

Patterns in Pythagorean Triples

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Abstract

The Pythagoras theorem is very famous in the literature of mathematics. It lead us to many Pythagorean triples. Some of these triples allows us to write as pattern. The aim of this work is to write patterns in Pythagorean triples in a sequential way, i.e., starting from 3 to 1000. Patterns in Pythagorean triples are also studied by author in previous works, but in different ways. For details refer to [5, 6, 7, 8, 9, 10]. The work is from 3 to 1000 with lot of gaps, i.e., still we don't have patterns for them. This will be completed in near future. Also some patterns are not so good to check their further values. These shall be removed in future study.

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1 Introduction

By Pythagoras theorem it is understood that

$$a^2 + b^2 = c^2, \forall a, b, c \in N_+$$

For simplicity, let's write it as (a, b, c) . Let's consider the initial Pythagorean triple $(3, 4, 5)$. This means that $3^2 + 4^2 = 5^2$.

The symmetric extension of above triple we call as **pattern in Pythagorean triple**. There two obvious ways of getting **pattern in Pythagorean triple**.

1.1 Simple Patterns

- **Multiplication by 10, 100, 1000, ... :**

See two examples

$$\begin{aligned} 3^2 + 4^2 &= 5^2 := 25 \\ 30^2 + 40^2 &= 50^2 := 2500 \\ 300^2 + 400^2 &= 500^2 := 250000 \\ \dots &\quad \dots \quad \dots \quad \dots \end{aligned} \tag{1}$$

$$\begin{aligned} 9^2 + 40^2 &= 41^2 := 1681 \\ 90^2 + 400^2 &= 410^2 := 168100 \\ 900^2 + 4000^2 &= 4100^2 := 16810000 \\ \dots &\quad \dots \quad \dots \quad \dots \end{aligned} \tag{2}$$

The difference in above two examples is that the first one is with single digit in each case, i.e., 3, 4 and 5, and in second example (2) not all the same digits are with same length, i.e., the first one is of length 1 and other two are with length 2. This process is generally true for all types of **Pythagorean triples**.

- **Repetition of Digits:**

$$\begin{aligned}
 3^2 + 4^2 &= 5^2 & := & 25 \\
 33^2 + 44^2 &= 55^2 & := & 3025 \\
 333^2 + 444^2 &= 555^2 & := & 308035 \\
 \dots & \dots & \dots & \dots
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 12^2 + 35^2 &= 37^2 & := & 1369 \\
 1212^2 + 3535^2 &= 3737^2 & := & 13965169 \\
 121212^2 + 353535^2 &= 373737^2 & := & 139679345169 \\
 \dots & \dots & \dots & \dots
 \end{aligned} \tag{4}$$

$$\begin{aligned}
 119^2 + 120^2 &= 169^2 & := & 28561 \\
 119119^2 + 120120^2 &= 169169^2 & := & 28618150561 \\
 119119119^2 + 120120120^2 &= 169169169^2 & := & 28618207740150561 \\
 \dots & \dots & \dots & \dots
 \end{aligned} \tag{5}$$

In the examples (3), (4) and (5), we observe that the repetition of digits give us patterned results when we work with same length triples. Here we have (3,4,5), (12, 35, 27) and (119, 120, 169). In the example (3, 4, 5) each digit is of length 1. In the example (12, 35, 27) each digit is of length 2, and the triple (119, 120, 169) each digit is of length 3. This theory doesn't work when the triples are with different lengths, for example, (5, 12, 13). This gives

$$\begin{aligned}
 5^2 + 12^2 &= 13^2 & \Rightarrow & 169 = 169 \\
 55^2 + 1212^2 &\neq 1313^2 & \Rightarrow & 1471969 \neq 1723969
 \end{aligned} \tag{6}$$

In this case the pattern is not extended obviously as in case examples (3), (4) and (5). The examples (3), (4) and (5) are based on multiplications by 11, 111, 1111, ..., while examples (1) and (2) are based on multiplications by 10, 100, 1000,

Remark 1. *Analysing the final sums, we observe that the examples (1) and (2) are with good patterns with final sums. The example (3) is not so good but acceptable. In case of examples (4) and (5), the patterns with final sums are not good.*

More work in this direction can be seen in [1, 5, 6, 7, 8, 9, 10]. This work brings in a sequential way the **Pythagorean triples patterns** from 3 to 1000. There are many case, still, we don't have patterns. This will be completed in near future. Also some patterns are not so good to check their further values. These shall also be changed in future with better results. As soon as we complete the rest, the work shall be revised.

2 Pattern in Pythagorean Triples: 3 to 1000

This section will bring patterns in Pythagorean triples in a sequential way, i.e., from 3 to 1000. In many cases, still we don't have results. These shall be completed later on. In these cases, few Pythagorean triples are written.

2.1 Pattern in Pythagorean Triples: 3 to 100

1) Patterns for Number 3

(a)	$3^2 + 4^2 := 5^2$ $33^2 + 544^2 := 545^2$ $333^2 + 55444^2 := 55445^2$ $3333^2 + 5554444^2 := 5554445^2$	(d)	$3^2 + 4^2 := 5^2$ $13^2 + 84^2 := 85^2$ $133^2 + 8844^2 := 8845^2$ $1333^2 + 888444^2 := 888445^2$
(b)	$3^2 + 4^2 := 5^2$ $143^2 + 24^2 := 145^2$ $12543^2 + 224^2 := 12545^2$ $1236543^2 + 2224^2 := 1236545^2$	(e)	$3^2 + 4^2 := 5^2$ $23^2 + 264^2 := 265^2$ $203^2 + 20604^2 := 20605^2$ $2003^2 + 2006004^2 := 2006005^2$
(c)	$3^2 + 4^2 := 5^2$ $143^2 + 24^2 := 145^2$ $17423^2 + 264^2 := 17425^2$ $1774223^2 + 2664^2 := 1774225^2$	(f)	$3^2 + 4^2 := 5^2$ $63^2 + 1984^2 := 1985^2$ $663^2 + 219784^2 := 219785^2$ $6663^2 + 22197784^2 := 22197785^2$
		(g)	$3^2 + 4^2 := 5^2$ $123^2 + 7564^2 := 7565^2$ $1323^2 + 875164^2 := 875165^2$ $13323^2 + 88751164^2 := 88751165^2$

(h)

$$\begin{aligned} 3^2 + 4^2 &:= 5^2 \\ 143^2 + 24^2 &:= 145^2 \\ 10403^2 + 204^2 &:= 10405^2 \\ 1004003^2 + 2004^2 &:= 1004005^2 \end{aligned}$$

2) Patterns for Number 4

(a)

$$\begin{aligned} 4^2 + 3^2 &:= 5^2 \\ 544^2 + 33^2 &:= 545^2 \\ 55444^2 + 333^2 &:= 55445^2 \\ 5554444^2 + 3333^2 &:= 5554445^2 \end{aligned}$$

(b)

$$\begin{aligned} 4^2 + 3^2 &:= 5^2 \\ 24^2 + 143^2 &:= 145^2 \\ 224^2 + 12543^2 &:= 12545^2 \\ 2224^2 + 1236543^2 &:= 1236545^2 \end{aligned}$$

(c)

$$\begin{aligned} 4^2 + 3^2 &:= 5^2 \\ 24^2 + 143^2 &:= 145^2 \\ 264^2 + 17423^2 &:= 17425^2 \\ 2664^2 + 1774223^2 &:= 1774225^2 \end{aligned}$$

(d)

$$\begin{aligned} 4^2 + 3^2 &:= 5^2 \\ 264^2 + 23^2 &:= 265^2 \\ 20604^2 + 203^2 &:= 20605^2 \\ 2006004^2 + 2003^2 &:= 2006005^2 \end{aligned}$$

(e)

$$\begin{aligned} 4^2 + 3^2 &:= 5^2 \\ 84^2 + 13^2 &:= 85^2 \\ 8844^2 + 133^2 &:= 8845^2 \\ 888444^2 + 1333^2 &:= 888445^2 \end{aligned}$$

(f)

$$\begin{aligned} 4^2 + 3^2 &:= 5^2 \\ 1984^2 + 63^2 &:= 1985^2 \\ 219784^2 + 663^2 &:= 219785^2 \\ 22197784^2 + 6663^2 &:= 22197785^2 \end{aligned}$$

(g)

$$\begin{aligned} 4^2 + 3^2 &:= 5^2 \\ 7564^2 + 123^2 &:= 7565^2 \\ 875164^2 + 1323^2 &:= 875165^2 \\ 88751164^2 + 13323^2 &:= 88751165^2 \end{aligned}$$

(h)

$$\begin{aligned} 4^2 + 3^2 &:= 5^2 \\ 24^2 + 143^2 &:= 145^2 \\ 204^2 + 10403^2 &:= 10405^2 \\ 2004^2 + 1004003^2 &:= 1004005^2 \end{aligned}$$

(i)

$$\begin{aligned} 4^2 + 3^2 &:= 5^2 \\ 544^2 + 33^2 &:= 545^2 \\ 45904^2 + 303^2 &:= 45905^2 \\ 4509004^2 + 3003^2 &:= 4509005^2 \end{aligned}$$

(d)

$$\begin{aligned} 3^2 + 4^2 &:= 5^2 \\ 123^2 + 7564^2 &:= 7565^2 \\ 1323^2 + 875164^2 &:= 875165^2 \\ 13323^2 + 88751164^2 &:= 88751165^2 \end{aligned}$$

3) Patterns for Number 5

(a)

$$\begin{aligned} 3^2 + 4^2 &:= 5^2 \\ 143^2 + 24^2 &:= 145^2 \\ 12543^2 + 224^2 &:= 12545^2 \\ 1236543^2 + 2224^2 &:= 1236545^2 \end{aligned}$$

(e)

$$\begin{aligned} 3^2 + 4^2 &:= 5^2 \\ 143^2 + 24^2 &:= 145^2 \\ 10403^2 + 204^2 &:= 10405^2 \\ 1004003^2 + 2004^2 &:= 1004005^2 \end{aligned}$$

(f)

$$\begin{aligned} 3^2 + 4^2 &:= 5^2 \\ 143^2 + 24^2 &:= 145^2 \\ 17423^2 + 264^2 &:= 17425^2 \\ 1774223^2 + 2664^2 &:= 1774225^2 \end{aligned}$$

(b)

$$\begin{aligned} 3^2 + 4^2 &:= 5^2 \\ 33^2 + 544^2 &:= 545^2 \\ 333^2 + 55444^2 &:= 55445^2 \\ 3333^2 + 5554444^2 &:= 5554445^2 \end{aligned}$$

(g)

$$\begin{aligned} 3^2 + 4^2 &:= 5^2 \\ 33^2 + 544^2 &:= 545^2 \\ 303^2 + 45904^2 &:= 45905^2 \\ 3003^2 + 4509004^2 &:= 4509005^2 \end{aligned}$$

(c)

$$\begin{aligned} 3^2 + 4^2 &:= 5^2 \\ 63^2 + 1984^2 &:= 1985^2 \\ 663^2 + 219784^2 &:= 219785^2 \\ 6663^2 + 22197784^2 &:= 22197785^2 \end{aligned}$$

(h)

$$\begin{aligned} 4^2 + 3^2 &:= 5^2 \\ 84^2 + 13^2 &:= 85^2 \\ 8844^2 + 133^2 &:= 8845^2 \\ 888444^2 + 1333^2 &:= 888445^2 \end{aligned}$$

(i)

$$\begin{aligned} 4^2 + 3^2 &:= 5^2 \\ 264^2 + 23^2 &:= 265^2 \\ 20604^2 + 203^2 &:= 20605^2 \\ 2006004^2 + 2003^2 &:= 2006005^2 \end{aligned}$$

(j)

$$\begin{aligned} 5^2 + 12^2 &:= 13^2 \\ 125^2 + 812^2 &:= 7813^2 \\ 1325^2 + 877812^2 &:= 877813^2 \\ 13325^2 + 88777812^2 &:= 88777813^2 \end{aligned}$$

(k)

$$\begin{aligned} 5^2 + 12^2 &:= 13^2 \\ 1085^2 + 132^2 &:= 1093^2 \\ 110885^2 + 1332^2 &:= 110893^2 \\ 11108885^2 + 13332^2 &:= 11108893^2 \end{aligned}$$

(l)

$$\begin{aligned} 5^2 + 12^2 &:= 13^2 \\ 65^2 + 2112^2 &:= 2113^2 \\ 665^2 + 221112^2 &:= 221113^2 \\ 6665^2 + 22211112^2 &:= 22211113^2 \end{aligned}$$

(m)

$$\begin{aligned} 5^2 + 12^2 &:= 13^2 \\ 185^2 + 17112^2 &:= 17113^2 \\ 1985^2 + 1970112^2 &:= 1970113^2 \\ 19985^2 + 199700112^2 &:= 199700113^2 \end{aligned}$$

4) Patterns for Number 6

(a)

$$\begin{aligned} 6^2 + 8^2 &:= 10^2 \\ 26^2 + 168^2 &:= 170^2 \\ 266^2 + 17688^2 &:= 17690^2 \\ 2666^2 + 1776888^2 &:= 1776890^2 \end{aligned}$$

(b)

$$\begin{aligned} 6^2 + 8^2 &:= 10^2 \\ 66^2 + 1088^2 &:= 1090^2 \\ 666^2 + 110888^2 &:= 110890^2 \\ 6666^2 + 11108888^2 &:= 11108890^2 \end{aligned}$$

(c)

$$\begin{aligned} 6^2 + 8^2 &:= 10^2 \\ 66^2 + 1088^2 &:= 1090^2 \\ 606^2 + 91808^2 &:= 91810^2 \\ 6006^2 + 9018008^2 &:= 9018010^2 \end{aligned}$$

5) Patterns for Number 7

(a)

$$\begin{aligned} 7^2 + 24^2 &:= 25^2 \\ 67^2 + 2244^2 &:= 2245^2 \\ 667^2 + 222444^2 &:= 222445^2 \\ 6667^2 + 22224444^2 &:= 22224445^2 \end{aligned}$$

(b)

$$\begin{aligned}7^2 + 24^2 &:= 25^2 \\73^2 + 2664^2 &:= 2665^2 \\673^2 + 226464^2 &:= 226465^2 \\6673^2 + 22264464^2 &:= 22264465^2\end{aligned}$$

(d)

$$\begin{aligned}8^2 + 6^2 &:= 10^2 \\1088^2 + 66^2 &:= 1090^2 \\110888^2 + 666^2 &:= 110890^2 \\11108888^2 + 6666^2 &:= 11108890^2\end{aligned}$$

6) Patterns for Number 8

(a)

$$\begin{aligned}15^2 + 8^2 &:= 17^2 \\1155^2 + 68^2 &:= 1157^2 \\111555^2 + 668^2 &:= 111557^2 \\11115555^2 + 6668^2 &:= 11115557^2\end{aligned}$$

(e)

$$\begin{aligned}8^2 + 6^2 &:= 10^2 \\1088^2 + 66^2 &:= 1090^2 \\91808^2 + 606^2 &:= 91810^2 \\9018008^2 + 6006^2 &:= 9018010^2\end{aligned}$$

7) Patterns for Number 9

(b)

$$\begin{aligned}8^2 + 6^2 &:= 10^2 \\168^2 + 26^2 &:= 170^2 \\17688^2 + 266^2 &:= 17690^2 \\1776888^2 + 2666^2 &:= 1776890^2\end{aligned}$$

(a)

$$\begin{aligned}9^2 + 40^2 &:= 41^2 \\99^2 + 4900^2 &:= 4901^2 \\999^2 + 499000^2 &:= 499001^2 \\9999^2 + 49990000^2 &:= 49990001^2\end{aligned}$$

(c)

$$\begin{aligned}8^2 + 15^2 &:= 17^2 \\68^2 + 1155^2 &:= 1157^2 \\668^2 + 111555^2 &:= 111557^2 \\6668^2 + 11115555^2 &:= 11115557^2\end{aligned}$$

(b)

$$\begin{aligned}9^2 + 12^2 &:= 15^2 \\99^2 + 1632^2 &:= 1635^2 \\999^2 + 166332^2 &:= 166335^2 \\9999^2 + 16663332^2 &:= 16663335^2\end{aligned}$$

(c)

$$\begin{aligned} 9^2 + 12^2 &:= 15^2 \\ 39^2 + 25^2 &:= 255^2 \\ 399^2 + 26532^2 &:= 26535^2 \\ 3999^2 + 2665332^2 &:= 2665335^2 \end{aligned}$$

