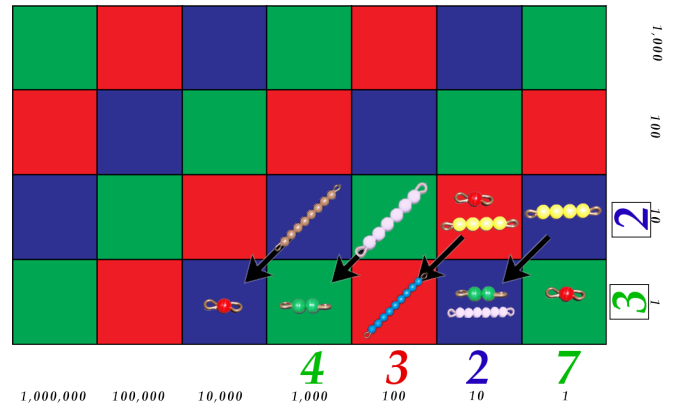
Math

Step 9: Multiply the 10s column (2) with the 1000s column (4) and we get 8. We know that the 8 goes in the 10,000s square of the 2nd level.

Memorization



Step 10: Slide and exchange to get the answer.



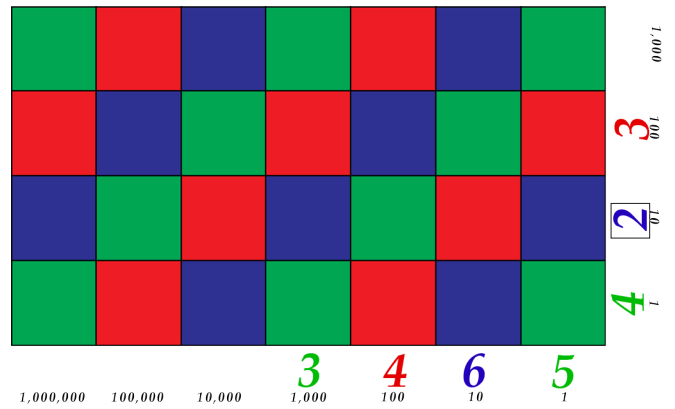


Three digit multiplication (Partial Products):

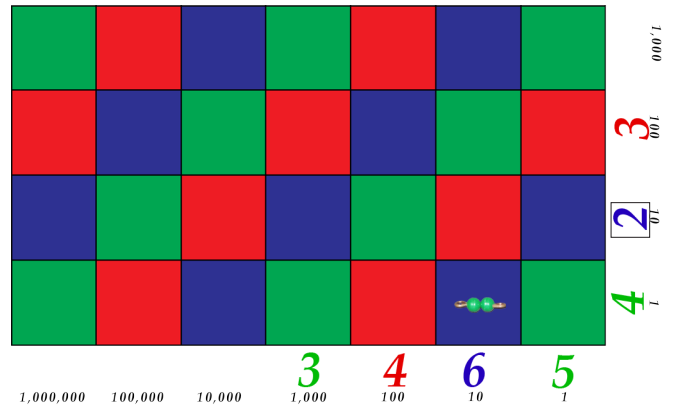
Equation:  $3465 \times 423$

Step 1: Lay out the numbers.

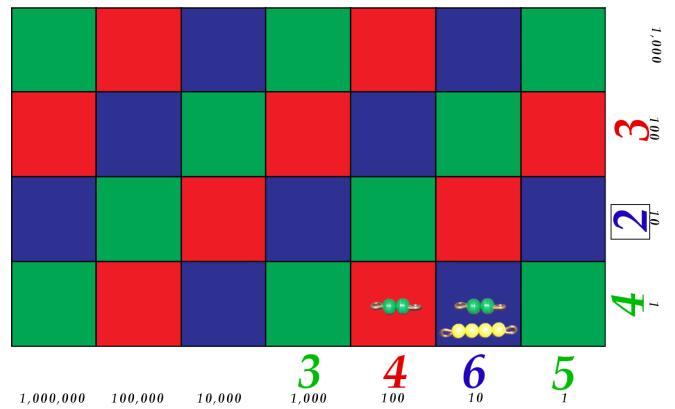
- The multiplacans are made on horizontal bottom with white squares.
- Multiplier is on right hand side with gray tiles.



