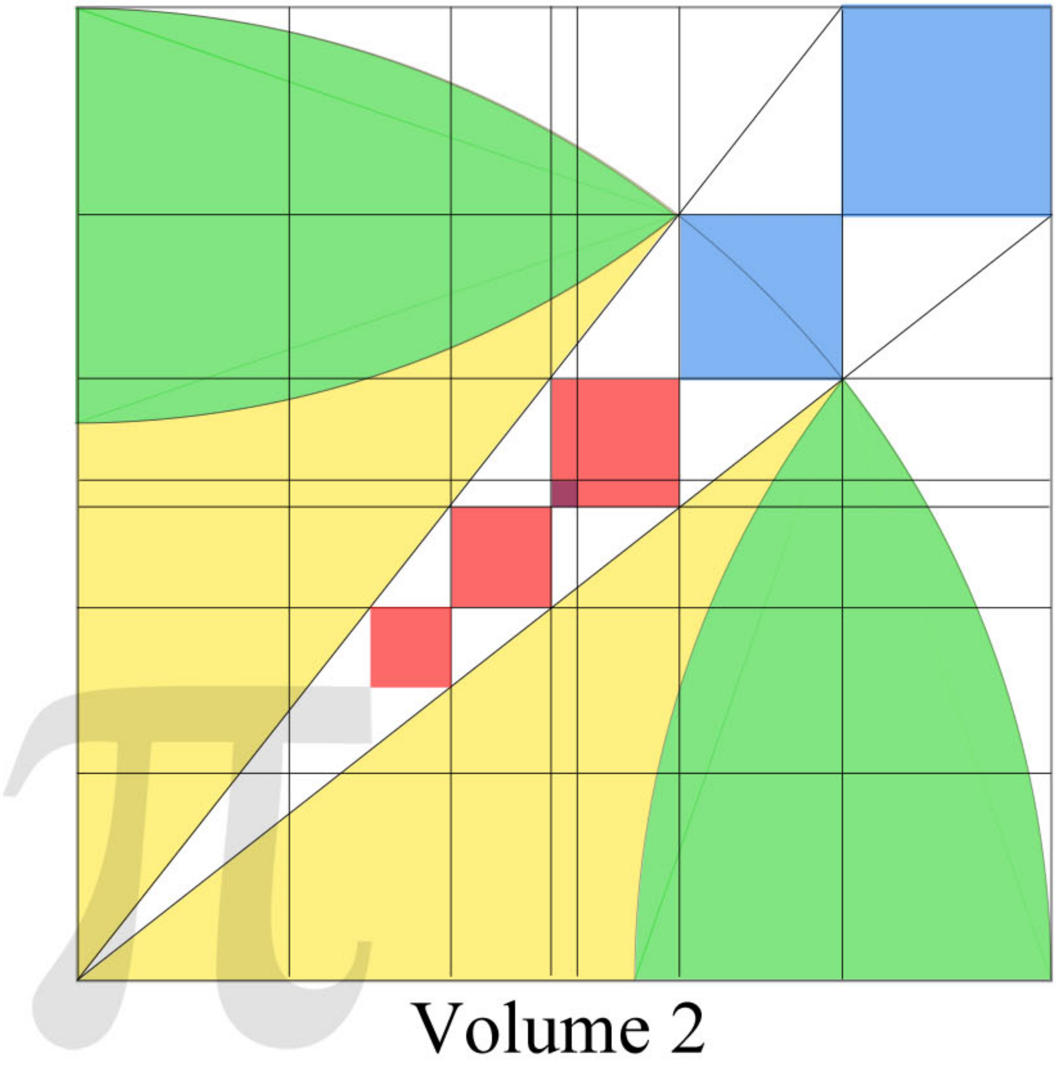
Proof of Pi

(the search for)