(d)

$$\begin{aligned} 9^2 + 40^2 &:= 41^2 \\ 3009^2 + 440^2 &:= 3041^2 \\ 308009^2 + 4440^2 &:= 308041^2 \\ 30858009^2 + 44440^2 &:= 30858041^2 \end{aligned}$$

8) Patterns for Number 10

(a)

$$\begin{aligned} 8^2 + 6^2 &:= 10^2 \\ 168^2 + 26^2 &:= 170^2 \\ 17688^2 + 266^2 &:= 17690^2 \\ 1776888^2 + 2666^2 &:= 1776890^2 \end{aligned}$$

(b)

$$\begin{aligned} 10^2 + 24^2 &:= 26^2 \\ 100^2 + 2499^2 &:= 2501^2 \\ 1000^2 + 24999^2 &:= 250001^2 \\ 10000^2 + 2499999^2 &:= 25000001^2 \end{aligned}$$

(c)

$$\begin{aligned} 10^2 + 24^2 &:= 26^2 \\ 110^2 + 3024^2 &:= 3026^2 \\ 1100^2 + 302499^2 &:= 302501^2 \\ 11000^2 + 3024999^2 &:= 30250001^2 \end{aligned}$$

(d)

$$\begin{aligned} 10^2 + 24^2 &:= 26^2 \\ 110^2 + 3024^2 &:= 3026^2 \\ 1110^2 + 308024^2 &:= 308026^2 \\ 11110^2 + 30858024^2 &:= 30858026^2 \end{aligned}$$

(e)

$$\begin{aligned} 8^2 + 6^2 &:= 10^2 \\ 1088^2 + 66^2 &:= 1090^2 \\ 91808^2 + 606^2 &:= 91810^2 \\ 9018008^2 + 6006^2 &:= 9018010^2 \end{aligned}$$

(f)

$$\begin{aligned} 10^2 + 24^2 &:= 26^2 \\ 2170^2 + 264^2 &:= 2186^2 \\ 221770^2 + 2664^2 &:= 221786^2 \\ 22217770^2 + 26664^2 &:= 22217786^2 \end{aligned}$$

(g)

$$\begin{aligned} 8^2 + 6^2 &:= 10^2 \\ 1088^2 + 66^2 &:= 1090^2 \\ 110888^2 + 666^2 &:= 110890^2 \\ 11108888^2 + 6666^2 &:= 11108890^2 \end{aligned}$$

(h)

$$\begin{aligned} 8^2 + 6^2 &:= 10^2 \\ 1088^2 + 66^2 &:= 1090^2 \\ 110888^2 + 666^2 &:= 110890^2 \\ 11108888^2 + 6666^2 &:= 11108890^2 \end{aligned}$$

9) Patterns for Number 11

(a)

$$\begin{aligned} 11^{22} + 60^2 &:= 61^2 \\ 111^2 + 6160^2 &:= 6161^2 \\ 1111^2 + 617160^2 &:= 617161^2 \\ 11111^2 + 61727160^2 &:= 61727161^2 \end{aligned}$$

10) Patterns for Number 12

(a)

$$\begin{aligned} 12^2 + 5^2 &:= 13^2 \\ 812^2 + 125^2 &:= 7813^2 \\ 877812^2 + 1325^2 &:= 877813^2 \\ 88777812^2 + 13325^2 &:= 88777813^2 \end{aligned}$$

(b)

$$\begin{aligned} 12^2 + 35^2 &:= 37^2 \\ 132^2 + 4355^2 &:= 4357^2 \\ 1332^2 + 443555^2 &:= 443557^2 \\ 13332^2 + 44435555^2 &:= 44435557^2 \end{aligned}$$

(c)

$$\begin{aligned} 12^2 + 5^2 &:= 13^2 \\ 2112^2 + 65^2 &:= 2113^2 \\ 221112^2 + 665^2 &:= 221113^2 \\ 22211112^2 + 6665^2 &:= 22211113^2 \end{aligned}$$

(d)

$$\begin{aligned} 12^2 + 9^2 &:= 15^2 \\ 1632^2 + 99^2 &:= 1635^2 \\ 166332^2 + 999^2 &:= 166335^2 \\ 16663332^2 + 9999^2 &:= 16663335^2 \end{aligned}$$

(e)

$$\begin{aligned} 12^2 + 5^2 &:= 13^2 \\ 132^2 + 1085^2 &:= 1093^2 \\ 1332^2 + 110885^2 &:= 110893^2 \\ 13332^2 + 11108885^2 &:= 11108893^2 \end{aligned}$$

(f)

$$\begin{aligned} 12^2 + 35^2 &:= 37^2 \\ 132^2 + 4355^2 &:= 4357^2 \\ 1332^2 + 443555^2 &:= 443557^2 \\ 13332^2 + 44435555^2 &:= 44435557^2 \end{aligned}$$

(g)

$$\begin{aligned} 12^2 + 16^2 &:= 20^2 \\ 132^2 + 2176^2 &:= 2180^2 \\ 1332^2 + 221776^2 &:= 221780^2 \\ 13332^2 + 22217776^2 &:= 22217780^2 \end{aligned}$$

(h)

$$\begin{aligned} 12^2 + 9^2 &:= 15^2 \\ 1632^2 + 99^2 &:= 1635^2 \\ 166332^2 + 999^2 &:= 166335^2 \\ 16663332^2 + 9999^2 &:= 16663335^2 \end{aligned}$$

(l)

$$\begin{aligned} 12^2 + 35^2 &:= 37^2 \\ 120^2 + 3599^2 &:= 3601^2 \\ 1200^2 + 359999^2 &:= 360001^2 \\ 12000^2 + 35999999^2 &:= 36000001^2 \end{aligned}$$

11) Patterns for Number 13

(i)

$$\begin{aligned} 12^2 + 9^2 &:= 15^2 \\ 252^2 + 39^2 &:= 255^2 \\ 26532^2 + 399^2 &:= 26535^2 \\ 2665332^2 + 3999^2 &:= 2665335^2 \end{aligned}$$

(a)

$$\begin{aligned} 12^2 + 5^2 &:= 13^2 \\ 812^2 + 125^2 &:= 7813^2 \\ 877812^2 + 1325^2 &:= 877813^2 \\ 88777812^2 + 13325^2 &:= 88777813^2 \end{aligned}$$

(j)

$$\begin{aligned} 12^2 + 5^2 &:= 13^2 \\ 17112^2 + 185^2 &:= 17113^2 \\ 1970112^2 + 1985^2 &:= 1970113^2 \\ 199700112^2 + 19985^2 &:= 199700113^2 \end{aligned}$$

(b)

$$\begin{aligned} 12^2 + 5^2 &:= 13^2 \\ 2112^2 + 65^2 &:= 2113^2 \\ 221112^2 + 665^2 &:= 221113^2 \\ 22211112^2 + 6665^2 &:= 22211113^2 \end{aligned}$$

(k)

$$\begin{aligned} 12^2 + 5^2 &:= 13^2 \\ 132^2 + 1085^2 &:= 1093^2 \\ 1332^2 + 110885^2 &:= 110893^2 \\ 13332^2 + 11108885^2 &:= 11108893^2 \end{aligned}$$

(c)

$$\begin{aligned} 13^2 + 84^2 &:= 85^2 \\ 133^2 + 8844^2 &:= 8845^2 \\ 1333^2 + 888444^2 &:= 888445^2 \\ 13333^2 + 88884444^2 &:= 88884445^2 \end{aligned}$$

(d)

$$\begin{aligned} 12^2 + 5^2 &:= 13^2 \\ 17112^2 + 185^2 &:= 17113^2 \\ 1970112^2 + 1985^2 &:= 1970113^2 \\ 199700112^2 + 19985^2 &:= 199700113^2 \end{aligned}$$

(b)

$$\begin{aligned} 12^2 + 9^2 &:= 15^2 \\ 1632^2 + 99^2 &:= 1635^2 \\ 166332^2 + 999^2 &:= 166335^2 \\ 16663332^2 + 9999^2 &:= 16663335^2 \end{aligned}$$

(e)

$$\begin{aligned} 5^2 + 12^2 &:= 13^2 \\ 1085^2 + 132^2 &:= 1093^2 \\ 110885^2 + 1332^2 &:= 110893^2 \\ 11108885^2 + 13332^2 &:= 11108893^2 \end{aligned}$$

(c)

$$\begin{aligned} 15^2 + 20^2 &:= 25^2 \\ 165^2 + 2720^2 &:= 2725^2 \\ 1665^2 + 277220^2 &:= 277225^2 \\ 16665^2 + 27772220^2 &:= 27772225^2 \end{aligned}$$

12) Patterns for Number 14

(a)

$$\begin{aligned} 14^2 + 48^2 &:= 50^2 \\ 1214^2 + 368448^2 &:= 368450^2 \\ 12014^2 + 36084048^2 &:= 36084050^2 \\ 120014^2 + 3600840048^2 &:= 3600840050^2 \end{aligned}$$

(d)

$$\begin{aligned} 12^2 + 9^2 &:= 15^2 \\ 1632^2 + 99^2 &:= 1635^2 \\ 166332^2 + 999^2 &:= 166335^2 \\ 16663332^2 + 9999^2 &:= 16663335^2 \end{aligned}$$

13) Patterns for Number 15

(a)

$$\begin{aligned} 15^2 + 8^2 &:= 17^2 \\ 1155^2 + 68^2 &:= 1157^2 \\ 111555^2 + 668^2 &:= 111557^2 \\ 11115555^2 + 6668^2 &:= 11115557^2 \end{aligned}$$

(e)

$$\begin{aligned} 12^2 + 9^2 &:= 15^2 \\ 252^2 + 39^2 &:= 255^2 \\ 26532^2 + 399^2 &:= 26535^2 \\ 2665332^2 + 3999^2 &:= 2665335^2 \end{aligned}$$

14) Patterns for Number 16

(a)

$$\begin{aligned} 16^2 + 30^2 &:= 34^2 \\ 136^2 + 2310^2 &:= 2314^2 \\ 1336^2 + 223110^2 &:= 223114^2 \\ 13336^2 + 22231110^2 &:= 22231114^2 \end{aligned}$$

(b)

$$\begin{aligned} 16^2 + 12^2 &:= 20^2 \\ 2176^2 + 132^2 &:= 2180^2 \\ 221776^2 + 1332^2 &:= 221780^2 \\ 22217776^2 + 13332^2 &:= 22217780^2 \end{aligned}$$

(c)

$$\begin{aligned} 16^2 + 12^2 &:= 20^2 \\ 336^2 + 52^2 &:= 340^2 \\ 35376^2 + 532^2 &:= 35380^2 \\ 3553776^2 + 5332^2 &:= 3553780^2 \end{aligned}$$

(d)

$$\begin{aligned} 16^2 + 30^2 &:= 34^2 \\ 3016^2 + 330^2 &:= 3034^2 \\ 308016^2 + 3330^2 &:= 308034^2 \\ 30858016^2 + 33330^2 &:= 30858034^2 \end{aligned}$$

(a)

$$\begin{aligned} 15^2 + 8^2 &:= 17^2 \\ 1155^2 + 68^2 &:= 1157^2 \\ 111555^2 + 668^2 &:= 111557^2 \\ 11115555^2 + 6668^2 &:= 11115557^2 \end{aligned}$$

(b)

$$\begin{aligned} 8^2 + 15^2 &:= 17^2 \\ 68^2 + 1155^2 &:= 1157^2 \\ 668^2 + 111555^2 &:= 111557^2 \\ 6668^2 + 11115555^2 &:= 11115557^2 \end{aligned}$$

16) Patterns for Number 18

(a)

$$\begin{aligned} 24^2 + 18^2 &:= 30^2 \\ 3264^2 + 198^2 &:= 3270^2 \\ 332664^2 + 1998^2 &:= 332670^2 \\ 33326664^2 + 19998^2 &:= 33326670^2 \end{aligned}$$

(b)

$$\begin{aligned} 18^2 + 80^2 &:= 82^2 \\ 198^2 + 9800^2 &:= 9802^2 \\ 1998^2 + 998000^2 &:= 998002^2 \\ 19998^2 + 99980000^2 &:= 99980002^2 \end{aligned}$$

15) Patterns for Number 17

(c)

$$\begin{aligned} 18^2 + 80^2 &:= 82^2 \\ 180^2 + 8099^2 &:= 8101^2 \\ 1800^2 + 809999^2 &:= 810001^2 \\ 18000^2 + 80999999^2 &:= 81000001^2 \end{aligned}$$

(b)

$$\begin{aligned} 16^2 + 12^2 &:= 20^2 \\ 2176^2 + 132^2 &:= 2180^2 \\ 221776^2 + 1332^2 &:= 221780^2 \\ 22217776^2 + 13332^2 &:= 22217780^2 \end{aligned}$$

17) Patterns for Number 19

(a)

$$\begin{aligned} 19^2 + 180^2 &:= 181^2 \\ 199^2 + 19800^2 &:= 19801^2 \\ 1999^2 + 1998000^2 &:= 1998001^2 \\ 19999^2 + 199980000^2 &:= 199980001^2 \end{aligned}$$

(b)

$$\begin{aligned} 19^2 + 180^2 &:= 181^2 \\ 9919^2 + 1800^2 &:= 10081^2 \\ 999919^2 + 18000^2 &:= 1000081^2 \\ 99999919^2 + 180000^2 &:= 100000081^2 \end{aligned}$$

(c)

$$\begin{aligned} 20^2 + 99^2 &:= 101^2 \\ 200^2 + 9999^2 &:= 10001^2 \\ 2000^2 + 999999^2 &:= 1000001^2 \\ 20000^2 + 99999999^2 &:= 100000001^2 \end{aligned}$$

(d)

$$\begin{aligned} 20^2 + 99^2 &:= 101^2 \\ 220^2 + 12099^2 &:= 12101^2 \\ 2220^2 + 1232099^2 &:= 1232101^2 \\ 22220^2 + 123432099^2 &:= 123432101^2 \end{aligned}$$

(e)

$$\begin{aligned} 16^2 + 12^2 &:= 20^2 \\ 336^2 + 52^2 &:= 340^2 \\ 35376^2 + 532^2 &:= 35380^2 \\ 3553776^2 + 5332^2 &:= 3553780^2 \end{aligned}$$

18) Patterns for Number 20

(a)

$$\begin{aligned} 20^2 + 15^2 &:= 25^2 \\ 2720^2 + 165^2 &:= 2725^2 \\ 277220^2 + 1665^2 &:= 277225^2 \\ 27772220^2 + 16665^2 &:= 27772225^2 \end{aligned}$$

(f)

$$\begin{aligned} 20^2 + 21^2 &:= 29^2 \\ 220^2 + 3021^2 &:= 3029^2 \\ 2220^2 + 308021^2 &:= 308029^2 \\ 22220^2 + 30858021^2 &:= 30858029^2 \end{aligned}$$

19) Patterns for Number 21

(a)

$$\begin{aligned} 21^2 + 20^2 &:= 29^2 \\ 3021^2 + 220^2 &:= 3029^2 \\ 308021^2 + 2220^2 &:= 308029^2 \\ 30858021^2 + 22220^2 &:= 30858029^2 \end{aligned}$$

(b)

$$\begin{aligned} 21^2 + 220^2 &:= 221^2 \\ 201^2 + 20200^2 &:= 20201^2 \\ 2001^2 + 2002000^2 &:= 2002001^2 \\ 20001^2 + 200020000^2 &:= 200020001^2 \end{aligned}$$

(c)

$$\begin{aligned} 21^2 + 220^2 &:= 221^2 \\ 12221^2 + 2220^2 &:= 12421^2 \\ 1234221^2 + 22220^2 &:= 1234421^2 \\ 123454221^2 + 222220^2 &:= 123454421^2 \end{aligned}$$

(d)

$$\begin{aligned} 21^2 + 28^2 &:= 35^2 \\ 231^2 + 3808^2 &:= 3815^2 \\ 2331^2 + 388108^2 &:= 388115^2 \\ 23331^2 + 38881108^2 &:= 38881115^2 \end{aligned}$$

20) Patterns for Number 22

(a)

$$\begin{aligned} 120^2 + 22^2 &:= 122^2 \\ 10200^2 + 202^2 &:= 10202^2 \\ 1002000^2 + 2002^2 &:= 1002002^2 \\ 100020000^2 + 20002^2 &:= 100020002^2 \end{aligned}$$

