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Researching high school students' strategies for solving the Chinese rings puzzle

Abstract

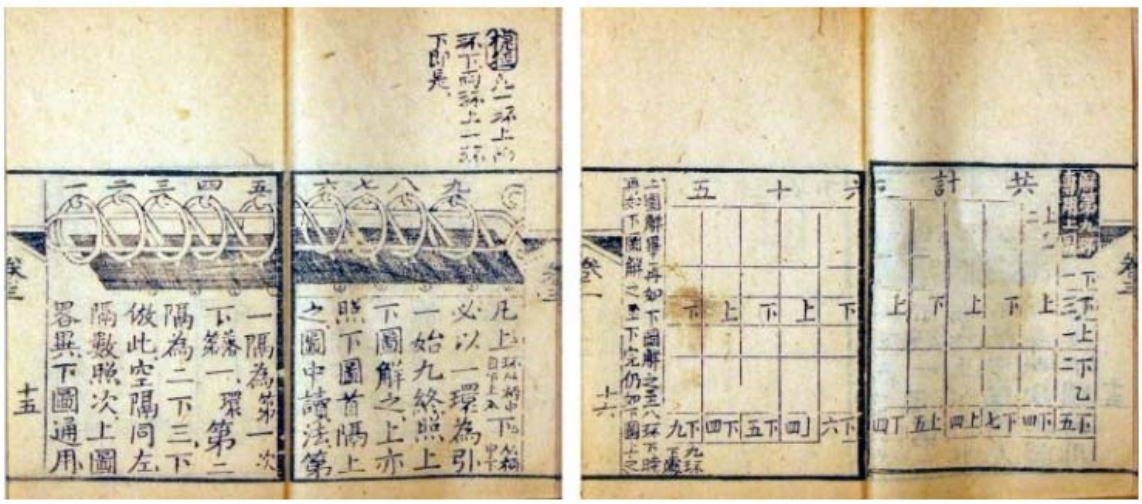
The Chinese nine linked rings puzzle (Chinese rings puzzle) is one of the oldest known mechanical puzzles. It consists of a long loop with a handle on one end that is interlocked with nine rings. It is thought to have been invented originally in China. The origins are obscure. Stewart Culin records a story that the Chinese rings puzzle was invented by the famous Chinese hero Mung Ming (A.D. 181 - 234) in the book "Games of the Orient". The purpose of our study is to investigate high school students' strategies for solving the Chinese rings puzzle. We will design a lesson plan to evaluate students' strategies and mathematical narratives. Students need to disentangle the long loop from all nine rings, and the solution takes 341 moves, so lots of patience is required.

The study will be organized in spring 2018. For a ring to be removed it needs to meet certain requirements, which involve constantly taking the rings off and on. We expect students can find the procedure goes through when one of the steps of the procedure involves invoking the procedure itself using recursion and derive the minimum number of moves to solve an *n*-ringed puzzle. The minimum number of moves to solve an *n*-ringed puzzle is

$$\frac{2^{(2+n)}-3-(-1)^n}{6}.$$

Puzzle solving as a way to treat mathematical theories will be discussed and the limitation of puzzle solving approach raised by the issue of mathematical culture will be made explicit.

Keywords: Chinese nine linked rings puzzle, High school students, Recursion.



Nine linked rings solution in Bits of Wisdom by Zhu Xiang Zhuren, ca. 1821

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