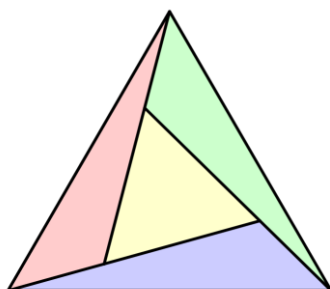# A tetrad made of 4 triangles with equal areas

Properties

The side length of the inner triangle is half of the side length of the tetrad.
(Its area is a quarter of the tetrad area.)

The height of each outside triangle is a quarter of the height of the tetrad.
(Triangle and tetrad have common sides, hence the ratio of the heights is equal to the ratio of the areas.)
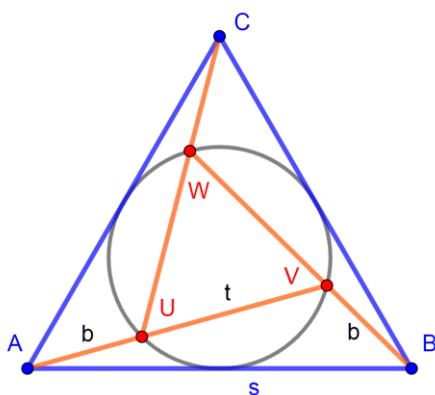
The incircle of the tetrad is the excircle of the inner triangle.
(For each equilateral triangle the inradius is half of the exradius.)

Construction of an inner vertex V
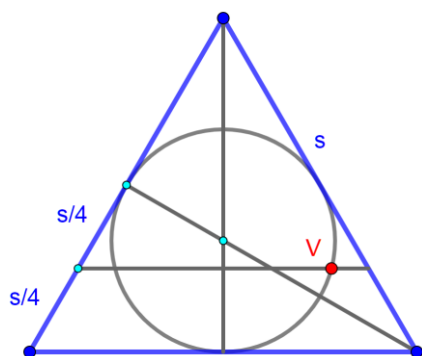
Draw the incircle of the tetrad and a line parallel to the bottom side of the tetrad.

The golden ratio

$s = 2t$, angle AVB = 120°

Law of cosines:

$s^2 = (t + b)^2 + b^2 - 2b(t + b) \cos 120°$

$4t^2 = (t + b)^2 + b^2 + b(t + b)$

$3t^2 = 3tb + 3b^2$

$$\frac{t}{b} = \frac{t+b}{t} = \text{golden ratio}$$