(b)

$$\begin{aligned} 120^2 + 22^2 &:= 122^2 \\ 12320^2 + 222^2 &:= 12322^2 \\ 1234320^2 + 2222^2 &:= 1234322^2 \\ 123454320^2 + 22222^2 &:= 123454322^2 \end{aligned}$$

21) Patterns for Number 23

(a)

$$\begin{aligned} 264^2 + 23^2 &:= 265^2 \\ 20604^2 + 203^2 &:= 20605^2 \\ 2006004^2 + 2003^2 &:= 2006005^2 \\ 200060004^2 + 20003^2 &:= 200060005^2 \end{aligned}$$

(b)

$$\begin{aligned} 264^2 + 23^2 &:= 265^2 \\ 20604^2 + 203^2 &:= 20605^2 \\ 2006004^2 + 2003^2 &:= 2006005^2 \\ 200060004^2 + 20003^2 &:= 200060005^2 \end{aligned}$$

22) Patterns for Number 24

(a)

$$\begin{aligned} 24^2 + 7^2 &:= 25^2 \\ 2244^2 + 67^2 &:= 2245^2 \\ 222444^2 + 667^2 &:= 222445^2 \\ 22224444^2 + 6667^2 &:= 22224445^2 \end{aligned}$$

(b)

$$\begin{aligned} 10^2 + 24^2 &:= 26^2 \\ 100^2 + 2499^2 &:= 2501^2 \\ 1000^2 + 24999^2 &:= 250001^2 \\ 10000^2 + 2499999^2 &:= 25000001^2 \end{aligned}$$

(c)

$$\begin{aligned} 10^2 + 24^2 &:= 26^2 \\ 110^2 + 3024^2 &:= 3026^2 \\ 1100^2 + 302499^2 &:= 302501^2 \\ 11000^2 + 3024999^2 &:= 30250001^2 \\ 110000^2 + 302499999^2 &:= 3025000001^2 \end{aligned}$$

(d)

$$\begin{aligned} 10^2 + 24^2 &:= 26^2 \\ 110^2 + 3024^2 &:= 3026^2 \\ 1110^2 + 308024^2 &:= 308026^2 \\ 11110^2 + 30858024^2 &:= 30858026^2 \\ 111110^2 + 3086358024^2 &:= 3086358026^2 \end{aligned}$$

(e)

$$\begin{aligned} 32^2 + 24^2 &:= 40^2 \\ 4352^2 + 264^2 &:= 4360^2 \\ 443552^2 + 2664^2 &:= 443560^2 \\ 44435552^2 + 26664^2 &:= 44435560^2 \end{aligned}$$

(f)

$$\begin{aligned} 10^2 + 24^2 &:= 26^2 \\ 2170^2 + 264^2 &:= 2186^2 \\ 221770^2 + 2664^2 &:= 221786^2 \\ 22217770^2 + 26664^2 &:= 22217786^2 \end{aligned}$$

(g)

$$\begin{aligned} 24^2 + 18^2 &:= 30^2 \\ 3264^2 + 198^2 &:= 3270^2 \\ 332664^2 + 1998^2 &:= 332670^2 \\ 33326664^2 + 19998^2 &:= 33326670^2 \end{aligned}$$

(h)

$$\begin{aligned} 70^2 + 24^2 &:= 74^2 \\ 8710^2 + 264^2 &:= 8714^2 \\ 887110^2 + 2664^2 &:= 887114^2 \\ 88871110^2 + 26664^2 &:= 88871114^2 \end{aligned}$$

(i)

$$\begin{aligned} 143^2 + 24^2 &:= 145^2 \\ 17423^2 + 264^2 &:= 17425^2 \\ 1774223^2 + 2664^2 &:= 1774225^2 \\ 177742223^2 + 26664^2 &:= 177742225^2 \end{aligned}$$

(j)

$$\begin{aligned} 143^2 + 24^2 &:= 145^2 \\ 10403^2 + 204^2 &:= 10405^2 \\ 1004003^2 + 2004^2 &:= 1004005^2 \\ 100040003^2 + 20004^2 &:= 100040005^2 \end{aligned}$$

(k)

$$\begin{aligned} 24^2 + 7^2 &:= 25^2 \\ 2664^2 + 73^2 &:= 2665^2 \\ 226464^2 + 673^2 &:= 226465^2 \\ 22264464^2 + 6673^2 &:= 22264465^2 \end{aligned}$$

(l)

$$\begin{aligned} 143^2 + 24^2 &:= 145^2 \\ 10403^2 + 204^2 &:= 10405^2 \\ 1004003^2 + 2004^2 &:= 1004005^2 \\ 100040003^2 + 20004^2 &:= 100040005^2 \end{aligned}$$

(m)

$$\begin{aligned} 143^2 + 24^2 &:= 145^2 \\ 12543^2 + 224^2 &:= 12545^2 \\ 1236543^2 + 2224^2 &:= 1236545^2 \\ 123476543^2 + 22224^2 &:= 123476545^2 \end{aligned}$$

(n)

$$\begin{aligned} 24^2 + 10^2 &:= 26^2 \\ 3024^2 + 110^2 &:= 3026^2 \\ 308024^2 + 1110^2 &:= 308026^2 \\ 30858024^2 + 11110^2 &:= 30858026^2 \end{aligned}$$

(o)

$$\begin{aligned} 32^2 + 24^2 &:= 40^2 \\ 4352^2 + 264^2 &:= 4360^2 \\ 443552^2 + 2664^2 &:= 443560^2 \\ 44435552^2 + 26664^2 &:= 44435560^2 \end{aligned}$$

23) Patterns for Number 25

(a)

$$\begin{aligned} 24^2 + 7^2 &:= 25^2 \\ 2244^2 + 67^2 &:= 2245^2 \\ 222444^2 + 667^2 &:= 222445^2 \\ 22224444^2 + 6667^2 &:= 22224445^2 \end{aligned}$$

(b)

$$\begin{aligned} 20^2 + 15^2 &:= 25^2 \\ 2720^2 + 165^2 &:= 2725^2 \\ 277220^2 + 1665^2 &:= 277225^2 \\ 27772220^2 + 16665^2 &:= 27772225^2 \end{aligned}$$

(c)

$$\begin{aligned} 24^2 + 7^2 &:= 25^2 \\ 2664^2 + 73^2 &:= 2665^2 \\ 226464^2 + 673^2 &:= 226465^2 \\ 22264464^2 + 6673^2 &:= 22264465^2 \end{aligned}$$

24) Patterns for Number 26

(a)

$$\begin{aligned}8^2 + 6^2 &:= 10^2 \\168^2 + 26^2 &:= 170^2 \\17688^2 + 266^2 &:= 17690^2 \\1776888^2 + 2666^2 &:= 1776890^2\end{aligned}$$

(b)

$$\begin{aligned}10^2 + 24^2 &:= 26^2 \\110^2 + 3024^2 &:= 3026^2 \\1100^2 + 302499^2 &:= 302501^2 \\11000^2 + 30249999^2 &:= 30250001^2 \\110000^2 + 3024999999^2 &:= 3025000001^2\end{aligned}$$

(c)

$$\begin{aligned}10^2 + 24^2 &:= 26^2 \\2170^2 + 264^2 &:= 2186^2 \\221770^2 + 2664^2 &:= 221786^2 \\22217770^2 + 26664^2 &:= 22217786^2\end{aligned}$$

(d)

$$\begin{aligned}24^2 + 10^2 &:= 26^2 \\3024^2 + 110^2 &:= 3026^2 \\308024^2 + 1110^2 &:= 308026^2 \\30858024^2 + 11110^2 &:= 30858026^2\end{aligned}$$

25) Patterns for Number 27

(a)

$$\begin{aligned}36^2 + 27^2 &:= 45^2 \\4896^2 + 297^2 &:= 4905^2 \\498996^2 + 2997^2 &:= 499005^2 \\49989996^2 + 29997^2 &:= 49990005^2\end{aligned}$$

(b)

$$\begin{aligned}364^2 + 27^2 &:= 365^2 \\35644^2 + 267^2 &:= 35645^2 \\3556444^2 + 2667^2 &:= 3556445^2 \\355564444^2 + 26667^2 &:= 355564445^2\end{aligned}$$

26) Patterns for Number 28

(a)

$$\begin{aligned}28^2 + 21^2 &:= 35^2 \\3808^2 + 231^2 &:= 3815^2 \\388108^2 + 2331^2 &:= 388115^2 \\38881108^2 + 23331^2 &:= 38881115^2\end{aligned}$$

27) Patterns for Number 29

(a)

$$\begin{aligned}21^2 + 20^2 &:= 29^2 \\3021^2 + 220^2 &:= 3029^2 \\308021^2 + 2220^2 &:= 308029^2 \\30858021^2 + 22220^2 &:= 30858029^2\end{aligned}$$

28) Patterns for Number 30

(a)

$$16^2 + 30^2 := 34^2$$

$$136^2 + 2310^2 := 2314^2$$

$$1336^2 + 223110^2 := 223114^2$$

$$13336^2 + 22231110^2 := 22231114^2$$

(b)

$$24^2 + 18^2 := 30^2$$

$$3264^2 + 198^2 := 3270^2$$

$$332664^2 + 1998^2 := 332670^2$$

$$33326664^2 + 19998^2 := 33326670^2$$

(c)

$$16^2 + 30^2 := 34^2$$

$$3016^2 + 330^2 := 3034^2$$

$$308016^2 + 3330^2 := 308034^2$$

$$30858016^2 + 33330^2 := 30858034^2$$

(d)

$$224^2 + 30^2 := 226^2$$

$$24024^2 + 310^2 := 24026^2$$

$$2418024^2 + 3110^2 := 2418026^2$$

$$241958024^2 + 31110^2 := 241958026^2$$

29) Patterns for Number 31

(a)

$$480^2 + 31^2 := 481^2$$

$$45300^2 + 301^2 := 45301^2$$

$$4503000^2 + 3001^2 := 4503001^2$$

$$450030000^2 + 30001^2 := 450030001^2$$

30) Patterns for Number 32

(a)

$$32^2 + 24^2 := 40^2$$

$$4352^2 + 264^2 := 4360^2$$

$$443552^2 + 2664^2 := 443560^2$$

$$44435552^2 + 26664^2 := 44435560^2$$

(b)

$$255^2 + 32^2 := 257^2$$

$$27555^2 + 332^2 := 27557^2$$

$$2775555^2 + 3332^2 := 2775557^2$$

$$277755555^2 + 33332^2 := 277755557^2$$

31) Patterns for Number 33

(a)

$$33^2 + 544^2 := 545^2$$

$$333^2 + 55444^2 := 55445^2$$

$$3333^2 + 5554444^2 := 5554445^2$$

$$33333^2 + 555544444^2 := 555544445^2$$

(b)

$$\begin{aligned} 544^2 + 33^2 &:= 545^2 \\ 45904^2 + 303^2 &:= 45905^2 \\ 4509004^2 + 3003^2 &:= 4509005^2 \\ 450090004^2 + 30003^2 &:= 450090005^2 \end{aligned}$$

32) Patterns for Number 34

(a)

$$\begin{aligned} 16^2 + 30^2 &:= 34^2 \\ 136^2 + 2310^2 &:= 2314^2 \\ 1336^2 + 223110^2 &:= 223114^2 \\ 13336^2 + 22231110^2 &:= 22231114^2 \end{aligned}$$

(b)

$$\begin{aligned} 16^2 + 30^2 &:= 34^2 \\ 3016^2 + 330^2 &:= 3034^2 \\ 308016^2 + 3330^2 &:= 308034^2 \\ 30858016^2 + 33330^2 &:= 30858034^2 \end{aligned}$$

(c)

$$\begin{aligned} 34^2 + 288^2 &:= 290^2 \\ 340^2 + 28899^2 &:= 28901^2 \\ 3400^2 + 2889999^2 &:= 2890001^2 \\ 34000^2 + 288999999^2 &:= 289000001^2 \end{aligned}$$

33) Patterns for Number 35

(a)

$$\begin{aligned} 35^2 + 12^2 &:= 37^2 \\ 4355^2 + 132^2 &:= 4357^2 \\ 443555^2 + 1332^2 &:= 443557^2 \\ 44435555^2 + 13332^2 &:= 44435557^2 \end{aligned}$$

(b)

$$\begin{aligned} 28^2 + 21^2 &:= 35^2 \\ 3808^2 + 231^2 &:= 3815^2 \\ 388108^2 + 2331^2 &:= 388115^2 \\ 38881108^2 + 23331^2 &:= 38881115^2 \end{aligned}$$

(c)

$$\begin{aligned} 12^2 + 35^2 &:= 37^2 \\ 120^2 + 3599^2 &:= 3601^2 \\ 1200^2 + 359999^2 &:= 360001^2 \\ 12000^2 + 35999999^2 &:= 36000001^2 \end{aligned}$$

34) Patterns for Number 36

(a)

$$\begin{aligned} 77^2 + 36^2 &:= 85^2 \\ 9797^2 + 396^2 &:= 9805^2 \\ 997997^2 + 3996^2 &:= 998005^2 \\ 99979997^2 + 39996^2 &:= 99980005^2 \end{aligned}$$

(b)

$$\begin{aligned} 323^2 + 36^2 &:= 325^2 \\ 39203^2 + 396^2 &:= 39205^2 \\ 3992003^2 + 3996^2 &:= 3992005^2 \\ 399920003^2 + 39996^2 &:= 399920005^2 \end{aligned}$$

(c)

$$\begin{aligned} 36^2 + 160^2 &:= 164^2 \\ 9936^2 + 1600^2 &:= 10064^2 \\ 999936^2 + 16000^2 &:= 1000064^2 \\ 99999936^2 + 160000^2 &:= 10000064^2 \end{aligned}$$

(d)

$$\begin{aligned} 36^2 + 27^2 &:= 45^2 \\ 4896^2 + 297^2 &:= 4905^2 \\ 498996^2 + 2997^2 &:= 499005^2 \\ 49989996^2 + 29997^2 &:= 49990005^2 \end{aligned}$$

(e)

$$\begin{aligned} 160^2 + 36^2 &:= 164^2 \\ 19600^2 + 396^2 &:= 19604^2 \\ 1996000^2 + 3996^2 &:= 1996004^2 \\ 199960000^2 + 39996^2 &:= 199960004^2 \end{aligned}$$

35) Patterns for Number 37

(a)

$$\begin{aligned} 35^2 + 12^2 &:= 37^2 \\ 4355^2 + 132^2 &:= 4357^2 \\ 443555^2 + 1332^2 &:= 443557^2 \\ 44435555^2 + 13332^2 &:= 44435557^2 \end{aligned}$$

(b)

$$\begin{aligned} 12^2 + 35^2 &:= 37^2 \\ 120^2 + 3599^2 &:= 3601^2 \\ 1200^2 + 359999^2 &:= 360001^2 \\ 12000^2 + 35999999^2 &:= 36000001^2 \end{aligned}$$

36) Patterns for Number 38

(a)

$$\begin{aligned} 360^2 + 38^2 &:= 362^2 \\ 39600^2 + 398^2 &:= 39602^2 \\ 3996000^2 + 3998^2 &:= 3996002^2 \\ 399960000^2 + 39998^2 &:= 399960002^2 \end{aligned}$$

37) Patterns for Number 39

(a)

$$\begin{aligned} 252^2 + 39^2 &:= 255^2 \\ 26532^2 + 399^2 &:= 26535^2 \\ 2665332^2 + 3999^2 &:= 2665335^2 \\ 266653332^2 + 39999^2 &:= 266653335^2 \end{aligned}$$

(b)

$$\begin{aligned} 760^2 + 39^2 &:= 761^2 \\ 79600^2 + 399^2 &:= 79601^2 \\ 7996000^2 + 3999^2 &:= 7996001^2 \\ 799960000^2 + 39999^2 &:= 799960001^2 \end{aligned}$$

(d)

$$\begin{aligned} 32^2 + 24^2 &:= 40^2 \\ 4352^2 + 264^2 &:= 4360^2 \\ 443552^2 + 2664^2 &:= 443560^2 \\ 44435552^2 + 26664^2 &:= 44435560^2 \end{aligned}$$

38) Patterns for Number 40

(a)

$$\begin{aligned} 40^2 + 9^2 &:= 41^2 \\ 4900^2 + 99^2 &:= 4901^2 \\ 499000^2 + 999^2 &:= 499001^2 \\ 49990000^2 + 9999^2 &:= 49990001^2 \end{aligned}$$