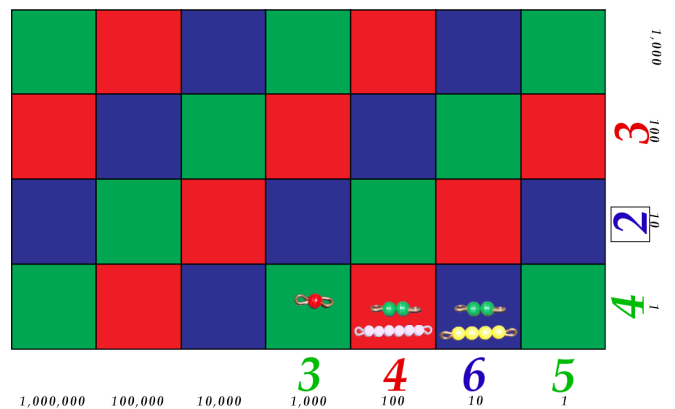
Step 2: Multiply the 1s columns (5 x 4) and we get 20. We know that the 2 goes in the 10s and nothing goes in the 1s.



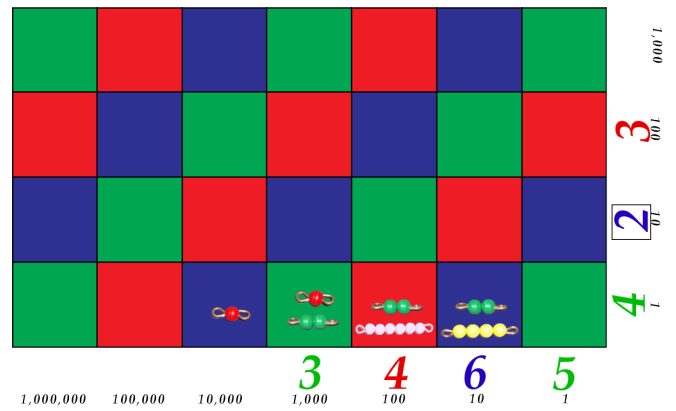
Step 3: Multiply the 1s vertical column (4) by the 10s column (6) and we get 24. We know that the 2 goes in the 100s and 4 goes in the 10s.



Step 3: Multiply the 1s vertical column (4) by the 100s horizontal column (4) and we get 16. We know that the 1 goes in the 1000s and 6 goes in the 100s.



Step 4: Multiply the 1s vertical column (4) by the 1000s horizontal column (3) and we get 12. We know that the 1 goes in the 10000s and 2 goes in the 1000s.

