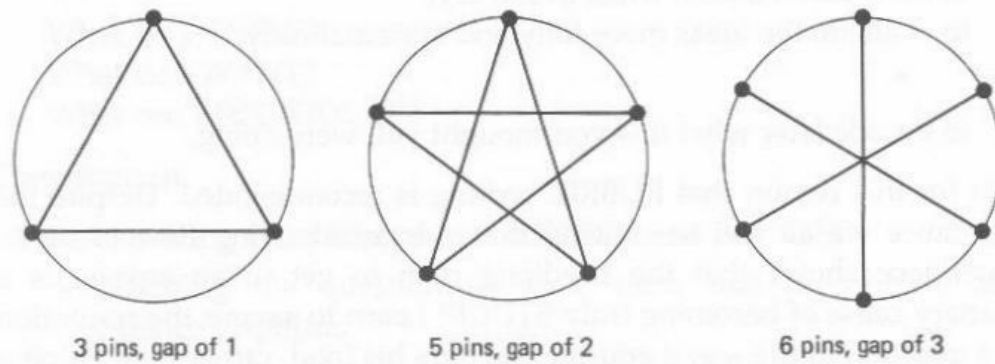


## Threads

A number of pins are placed around a circle. A thread is tied to one pin, and then looped tightly around a second pin. The thread is then looped tightly round a third pin so that the clockwise gap between the first and second pin is the same as the clockwise gap between the second and third pin as illustrated in the example.

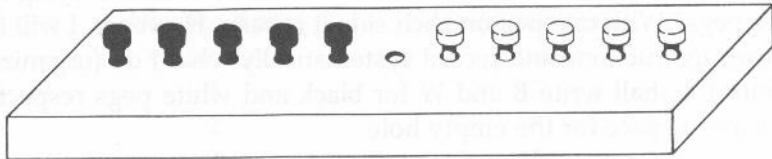


The process is continued, always preserving the same clockwise gap until the first pin is reached. If some pin has not yet been used, the process starts again.

Five pins with a gap of two use just one thread, while six pins with a gap of three uses three threads. How many pieces of thread will be needed in general?

## IQ TESTER

Ten pegs of two colors are laid out in a line of eleven holes as shown. I want to interchange the black and white pegs, but I am only allowed to move pegs into an adjacent empty hole or to jump over one peg into an empty hole. Can I make the interchange?



## Grid chase

This is a game for two players on a rectangular grid with a fixed number of rows and columns. Play begins in the bottom left hand square where the first player puts his mark. On his turn a player may put his mark into a square

directly above or directly to the right of or diagonally above and to the right of

the last mark made by his opponent. Play continues in this fashion, and the winner is the player who gets their mark in the upper right hand corner first. Find a way of winning which your great aunt Maud could understand and use.

## Entry

- o Specialize. Choose small grids and play the game.
- o You WANT to give instructions for
  - (i) whether you go first or second,
  - (ii) what move to make in response to any possible move by your opponent.

## Attack

- o Work backwards. Look at how you finish rather than how you start.
- o Where do you want your opponent to be? How can you force your opponent there?

## Extend

- o What if the rules are changed so that the player who plays in the upper right corner loses?
- o Would your method of play enable you to play on a huge rectangle without undue counting?
- o Three dimensions?

## Coins

Place two coins of the same size flat on a table and roll one around the edge of the other, as if they were gears. When the rolling coin has made one trip around the circumference of the fixed coin, how many times will it have revolved around its own center?