(e)

$$\begin{aligned} 40^2 + 75^2 &:= 85^2 \\ 340^2 + 5775^2 &:= 5785^2 \\ 3340^2 + 557775^2 &:= 557785^2 \\ 33340^2 + 55577775^2 &:= 55577785^2 \end{aligned}$$

(b)

$$\begin{aligned} 399^2 + 40^2 &:= 401^2 \\ 48399^2 + 440^2 &:= 48401^2 \\ 4080399^2 + 4040^2 &:= 4080401^2 \\ 400800399^2 + 40040^2 &:= 400800401^2 \end{aligned}$$

(f)

$$\begin{aligned} 198^2 + 40^2 &:= 202^2 \\ 19998^2 + 400^2 &:= 20002^2 \\ 1999998^2 + 4000^2 &:= 2000002^2 \\ 199999998^2 + 40000^2 &:= 200000002^2 \end{aligned}$$

(c)

$$\begin{aligned} 399^2 + 40^2 &:= 401^2 \\ 39999^2 + 400^2 &:= 40001^2 \\ 3999999^2 + 4000^2 &:= 4000001^2 \\ 399999999^2 + 40000^2 &:= 400000001^2 \end{aligned}$$

(g)

$$\begin{aligned} 9^2 + 40^2 &:= 41^2 \\ 3009^2 + 440^2 &:= 3041^2 \\ 308009^2 + 4440^2 &:= 308041^2 \\ 30858009^2 + 44440^2 &:= 30858041^2 \end{aligned}$$

(h)

$$\begin{aligned} 96^2 + 40^2 &:= 104^2 \\ 9996^2 + 400^2 &:= 10004^2 \\ 999996^2 + 4000^2 &:= 1000004^2 \\ 99999996^2 + 40000^2 &:= 100000004^2 \end{aligned}$$

(i)

$$\begin{aligned} 40^2 + 198^2 &:= 202^2 \\ 12240^2 + 1998^2 &:= 12402^2 \\ 1234240^2 + 19998^2 &:= 1234402^2 \\ 123454240^2 + 199998^2 &:= 123454402^2 \end{aligned}$$

(a)

$$\begin{aligned} 440^2 + 42^2 &:= 442^2 \\ 40400^2 + 402^2 &:= 40402^2 \\ 4004000^2 + 4002^2 &:= 4004002^2 \\ 400040000^2 + 40002^2 &:= 400040002^2 \end{aligned}$$

39) Patterns for Number 41

(a)

$$\begin{aligned} 40^2 + 9^2 &:= 41^2 \\ 4900^2 + 99^2 &:= 4901^2 \\ 499000^2 + 999^2 &:= 499001^2 \\ 49990000^2 + 9999^2 &:= 49990001^2 \end{aligned}$$

(b)

$$\begin{aligned} 840^2 + 41^2 &:= 841^2 \\ 80400^2 + 401^2 &:= 80401^2 \\ 8004000^2 + 4001^2 &:= 8004001^2 \\ 800040000^2 + 40001^2 &:= 800040001^2 \end{aligned}$$

(c)

$$\begin{aligned} 9^2 + 40^2 &:= 41^2 \\ 3009^2 + 440^2 &:= 3041^2 \\ 308009^2 + 4440^2 &:= 308041^2 \\ 30858009^2 + 44440^2 &:= 30858041^2 \end{aligned}$$

40) Patterns for Number 42

41) Patterns for Number 43

(a)

$$\begin{aligned} 43^2 + 924^2 &:= 925^2 \\ 443^2 + 98124^2 &:= 98125^2 \\ 4443^2 + 9870124^2 &:= 9870125^2 \\ 44443^2 + 987590124^2 &:= 987590125^2 \end{aligned}$$

42) Patterns for Number 44

(a)

$$\begin{aligned} 483^2 + 44^2 &:= 485^2 \\ 40803^2 + 404^2 &:= 40805^2 \\ 4008003^2 + 4004^2 &:= 4008005^2 \\ 400080003^2 + 40004^2 &:= 400080005^2 \end{aligned}$$

(b)

$$\begin{aligned} 117^2 + 44^2 &:= 125^2 \\ 12317^2 + 444^2 &:= 12325^2 \\ 1234317^2 + 4444^2 &:= 1234325^2 \\ 123454317^2 + 44444^2 &:= 123454325^2 \end{aligned}$$

(c)

$$\begin{aligned} 483^2 + 44^2 &:= 485^2 \\ 49283^2 + 444^2 &:= 49285^2 \\ 4937283^2 + 4444^2 &:= 4937285^2 \\ 493817283^2 + 44444^2 &:= 493817285^2 \end{aligned}$$

(b)

$$\begin{aligned} 48^2 + 55^2 &:= 73^2 \\ 6148^2 + 555^2 &:= 6173^2 \\ 617148^2 + 5555^2 &:= 617173^2 \\ 61727148^2 + 55555^2 &:= 61727173^2 \end{aligned}$$

43) Patterns for Number 45

(a)

$$\begin{aligned} 36^2 + 27^2 &:= 45^2 \\ 4896^2 + 297^2 &:= 4905^2 \\ 498996^2 + 2997^2 &:= 499005^2 \\ 49989996^2 + 29997^2 &:= 49990005^2 \end{aligned}$$

46) Patterns for Number 49

(a)

$$\begin{aligned} 49^2 + 1200 &:= 1201^2 \\ 499^2 + 124500 &:= 124501^2 \\ 4999^2 + 12495000 &:= 12495001^2 \\ 49999^2 + 1249950000 &:= 1249950001^2 \end{aligned}$$

44) Patterns for Number 46

(a)

$$\begin{aligned} 46^2 + 528^2 &:= 530^2 \\ 460^2 + 52899^2 &:= 52901 \\ 4600^2 + 5289999^2 &:= 5290001 \\ 46000^2 + 52899999^2 &:= 529000001 \end{aligned}$$

47) Patterns for Number 50

(a)

$$\begin{aligned} 48^2 + 14^2 &:= 50^2 \\ 368448^2 + 1214^2 &:= 368450^2 \\ 36084048^2 + 12014^2 &:= 36084050^2 \\ 3600840048^2 + 120014^2 &:= 3600840050^2 \end{aligned}$$

Since the first line is not following the pattern, we call it **semi-Pythagorean triples pattern**.

45) Patterns for Number 48

(a)

$$\begin{aligned} 48^2 + 14^2 &:= 50^2 \\ 368448^2 + 1214^2 &:= 368450^2 \\ 36084048^2 + 12014^2 &:= 36084050^2 \\ 3600840048^2 + 120014^2 &:= 3600840050^2 \end{aligned}$$

(b)

$$\begin{aligned} 624^2 + 50^2 &:= 626^2 \\ 65024^2 + 510^2 &:= 65026^2 \\ 6528024^2 + 5110^2 &:= 6528026^2 \\ 653058024^2 + 51110^2 &:= 653058026^2 \end{aligned}$$

48) Patterns for Number 51

(a)

$$\begin{aligned}51^2 + 140^2 &:= 149^2 \\9951^2 + 1400^2 &:= 10049^2 \\999951^2 + 14000^2 &:= 1000049^2 \\99999951^2 + 140000^2 &:= 100000049^2\end{aligned}$$

49) Patterns for Number 52

(a)

$$\begin{aligned}336^2 + 52^2 &:= 340^2 \\35376^2 + 532^2 &:= 35380^2 \\3553776^2 + 5332^2 &:= 3553780^2 \\355537776^2 + 53332^2 &:= 355537780^2\end{aligned}$$

50) Patterns for Number 53

(a)

$$\begin{aligned}53^2 + 1404^2 &:= 1405^2 \\533^2 + 142044^2 &:= 142045^2 \\5333^2 + 14220444^2 &:= 14220445^2 \\53333^2 + 1422204444^2 &:= 1422204445^2\end{aligned}$$

51) Patterns for Number 54

(a)

$$\begin{aligned}72^2 + 54^2 &:= 90^2 \\9792^2 + 594^2 &:= 9810^2 \\997992^2 + 5994^2 &:= 998010^2 \\99979992^2 + 59994^2 &:= 99980010^2\end{aligned}$$

52) Patterns for Number 55

(a)

$$\begin{aligned}48^2 + 55^2 &:= 73^2 \\6148^2 + 555^2 &:= 6173^2 \\617148^2 + 5555^2 &:= 617173^2 \\61727148^2 + 55555^2 &:= 61727173^2\end{aligned}$$

(b)

$$\begin{aligned}512^2 + 55^2 &:= 1513^2 \\154012^2 + 555^2 &:= 154013^2 \\15429012^2 + 5555^2 &:= 15429013^2 \\1543179012^2 + 55555^2 &:= 1543179013^2\end{aligned}$$

53) Patterns for Number 56

(a)

$$\begin{aligned}56^2 + 783^2 &:= 785^2 \\536^2 + 71823^2 &:= 71825^2 \\5336^2 + 7118223^2 &:= 7118225^2 \\53336^2 + 711182223^2 &:= 711182225^2\end{aligned}$$

54) Patterns for Number 57

(a)

$$\begin{aligned}57^2 + 176^2 &:= 185^2 \\12257^2 + 1776^2 &:= 12385^2 \\1234257^2 + 17776^2 &:= 1234385^2 \\123454257^2 + 177776^2 &:= 123454385^2\end{aligned}$$

55) Patterns for Number 58

(a)

$$\begin{aligned}840^2 + 58^2 &:= 842^2 \\89400^2 + 598^2 &:= 89402^2 \\8994000^2 + 5998^2 &:= 8994002^2 \\899940000^2 + 59998^2 &:= 899940002^2\end{aligned}$$

(c)

$$\begin{aligned}297^2 + 60^2 &:= 303^2 \\29997^2 + 600^2 &:= 30003^2 \\2999997^2 + 6000^2 &:= 3000003^2 \\299999997^2 + 60000^2 &:= 300000003^2\end{aligned}$$

56) Patterns for Number 59

(a)

$$\begin{aligned}1740^2 + 59^2 &:= 1741^2 \\179400^2 + 599^2 &:= 179401^2 \\17994000^2 + 5999^2 &:= 17994001^2 \\1799940000^2 + 59999^2 &:= 1799940001^2\end{aligned}$$

(d)

$$\begin{aligned}899^2 + 60^2 &:= 901^2 \\89999^2 + 600^2 &:= 90001^2 \\8999999^2 + 6000^2 &:= 9000001^2 \\899999999^2 + 60000^2 &:= 900000001^2\end{aligned}$$

57) Patterns for Number 60

(a)

$$\begin{aligned}60^2 + 11^2 &:= 61^2 \\6160^2 + 111^2 &:= 6161^2 \\617160^2 + 1111^2 &:= 617161^2 \\61727160^2 + 11111^2 &:= 61727161^2\end{aligned}$$

(e)

$$\begin{aligned}221^2 + 60^2 &:= 229^2 \\24021^2 + 620^2 &:= 24029^2 \\2418021^2 + 6220^2 &:= 2418029^2 \\241958021^2 + 62220^2 &:= 241958029^2\end{aligned}$$

(b)

$$\begin{aligned}91^2 + 60^2 &:= 109^2 \\9991^2 + 600^2 &:= 10009^2 \\999991^2 + 6000^2 &:= 1000009^2 \\99999991^2 + 60000^2 &:= 100000009^2\end{aligned}$$

(f)

$$\begin{aligned}448^2 + 60^2 &:= 452^2 \\44998^2 + 600^2 &:= 45002^2 \\4499998^2 + 6000^2 &:= 4500002^2 \\449999998^2 + 60000^2 &:= 450000002^2\end{aligned}$$

58) Patterns for Number 61

(a)

$$\begin{aligned}60^2 + 11^2 &:= 61^2 \\6160^2 + 111^2 &:= 6161^2 \\617160^2 + 1111^2 &:= 617161^2 \\61727160^2 + 11111^2 &:= 61727161^2\end{aligned}$$

(b)

$$\begin{aligned}1860^2 + 61^2 &:= 1861^2 \\180600^2 + 601^2 &:= 180601^2 \\18006000^2 + 6001^2 &:= 18006001^2 \\1800060000^2 + 60001^2 &:= 1800060001^2\end{aligned}$$

59) Patterns for Number 62

(a)

$$\begin{aligned}960^2 + 62^2 &:= 962^2 \\90600^2 + 602^2 &:= 90602^2 \\9006000^2 + 6002^2 &:= 9006002^2 \\900060000^2 + 60002^2 &:= 900060002^2\end{aligned}$$

60) Patterns for Number 63

(a)

$$\begin{aligned}660^2 + 63^2 &:= 663^2 \\60600^2 + 603^2 &:= 60603^2 \\6006000^2 + 6003^2 &:= 6006003^2 \\600060000^2 + 60003^2 &:= 600060003^2\end{aligned}$$

(b)

$$\begin{aligned}1984^2 + 63^2 &:= 1985^2 \\219784^2 + 663^2 &:= 219785^2 \\22197784^2 + 6663^2 &:= 22197785^2 \\2221977784^2 + 66663^2 &:= 2221977785^2\end{aligned}$$

61) Patterns for Number 64

(a)

$$\begin{aligned}1023^2 + 64^2 &:= 1025^2 \\110223^2 + 664^2 &:= 110225^2 \\11102223^2 + 6664^2 &:= 11102225^2 \\1111022223^2 + 66664^2 &:= 1111022225^2\end{aligned}$$

(b)

$$\begin{aligned}64^2 + 120^2 &:= 136^2 \\9964^2 + 1200^2 &:= 10036^2 \\999964^2 + 12000^2 &:= 1000036^2 \\99999964^2 + 120000^2 &:= 100000036^2\end{aligned}$$

62) Patterns for Number 65

(a)

$$\begin{aligned}2112^2 + 65^2 &:= 2113^2 \\221112^2 + 665^2 &:= 221113^2 \\22211112^2 + 6665^2 &:= 22211113^2 \\2222111112^2 + 66665^2 &:= 2222111113^2\end{aligned}$$

(b)

$$\begin{aligned}420^2 + 65^2 &:= 425^2 \\44220^2 + 665^2 &:= 44225^2 \\4442220^2 + 6665^2 &:= 4442225^2 \\444422220^2 + 66665^2 &:= 444422225^2\end{aligned}$$

63) Patterns for Number 66

(a)

$$\begin{aligned}1088^2 + 66^2 &:= 1090^2 \\11088^2 + 666^2 &:= 110890^2 \\1110888^2 + 6666^2 &:= 11108890^2 \\111108888^2 + 66666^2 &:= 1111088890^2\end{aligned}$$

(b)

$$\begin{aligned}1088^2 + 66^2 &:= 1090^2 \\91808^2 + 606^2 &:= 91810^2 \\9018008^2 + 6006^2 &:= 9018010^2 \\900180008^2 + 60006^2 &:= 900180010^2\end{aligned}$$

(c)

$$\begin{aligned}112^2 + 66^2 &:= 130^2 \\12312^2 + 666^2 &:= 12330^2 \\1234312^2 + 6666^2 &:= 1234330^2 \\123454312^2 + 66666^2 &:= 123454330^2\end{aligned}$$

64) Patterns for Number 67

(a)

$$\begin{aligned}67^2 + 2244^2 &:= 2245^2 \\667^2 + 222444^2 &:= 222445^2 \\6667^2 + 22224444^2 &:= 22224445^2 \\66667^2 + 2222244444^2 &:= 2222244445^2\end{aligned}$$

65) Patterns for Number 68

(a)

$$\begin{aligned}68^2 + 1155^2 &:= 1157^2 \\668^2 + 111555^2 &:= 111557^2 \\6668^2 + 11115555^2 &:= 11115557^2 \\66668^2 + 1111155555^2 &:= 1111155557^2\end{aligned}$$

66) Patterns for Number 69

(a)

$$\begin{aligned}69^2 + 2380^2 &:= 2381^2 \\669^2 + 223780^2 &:= 223781^2 \\6669^2 + 22237780^2 &:= 22237781^2 \\66669^2 + 2222377780^2 &:= 2222377781^2\end{aligned}$$

67) Patterns for Number 70

(a)

$$\begin{aligned}70^2 + 24^2 &:= 74^2 \\8710^2 + 264^2 &:= 8714^2 \\887110^2 + 2664^2 &:= 887114^2 \\88871110^2 + 26664^2 &:= 88871114^2\end{aligned}$$