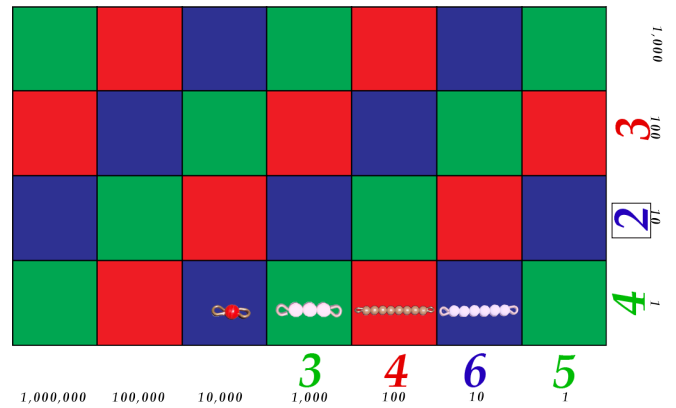


Step 5: Simplify

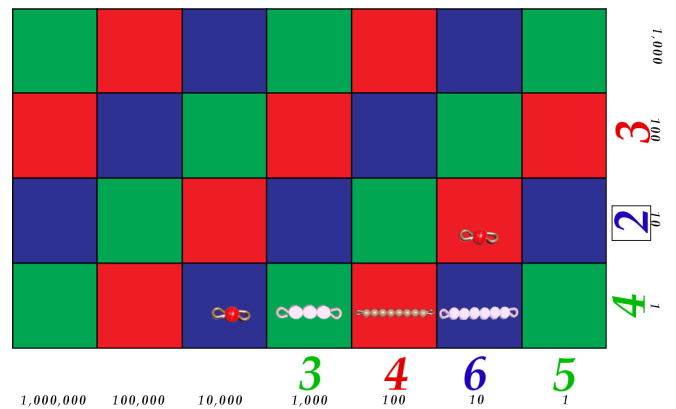
- 10s -  $4 + 2 = 6$
- 100s  $6 + 2 = 8$
- 1000s  $2 + 1 = 3$
- 10000s  $1 + 0 = 1$

After we have simplified we need to write the partial product we have found.

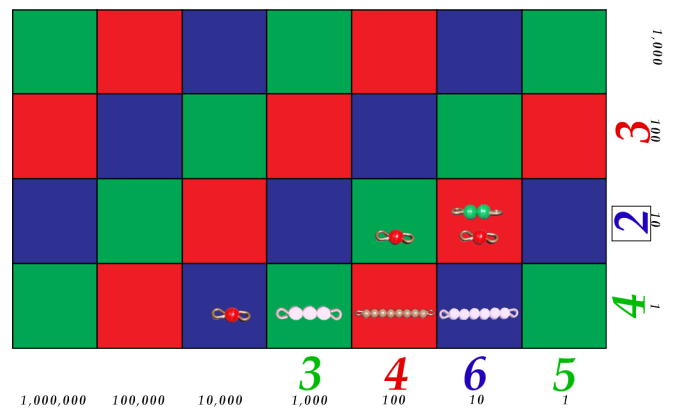
$$\begin{array}{r} 3465 \\ \times 423 \\ \hline 13860 \end{array} \text{ - Partial Product 1}$$



Step 6: Multiply the 10s vertical column (2) by the 1s horizontal column (5) and we get 10. We know that the 1 goes in the 100s in the second row and zero goes in the 10s in the second row.

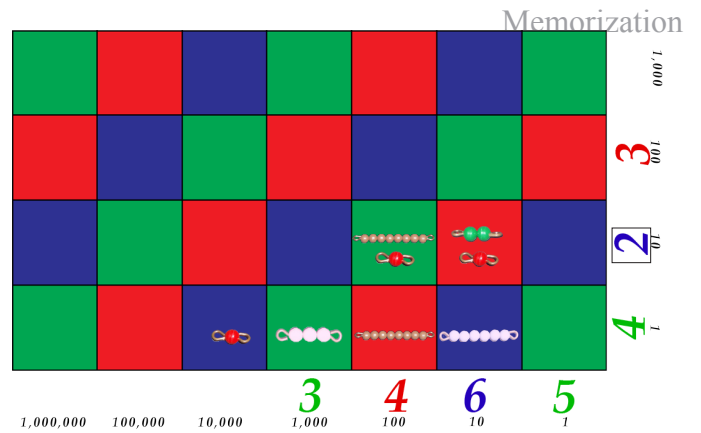


Step 7: Multiply the 10s vertical column (2) by the 10s horizontal column (6) and we get 12. We know that the 1 goes in the 1000s in the second row and 2 goes in the 100s in the second row.

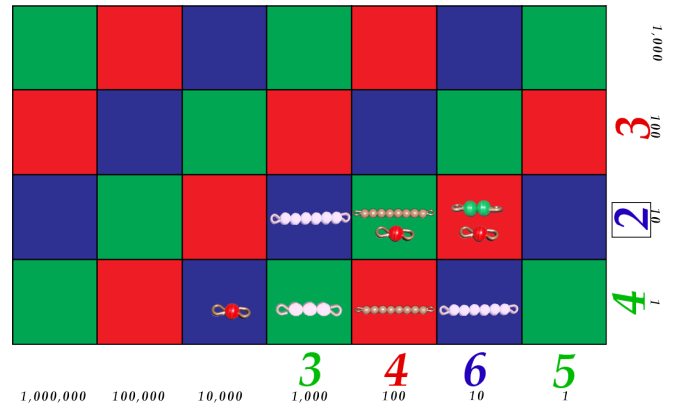


Math

Step 8: Multiply the 10s vertical column (2) by the 100s horizontal column (4) and we get 8. We know that the 8 goes in the 1000s in the second row.