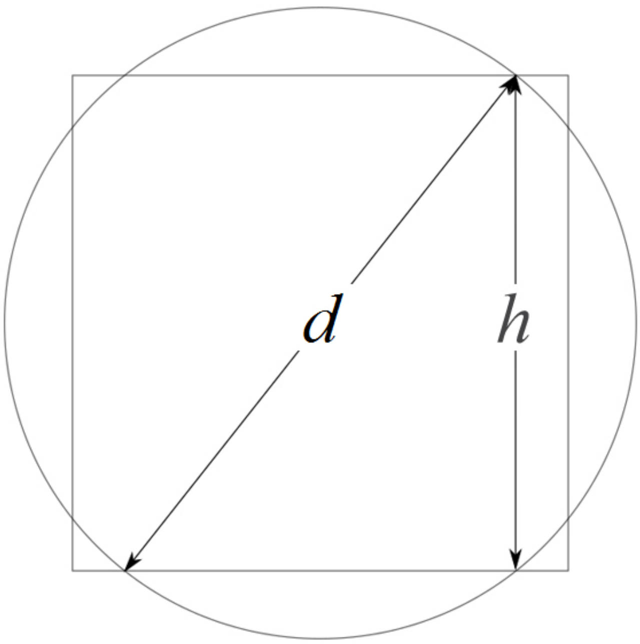
Volume 2

Carl Thompson

The search for a proof for π using the method of 'squaring the circle'.

When the circumference (c) of a circle with diameter (d), and the perimeter (4h) of a square are equal, we will call it a squared circle.

$$c = \pi d$$
$$h = c/4 = \pi d/4$$



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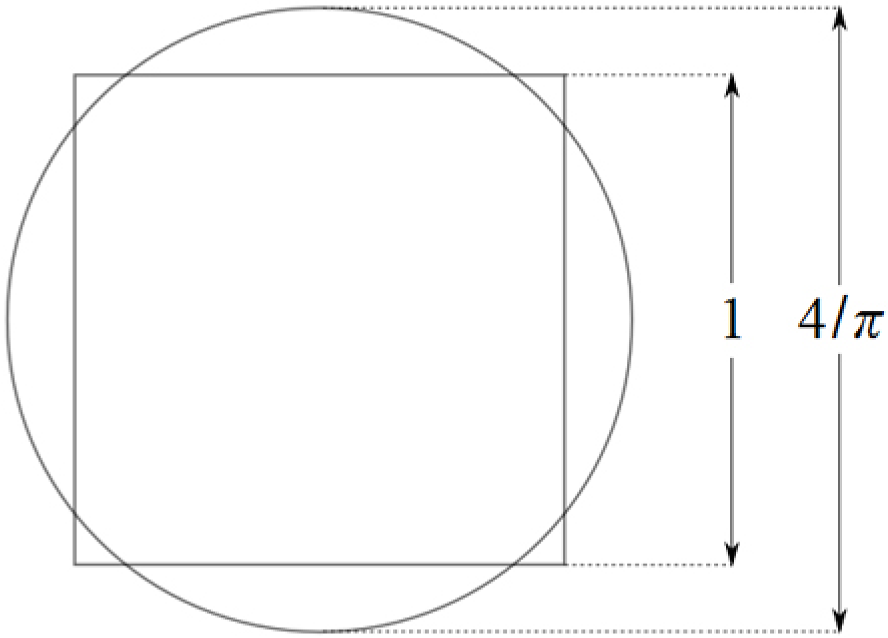
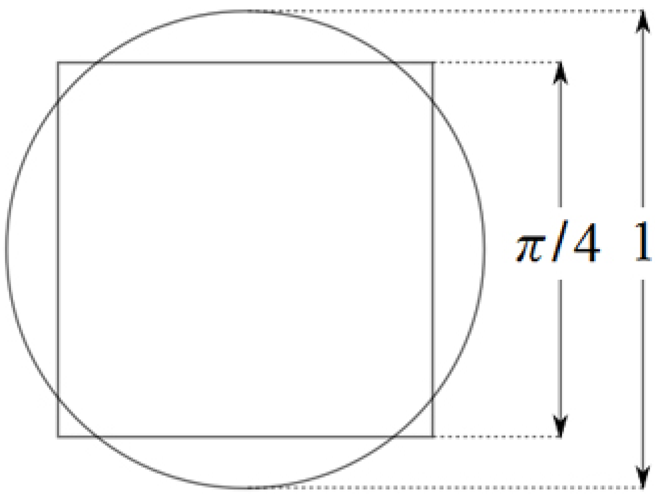
Our first squared circle. (Fig. 1)



