Solution

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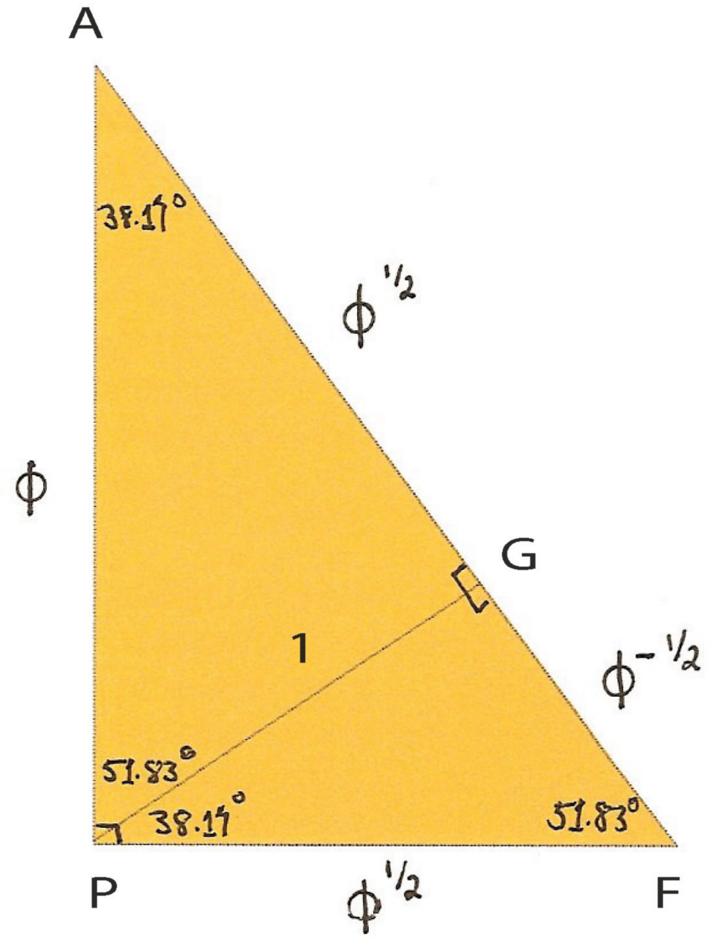

1. From triangle AGP, cos $\alpha = 1/\Phi$, thus, $\alpha = \cos^{-1} 0.6180 = 51.83°$. $\beta = 90 - \alpha = 38.17°$

2. α is the Great Pyramid Golden Angle, and β is its golden angle complement.

3. Applying the Pythagorean Theorem, $a^2 + b^2 = c^2$ to right triangle AGP, where a = 1, and c = Φ, becomes $1 + (AG)^2 = \Phi^2$ and since the golden proportion is $1 + \Phi = \Phi^2$ we see that $(AG)^2 = \Phi$, and finally that $AG = \Phi^{1/2}$.

4. $1/PF = \cos\beta = AG/AP = \Phi^{1/2}/\Phi = 1/\Phi^{1/2}$; thus, $PF = \Phi^{1/2}$ which also equals AG.

5. Applying the Pythagorean Theorem to triangle PGF, we see that $1 + (GF)^2 = \Phi$, and from $1 + \Phi = \Phi^2$ when both sides are divided by Φ, becomes $1/\Phi + 1 = \Phi$, and comparing with $1 + (GF)^2 = \Phi$, we see that $(GF)^2 = 1/\Phi$, so the we get the desired result $GF = \Phi^{-1/2}$.

6. $AG/GF = \Phi$ the Golden Proportion.

[It is left for the interested readership to confirm that these values are satisfied for triangle APF. Also compare the relationship of this triangle to the actual Great Pyramid cross section showing the chambers and the air shafts.]