Step 9: Multiply the 10s vertical column (2) by the 1000s horizontal column (3) and we get 6. We know that the 6 goes in the 10000s in the second row.

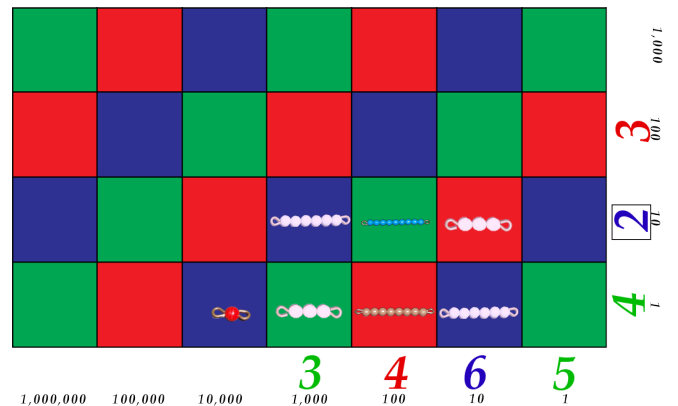


Step 10: Simplify

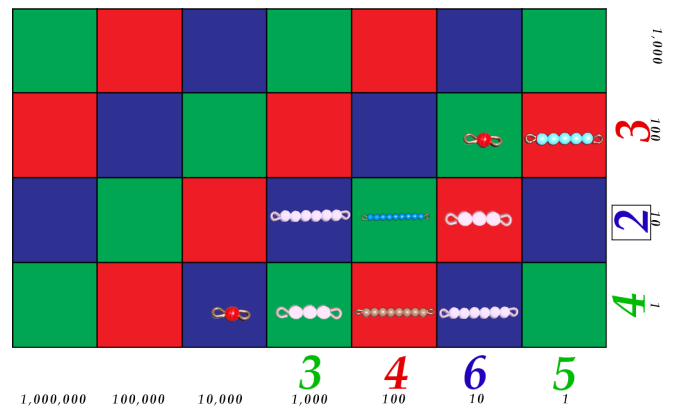
- 100s -  $2 + 1 = 3$
- 1000s  $8 + 1 = 9$
- 10000s  $0 + 6 = 6$

After we have simplified we need to write the partial product we have found.

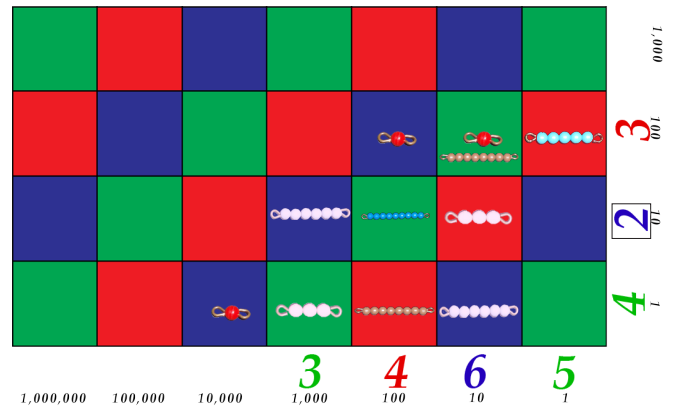
$$\begin{array}{r}
 3465 \\
 \times 423 \\
 \hline
 13860 \text{ - Partial Product 1} \\
 69300 \text{ - Partial Product 2}
 \end{array}$$