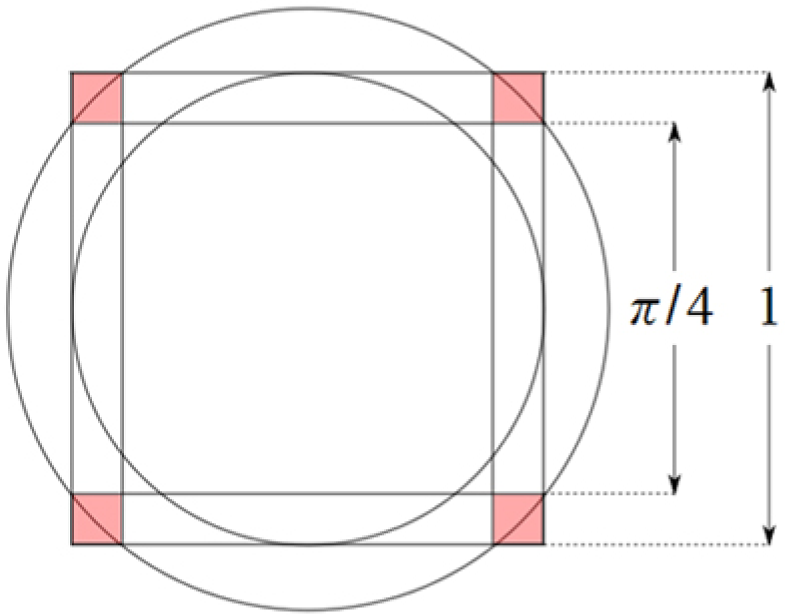
(Figure 1)

Our second squared circle, which is π/4 times smaller. (Fig. 2)



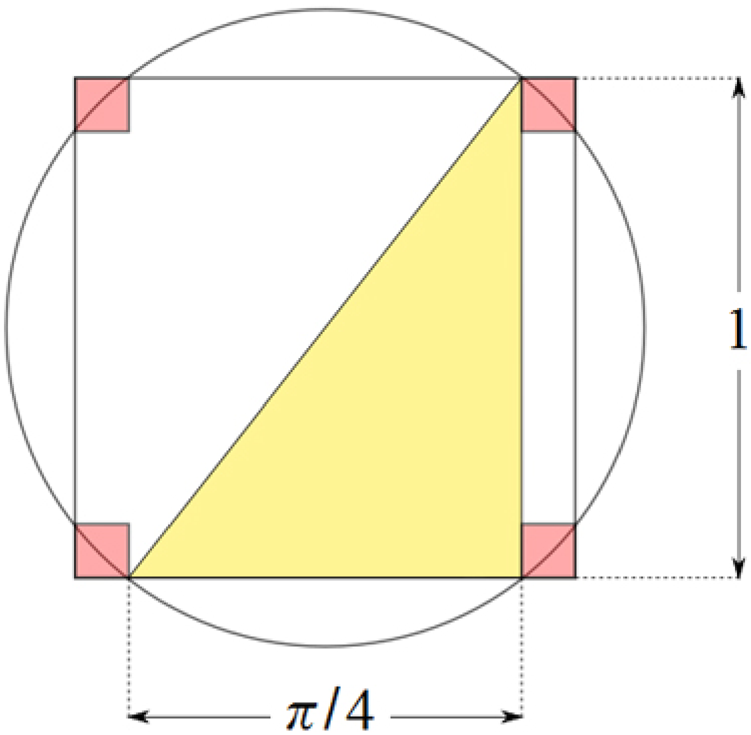
(Figure 2)

