problem 1 (solution)

We are going to have the biggest sum of perimeters if we have 100 1x1 squares - $100 \cdot 4 \cdot 1 = 400$ sum. The less we cut the lower the sum becomes. If we don't cut only two squares one of each other, we will have 98 1x1 squares and one either 2x1 either 1x2 quadrilateral and their total sum will be 398, which we want. If it's a 2x1 we have 90 options (~~ways~~ ways) to cut the 10x10 square. If it's a 1x2 we have 90 again. $90+90=180$ total ways to cut a 10x10 square into several rectangles such that the sum of their perimeters is equal to 398.

Answer - 180

problem 2 (solution)

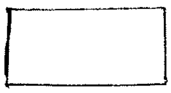
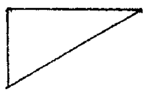
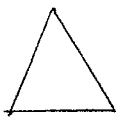
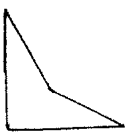
A perfect square ends with either 1, 4, 6, 9, 5 or 0, so if Ben puts last digit 2, 3, 7 or 8 he wins for sure. And if Ben puts a zero ~~in the~~ as a first digit, he still wins because the result is a 8- or less digit number and Alex needs 9-digit number. ~~So Ben~~ So as Ben has the second turn he will be always able to write either the first digit, either the last, either both and by doing that he has 100% guaranteed win.

Answer - Ben

problem 3 (solution)

In my example the first row corresponds to a rectangle, the second to a triangle with an angle of 90° and three non-equal sides, the third to a triangle with three equal sides and the fourth ~~se~~ row corresponds to a ~~rectangle wit~~ quadrilateral with two equal sides, one 90° angle and one over 90° angle. The first column corresponds to the property „the figure has an acute angle". The second to the priority „some of the sides are equal". The third to the priority „has a 90° angle" and the fourth to the priority „hasn't got an angle over 90°".

This is how it looks like.

	pr. 1	pr. 2	pr. 3	pr. 4
	0	1	1	1
	1	0	1	1
	1	1	0	1
	1	1		0

problem 4 (solution)

If we don't put bags in other bags, and each one has different amount of pieces, bigger than zero we will need $1+2+3\ldots+100=$ $=5050$ ~~cand~~ pieces to fill up all of the bags. We have only 2018, so this isn't a solution. If we put 50 of the bags in the other 50 so there is exactly one in 50 of the bags, we will need to put one piece in each outer bag and 1 in the first inner, three in the second inner bag, five in the third inner bag and etc. to fill up all the bags with different amount of pieces. If we do that the 50 outer bags will have $2+4+6\ldots+98+100=$ $=2550$ pieces. Unfortunately we have only 2018 pieces so we should put some bags in other bags, that are in another bag.

problem 5 (solution)

If the two non-colored numbers are neighbors, and they are both the lowest (2;2), the numbers over them will be bigger and atleast one of them will be lower/equal to it's neighbor and will get un-colored so (2;2) isn't option.

If they are neighbors and they are (3;2), the "2" should be bigger than another neighbor or it will be colored. Since 2 is the lowest number that could be written (3;2) isn't an option.

If the two non-colored aren't neighbors, there will be more ~~non~~-colored, so this option doesn't work for us too.

Here I have an example where the (3;3) are the only uncolored so the smallest possible sum is 6 (3+3).

5	3	5	3	5	3	5	3	5	3
3	5	3	5	3	5	3	5	3	5
5	2	5	2	5	2	5	2	5	2
3	5	3	5	3	5	3	5	3	5
7	2	7	2	7	2	7	2	7	2
5	7	5	7	5	7	5	7	5	7
7	2	7	2	7	2	7	2	7	2
2	3	2	3	2	3	2	3	2	3
5	2	5	2	5	2	5	2	5	2
3	7	3	7	3	7	3	7	3	3

Answer - 6