(b)

$$\begin{aligned}1224^2 + 70^2 &:= 1226^2 \\112224^2 + 670^2 &:= 112226^2 \\11122224^2 + 6670^2 &:= 11122226^2 \\1111222224^2 + 6670^2 &:= 1111222226^2\end{aligned}$$

(c)

$$\begin{aligned}72^2 + 154^2 &:= 170^2 \\12272^2 + 1554^2 &:= 12370^2 \\1234272^2 + 15554^2 &:= 1234370^2 \\123454272^2 + 155554^2 &:= 123454370^2\end{aligned}$$

68) Patterns for Number 71

(a)

$$\begin{aligned}71^2 + 2520^2 &:= 2521^2 \\671^2 + 225120^2 &:= 225121^2 \\6671^2 + 22251120^2 &:= 22251121^2 \\66671^2 + 2222511120^2 &:= 2222511121^2\end{aligned}$$

69) Patterns for Number 72

(a)

$$\begin{aligned}72^2 + 54^2 &:= 90^2 \\9792^2 + 594^2 &:= 9810^2 \\997992^2 + 5994^2 &:= 998010^2 \\99979992^2 + 59994^2 &:= 99980010^2\end{aligned}$$

(b)

$$\begin{aligned}320^2 + 72^2 &:= 328^2 \\39200^2 + 792^2 &:= 39208^2 \\3992000^2 + 7992^2 &:= 3992008^2 \\399920000^2 + 79992^2 &:= 399920008^2\end{aligned}$$

70) Patterns for Number 73

(a)

$$\begin{aligned}48^2 + 55^2 &:= 73^2 \\6148^2 + 555^2 &:= 6173^2 \\617148^2 + 5555^2 &:= 617173^2 \\61727148^2 + 55555^2 &:= 61727173^2\end{aligned}$$

(b)

$$\begin{aligned}73^2 + 2664^2 &:= 2665^2 \\673^2 + 226464^2 &:= 226465^2 \\6673^2 + 22264464^2 &:= 22264465^2 \\66673^2 + 2222644464^2 &:= 2222644465^2\end{aligned}$$

71) Patterns for Number 74

(a)

$$\begin{aligned}70^2 + 24^2 &:= 74^2 \\8710^2 + 264^2 &:= 8714^2 \\887110^2 + 2664^2 &:= 887114^2 \\88871110^2 + 26664^2 &:= 88871114^2\end{aligned}$$

72) Patterns for Number 75

(a)

$$\begin{aligned}75^2 + 100^2 &:= 125^2 \\9975^2 + 1000^2 &:= 10025^2 \\999975^2 + 10000^2 &:= 1000025^2 \\99999975^2 + 100000^2 &:= 100000025^2\end{aligned}$$

(b)

$$\begin{aligned}40^2 + 75^2 &:= 85^2 \\340^2 + 5775^2 &:= 5785^2 \\3340^2 + 557775^2 &:= 557785^2 \\33340^2 + 55577775^2 &:= 55577785^2\end{aligned}$$

(a)

$$\begin{aligned}504^2 + 78^2 &:= 510^2 \\53064^2 + 798^2 &:= 53070^2 \\5330664^2 + 7998^2 &:= 5330670^2 \\533306664^2 + 79998^2 &:= 533306670^2\end{aligned}$$

(b)

$$\begin{aligned}1520^2 + 78^2 &:= 1522^2 \\159200^2 + 798^2 &:= 159202^2 \\15992000^2 + 7998^2 &:= 15992002^2 \\1599920000^2 + 79998^2 &:= 1599920002^2\end{aligned}$$

73) Patterns for Number 76

(a)

$$\begin{aligned}76^2 + 1443^2 &:= 1445^2 \\676^2 + 114243^2 &:= 114245^2 \\6676^2 + 11142243^2 &:= 11142245^2 \\66676^2 + 1111422243^2 &:= 1111422245^2\end{aligned}$$

74) Patterns for Number 77

(a)

$$\begin{aligned}77^2 + 36^2 &:= 85^2 \\9797^2 + 396^2 &:= 9805^2 \\997997^2 + 3996^2 &:= 998005^2 \\99979997^2 + 39996^2 &:= 99980005^2\end{aligned}$$

75) Patterns for Number 78

76) Patterns for Number 79

(a)

$$\begin{aligned}79^2 + 3120^2 &:= 3121^2 \\799^2 + 319200^2 &:= 319201^2 \\7999^2 + 31992000^2 &:= 31992001^2 \\79999^2 + 3199920000^2 &:= 3199920001^2\end{aligned}$$

77) Patterns for Number 80

(a)

$$\begin{aligned}396^2 + 80^2 &:= 404^2 \\39996^2 + 800^2 &:= 40004^2 \\3999996^2 + 8000^2 &:= 4000004^2 \\399999996^2 + 80000^2 &:= 400000004^2\end{aligned}$$

(b)

$$\begin{aligned}18^2 + 80^2 &:= 82^2 \\180^2 + 8099^2 &:= 8101^2 \\1800^2 + 809999^2 &:= 810001^2 \\18000^2 + 80999999^2 &:= 81000001^2\end{aligned}$$

(a)

$$\begin{aligned}3280^2 + 81^2 &:= 3281^2 \\320800^2 + 801^2 &:= 320801^2 \\32008000^2 + 8001^2 &:= 32008001^2 \\3200080000^2 + 80001^2 &:= 3200080001^2\end{aligned}$$

79) Patterns for Number 82

(c)

$$\begin{aligned}80^2 + 18^2 &:= 82^2 \\9800^2 + 198^2 &:= 9802^2 \\998000^2 + 1998^2 &:= 998002^2 \\99980000^2 + 19998^2 &:= 99980002^2\end{aligned}$$

(a)

$$\begin{aligned}80^2 + 18^2 &:= 82^2 \\9800^2 + 198^2 &:= 9802^2 \\998000^2 + 1998^2 &:= 998002^2 \\99980000^2 + 19998^2 &:= 99980002^2\end{aligned}$$

(d)

$$\begin{aligned}1599^2 + 80^2 &:= 1601^2 \\159999^2 + 800^2 &:= 160001^2 \\15999999^2 + 8000^2 &:= 16000001^2 \\1599999999^2 + 80000^2 &:= 1600000001^2\end{aligned}$$

(b)

$$\begin{aligned}1680^2 + 82^2 &:= 1682^2 \\160800^2 + 802^2 &:= 160802^2 \\16008000^2 + 8002^2 &:= 16008002^2 \\1600080000^2 + 80002^2 &:= 1600080002^2\end{aligned}$$

(e)

$$\begin{aligned}84^2 + 80^2 &:= 116^2 \\9984^2 + 800^2 &:= 10016^2 \\999984^2 + 8000^2 &:= 1000016^2 \\99999984^2 + 80000^2 &:= 100000016^2\end{aligned}$$

(c)

$$\begin{aligned}18^2 + 80^2 &:= 82^2 \\180^2 + 8099^2 &:= 8101^2 \\1800^2 + 809999^2 &:= 810001^2 \\18000^2 + 80999999^2 &:= 81000001^2\end{aligned}$$

80) Patterns for Number 83

78) Patterns for Number 81

(a)

$$\begin{aligned}83^2 + 3444^2 &:= 3445^2 \\833^2 + 346944^2 &:= 346945^2 \\8333^2 + 34719444^2 &:= 34719445^2 \\83333^2 + 3472194444^2 &:= 3472194445^2\end{aligned}$$

(a)

$$\begin{aligned}77^2 + 36^2 &:= 85^2 \\9797^2 + 396^2 &:= 9805^2 \\997997^2 + 3996^2 &:= 998005^2 \\99979997^2 + 39996^2 &:= 99980005^2\end{aligned}$$

81) Patterns for Number 84

(a)

$$\begin{aligned}84^2 + 13^2 &:= 85^2 \\8844^2 + 133^2 &:= 8845^2 \\888444^2 + 1333^2 &:= 888445^2 \\88884444^2 + 13333^2 &:= 88884445^2\end{aligned}$$

(b)

$$\begin{aligned}880^2 + 84^2 &:= 884^2 \\80800^2 + 804^2 &:= 80804^2 \\8008000^2 + 8004^2 &:= 8008004^2 \\800080000^2 + 80004^2 &:= 800080004^2\end{aligned}$$

(c)

$$\begin{aligned}84^2 + 80^2 &:= 116^2 \\9984^2 + 800^2 &:= 10016^2 \\999984^2 + 8000^2 &:= 1000016^2 \\9999984^2 + 80000^2 &:= 100000016^2\end{aligned}$$

82) Patterns for Number 85

(b)

$$\begin{aligned}40^2 + 75^2 &:= 85^2 \\340^2 + 5775^2 &:= 5785^2 \\3340^2 + 557775^2 &:= 557785^2 \\33340^2 + 55577775^2 &:= 55577785^2\end{aligned}$$

(c)

$$\begin{aligned}85^2 + 132^2 &:= 157^2 \\12285^2 + 1332^2 &:= 12357^2 \\1234285^2 + 13332^2 &:= 1234357^2 \\123454285^2 + 133332^2 &:= 123454357^2\end{aligned}$$

83) Patterns for Number 88

(a)

$$\begin{aligned}105^2 + 88^2 &:= 137^2 \\12305^2 + 888^2 &:= 12337^2 \\1234305^2 + 8888^2 &:= 1234337^2 \\123454305^2 + 88888^2 &:= 123454337^2\end{aligned}$$

(b)

$$\begin{aligned}480^2 + 88^2 &:= 488^2 \\49280^2 + 888^2 &:= 49288^2 \\4937280^2 + 8888^2 &:= 4937288^2 \\493817280^2 + 88888^2 &:= 493817288^2\end{aligned}$$

(c)

$$\begin{aligned}1935^2 + 88^2 &:= 1937^2 \\197135^2 + 888^2 &:= 197137^2 \\19749135^2 + 8888^2 &:= 19749137^2 \\1975269135^2 + 88888^2 &:= 1975269137^2\end{aligned}$$

(b)

$$\begin{aligned}2024^2 + 90^2 &:= 2026^2 \\207024^2 + 910^2 &:= 207026^2 \\20748024^2 + 9110^2 &:= 20748026^2 \\2075258024^2 + 91110^2 &:= 2075258026^2\end{aligned}$$

(c)

$$\begin{aligned}48^2 + 90^2 &:= 102^2 \\408^2 + 6930^2 &:= 6942^2 \\4008^2 + 669330^2 &:= 669342^2 \\40008^2 + 66693330^2 &:= 66693342^2\end{aligned}$$

84) Patterns for Number 89

(a)

$$\begin{aligned}89^2 + 3960^2 &:= 3961^2 \\889^2 + 395160^2 &:= 395161^2 \\8889^2 + 39507160^2 &:= 39507161^2 \\88889^2 + 3950627160^2 &:= 3950627161^2\end{aligned}$$

(d)

$$\begin{aligned}216^2 + 90^2 &:= 234^2 \\24016^2 + 930^2 &:= 24034^2 \\2418016^2 + 9330^2 &:= 2418034^2 \\241958016^2 + 93330^2 &:= 241958034^2\end{aligned}$$

85) Patterns for Number 90

(a)

$$\begin{aligned}72^2 + 54^2 &:= 90^2 \\9792^2 + 594^2 &:= 9810^2 \\997992^2 + 5994^2 &:= 998010^2 \\99979992^2 + 59994^2 &:= 99980010^2\end{aligned}$$

(a)

$$\begin{aligned}91^2 + 60^2 &:= 109^2 \\9991^2 + 600^2 &:= 10009^2 \\999991^2 + 6000^2 &:= 1000009^2 \\99999991^2 + 60000^2 &:= 100000009^2\end{aligned}$$

87) Patterns for Number 96

(a)

$$\begin{aligned}96^2 + 110^2 &:= 146^2 \\960^2 + 1100^2 &:= 1460^2 \\9600^2 + 11000^2 &:= 14600^2 \\96000^2 + 110000^2 &:= 146000^2\end{aligned}$$

(b)

$$\begin{aligned}96^2 + 40^2 &:= 104^2 \\9996^2 + 400^2 &:= 10004^2 \\999996^2 + 4000^2 &:= 1000004^2 \\99999996^2 + 40000^2 &:= 100000004^2\end{aligned}$$

(c)

$$\begin{aligned}1632^2 + 99^2 &:= 1635^2 \\166332^2 + 999^2 &:= 166335^2 \\16663332^2 + 9999^2 &:= 16663335^2 \\1666633332^2 + 99999^2 &:= 1666633335^2\end{aligned}$$

(d)

$$\begin{aligned}540^2 + 99^2 &:= 549^2 \\55440^2 + 999^2 &:= 55449^2 \\5554440^2 + 9999^2 &:= 5554449^2 \\555544440^2 + 99999^2 &:= 555544449^2\end{aligned}$$

88) Patterns for Number 99

(a)

$$\begin{aligned}99^2 + 4900^2 &:= 4901^2 \\999^2 + 499000^2 &:= 499001^2 \\9999^2 + 49990000^2 &:= 49990001^2 \\99999^2 + 4999900000^2 &:= 4999900001^2\end{aligned}$$

(b)

$$\begin{aligned}99^2 + 20^2 &:= 101^2 \\12099^2 + 220^2 &:= 12101^2 \\1232099^2 + 2220^2 &:= 1232101^2 \\123432099^2 + 22220^2 &:= 123432101^2\end{aligned}$$

(e)

$$\begin{aligned}99^2 + 20^2 &:= 101^2 \\9999^2 + 200^2 &:= 10001^2 \\999999^2 + 2000^2 &:= 1000001^2 \\99999999^2 + 20000^2 &:= 100000001^2\end{aligned}$$

89) Patterns for Number 100

(a)

$$\begin{aligned}75^2 + 100^2 &:= 125^2 \\9975^2 + 1000^2 &:= 10025^2 \\999975^2 + 10000^2 &:= 1000025^2 \\99999975^2 + 100000^2 &:= 100000025^2\end{aligned}$$

(b)

$$\begin{aligned} 495^2 + 100^2 &:= 505^2 \\ 49995^2 + 1000^2 &:= 50005^2 \\ 4999995^2 + 10000^2 &:= 5000005^2 \\ 499999995^2 + 100000^2 &:= 500000005^2 \end{aligned}$$

(c)

$$\begin{aligned} 2499^2 + 100^2 &:= 2501^2 \\ 24999^2 + 1000^2 &:= 250001^2 \\ 2499999^2 + 10000^2 &:= 25000001^2 \\ 249999999^2 + 100000^2 &:= 2500000001^2 \end{aligned}$$

(d)

$$\begin{aligned} 621^2 + 100^2 &:= 629^2 \\ 65021^2 + 1020^2 &:= 65029^2 \\ 6528021^2 + 10220^2 &:= 6528029^2 \\ 653058021^2 + 102220^2 &:= 653058029^2 \end{aligned}$$

(e)

$$\begin{aligned} 100^2 + 2499^2 &:= 2501^2 \\ 1000^2 + 24999^2 &:= 250001^2 \\ 10000^2 + 2499999^2 &:= 25000001^2 \\ 100000^2 + 249999999^2 &:= 2500000001^2 \end{aligned}$$

2.2 Pattern in Pythagorean Triples: 101 to 200

90) Patterns for Number 101

(a)

$$\begin{aligned} 5100^2 + 101^2 &:= 5101^2 \\ 501000^2 + 1001^2 &:= 501001^2 \\ 50010000^2 + 10001^2 &:= 50010001^2 \\ 5000100000^2 + 100001^2 &:= 5000100001^2 \end{aligned}$$

(b)

$$\begin{aligned} 20^2 + 99^2 &:= 101^2 \\ 200^2 + 9999^2 &:= 10001^2 \\ 2000^2 + 999999^2 &:= 1000001^2 \\ 20000^2 + 99999999^2 &:= 100000001^2 \end{aligned}$$

(c)

$$\begin{aligned} 99^2 + 20^2 &:= 101^2 \\ 12099^2 + 220^2 &:= 12101^2 \\ 1232099^2 + 2220^2 &:= 1232101^2 \\ 123432099^2 + 22220^2 &:= 123432101^2 \end{aligned}$$

91) Patterns for Number 102

(a)

$$\begin{aligned} 48^2 + 90^2 &:= 102^2 \\ 408^2 + 6930^2 &:= 6942^2 \\ 4008^2 + 669330^2 &:= 669342^2 \\ 40008^2 + 66693330^2 &:= 66693342^2 \end{aligned}$$