Next we stack our two squared circles. (Fig. 3)



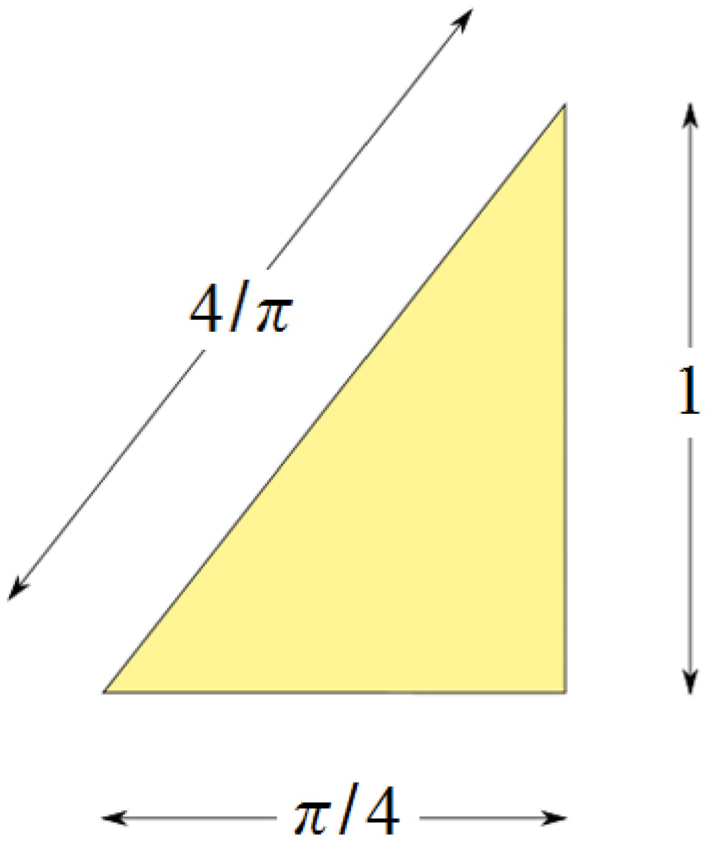
(Figure 3)

Then we can add in our triangle. (Fig. 4)



(Figure 4)

Our full triangle where the hypotenuse equals the diameter (d) of the previous circle. (Fig. 5)



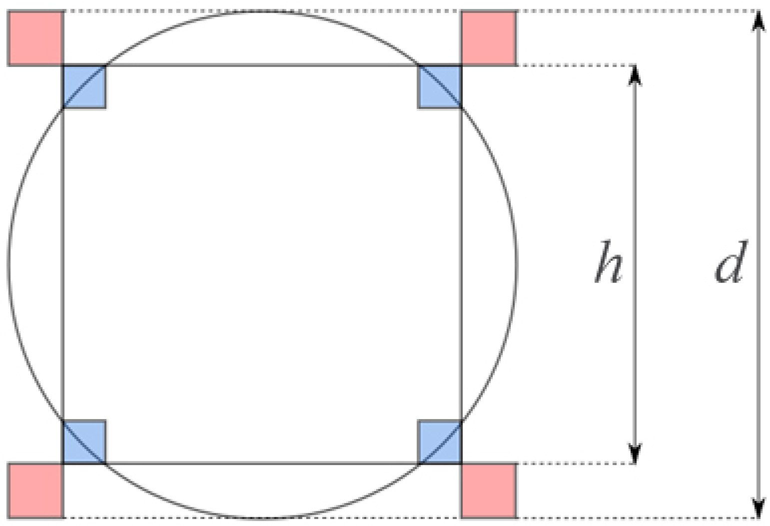
(Figure 5)

Then we could use Pythagoras to calculate π.

