# 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 5 times the digit 2, represent as many consecutive 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.

   Examples:

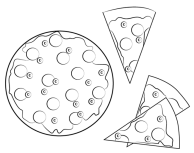
   $1 = (2 - 2/2) \times (2/2)$ $\qquad\qquad$ $2 = 22 - 22 + 2$

   *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. Cut a circle with seven straight lines so as to get as many triangular pieces as possible. "Triangles" with curved sides don't count, nor do cut triangles. (That is, do not count triangles made of smaller triangles or polygons.)

   *A team has a stronger solution for this problem if it is able to present a drawing that has more triangles.*

3. Cut 7 round pizzas into wedges in such a way as to be able to equally divide these pizzas between 8 people. Make as few cuts as possible. (A cut is a straight line that starts and ends at an outer edge of a pizza. Everybody should get the same share, and there should be no leftovers.Different people can get a different assortment of slices as long as they add up to equal shares.)

   *A team has a stronger solution for this problem if it is able to cut the pizzas using fewer cuts.*

4. Ali the Trader has a gold chain with 20 links. (The chain is not fastened into a loop. ) During one of his trips, he decides to take a break from work and stay at a local inn for 20 days. Since Ali has no money, the innkeeper asks him for one gold link per day as payment. The trader does not want to pay more that he owns, while the innkeeper wants to get his payment daily. However, the innkeeper is willing to trade the links to make even. For example, if Ali pays with the a single link on day one, he can give a chain with two links on day two and get the single link back. Therefore, the trader will have to cut his chain into pieces by cutting a few of its links. What is the minimum number of links Ali needs to cut?

   *A team has a stronger solution for this problem if it is able to present a solution with fewer open links.*

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