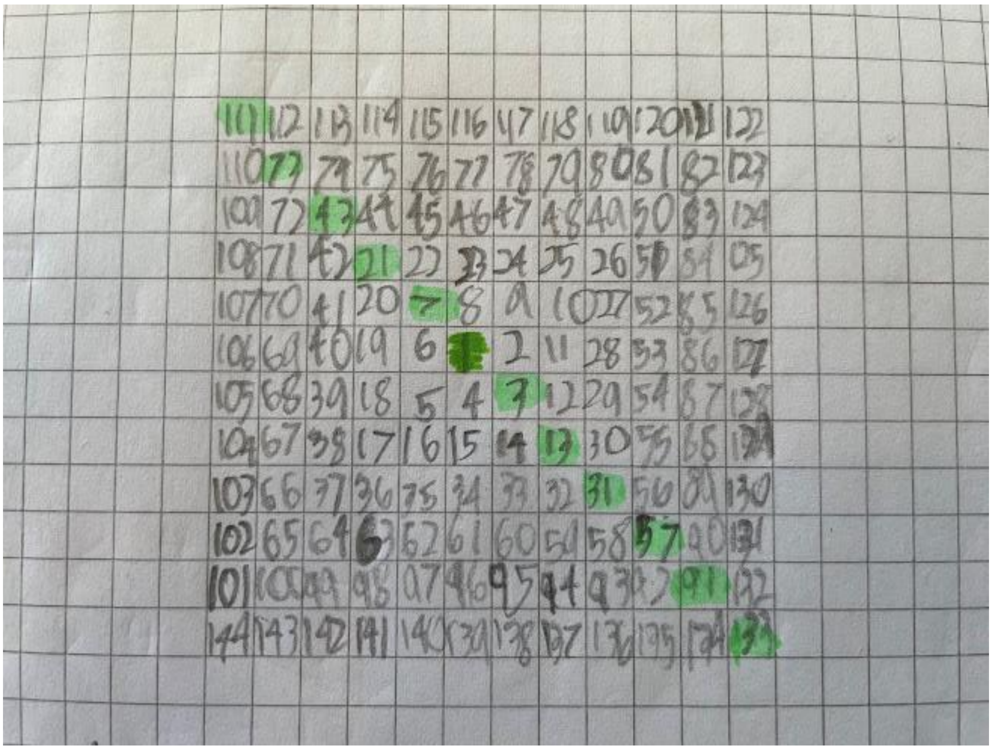
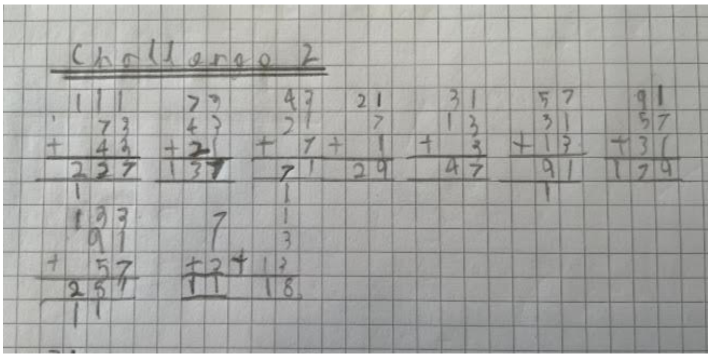
Challenge 1



Challenge 2



Challenge 3a

I have realised that to end up with a total that has a 2 in the ones column, the combined ones columns of the digits I am adding have to equal 2, 12, 22, 32, 42. I cannot make a total where the ones column adds up to 52 because it use all our numbers and all our numbers only equal 51.

Total of 2

I know that 1+1 = 2, so any two numbers that have a 1 in the ones column will equal a number with 2 in the ones column:

11+281

11+71

11+91

281+71

281+91

71+91

Total of 12

I also know that 9+1+1+1=12 so has a 2 in the ones column so that tells me that all these combinations end up with a 2 in the ones column:

29+71+281+11

29+71+281+91

29+71+91+11

29+281+11+91

179+71+281+11

179+71+281+91

179+71+91+11

179+281+11+91

Total of 22

I know that 7+7+8=22 and has a 2 as the ones digit.