$$(4/\pi)^2 = 1 + (\pi/4)^2$$

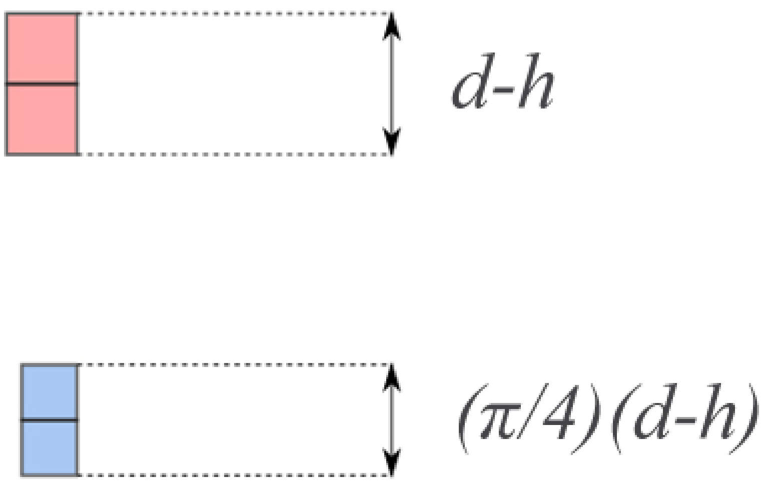
But first, lets dig a little deeper.

Any generic squared circle. (Fig. 6)



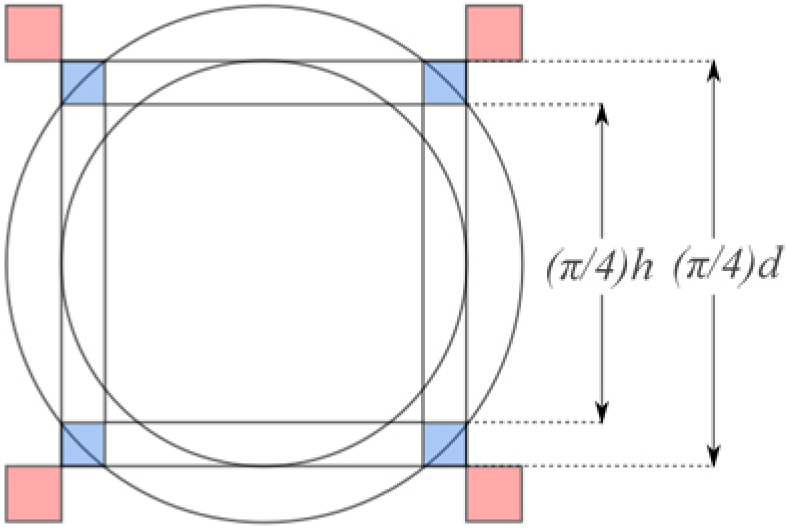
(Figure 6)

From this we get our red and blue squares. (Fig. 7)



(Figure 7)

The blue squares link the previous squared circle with the next consecutive squared circle, which is always π/4 times smaller. (Fig. 8)

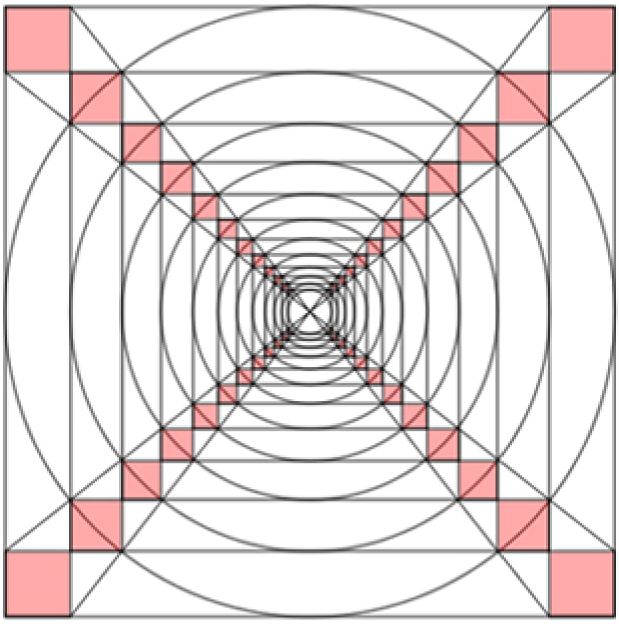


(Figure 8)

This can be seen more clearly in the table below, the arrows show this relationship between any two consecutive squared circles.

