BARD

For each villager we keep track of which songs he or she knows. We will also need to know the number of songs sung by the Bard.

When the bard is present, the song counter is incremented by one and the arrays of all villagers present are updated accordingly. If the bard is not present, then all present villagers learn the union of the songs they know between them.

TETRIS

Imagine that a piece is at the bottom of an empty field. The piece can then be encoded as a sequence of numbers if we write down the lowest occupied row for each column the piece occupies.

For example, piece number 5 in its four rotations gives following four sequences:

{ 1, 1, 1 }, { 1, 2 }, { 2, 1, 2 } and { 2, 1 }.

We say that sequence A corresponds to sequence B if adding some constant to all elements of A gives sequence B.

For example, sequence { 2, 1, 2 } corresponds to { 5, 4, 5 }, but not to { 4, 5, 4 } or { 5, 4 }.

Observe that a piece can be inserted at a given position only if the sequence of heights at that position corresponds to the encoding of the piece. Therefore in order to obtain the solution we simply need to check all possible positions of all rotations for the given piece and field. Note that not all pieces have 4 possible rotations. Piece 2 is the same regardless of the rotation and pieces 1, 3 and 4 have only two possible rotations.

FIREFLY

If the firefly destroys a stalagmite (stalactite) of size X, then it will also destroy all stalagmites (stalactites) of size greater than or equal to X, so the relative ordering of stalagmites (stalactites) is irrelevant. We can therefore separately sort stalactites and stalagmites and use binary search to determine the number of obstacles destroyed on any given level. Iterating on all possible levels gives us the solution.

It is also possible to solve the problem faster, by preprocessing the number of stalagmites (stalactites) of size less than X, for each number X.

CIRCLE

The first step in solving this problem is to simulate the described transformation K times in order to obtain Stanko's final circle.

The reverse transformation is not unique, but there are at most two different circles that, when transformed, yield any given circle – if we fix B or W as one of the pebbles, the rest are determined uniquely.

Therefore there are at most 2^K different possible starting circles. Since K is small enough we can check all of these and remove any duplicates.