

# Constructing a Square the Ancient Indian Way Activity

## Overview

In this activity, the students will model constructing a square with a method similar to one the ancient Indians used in building a fire altar. The activity works best with the students working in pairs.

## Materials for each pair of students

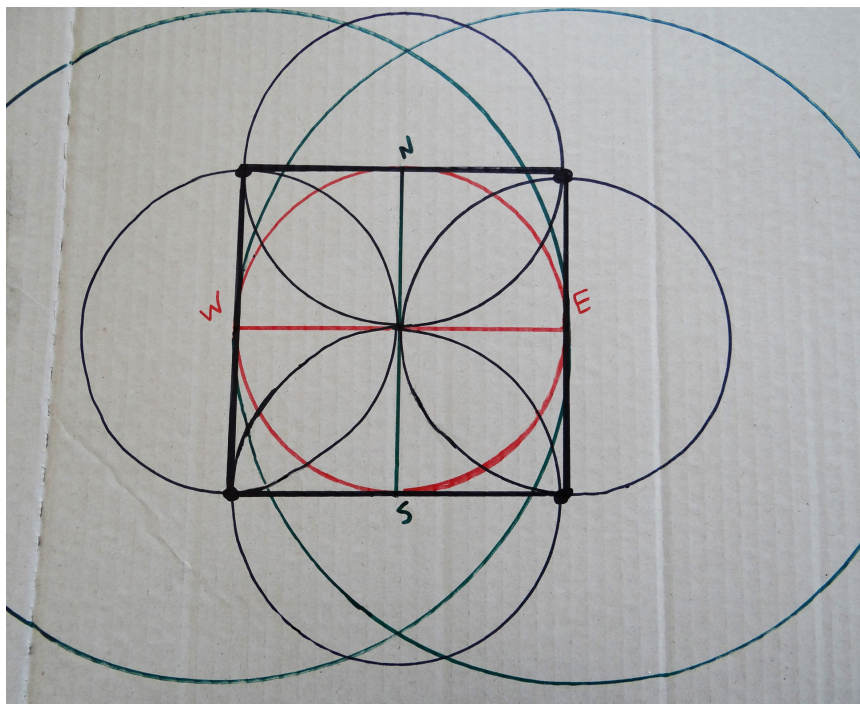
- 4 thumbtacks or push pins
- Square or rectangular piece of corrugated cardboard, e.g. the top of a pizza box
- Piece of string, length should be about half the length of the shortest side of the piece of cardboard, e.g. 7 inches for a 14 inch pizza box
- Straightedge
- Marker or pen

## Instructions

1. Tie a loop at each end of the string. (Instructions for tying a perfection loop knot can be found at [http://www.netknots.com/fishing\\_knots/perfection-loop/](http://www.netknots.com/fishing_knots/perfection-loop/).)
2. Fold the string in half, and using the marker, mark the midpoint of the string.
3. Lay the string horizontally across the middle of the cardboard and trace a line segment with length the same as the string. This will be the East-West line. Then place a pushpin at the midpoint of the string, but not going through the string.
4. Remove the pushpin, place both loops on the shank of the pin, and replace the pin in the hole in the cardboard. Using the string like a compass, draw a circle in the cardboard.
5. Place pushpins at the East and West poles, the ends of the drawn diameter of the circle.
6. Put one loop of the string on the shank of the East pin and use the string to draw a circle with center at the East pin.
7. Repeat Step 6 at the West pin.
8. Draw the diameter of the first circle (from Step 4) which lies on the line connecting the points of intersection of the circles drawn in Steps 6 and 7. Place pushpins at the ends of this diameter (North and South poles).
9. At each of the 4 poles (East, South, West, and North), place both loops of the string on the shank of the pin and draw a circle.
10. The 4 (non-tangent) intersection points of the circles drawn in Step 9 are the four corners of the desired square.

Picture of a

Completed Activity



### Follow-up Activity

Have the students prove that the result is actually a square, by

- first proving it is a rhombus (*hint*: each side is the diameter of a congruent circle), and
- then proving that each interior angle is a right angle (*hint*: steps 6 – 8 construct a perpendicular bisector of the East-West line and each side of the “desired square” is tangent to the first circle from Step 4).

### Notes

- The string should not be stretchy.
- Loops on the ends of the string should be fixed so they won't slide.
- When making circles, the pin should be held steady but not flush against the cardboard so that the loops can move freely about the shank of the pin.
- Watch out for the sharp ends of the pins poking through the cardboard.
- It is okay if the two larger circles from Steps 6 and 7 don't fit entirely on the cardboard, just as long as their two points of intersection are on the cardboard.
- [Common Core Standard G.CO.12](#) recommends making formal geometric constructions with a variety of tools and methods.
- This activity is included in the article, “[Ancient Indian Rope Geometry in the Classroom](#),” by Dr. Cynthia Huffman and Dr. Scott Thuong, in [MAA Convergence](#) (October 2015). The activity follows closely pp. 388-389 of Chapter 4, “Mathematics in India,” by Kim Plofker, of *The Mathematics of Egypt, Mesopotamia, China, India, and Islam: A Sourcebook*, edited by Victor J. Katz and published by Princeton University Press in 2007.