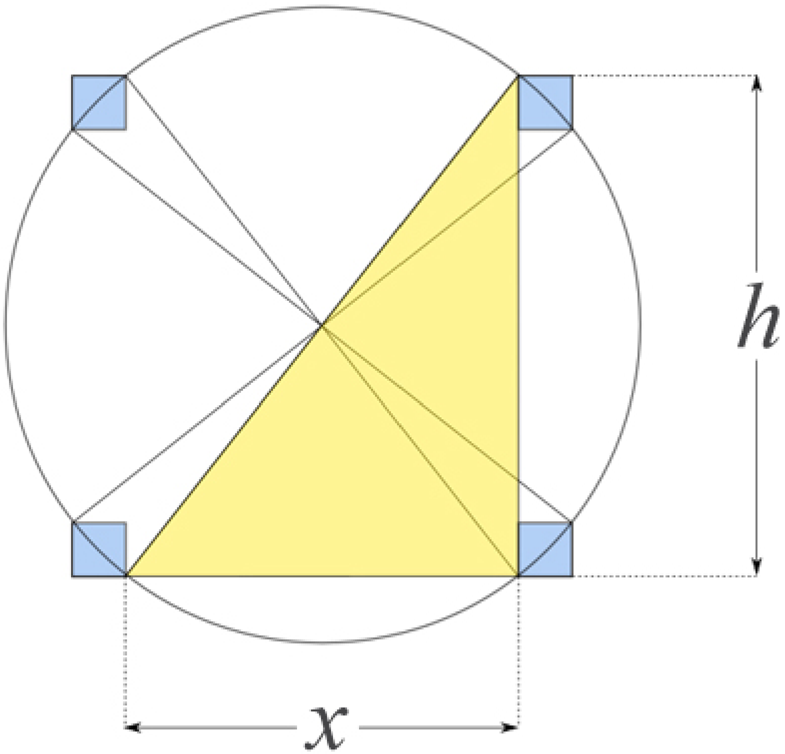
d	h	d-h	$(\pi/4)(d$-$h)$
$(4/\pi)^2$	$4/\pi$	$(4/\pi)^2-4/\pi$	$4/\pi-1$
$4/\pi$	1	$4/\pi-1$	$1-\pi/4$
1	$\pi/4$	$1-\pi/4$	$\pi/4-(\pi/4)^2$
$\pi/4$	$(\pi/4)^2$	$\pi/4-(\pi/4)^2$	$(\pi/4)^2-(\pi/4)^3$
$(\pi/4)^2$	$(\pi/4)^3$	$(\pi/4)^2-(\pi/4)^3$	$(\pi/4)^3-(\pi/4)^4$

This repeating pattern goes on ad infinitum, where each consecutive squared circle is always π/4 times smaller. (Fig. 9)



(Figure 9)

This gives us our angles and our generic triangle. The base (x) of the triangle is equal to the height (h) of the triangle minus the side-lengths of the two blue squares. (Fig. 10)



(Figure 10)

$$x = h - (\pi/4)(d - h)$$

The side-length (h) divided by the diameter (d) is always π/4.

