Kinawa – Chippewa Mathematical Circle
Problem Solving Session 2
Problems are from the book
"Invitation to Mathematics Festival"

Logic

Problem 1.

Find all solutions of the following cryptogram, where each distinct letter encodes a distinct digit.

I + HE + HE + HE + HE + HE + HE + HE + HE = US.

Problem 2.

The book *Magic for Dummies* contains the following passage:
"If you replace each of the distinct letters in GLOBALHELLFRY with distinct digits, and you get a prime number, then the world will have to suffer a terrible heat wave."
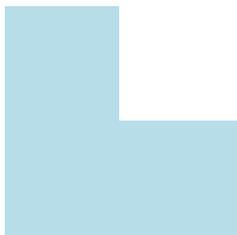
Is it possible to use this to actually create a heat wave?
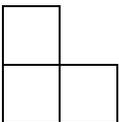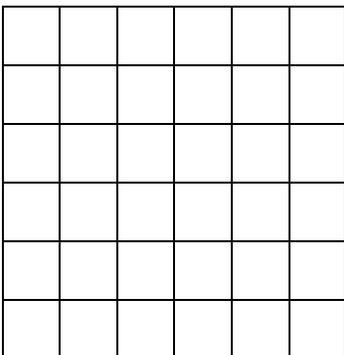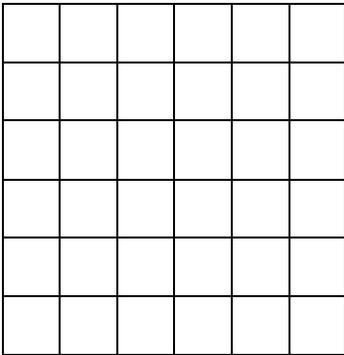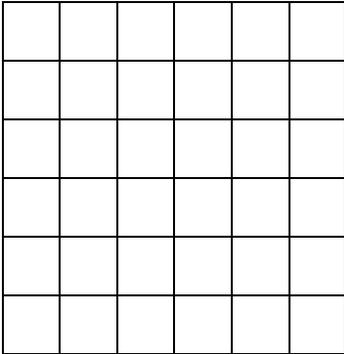
Problem 3.

In the numbers MIHAYLO and LOMONOSOV each letter corresponds to a digit (different digits correspond to different letters). It is known that the products of all digits in these numbers are equal. Is it possible that both numbers are odd?
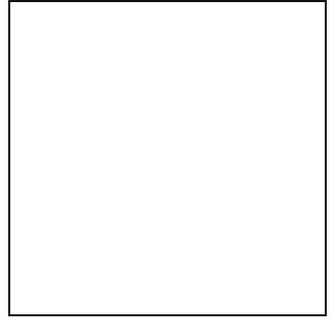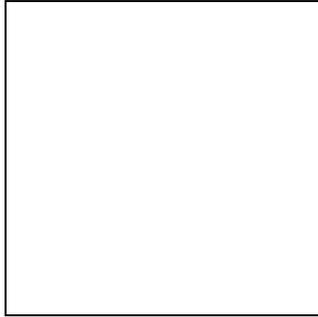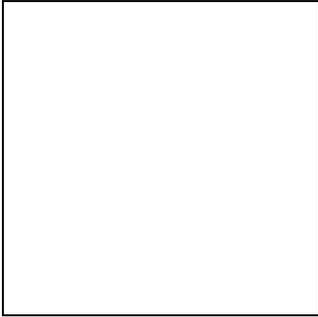
Geometry

Problem 4. Tile the following figure with 8 congruent pieces.

Problem 5. Partition a 6 x 6 chessboard with triominos so that no two adjacent triominos form a 2 x 3 rectangle.

Problem 6. Divide a square into squares of two different sizes so that the number of large and small squares is the same.

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Knights and liars live on an island, which is also visited by tourists. Knights always tell the truth, liars always lie and tourists can choose to tell the truth or to lie.

Question 1. A boy tells me he is a liar, is he an islander?

Question 2. Sam and Bob introduce themselves. Sam says: "at least one of us is a liar", can you figure out who is what?

Question 3. I asked a knight the same question twice and he gave me two different answers. How could this be?

Question 4. You meet Tom, George, and Betty and ask "How many knights are in the group?". Tom replies "none", George says "one". What is Betty?

Question 5. You meet three islanders, Sam, Bob, and Tom. You ask Sam, "Are you a knight or a liar?". Sam answers but you could not hear what he said. So you ask Bob, "what did Sam say?" and Bob replies: "He said he is a liar". Then Tom says: "Don't trust Bob". Who is what?