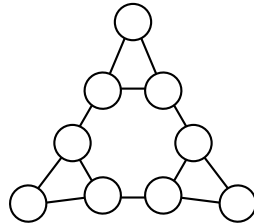# The Georg Mohr Contest 2020
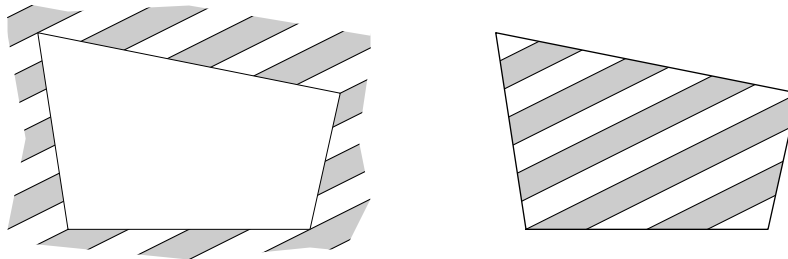## Second Round

Tuesday, January 7th, 2020 at 9–13

Aids permitted: only writing and drawing tools.
Remember that your arguments are important in the assessment
and that points may also be awarded to partial answers.

Problem 1. The figure shows 9 circles connected by 12 lines. Georg must colour each circle either red or blue. He gets one point for each line connecting circles with different colours.

How many points can he at most achieve?

Problem 2. A quadrilateral is cut from a piece of gift wrapping paper, which has equally wide white and gray stripes:

The grey stripes in the quadrilateral have a combined area of 10. Determine the area of the quadrilateral.

Problem 3. Which positive integers satisfy the following three conditions?

 a) The number consists of at least two digits.

 b) The last digit is not zero.

 c) Inserting a zero between the last two digits yields a number divisible by the original number.

Problem 4. Identical rectangular cardboard pieces are handed out to 30 students, one to each. Each student cuts (parallel to the edges) his or her piece into equally large squares. Two different students' squares do not necessarily have the same size. After all the cutting it turns out that the total number of squares is a prime.

Prove that the original cardboard pieces must have been quadratic.

Problem 5. Alma places spies on some of the squares on a 2020×2020 game board. Now Bertha secretly chooses a quadradic area consisting of 1020×1020 squares and tells Alma which spies are standing on a square in the secret quadradic area.

At least how many spies must Alma have placed in order for her to determine with certainty which area Bertha has chosen?