(b)

$$\begin{aligned}102^2 + 2600^2 &:= 2602^2 \\1020^2 + 260099^2 &:= 260101^2 \\10200^2 + 26009999^2 &:= 26010001^2 \\102000^2 + 2600999999^2 &:= 2601000001^2\end{aligned}$$

(c)

$$\begin{aligned}102^2 + 136^2 &:= 170^2 \\1002^2 + 1336^2 &:= 1670^2 \\10002^2 + 13336^2 &:= 16670^2 \\100002^2 + 133336^2 &:= 166670^2\end{aligned}$$

(b)

$$\begin{aligned}96^2 + 40^2 &:= 104^2 \\9996^2 + 400^2 &:= 10004^2 \\999996^2 + 4000^2 &:= 1000004^2 \\99999996^2 + 40000^2 &:= 100000004^2\end{aligned}$$

(c)

$$\begin{aligned}104^2 + 2703^2 &:= 2705^2 \\1040^2 + 270399^2 &:= 270401^2 \\10400^2 + 27039999^2 &:= 27040001^2 \\104000^2 + 2703999999^2 &:= 2704000001^2\end{aligned}$$

92) Patterns for Number 103

(a)

$$\begin{aligned}103^2 + 5304^2 &:= 5305^2 \\1003^2 + 503004^2 &:= 503005^2 \\10003^2 + 50030004^2 &:= 50030005^2 \\100003^2 + 5000300004^2 &:= 5000300005^2\end{aligned}$$

93) Patterns for Number 104

(a)

$$\begin{aligned}672^2 + 104^2 &:= 680^2 \\70752^2 + 1064^2 &:= 70760^2 \\7107552^2 + 10664^2 &:= 7107560^2 \\711075552^2 + 106664^2 &:= 711075560^2\end{aligned}$$

94) Patterns for Number 105

(a)

$$\begin{aligned}1100^2 + 105^2 &:= 1105^2 \\101000^2 + 1005^2 &:= 101005^2 \\10010000^2 + 10005^2 &:= 10010005^2 \\1000100000^2 + 100005^2 &:= 1000100005^2\end{aligned}$$

(b)

$$\begin{aligned}105^2 + 88^2 &:= 137^2 \\12305^2 + 888^2 &:= 12337^2 \\1234305^2 + 8888^2 &:= 1234337^2 \\123454305^2 + 88888^2 &:= 123454337^2\end{aligned}$$

(c)

$$\begin{aligned}105^2 + 5512^2 &:= 5513^2 \\1005^2 + 505012^2 &:= 505013^2 \\10005^2 + 50050012^2 &:= 50050013^2 \\100005^2 + 5000500012^2 &:= 5000500013^2\end{aligned}$$

(b)

$$\begin{aligned}108^2 + 2915^2 &:= 2917^2 \\1080^2 + 29159^2 &:= 29160^2 \\10800^2 + 291599^2 &:= 291600^2 \\108000^2 + 2915999^2 &:= 2916000^2 \\108000^2 + 29159999^2 &:= 29160000^2\end{aligned}$$

95) Patterns for Number 106

(a)

$$\begin{aligned}106^2 + 2808^2 &:= 2810^2 \\1060^2 + 28089^2 &:= 28090^2 \\10600^2 + 280899^2 &:= 280900^2 \\106000^2 + 2808999^2 &:= 2809000^2\end{aligned}$$

98) Patterns for Number 109

(a)

$$\begin{aligned}109^2 + 5940^2 &:= 5941^2 \\1009^2 + 509040^2 &:= 509041^2 \\10009^2 + 50090040^2 &:= 50090041^2 \\100009^2 + 5000900040^2 &:= 5000900041^2\end{aligned}$$

96) Patterns for Number 107

(a)

$$\begin{aligned}107^2 + 5724^2 &:= 5725^2 \\1007^2 + 507024^2 &:= 507025^2 \\10007^2 + 50070024^2 &:= 50070025^2 \\100007^2 + 5000700024^2 &:= 5000700025^2\end{aligned}$$

(b)

$$\begin{aligned}91^2 + 60^2 &:= 109^2 \\9991^2 + 600^2 &:= 10009^2 \\999991^2 + 6000^2 &:= 1000009^2 \\99999991^2 + 60000^2 &:= 100000009^2\end{aligned}$$

97) Patterns for Number 108

(a)

$$\begin{aligned}144^2 + 108^2 &:= 180^2 \\1440^2 + 1080^2 &:= 1800^2 \\14400^2 + 10800^2 &:= 18000^2 \\144000^2 + 108000^2 &:= 180000^2\end{aligned}$$

99) Patterns for Number 110

(a)

$$\begin{aligned}96^2 + 110^2 &:= 146^2 \\960^2 + 1100^2 &:= 1460^2 \\9600^2 + 11000^2 &:= 14600^2 \\96000^2 + 110000^2 &:= 146000^2\end{aligned}$$

(b)

$$\begin{aligned}3024^2 + 110^2 &:= 3026^2 \\308024^2 + 1110^2 &:= 308026^2 \\30858024^2 + 11110^2 &:= 30858026^2 \\3086358024^2 + 111110^2 &:= 3086358026^2\end{aligned}$$

(c)

$$\begin{aligned}110^2 + 3024^2 &:= 3026^2 \\1100^2 + 302499^2 &:= 302501^2 \\11000^2 + 30249999^2 &:= 30250001^2 \\110000^2 + 3024999999^2 &:= 3025000001^2\end{aligned}$$

100) Patterns for Number 111

(a)

$$\begin{aligned}111^2 + 6160^2 &:= 6161^2 \\1111^2 + 617160^2 &:= 617161^2 \\11111^2 + 61727160^2 &:= 61727161^2 \\111111^2 + 6172827160^2 &:= 6172827161^2\end{aligned}$$

101) Patterns for Number 112

(a)

$$\begin{aligned}112^2 + 66^2 &:= 130^2 \\12312^2 + 666^2 &:= 12330^2 \\1234312^2 + 6666^2 &:= 1234330^2 \\123454312^2 + 66666^2 &:= 123454330^2\end{aligned}$$

(b)

$$\begin{aligned}112^2 + 3135^2 &:= 3137^2 \\1112^2 + 309135^2 &:= 309137^2 \\11112^2 + 30869135^2 &:= 30869137^2 \\111112^2 + 3086469135^2 &:= 3086469137^2\end{aligned}$$

(c)

$$\begin{aligned}112^2 + 3135^2 &:= 3137^2 \\1120^2 + 313599^2 &:= 313601^2 \\11200^2 + 31359999^2 &:= 31360001^2 \\112000^2 + 3135999999^2 &:= 3136000001^2\end{aligned}$$

102) Patterns for Number 113

(a)

$$\begin{aligned}113^2 + 6384^2 &:= 6385^2 \\1133^2 + 641844^2 &:= 641845^2 \\11333^2 + 64218444^2 &:= 64218445^2 \\113333^2 + 6422184444^2 &:= 6422184445^2\end{aligned}$$

103) Patterns for Number 114

(a)

$$\begin{aligned}114^2 + 3248^2 &:= 3250^2 \\1140^2 + 324899^2 &:= 324901^2 \\11400^2 + 32489999^2 &:= 32490001^2 \\114000^2 + 3248999999^2 &:= 3249000001^2\end{aligned}$$

(b)

$$\begin{aligned}114^2 + 3248^2 &:= 3250^2 \\1114^2 + 310248^2 &:= 310250^2 \\11114^2 + 30880248^2 &:= 30880250^2 \\111114^2 + 3086580248^2 &:= 3086580250^2\end{aligned}$$

104) Patterns for Number 115

(a)

$$\begin{aligned}115^2 + 6612^2 &:= 6613^2 \\1115^2 + 621612^2 &:= 621613^2 \\11115^2 + 61771612^2 &:= 61771613^2 \\111115^2 + 6173271612^2 &:= 6173271613^2\end{aligned}$$

105) Patterns for Number 116

(a)

$$\begin{aligned}84^2 + 80^2 &:= 116^2 \\9984^2 + 800^2 &:= 10016^2 \\999984^2 + 8000^2 &:= 1000016^2 \\9999984^2 + 80000^2 &:= 100000016^2\end{aligned}$$

(b)

$$\begin{aligned}116^2 + 3363^2 &:= 3365^2 \\1160^2 + 336399^2 &:= 336401^2 \\11600^2 + 33639999^2 &:= 33640001^2 \\116000^2 + 3363999999^2 &:= 3364000001^2\end{aligned}$$

(c)

$$\begin{aligned}116^2 + 3363^2 &:= 3365^2 \\1116^2 + 311363^2 &:= 311365^2 \\11116^2 + 30891363^2 &:= 30891365^2 \\111116^2 + 3086691363^2 &:= 3086691365^2\end{aligned}$$

106) Patterns for Number 117

(a)

$$\begin{aligned}756^2 + 117^2 &:= 765^2 \\79596^2 + 1197^2 &:= 79605^2 \\7995996^2 + 11997^2 &:= 7996005^2 \\799959996^2 + 119997^2 &:= 799960005^2\end{aligned}$$

(b)

$$\begin{aligned}117^2 + 44^2 &:= 125^2 \\12317^2 + 444^2 &:= 12325^2 \\1234317^2 + 4444^2 &:= 1234325^2 \\123454317^2 + 44444^2 &:= 123454325^2\end{aligned}$$

(c)

$$\begin{aligned}117^2 + 6844^2 &:= 6845^2 \\1117^2 + 623844^2 &:= 623845^2 \\11117^2 + 61793844^2 &:= 61793845^2 \\111117^2 + 6173493844^2 &:= 6173493845^2\end{aligned}$$

107) Patterns for Number 118

(a)

$$118^2 + 3480^2 := 3482^2$$

$$1118^2 + 312480^2 := 312482^2$$

$$11118^2 + 30902480^2 := 30902482^2$$

$$111118^2 + 3086802480^2 := 3086802482^2$$

(b)

$$118^2 + 3480^2 := 3482^2$$

$$1180^2 + 348099^2 := 348101^2$$

$$11800^2 + 34809999^2 := 34810001^2$$

$$118000^2 + 3480999999^2 := 3481000001^2$$

108) Patterns for Number 119

(a)

$$119^2 + 7080^2 := 7081^2$$

$$1199^2 + 718800^2 := 718801^2$$

$$11999^2 + 71988000^2 := 71988001^2$$

$$119999^2 + 7199880000^2 := 7199880001^2$$

109) Patterns for Number 120

(a)

$$896^2 + 120^2 := 904^2$$

$$89996^2 + 1200^2 := 90004^2$$

$$8999996^2 + 12000^2 := 9000004^2$$

$$899999996^2 + 120000^2 := 900000004^2$$

(b)

$$64^2 + 120^2 := 136^2$$

$$9964^2 + 1200^2 := 10036^2$$

$$999964^2 + 12000^2 := 1000036^2$$

$$99999964^2 + 120000^2 := 100000036^2$$

(c)

$$3599^2 + 120^2 := 3601^2$$

$$359999^2 + 1200^2 := 360001^2$$

$$35999999^2 + 12000^2 := 36000001^2$$

$$3599999999^2 + 120000^2 := 3600000001^2$$

(d)

$$120^2 + 22^2 := 122^2$$

$$12320^2 + 222^2 := 12322^2$$

$$1234320^2 + 2222^2 := 1234322^2$$

$$123454320^2 + 22222^2 := 123454322^2$$

(e)

$$120^2 + 22^2 := 122^2$$

$$10200^2 + 202^2 := 10202^2$$

$$1002000^2 + 2002^2 := 1002002^2$$

$$100020000^2 + 20002^2 := 100020002^2$$

(f)

$$594^2 + 120^2 := 606^2$$

$$59994^2 + 1200^2 := 60006^2$$

$$5999994^2 + 12000^2 := 6000006^2$$

$$599999994^2 + 120000^2 := 600000006^2$$

(g)

$$\begin{aligned} 120^2 + 182^2 &:= 218^2 \\ 1200^2 + 19982^2 &:= 20018^2 \\ 12000^2 + 1999982^2 &:= 2000018^2 \\ 120000^2 + 199999982^2 &:= 200000018^2 \end{aligned}$$

(h)

$$\begin{aligned} 209^2 + 120^2 &:= 241^2 \\ 24009^2 + 1240^2 &:= 24041^2 \\ 2418009^2 + 12440^2 &:= 2418041^2 \\ 241958009^2 + 124440^2 &:= 241958041^2 \end{aligned}$$

(i)

$$\begin{aligned} 391^2 + 120^2 &:= 409^2 \\ 39991^2 + 1200^2 &:= 40009^2 \\ 3999991^2 + 12000^2 &:= 4000009^2 \\ 399999991^2 + 120000^2 &:= 400000009^2 \end{aligned}$$

110) Patterns for Number 121

(a)

$$\begin{aligned} 121^2 + 7320^2 &:= 7321^2 \\ 1211^2 + 733260^2 &:= 733261^2 \\ 12111^2 + 73338160^2 &:= 73338161^2 \\ 121111^2 + 7333937160^2 &:= 7333937161^2 \end{aligned}$$

(b)

$$\begin{aligned} 121^2 + 660^2 &:= 671^2 \\ 1221^2 + 6660^2 &:= 6771^2 \\ 12221^2 + 66660^2 &:= 67771^2 \\ 122221^2 + 666660^2 &:= 677771^2 \end{aligned}$$

111) Patterns for Number 122

(a)

$$\begin{aligned} 120^2 + 22^2 &:= 122^2 \\ 10200^2 + 202^2 &:= 10202^2 \\ 1002000^2 + 2002^2 &:= 1002002^2 \\ 100020000^2 + 20002^2 &:= 100020002^2 \end{aligned}$$

(b)

$$\begin{aligned} 120^2 + 22^2 &:= 122^2 \\ 12320^2 + 222^2 &:= 12322^2 \\ 1234320^2 + 2222^2 &:= 1234322^2 \\ 123454320^2 + 22222^2 &:= 123454322^2 \end{aligned}$$

(c)

$$\begin{aligned} 122^2 + 3720^2 &:= 3722^2 \\ 1222^2 + 373320^2 &:= 373322^2 \\ 12222^2 + 37344320^2 &:= 37344322^2 \\ 122222^2 + 3734554320^2 &:= 3734554322^2 \end{aligned}$$

(d)

$$\begin{aligned}122^2 + 3720^2 &:= 3722^2 \\1220^2 + 372099^2 &:= 372101^2 \\12200^2 + 37209999^2 &:= 37210001^2 \\122000^2 + 3720999999^2 &:= 3721000001^2\end{aligned}$$

(b)

$$\begin{aligned}124^2 + 3843^2 &:= 3845^2 \\1240^2 + 384399^2 &:= 384401^2 \\12400^2 + 38439999^2 &:= 38440001^2 \\124000^2 + 3843999999^2 &:= 3844000001^2\end{aligned}$$

112) Patterns for Number 123

(a)

$$\begin{aligned}7564^2 + 123^2 &:= 7565^2 \\875164^2 + 1323^2 &:= 875165^2 \\88751164^2 + 13323^2 &:= 88751165^2 \\8887511164^2 + 133323^2 &:= 8887511165^2\end{aligned}$$

(b)

$$\begin{aligned}123^2 + 164^2 &:= 205^2 \\1233^2 + 1644^2 &:= 2055^2 \\12333^2 + 16444^2 &:= 20555^2 \\123333^2 + 164444^2 &:= 205555^2\end{aligned}$$

113) Patterns for Number 124

(a)

$$\begin{aligned}124^2 + 3843^2 &:= 3845^2 \\1124^2 + 315843^2 &:= 315845^2 \\11124^2 + 30935843^2 &:= 30935845^2 \\111124^2 + 3087135843^2 &:= 3087135845^2\end{aligned}$$

114) Patterns for Number 125

(a)

$$\begin{aligned}125^2 + 7812^2 &:= 7813^2 \\1255^2 + 787512^2 &:= 787513^2 \\12555^2 + 78814012^2 &:= 78814013^2 \\125555^2 + 7882029012^2 &:= 7882029013^2\end{aligned}$$

(b)

$$\begin{aligned}812^2 + 125^2 &:= 7813^2 \\877812^2 + 1325^2 &:= 877813^2 \\88777812^2 + 13325^2 &:= 88777813^2 \\8887777812^2 + 133325^2 &:= 8887777813^2\end{aligned}$$

(c)

$$\begin{aligned}75^2 + 100^2 &:= 125^2 \\9975^2 + 1000^2 &:= 10025^2 \\999975^2 + 10000^2 &:= 1000025^2 \\99999975^2 + 100000^2 &:= 100000025^2\end{aligned}$$

