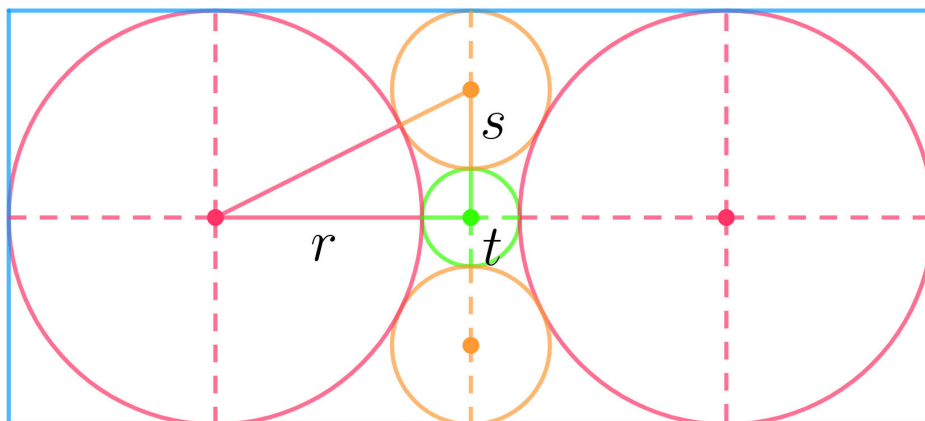# Sākuru: Solution

The rectangle's length is $4r + 2t$ and its height is $2r$ or also $4s + 2t$. Then the ratio of length to height is $(4r + 2t)/(2r) = 2 + (t/r)$. We can rescale all lengths without changing proportions, so without loss of generality $r = 1$.

Equating the two expressions for height and halving, we can say $1 = 2s + t$.

The right triangle has base $1 + t$, altitude $s + t$ and hypotenuse $1 + s$. Then the Pythagorean theorem says $(1 + t)^2 + (s + t)^2 = (1 + s)^2$. Expanding the squares and cancelling $1 + s^2$ from both sides yields $2t + 2t^2 + 2st = 2s$. We can replace $2s$ with $1 - t$ and this becomes $2t + 2t^2 + (1 - t)t = 1 - t$, or

$$t^2 + 4t - 1 = 0.$$

The quadratic formula tells us the positive root of this is

$$t = \frac{-4 + \sqrt{16 + 4}}{2} = -2 + \sqrt{5}.$$

Therefore, the ratio is $2 + t = 2 + (-2 + \sqrt{5}) = \boldsymbol{\sqrt{5}}$.

This is a **Sangaku**: "Japanese geometrical problems or theorems on wooden tablets which were placed as offerings at Shinto shrines or Buddhist temples during the Edo period by members of all social classes." (Wikipedia)