Tertiary Tree of Primitive Pythagorean Triples

Trunk								A ÷ 7	1st Tertiary Branch								A ÷ 7	2nd Tertiary Branches								A ÷ 7	3rd Tertiary Branches							
PPT	*r*	*s*	*t*	A	4A	8A	*f*		PPT	*r*	*s*	*t*	A	4A	8A	*f*		PPT	*r*	*s*	*t*	A	4A	8A	*f*		PPT	*r*	*s*	*t*	A	4A	8A	*f*	
																		7-24-25	6	1	18	84	336	672	17	✓									
									5-12-13	4	1	8	30	120	240	7		48-55-73	30	18	25	1320	5280	10560	7										
																		28-45-53	20	8	25	630	2520	5040	17	✓									
																		39-80-89	30	9	50	1560	6240	12480	41										
3-4-5	2	1	2	6	24	48	1		20-21-29	12	8	9	210	840	1680	1	✓	119-120-169	70	49	50	7140	28560	57120	1	✓	696-697-985	408	288	289	242556	970224	1940448	1	
																		36-77-85	28	8	49	1386	5544	11088	41	✓									
																		33-56-65	24	9	32	924	3696	7392	23	✓									
									8-15-17	6	2	9	60	240	480	7		65-72-97	40	25	32	2340	9360	18720	7										
																		12-35-37	10	2	25	210	840	1680	23	✓									

Following *f*:

The *f*-value as $f = b - a$, remains constant within a given color, e.i. RED=1, BLUE=7, PURPLE=17, GREEN=23, YELLOW=41,…

As, $b = r + t$ & $a = r + s$,

f* = *b* - *a* = *t* - *s

For a given (**MIDDLE**) color, $f = t - s$ and the next **MIDDLE** color has same *f*.

For the **UPPER** & **LOWER Branch** of a given color, one takes the square root of the sum, ∑, of $8A + f^2$, for example:

$(48 + 1^2)^{1/2} = 7$
$(1680 + 1^2)^{1/2} = 41$
$(240 + 7^2)^{1/2} = 17$
$(480 + 7^2)^{1/2} = 23$
$(676 + 17^2)^{1/2} = 31$
$(10560 + 7^2)^{1/2} = 103$
$(5040 + 17^2)^{1/2} = 73$
$(12480 + 41^2)^{1/2} = 119$
$(57120 + 1^2)^{1/2} = 239$

Table 2e

Key: PPT=Primitive Pythagorean Triple; *r*=even # such that $r^2/2 = st$ where *s,t* are Factor Pairs; A=Area; 4A=4Area; 8A=8Area; $f = b-a$ & $f^2 = (b-a)^2$, as $a^2 + b^2 = c^2 = 4A + f^2 = (8A + f^2) - 4A$

The Tree of Pythagorean Triples branches from the **3-4-5 PPT** trunk first into a 3-part main branch, each of which further branches into 2nd, 3rd, 4th, …, tertiary branches. Each tertiary follows the lead *f*-value of its predecessor, but is actually formed as an intermediary to the upper and lower branches of which it is a part. All **PPT**s — with no repeats — are to be found. ***Pythagoras*** first discovered the UPPER branch sequence, ***Plato*** (a century later) discovered the LOWER branch sequence. The MIDDLE branch sequence follows as an intermediary, hybrid sequence of the UPPER and LOWER.

Using the *Expanded Dickson Method* on the **BBS-ISL Matrix**, every **PPT** branch is accounted for by the previous branch. This is done by enlisting the *r,s,t*,A,4A,8A,*f* associated values. All these values are derived directly from the respective **PTT** by both algebra and geometry. In **Table 2a** we looked at the overall. In **Table 2b**, we examine how the UPPER and LOWER branches (blue) are made from the trunk (red). In **Table 2c**, we see how the MIDDLE branch (red) is formed from the UPPER and LOWER (blue) branches and the trunk (red). As a fractal, this ***Number Pattern Sequence*** that defines the first branchings, continues through the entire tree. **Table 2d** shows BLUE branching to **2nd Tertiary Branches**. **Table 2e** reveals the power of *f*. **Table 2f** tells all.