

Puzzles prepared by Sinead McCarthy

Question 1: Arithmetic

John gets 2 new licence plates for his car. They are identical. They have a 5 digit number with no digit repeated. When putting these on his car John puts one on the front correctly but puts the one on the back upside down. He doesn't notice his mistake and goes for a drive. A few minutes down the road he gets pulled over. A guard approaches him and states that the licence plate on the front of his car is 63783 smaller than the one on the back. What is the number on Johns licence plate??

(from Edward Tarte's YouTube collection)

Solutions

Question 1

16908

Method: _ _ _ _ _ + 63783 = _ _ _ _ _

The only numbers that can be on the licence plates are 0 1 6 8 9, as there are no other numbers that read out numbers when turned upside down. So our answer is clearly a combination of these 5 numbers.

The last number of licence plate one (L1) has to be 3 less than the last of L2. So our choices are: i) _ _ _ _ 6 + 63783 = _ _ _ _ 9

ii) _ _ _ _ 8 + 63783 = _ _ _ _ 1

Option 1 is impossible. If 6 is the last number in L1 when you turn it upside down 9 would be the 1st number in L2 and the last number. Since no number is repeated the answer has to be ii)

1 _ _ _ 8 + 63783 = 8 _ _ _ 1

Now all that's left is to fill in 0, 6, 9

The value in L2 needs to be small so as not to require a value in the 20000's for L2. The smallest possible value using the numbers provided is 80691.

80691 – 63783 = 16908 which is the correct solution.

Hints

1

Only usable numbers are 0, 1, 6, 8, 9

2

L1 has to begin with 1 and end in 8 1 _ _ _ 8

⇒ L2 begins with 8 and ends in 1 8 _ _ _ 1

(explanation given in solutions)

Question 2: Triangular numbers. Divisibility

Eddie is playing with marbles. He has less than 300. After some time of playing he calls his mother in and she sees he has separated all his marbles into many small triangles of equal size, much like the way you would organise balls in a game of pool.



His mother said well done and left him to play some more. A few minutes later he called her again. This time he had organised all the marbles into larger triangles of equal size. He did this 6 times in total, each time calling his mother for her to see how he had organised them into fewer triangles of a larger equal size until finally on the 6th time he had organised them into one big triangle.

How many marbles did he have?

(from Edward Tarte's YouTube collection)

Question 2 simpler versions:

a) Eddie has less than 40 marbles and he arranges them in equal triangles 3 times.

b) Eddie has less than 50 marbles and he arranges them in equal triangles 3 times.

(there are two possible answers in this case).

Solution for Question 2

210

Method: Make a list of all the triangular numbers less than 300.

3
3+3=6
6+4=10
10+5=15
15+6=21
.....
253+23=276
276+24=300

By getting the factors of each number starting at 276 and going down I see that 210 is the only number with the necessary factors.

1 triangle with 210 marbles
2 triangles with 105 marbles
10 triangles with 21 marbles
14 triangles with 15 marbles
21 triangles with 10 marbles
35 triangles with 6 marbles
70 triangles with 3 marbles

Hints

1. Make a list of all triangular numbers.

3, 6, 10, 15, 21, 28,
36, 45, 55, 66, 78, 91,
105, 120, 136, 153, 171, 190,
210, 231, 253, 276, 300

2. Five factors of the number must also be triangular numbers.

Answers for simpler versions:

a) 36 with factors 3, 6.

b) Same as before and also 45 with factors 3 and 15.