All the numbers that are the product of three numbers ending in 7, 7 and 8 will always have a 2 in the ones digit. So that tells me that all these combinations end up with a 2 in the ones column:

227+137+18

227+47+18

137+47+18

Using my knowledge of number bonds I know that four numbers with 7, 7, 7 and 1 in the ones column will always equal a number with 2 in the ones column because 7+7+8 = 7+7+7+8

So that tells me that all these combinations end up with a 2 in the ones column:

227+137+47+11

227+137+47+91

227+137+47+71

227+137+47+281

Total of 32

I know that 9+9+7+7=32, so four numbers with these digits in the ones column will equal a number that has a 2 in the ones column:

29+179+47+137

29+179+47+227

29+179+227+137

I also know that I can switch one of the 9s for an 8 and a 1, so five numbers with digits 7+7+9+8+1 in the ones column will equal a number that has a 2 in the ones column:

18+91+179+47+137

18+91+179+47+227

18+91+179+227+137

18+91+29+47+137

18+91+29+47+227

18+91+29+227+137

18+11+179+47+137

18+11+179+47+227

18+11+179+227+137

18+11+29+47+137

18+11+29+47+227

18+11+29+227+137

18+281+179+47+137

18+281+179+47+227

18+281+179+227+137

18+281+29+47+137

18+281+29+47+227

18+281+29+227+137

18+71+179+47+137

18+71+179+47+227

18+71+179+227+137

18+71+29+47+137

18+71+29+47+227

18+71+29+227+137

<u>Total of 42</u>

I can make a digit where the ones column equals 42 so the total will have a 2 in the ones column using digits that end in 9+9+7+7+7+1+1+1:

179+29+137+227+47+281+91+71

179+29+137+227+47+281+11+71

179+29+137+227+47+281+11+91

179+29+137+227+47+11+91+71

<u>3b</u>

I have realised that to end up with a total that has an 8 in the ones column, the combined ones columns of the digits I am adding have to equal 8, 18, 28, 38, 48. I cannot make a total where the ones column adds up to 58 because it uses all our numbers and all our numbers only equal 51.

<u>Total of 8</u>

47+11

47+91

47+281

47+71

137+11

137+91

137+281

137+71

227+11

227+91

227+281

227+71

<u>Total of 18</u>

The simplest version will have 1+9+8 in the ones column:

18+29+11

18+29+91

18+29+71

18+29+281

18+179+11

18+179+91

18+179+71

18+179+281

The next is a bit harder because you have to use 7+1+9+1 in the ones column:

29+11+47+71

29+11+47+91

29+11+47+281

29+11+227+71

29+11+227+91

29+11+227+281

29+11+137+71

29+11+137+91

29+11+137+281

29+71+47+91

29+71+47+281

29+71+227+91

29+71+227+281

29+71+137+91

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179+11+227+281

179+11+137+71

179+11+137+91

179+11+137+281

179+71+47+91

179+71+47+281

179+71+227+91

179+71+227+281

179+71+137+91

179+71+137+281

179+91+47+281

179+91+227+281

Once I had the full set using 29 as the digit with 9 in the ones column it was easy find the full set with 179 with 9 in the ones column as I just replaced 29 with 179 for every combination that I had already found.

Since I have four numbers with 1 in the ones column and at least two numbers with 7 in the ones column, the next combination will be 1+1+1+1+7+7.

11+281+71+91+227+137

11+281+71+91+227+47

11+281+71+91+137+47

<u>Total of 28</u>

The easiest way to make this is 8+9+9+1+1 in the ones column:

18+179+29+11+71

18+179+29+11+91

18+179+29+11+281

18+179+29+71+91

18+179+29+71+281

18+179+29+91+281

Next I will just change what I have done above to be 7+1 instead of 8, so the numbers I use will have 7+1+9+9+1+1 as I know 7+1=8:

47+91+179+29+11+71

47+281+179+29+11+71

47+11+179+29+281+91

137+91+179+29+11+71

137+281+179+29+11+71

137+11+179+29+281+91

227+91+179+29+11+71

227+281+179+29+11+71

227+11+179+29+281+91

I will now change what I have done to make 28 by changing 9 to 7+1+1, so the numbers I will use in the ones column are 8+9+7+1+1+1+1:

18+29+47+11+71+91+281

18+29+137+11+71+91+281

18+29+227+11+71+91+281

18+179+47+11+71+91+281

18+179+137+11+71+91+281

18+179+227+11+71+91+281

Total of 38

To make 38 I can use the following numbers in the ones column, 7+7+7+9+8 (I chose these numbers as I know that 3x7= 21, plus 9=30, plus 8=38)

227+137+47+29+18

227+137+47+179+18

I cannot find any other ways of making 38 because I have used all of the 7s which is what I would usually replace 9 or 8 with (by adding 1s).

Total of 48

If I use all the numbers it totals 51, so if I minus 3 of the numbers ending in 1 I will have a total of 48 in the ones column. For the numbers that I will add together, in the ones column I need 9+9+8+7+7+7+1:

179+29+18+227+137+47+11

179+29+18+227+137+47+71

179+29+18+227+137+47+91

179+29+18+227+137+47+281