Problem 1

What is the sum of the integers from 1 to 47 (inclusive) which are not divisible by 6?

Problem 2

What is $2020! - 2019! \cdot 2019 - 2018! \cdot 2018 - \ldots - 2! \cdot 2$? Remember that $n! = 1 \cdot 2 \cdot \ldots \cdot n$.

Problem 3

An equilateral triangle with side length 40 is divided into small equilateral triangles with side length 1. The small triangles are coloured black and white, so that any two small triangles with a common side have different colours. There are more black triangles than white ones. How many of the small triangles are white?

Problem 4

A parallelogram has corners in the points $(2,0)$, $(0,4)$, $(5,79)$ and $(3,83)$. A line passing through the point $(2,34)$ divides the parallelogram in two pieces of equal area. What is the slope of this line?

Problem 5

Sigrid, Petra and Odd are playing a game. In each round they throw two dice, and each receives one or zero points depending on the result. Sigrid gets a point if the sum is even, Petra gets a point if the product is even, while Odd gets a point if at least one of the dice shows an odd number. After 300 throws Sigrid has 147 points, and Petra has 226. How many points does Odd have?

Problem 6

What is the sum of the lengths of the hypothenuses of all right triangles with integer sides having a side of length 12? Two triangles which are congruent or mirror images are to be counted only once in the sum.

Problem 7

How many integers between 10000 and 99999 contain 777 (with no digits in between) at least once when written as decimal numbers?

Problem 8

The function f satisfies $2f(x) - f(1-x) = x^2 + 5x - 1$ for all real numbers x. What is $f(20)$?

Problem 9

What is the largest number of odd numbers we can choose between 0 and 2020, so that none of the chosen numbers divides any of the others?

Problem 10

A right triangle ABC has $\angle A = 60^\circ$, $\angle B = 30^\circ$, and $|AC| = 11$. The foot of the perpendicular from C to the line AB is D. The midpoint of CD is M, and the midpoint of CB is N. The line AM intersects CB in X, and the line AN intersects CD in Y. Determine the value of $(|XB| + 2|YD|)^2$.