(d)

$$\begin{aligned}117^2 + 44^2 &:= 125^2 \\12317^2 + 444^2 &:= 12325^2 \\1234317^2 + 4444^2 &:= 1234325^2 \\123454317^2 + 44444^2 &:= 123454325^2\end{aligned}$$

(e)

$$\begin{aligned}125^2 + 300^2 &:= 325^2 \\14025^2 + 31000^2 &:= 34025^2 \\1418025^2 + 3110000^2 &:= 3418025^2 \\141958025^2 + 311100000^2 &:= 341958025^2\end{aligned}$$

115) Patterns for Number 126

(a)

$$\begin{aligned}126^2 + 168^2 &:= 210^2 \\1266^2 + 1688^2 &:= 2110^2 \\12666^2 + 16888^2 &:= 21110^2 \\126666^2 + 168888^2 &:= 211110^2\end{aligned}$$

(b)

$$\begin{aligned}1320 + 126^2 &:= 1326^2 \\121200^2 + 1206^2 &:= 121206^2 \\12012000^2 + 12006^2 &:= 12012006^2 \\1200120000^2 + 120006^2 &:= 1200120006^2\end{aligned}$$

116) Patterns for Number 127

(a)

$$\begin{aligned}8064^2 + 127^2 &:= 8065^2 \\880464^2 + 1327^2 &:= 880465^2 \\88804464^2 + 13327^2 &:= 88804465^2 \\8888044464^2 + 133327^2 &:= 8888044465^2\end{aligned}$$

117) Patterns for Number 128

(a)

$$\begin{aligned}128^2 + 2046^2 &:= 2050^2 \\1328^2 + 220446^2 &:= 220450^2 \\13328^2 + 22204446^2 &:= 22204450^2 \\133328^2 + 2222044446^2 &:= 2222044450^2\end{aligned}$$

118) Patterns for Number 129

(a)

$$\begin{aligned}129^2 + 8320^2 &:= 8321^2 \\1329^2 + 883120^2 &:= 883121^2 \\13329^2 + 88831120^2 &:= 88831121^2 \\133329^2 + 8888311120^2 &:= 8888311121^2\end{aligned}$$

119) Patterns for Number 130

(a)

$$\begin{aligned}112^2 + 66^2 &:= 130^2 \\12312^2 + 666^2 &:= 12330^2 \\1234312^2 + 6666^2 &:= 1234330^2 \\123454312^2 + 66666^2 &:= 123454330^2\end{aligned}$$

(b)

$$\begin{aligned}4224^2 + 130^2 &:= 4226^2 \\442224^2 + 1330^2 &:= 442226^2 \\44422224^2 + 13330^2 &:= 44422226^2 \\4444222224^2 + 133330^2 &:= 4444222226^2\end{aligned}$$

(c)

$$\begin{aligned}2176^2 + 132^2 &:= 2180^2 \\221776^2 + 1332^2 &:= 221780^2 \\22217776^2 + 13332^2 &:= 22217780^2 \\2222177776^2 + 133332^2 &:= 2222177780^2\end{aligned}$$

120) Patterns for Number 131

(a)

$$\begin{aligned}131^2 + 8580^2 &:= 8581^2 \\1331^2 + 885780^2 &:= 885781^2 \\13331^2 + 88857780^2 &:= 88857781^2 \\133331^2 + 8888577780^2 &:= 8888577781^2\end{aligned}$$

(d)

$$\begin{aligned}85^2 + 132^2 &:= 157^2 \\12285^2 + 1332^2 &:= 12357^2 \\1234285^2 + 13332^2 &:= 1234357^2 \\123454285^2 + 133332^2 &:= 123454357^2\end{aligned}$$

121) Patterns for Number 132

(a)

$$\begin{aligned}1085^2 + 132^2 &:= 1093^2 \\110885^2 + 1332^2 &:= 110893^2 \\11108885^2 + 13332^2 &:= 11108893^2 \\1111088885^2 + 133332^2 &:= 1111088893^2\end{aligned}$$

(e)

$$\begin{aligned}475^2 + 132^2 &:= 493^2 \\49275^2 + 1332^2 &:= 49293^2 \\4937275^2 + 13332^2 &:= 4937293^2 \\493817275^2 + 133332^2 &:= 493817293^2\end{aligned}$$

122) Patterns for Number 133

(a)

$$\begin{aligned}8844^2 + 133^2 &:= 8845^2 \\888444^2 + 1333^2 &:= 888445^2 \\88884444^2 + 13333^2 &:= 88884445^2 \\8888844444^2 + 133333^2 &:= 8888844445^2\end{aligned}$$

(b)

$$\begin{aligned}4355^2 + 132^2 &:= 4357^2 \\443555^2 + 1332^2 &:= 443557^2 \\44435555^2 + 13332^2 &:= 44435557^2 \\4444355555^2 + 133332^2 &:= 4444355557^2\end{aligned}$$

123) Patterns for Number 134

(a)

$$\begin{aligned}134^2 + 4488^2 &:= 4490^2 \\1334^2 + 44488^2 &:= 444890^2 \\13334^2 + 4444888^2 &:= 44448890^2 \\133334^2 + 444448888^2 &:= 4444488890^2\end{aligned}$$

(b)

$$\begin{aligned}64^2 + 120^2 &:= 136^2 \\9964^2 + 1200^2 &:= 10036^2 \\999964^2 + 12000^2 &:= 1000036^2 \\9999964^2 + 120000^2 &:= 10000036^2\end{aligned}$$

124) Patterns for Number 135

(a)

$$\begin{aligned}135^2 + 9112^2 &:= 9113^2 \\1335^2 + 891112^2 &:= 891113^2 \\13335^2 + 88911112^2 &:= 88911113^2 \\133335^2 + 8889111112^2 &:= 8889111113^2\end{aligned}$$

(c)

$$\begin{aligned}136^2 + 4623^2 &:= 4625^2 \\1336^2 + 446223^2 &:= 446225^2 \\13336^2 + 44462223^2 &:= 44462225^2 \\133336^2 + 4444622223^2 &:= 4444622225^2\end{aligned}$$

(b)

$$\begin{aligned}135^2 + 9112^2 &:= 9113^2 \\1355^2 + 918012^2 &:= 918013^2 \\13555^2 + 91869012^2 &:= 91869013^2 \\135555^2 + 9187579012^2 &:= 9187579013^2\end{aligned}$$

(d)

$$\begin{aligned}102^2 + 136^2 &:= 170^2 \\1002^2 + 1336^2 &:= 1670^2 \\10002^2 + 13336^2 &:= 16670^2 \\100002^2 + 133336^2 &:= 166670^2\end{aligned}$$

125) Patterns for Number 136

(a)

$$\begin{aligned}136^2 + 2310^2 &:= 2314^2 \\1336^2 + 223110^2 &:= 223114^2 \\13336^2 + 22231110^2 &:= 22231114^2 \\133336^2 + 2222311110^2 &:= 2222311114^2\end{aligned}$$

(e)

$$\begin{aligned}136^2 + 4623^2 &:= 4625^2 \\1360^2 + 462399^2 &:= 462401^2 \\13600^2 + 46239999^2 &:= 46240001^2 \\136000^2 + 4623999999^2 &:= 4624000001^2\end{aligned}$$

126) Patterns for Number 137

(a)

$$105^2 + 88^2 := 137^2$$

$$12305^2 + 888^2 := 12337^2$$

$$1234305^2 + 8888^2 := 1234337^2$$

$$123454305^2 + 88888^2 := 123454337^2$$

(b)

$$137^2 + 9384^2 := 9385^2$$

$$1337^2 + 893784^2 := 893785^2$$

$$13337^2 + 88937784^2 := 88937785^2$$

$$133337^2 + 8889377784^2 := 8889377785^2$$

127) Patterns for Number 138

(a)

$$138^2 + 4760^2 := 4762^2$$

$$1338^2 + 447560^2 := 447562^2$$

$$13338^2 + 44475560^2 := 44475562^2$$

$$133338^2 + 4444755560^2 := 4444755562^2$$

128) Patterns for Number 139

(a)

$$9660^2 + 139^2 := 9661^2$$

$$896460^2 + 1339^2 := 896461^2$$

$$88964460^2 + 13339^2 := 88964461^2$$

$$8889644460^2 + 133339^2 := 8889644461^2$$

129) Patterns for Number 140

(a)

$$693^2 + 140^2 := 707^2$$

$$69993^2 + 1400^2 := 70007^2$$

$$6999993^2 + 14000^2 := 7000007^2$$

$$699999993^2 + 140000^2 := 700000007^2$$

(b)

$$2448^2 + 140^2 := 2452^2$$

$$244998^2 + 1400^2 := 245002^2$$

$$24499998^2 + 14000^2 := 24500002^2$$

$$2449999998^2 + 140000^2 := 2450000002^2$$

(c)

$$140^2 + 1221^2 := 1229^2$$

$$1340^2 + 112221^2 := 112229^2$$

$$13340^2 + 11122221^2 := 11122229^2$$

$$133340^2 + 1111222221^2 := 1111222229^2$$

(d)

$$51^2 + 140^2 := 149^2$$

$$9951^2 + 1400^2 := 10049^2$$

$$999951^2 + 14000^2 := 1000049^2$$

$$99999951^2 + 140000^2 := 100000049^2$$

(e)

$$4899^2 + 140^2 := 4901^2$$

$$489999^2 + 1400^2 := 490001^2$$

$$48999999^2 + 14000^2 := 49000001^2$$

$$4899999999^2 + 140000^2 := 4900000001^2$$

(f)

$$\begin{aligned} 1221^2 + 140^2 &:= 1229^2 \\ 112221^2 + 1340^2 &:= 112229^2 \\ 11122221^2 + 13340^2 &:= 11122229^2 \\ 1111222221^2 + 133340^2 &:= 1111222229^2 \end{aligned}$$

(a)

$$\begin{aligned} 143^2 + 24^2 &:= 145^2 \\ 17423^2 + 264^2 &:= 17425^2 \\ 1774223^2 + 2664^2 &:= 1774225^2 \\ 177742223^2 + 26664^2 &:= 177742225^2 \end{aligned}$$

130) Patterns for Number 141

(a)

$$\begin{aligned} 141^2 + 9940^2 &:= 9941^2 \\ 1411^2 + 995460^2 &:= 995461^2 \\ 14111^2 + 99560160^2 &:= 99560161^2 \\ 141111^2 + 9956157160^2 &:= 9956157161^2 \end{aligned}$$

(b)

$$\begin{aligned} 143^2 + 24^2 &:= 145^2 \\ 10403^2 + 204^2 &:= 10405^2 \\ 1004003^2 + 2004^2 &:= 1004005^2 \\ 100040003^2 + 20004^2 &:= 100040005^2 \end{aligned}$$

131) Patterns for Number 142

(a)

$$\begin{aligned} 142^2 + 5040^2 &:= 5042^2 \\ 1342^2 + 450240^2 &:= 450242^2 \\ 13342^2 + 44502240^2 &:= 44502242^2 \\ 133342^2 + 4445022240^2 &:= 4445022242^2 \end{aligned}$$

(c)

$$\begin{aligned} 143^2 + 24^2 &:= 145^2 \\ 12543^2 + 224^2 &:= 12545^2 \\ 1236543^2 + 2224^2 &:= 1236545^2 \\ 123476543^2 + 22224^2 &:= 123476545^2 \end{aligned}$$

133) Patterns for Number 144

(b)

$$\begin{aligned} 142^2 + 5040^2 &:= 5042^2 \\ 1420^2 + 504099^2 &:= 504101^2 \\ 14200^2 + 50409999^2 &:= 50410001^2 \\ 142000^2 + 5040999999^2 &:= 5041000001^2 \end{aligned}$$

(a)

$$\begin{aligned} 144^2 + 108^2 &:= 180^2 \\ 1440^2 + 1080^2 &:= 1800^2 \\ 14400^2 + 10800^2 &:= 18000^2 \\ 144000^2 + 108000^2 &:= 180000^2 \end{aligned}$$

132) Patterns for Number 143

(b)

$$5183^2 + 144^2 := 5185^2$$

$$521283^2 + 1444^2 := 521285^2$$

$$52157283^2 + 14444^2 := 52157285^2$$

$$5216017283^2 + 144444^2 := 5216017285^2$$

(c)

$$144^2 + 640^2 := 656^2$$

$$12444^2 + 66400^2 := 67556^2$$

$$1224444^2 + 6664000^2 := 6775556^2$$

$$122244444^2 + 666640000^2 := 677755556^2$$

(c)

$$143^2 + 24^2 := 145^2$$

$$10403^2 + 204^2 := 10405^2$$

$$1004003^2 + 2004^2 := 1004005^2$$

$$100040003^2 + 20004^2 := 100040005^2$$

(d)

$$145^2 + 10512^2 := 10513^2$$

$$1455^2 + 1058512^2 := 1058513^2$$

$$14555^2 + 105924012^2 := 105924013^2$$

$$145555^2 + 10593129012^2 := 10593129013^2$$

134) Patterns for Number 145

(a)

$$143^2 + 24^2 := 145^2$$

$$17423^2 + 264^2 := 17425^2$$

$$1774223^2 + 2664^2 := 1774225^2$$

$$177742223^2 + 26664^2 := 177742225^2$$

(b)

$$143^2 + 24^2 := 145^2$$

$$12543^2 + 224^2 := 12545^2$$

$$1236543^2 + 2224^2 := 1236545^2$$

$$123476543^2 + 22224^2 := 123476545^2$$

135) Patterns for Number 146

(a)

$$96^2 + 110^2 := 146^2$$

$$960^2 + 1100^2 := 1460^2$$

$$9600^2 + 11000^2 := 14600^2$$

$$96000^2 + 110000^2 := 146000^2$$

(b)

$$146^2 + 5328^2 := 5330^2$$

$$1460^2 + 53289^2 := 53290^2$$

$$14600^2 + 5328999^2 := 5329000^2$$

$$146000^2 + 532899999^2 := 532900000^2$$

136) Patterns for Number 147

(a)

$$\begin{aligned}147^2 + 504^2 &:= 525^2 \\1477^2 + 5064^2 &:= 5275^2 \\14777^2 + 50664^2 &:= 52775^2 \\147777^2 + 506664^2 &:= 527775^2\end{aligned}$$

137) Patterns for Number 148

(a)

$$\begin{aligned}140^2 + 48^2 &:= 148^2 \\14880^2 + 488^2 &:= 14888^2 \\1493280^2 + 4888^2 &:= 1493288^2 \\149377280^2 + 48888^2 &:= 149377288^2\end{aligned}$$

(b)

$$\begin{aligned}148^2 + 5475^2 &:= 5477^2 \\1480^2 + 547599^2 &:= 547601^2 \\14800^2 + 54759999^2 &:= 54760001^2 \\148000^2 + 5475999999^2 &:= 5476000001^2\end{aligned}$$

138) Patterns for Number 149

(a)

$$\begin{aligned}51^2 + 140^2 &:= 149^2 \\9951^2 + 1400^2 &:= 10049^2 \\999951^2 + 14000^2 &:= 1000049^2 \\99999951^2 + 140000^2 &:= 100000049^2\end{aligned}$$

139) Patterns for Number 150

(a)

$$\begin{aligned}200^2 + 150^2 &:= 250^2 \\24000^2 + 1550^2 &:= 24050^2 \\2418000^2 + 15550^2 &:= 2418050^2 \\241958000^2 + 155550^2 &:= 241958050^2\end{aligned}$$

(b)

$$\begin{aligned}616^2 + 150^2 &:= 634^2 \\65016^2 + 1530^2 &:= 65034^2 \\6528016^2 + 15330^2 &:= 6528034^2 \\653058016^2 + 153330^2 &:= 653058034^2\end{aligned}$$

140) Patterns for Number 152

(a)

$$\begin{aligned}152^2 + 5775^2 &:= 5777^2 \\1452^2 + 527075^2 &:= 527077^2 \\14452^2 + 52215075^2 &:= 52215077^2 \\144452^2 + 5216595075^2 &:= 5216595077^2\end{aligned}$$

(b)

$$\begin{aligned}152^2 + 5775^2 &:= 5777^2 \\1520^2 + 577599^2 &:= 577601^2 \\15200^2 + 57759999^2 &:= 57760001^2 \\152000^2 + 5775999999^2 &:= 5776000001^2\end{aligned}$$

