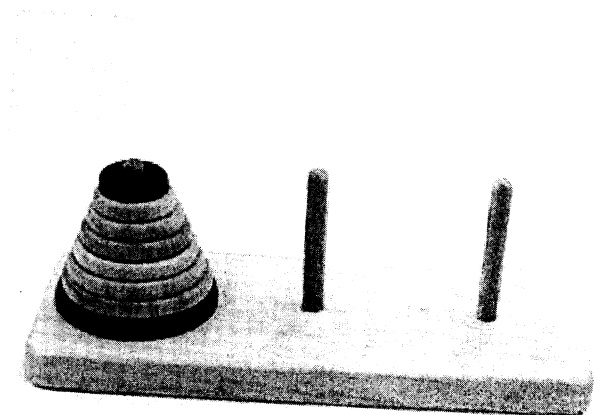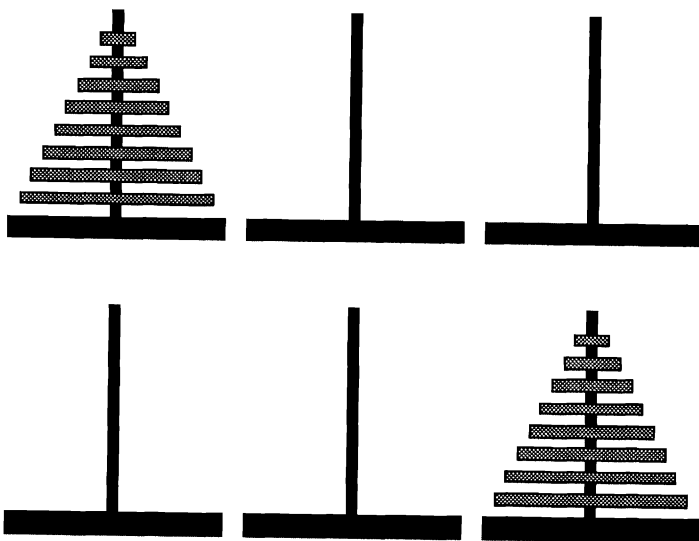# Tower of Hanoi

Most of the following paragraphs were copied from wikipedia [1]. Pictures were borrowed from [2] and [3].

The Tower of Hanoi or Towers of Hanoi is a mathematical game or puzzle. It consists of three pegs, and a number of disks of different sizes which can slide onto any peg. The puzzle starts with the disks neatly stacked in order of size on one peg, smallest at the top, thus making a conical shape.

The objective of the game is to move the entire stack to another peg, obeying the following rules:

- Only one disk may be moved at a time.

- Each move consists of taking the upper disk from one of the pegs and sliding it onto another peg, on top of the other disks that may already be present on that peg.

- No disk may be placed on top of a smaller disk.

The puzzle was invented by the French mathematician Édouard Lucas in 1883. There is a legend about an Indian temple which contains a large room with three time-worn posts in it surrounded by 64 golden disks. The priests of Brahma, acting out the command of an ancient prophecy, have been moving these disks, in accordance with the rules of the puzzle. According to the legend, when the last move of the puzzle is completed, the world will end. The puzzle is therefore also known as the Tower of Brahma puzzle. It is not clear whether Lucas invented this legend or was inspired by it.

Problem: *Assume that the priests are able to move the disks at a rate of 1 per second, using the smallest number of moves. How long will they take them to move all the disks? The universe is now about 13.7 billion years old. How long until it ends?*

There are many variations on this legend. For instance, in some tellings, the temple is a monastery and the priests are monks. The temple or monastery may be said to be in different parts of the world - including Hanoi, Vietnam, and may be associated with any religion. In some versions, other elements are introduced, such as the fact that the tower was created at the beginning of the world, or that the priests or monks may make only one move per day.

References

[1] *Towers of hanoi* Wikipedia article `http://en.wikipedia.org/wiki/Tower_of_Hanoi`

[2] `http://torito.jp/shopping/item_img/tower-of-hanoi_01.jpg`

[3] `http://www.mactech.com/articles/mactech/Vol.02/02.01/Towers/img002.gif`
For applets to play see

[4] `http://www.mazeworks.com/hanoi/index.htm`

[5] `http://www.cut-the-knot.org/recurrence/hanoi.shtml`

[6] `http://chemeng.p.lodz.pl/zylla/games/hanoi5e.html`