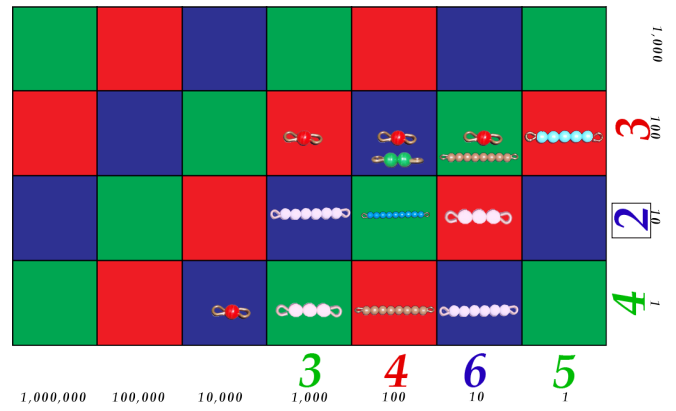
Step 11: Multiply the 100s vertical column (3) by the 1s horizontal column (5) and we get 15. We know that the 1 goes in the 1000s in the third row and the 5 goes in the 100s in the third row.



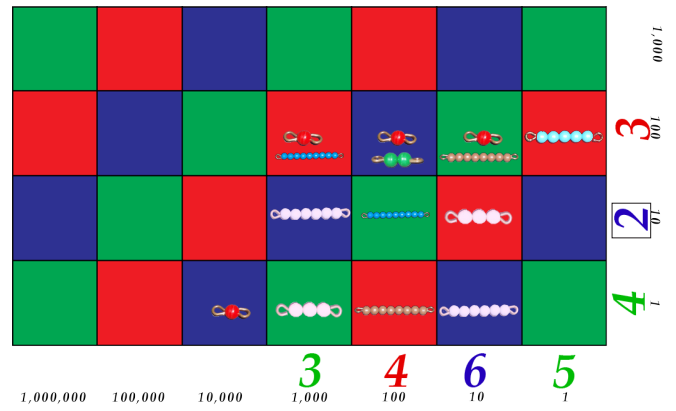
Step 12: Multiply the 100s vertical column (3) by the 10s horizontal column (6) and we get 18. We know that the 1 goes in the 10000s in the third row and the 8 goes in the 1000s in the third row.



Step 13: Multiply the 100s vertical column (3) by the 100s horizontal column (4) and we get 12. We know that the 1 goes in the 100000s in the third row and the 2 goes in the 10000s in the third row.



Step 14: Multiply the 100s vertical column (3) by the 1000s horizontal column (3) and we get 9. We know that the 9 goes in the 100000s in the third row.

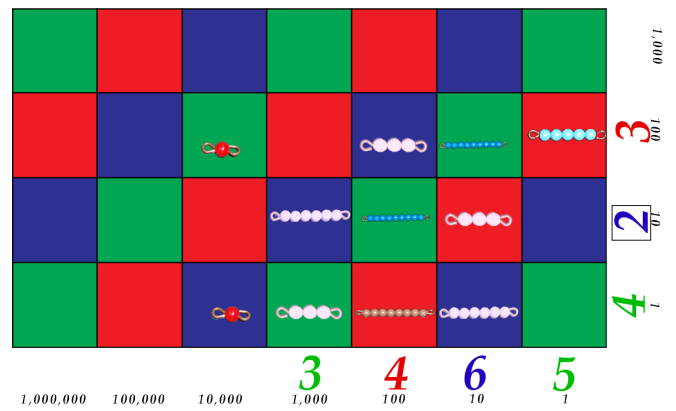


Step 15: Simplify

- 100s -  $5 + 0 = 5$
- 1000s  $8 + 1 = 9$
- 10000s  $2 + 1 = 3$
- 100000s  $9 + 1 = 10$

After we have simplified we need to write the partial product we have found.

$$\begin{array}{r}
 3465 \\
 \times 423 \\
 \hline
 13860 \text{ - Partial Product 1} \\
 69300 \text{ - Partial Product 2} \\
 10395000 \text{ - Partial Product 3}
 \end{array}$$



Step 16: Slide and Simplify to come up with the final answer.

$$\begin{array}{r}
 3465 \\
 \times 423 \\
 \hline
 13860 \text{ - Partial Product 1} \\
 69300 \text{ - Partial Product 2} \\
 1039500 \text{ - Partial Product 3} \\
 \hline
 1122660
 \end{array}$$