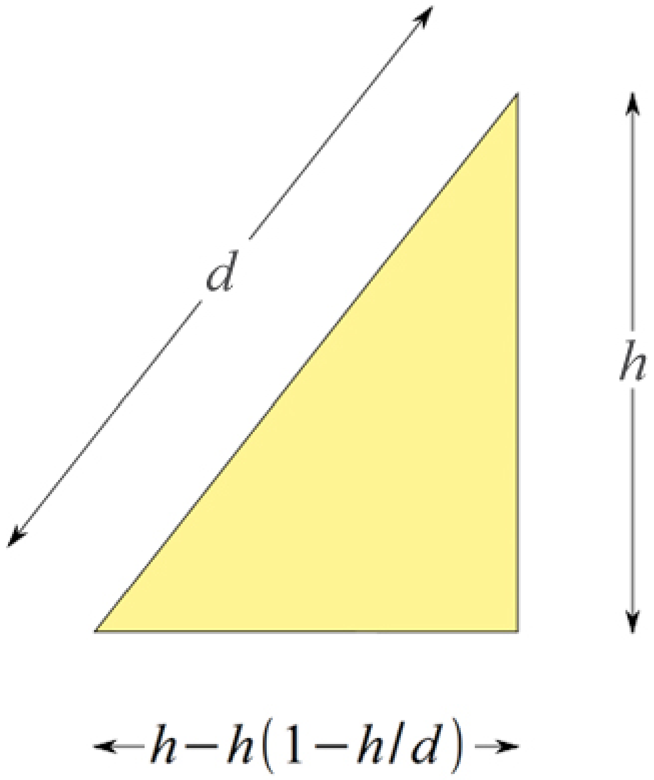
$$h/d = \pi/4$$

Then we can replace π/4 in our equation.

$$x = h - (h/d)(d - h)$$
$$x = h - (h - h^2/d)$$
$$x = h - h(1 - h/d)$$

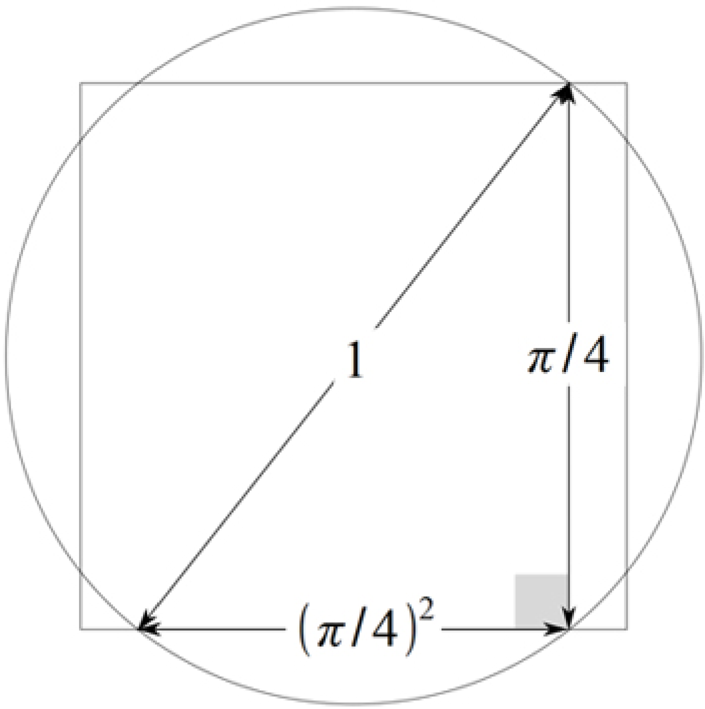
And then we use this value in the following triangle.

This gives us the generic triangle. (Fig. 11)



(Figure 11)

A circle with diameter (d) equal to 1. (Fig. 12)



(Figure 12)

Using Pythagoras we get the following equation.

$$1=(\pi/4)^2+(\pi/4)^4$$

From this equation we can calculate π.

$$\pi=4\sqrt{\sqrt{5/4}-\sqrt{1/4}}$$

3.1446055110296931442782343433718357180924882313508929506596078804047281904892436548476515566340325422595160489765784452235018414818847721014580011..[2]

References:

[1] Carl Thompson. 'Proof of Pi (The search for proof)' 2017.

[2] Decimal value of Pi from www.proofpi.com.