Math Auction

1 Rules of the Math Auction

1. We divide into teams and work for a fixed amount of time to solve the problems below.
2. Each team is given $200 to start.
3. The best solution to a problem is worth $100.
4. The problems are put up for auction in the order given. The team with the highest bid is allowed to present its solution.
5. The problem is then put up for bid again (and again), but each time the solution must be better than the previous solution.
6. When no other team wants to buy the problem, the team with the best solution collects the value of the problem. Every team that bought the problem pays for its bid, even if it did not have the winning solution.

2 Problems

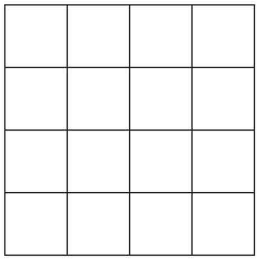
1. Using the digits $1, 2, 3, 4, 5, 6$ *in this order*, represent as many consecutive natural numbers as possible (starting from 1). You can use the arithmetic operations $+$, $-$, $\times$, $\div$, and parentheses. The same operation can be used several times. You are not required to use all four operations, but you must use all six numbers and they must appear in increasing order.

   Example:

   $2 = 1 + (2 \times 3) - 4 + 5 - 6$

   A team has a stronger solution for this problem if it is able to continue the list starting from where the previous team stopped.

2. Find as many different ways as possible to divide a 4×4 square into two equal parts of the same size and shape. You are allowed to cut along the grid lines only, not along the diagonals. The two parts are equal if, after the cut, you can place them on top of each other so that they match. It is fine to flip and rotate the shapes. You are not allowed to cut the square into more than two pieces.



   A team has a stronger solution for this problem if it is able to come up with a shape that has not been presented by previous teams.

3. Start with the number 123451234512345123451234512345 and cross out ten digits so that the remaining number is as large as possible.

   A team has a stronger solution for this problem if it is able to come up with a larger number.

This week's problems are from *Mathematical Circle Diaries, Year 1* by Anna Burago.