141) Patterns for Number 153

(a)

$$\begin{aligned}153^2 + 11704^2 &:= 11705^2 \\1533^2 + 1175044^2 &:= 1175045^2 \\15333^2 + 117550444^2 &:= 117550445^2 \\153333^2 + 11755504444^2 &:= 11755504445^2\end{aligned}$$

(b)

$$\begin{aligned}153^2 + 204^2 &:= 255^2 \\1533^2 + 2044^2 &:= 2555^2 \\15333^2 + 20444^2 &:= 25555^2 \\153333^2 + 204444^2 &:= 255555^2\end{aligned}$$

142) Patterns for Number 154

(a)

$$\begin{aligned}72^2 + 154^2 &:= 170^2 \\12272^2 + 1554^2 &:= 12370^2 \\1234272^2 + 15554^2 &:= 1234370^2 \\123454272^2 + 155554^2 &:= 123454370^2\end{aligned}$$

143) Patterns for Number 156

(a)

$$\begin{aligned}6083^2 + 156^2 &:= 6085^2 \\636803^2 + 1596^2 &:= 636805^2 \\63968003^2 + 15996^2 &:= 63968005^2 \\6399680003^2 + 159996^2 &:= 6399680005^2\end{aligned}$$

144) Patterns for Number 157

(a)

$$\begin{aligned}85^2 + 132^2 &:= 157^2 \\12285^2 + 1332^2 &:= 12357^2 \\1234285^2 + 13332^2 &:= 1234357^2 \\123454285^2 + 133332^2 &:= 123454357^2\end{aligned}$$

145) Patterns for Number 158

(a)

$$\begin{aligned}158^2 + 6240^2 &:= 6242^2 \\1580^2 + 624099^2 &:= 624101^2 \\15800^2 + 62409999^2 &:= 62410001^2 \\158000^2 + 6240999999^2 &:= 6241000001^2\end{aligned}$$

146) Patterns for Number 160

(a)

$$\begin{aligned}1596^2 + 160^2 &:= 1604^2 \\159996^2 + 1600^2 &:= 160004^2 \\15999996^2 + 16000^2 &:= 16000004^2 \\1599999996^2 + 160000^2 &:= 1600000004^2\end{aligned}$$

(b)

$$\begin{aligned}6399^2 + 160^2 &:= 6401^2 \\639999^2 + 1600^2 &:= 640001^2 \\63999999^2 + 16000^2 &:= 64000001^2 \\6399999999^2 + 160000^2 &:= 6400000001^2\end{aligned}$$

(c)

$$792^2 + 160^2 := 808^2$$

$$79992^2 + 1600^2 := 80008^2$$

$$7999992^2 + 16000^2 := 8000008^2$$

$$799999992^2 + 160000^2 := 800000008^2$$

(d)

$$36^2 + 160^2 := 164^2$$

$$9936^2 + 1600^2 := 10064^2$$

$$999936^2 + 16000^2 := 1000064^2$$

$$99999936^2 + 160000^2 := 100000064^2$$

(e)

$$384^2 + 160^2 := 416^2$$

$$39984^2 + 1600^2 := 40016^2$$

$$3999984^2 + 16000^2 := 4000016^2$$

$$399999984^2 + 160000^2 := 400000016^2$$

(f)

$$160^2 + 36^2 := 164^2$$

$$19600^2 + 396^2 := 19604^2$$

$$1996000^2 + 3996^2 := 1996004^2$$

$$199960000^2 + 39996^2 := 199960004^2$$

147) Patterns for Number 161

(a)

$$161^2 + 552^2 := 575^2$$

$$1561^2 + 5352^2 := 5575^2$$

$$15561^2 + 53352^2 := 55575^2$$

$$155561^2 + 533352^2 := 555575^2$$

148) Patterns for Number 162

(a)

$$720^2 + 162^2 := 738^2$$

$$76720^2 + 1662^2 := 76738^2$$

$$7711720^2 + 16662^2 := 7711738^2$$

$$771561720^2 + 166662^2 := 771561738^2$$

149) Patterns for Number 163

(a)

$$163^2 + 13284^2 := 13285^2$$

$$1663^2 + 1382784^2 := 1382785^2$$

$$16663^2 + 138827784^2 := 138827785^2$$

$$166663^2 + 13888277784^2 := 13888277785^2$$

150) Patterns for Number 164

(a)

$$36^2 + 160^2 := 164^2$$

$$9936^2 + 1600^2 := 10064^2$$

$$999936^2 + 16000^2 := 1000064^2$$

$$99999936^2 + 160000^2 := 100000064^2$$

(b)

$$\begin{aligned} 160^2 + 36^2 &:= 164^2 \\ 19600^2 + 396^2 &:= 19604^2 \\ 1996000^2 + 3996^2 &:= 1996004^2 \\ 199960000^2 + 39996^2 &:= 199960004^2 \end{aligned}$$

151) Patterns for Number 165

(a)

$$\begin{aligned} 2720^2 + 165^2 &:= 2725^2 \\ 277220^2 + 1665^2 &:= 277225^2 \\ 27772220^2 + 16665^2 &:= 27772225^2 \end{aligned}$$

(b)

$$\begin{aligned} 532^2 + 165^2 &:= 557^2 \\ 55432^2 + 1665^2 &:= 55457^2 \\ 5554432^2 + 16665^2 &:= 5554457^2 \\ 555544432^2 + 166665^2 &:= 555544457^2 \end{aligned}$$

(c)

$$\begin{aligned} 1508^2 + 165^2 &:= 1517^2 \\ 154008^2 + 1665^2 &:= 154017^2 \\ 15429008^2 + 16665^2 &:= 15429017^2 \\ 1543179008^2 + 166665^2 &:= 1543179017^2 \end{aligned}$$

152) Patterns for Number 166

(a)

$$\begin{aligned} 166^2 + 6888^2 &:= 6890^2 \\ 1660^2 + 68889^2 &:= 688901^2 \\ 16600^2 + 6888999^2 &:= 68890001^2 \\ 166000^2 + 688899999^2 &:= 6889000001^2 \end{aligned}$$

(b)

$$\begin{aligned} 166^2 + 6888^2 &:= 6890^2 \\ 1666^2 + 693888^2 &:= 693890^2 \\ 16666^2 + 69438888^2 &:= 69438890^2 \\ 166666^2 + 6944388888^2 &:= 6944388890^2 \end{aligned}$$

153) Patterns for Number 167

(a)

$$\begin{aligned} 167^2 + 13944^2 &:= 13945^2 \\ 1667^2 + 1389444^2 &:= 1389445^2 \\ 16667^2 + 138894444^2 &:= 138894445^2 \\ 166667^2 + 13888944444^2 &:= 13888944445^2 \end{aligned}$$

154) Patterns for Number 168

(a)

$$\begin{aligned} 168^2 + 26^2 &:= 170^2 \\ 17688^2 + 266^2 &:= 17690^2 \\ 1776888^2 + 2666^2 &:= 1776890^2 \\ 177768888^2 + 26666^2 &:= 177768890^2 \end{aligned}$$

(b)

$$168^2 + 7055^2 := 7057^2$$

$$1668^2 + 69555^2 := 69557^2$$

$$16668^2 + 694555^2 := 6945557^2$$

$$166668^2 + 69445555^2 := 694455557^2$$

(c)

$$168^2 + 224^2 := 280^2$$

$$1668^2 + 2224^2 := 2780^2$$

$$16668^2 + 22224^2 := 27780^2$$

$$166668^2 + 222224^2 := 277780^2$$

155) Patterns for Number 169

(a)

$$119^2 + 120^2 := 169^2$$

$$14859^2 + 1220^2 := 14909^2$$

$$1493259^2 + 12220^2 := 1493309^2$$

$$149377259^2 + 122220^2 := 149377309^2$$

156) Patterns for Number 170

(a)

$$168^2 + 26^2 := 170^2$$

$$17688^2 + 266^2 := 17690^2$$

$$1776888^2 + 2666^2 := 1776890^2$$

$$177768888^2 + 26666^2 := 177768890^2$$

(b)

$$72^2 + 154^2 := 170^2$$

$$12272^2 + 1554^2 := 12370^2$$

$$1234272^2 + 15554^2 := 1234370^2$$

$$123454272^2 + 155554^2 := 123454370^2$$

(c)

$$7224^2 + 170^2 := 7226^2$$

$$783224^2 + 1770^2 := 783226^2$$

$$78943224^2 + 17770^2 := 78943226^2$$

$$7900543224^2 + 177770^2 := 7900543226^2$$

(d)

$$102^2 + 136^2 := 170^2$$

$$1002^2 + 1336^2 := 1670^2$$

$$10002^2 + 13336^2 := 16670^2$$

$$100002^2 + 133336^2 := 166670^2$$

(e)

$$170^2 + 7224^2 := 7226^2$$

$$1700^2 + 722499^2 := 722501^2$$

$$17000^2 + 7224999^2 := 72250001^2$$

$$170000^2 + 72249999^2 := 7225000001^2$$

(f)

$$170^2 + 7224^2 := 7226^2$$

$$1670^2 + 697224^2 := 697226^2$$

$$16670^2 + 69472224^2 := 69472226^2$$

$$166670^2 + 6944722224^2 := 6944722226^2$$

157) Patterns for Number 171

(a)

$$\begin{aligned} 171^2 + 1620^2 &:= 1629^2 \\ 13271^2 + 166200^2 &:= 166729^2 \\ 1288271^2 + 16662000^2 &:= 16711729^2 \\ 128438271^2 + 1666620000^2 &:= 1671561729^2 \end{aligned}$$

(b)

$$\begin{aligned} 171^2 + 228^2 &:= 285^2 \\ 1713^2 + 2284^2 &:= 2855^2 \\ 17133^2 + 22844^2 &:= 28555^2 \\ 171333^2 + 228444^2 &:= 285555^2 \end{aligned}$$

158) Patterns for Number 172

(a)

$$\begin{aligned} 1845^2 + 172^2 &:= 1853^2 \\ 187485^2 + 1732^2 &:= 187493^2 \\ 18774885^2 + 17332^2 &:= 18774893^2 \\ 1877748885^2 + 173332^2 &:= 1877748893^2 \end{aligned}$$

(b)

$$\begin{aligned} 172^2 + 7395^2 &:= 7397^2 \\ 1720^2 + 739599^2 &:= 739601^2 \\ 17200^2 + 73959999^2 &:= 73960001^2 \\ 172000^2 + 7395999999^2 &:= 7396000001^2 \end{aligned}$$

159) Patterns for Number 173

(a)

$$\begin{aligned} 165^2 + 52^2 &:= 173^2 \\ 17685^2 + 532^2 &:= 17693^2 \\ 1776885^2 + 5332^2 &:= 1776893^2 \\ 177768885^2 + 53332^2 &:= 177768893^2 \end{aligned}$$

160) Patterns for Number 174

(a)

$$\begin{aligned} 174^2 + 232^2 &:= 290^2 \\ 1743^2 + 2324^2 &:= 2905^2 \\ 17433^2 + 23244^2 &:= 29055^2 \\ 174333^2 + 232444^2 &:= 290555^2 \end{aligned}$$

(b)

$$\begin{aligned} 832^2 + 174^2 &:= 850^2 \\ 89392^2 + 1794^2 &:= 89410^2 \\ 8993992^2 + 17994^2 &:= 8994010^2 \\ 899939992^2 + 179994^2 &:= 899940010^2 \end{aligned}$$

(c)

$$\begin{aligned} 174^2 + 7568^2 &:= 7570^2 \\ 1740^2 + 756899^2 &:= 756901^2 \\ 17400^2 + 75689999^2 &:= 75690001^2 \\ 174000^2 + 7568999999^2 &:= 7569000001^2 \end{aligned}$$

161) Patterns for Number 175

(a)

$$\begin{aligned}175^2 + 600^2 &:= 625^2 \\15975^2 + 62000^2 &:= 64025^2 \\1581975^2 + 6220000^2 &:= 6418025^2 \\158041975^2 + 622200000^2 &:= 641958025^2\end{aligned}$$

(b)

$$\begin{aligned}1932^2 + 176^2 &:= 1940^2 \\197132^2 + 1776^2 &:= 197140^2 \\19749132^2 + 17776^2 &:= 19749140^2 \\1975269132^2 + 177776^2 &:= 1975269140^2\end{aligned}$$

(b)

$$\begin{aligned}175^2 + 15312^2 &:= 15313^2 \\1775^2 + 1575312^2 &:= 1575313^2 \\17775^2 + 157975312^2 &:= 157975313^2 \\177775^2 + 15801975312^2 &:= 15801975313^2\end{aligned}$$

(c)

$$\begin{aligned}176^2 + 330^2 &:= 374^2 \\1776^2 + 3330^2 &:= 3774^2 \\17776^2 + 33330^2 &:= 37774^2 \\177776^2 + 333330^2 &:= 377774^2\end{aligned}$$

(c)

$$\begin{aligned}175^2 + 420^2 &:= 455^2 \\1775^2 + 4260^2 &:= 4615^2 \\17775^2 + 42660^2 &:= 46215^2 \\177775^2 + 426660^2 &:= 462215^2\end{aligned}$$

(d)

$$\begin{aligned}176^2 + 693^2 &:= 715^2 \\1776^2 + 6993^2 &:= 7215^2 \\17776^2 + 69993^2 &:= 72215^2 \\177776^2 + 699993^2 &:= 722215^2\end{aligned}$$

162) Patterns for Number 176

(a)

$$\begin{aligned}57^2 + 176^2 &:= 185^2 \\12257^2 + 1776^2 &:= 12385^2 \\1234257^2 + 17776^2 &:= 1234385^2 \\123454257^2 + 177776^2 &:= 123454385^2\end{aligned}$$

(e)

$$\begin{aligned}176^2 + 7743^2 &:= 7745^2 \\1760^2 + 774399^2 &:= 774401^2 \\17600^2 + 77439999^2 &:= 77440001^2 \\176000^2 + 7743999999^2 &:= 7744000001^2\end{aligned}$$

163) Patterns for Number 177

(a)

$$\begin{aligned}177^2 + 236^2 &:= 295^2 \\1977^2 + 2636^2 &:= 3295^2 \\19977^2 + 26636^2 &:= 33295^2 \\199977^2 + 266636^2 &:= 333295^2\end{aligned}$$

(b)

$$\begin{aligned}179^2 + 16020^2 &:= 16021^2 \\1799^2 + 1618200^2 &:= 1618201^2 \\17999^2 + 161982000^2 &:= 161982001^2 \\179999^2 + 16199820000^2 &:= 16199820001^2\end{aligned}$$

164) Patterns for Number 178

(a)

$$\begin{aligned}178^2 + 7920^2 &:= 7922^2 \\1778^2 + 790320^2 &:= 790322^2 \\17778^2 + 79014320^2 &:= 79014322^2 \\177778^2 + 7901254320^2 &:= 7901254322^2\end{aligned}$$

(b)

$$\begin{aligned}178^2 + 7920^2 &:= 7922^2 \\1780^2 + 792099^2 &:= 792101^2 \\17800^2 + 79209999^2 &:= 79210001^2 \\178000^2 + 7920999999^2 &:= 7921000001^2\end{aligned}$$

165) Patterns for Number 179

(a)

$$\begin{aligned}179^2 + 16020^2 &:= 16021^2 \\19679^2 + 1600200^2 &:= 1600321^2 \\1985679^2 + 160002000^2 &:= 160014321^2 \\198745679^2 + 16000020000^2 &:= 16001254321^2\end{aligned}$$

166) Patterns for Number 180

(a)

$$\begin{aligned}021^2 + 180^2 &:= 2029^2 \\207021^2 + 1820^2 &:= 207029^2 \\20748021^2 + 18220^2 &:= 20748029^2 \\2075258021^2 + 182220^2 &:= 2075258029^2\end{aligned}$$

(b)

$$\begin{aligned}4048^2 + 180^2 &:= 4052^2 \\404998^2 + 1800^2 &:= 405002^2 \\40499998^2 + 18000^2 &:= 40500002^2 \\4049999998^2 + 180000^2 &:= 4050000002^2\end{aligned}$$

(c)

$$\begin{aligned}891^2 + 180^2 &:= 909^2 \\89991^2 + 1800^2 &:= 90009^2 \\8999991^2 + 18000^2 &:= 9000009^2 \\899999991^2 + 180000^2 &:= 900000009^2\end{aligned}$$

(d)

$$\begin{aligned}180^2 + 8099^2 &:= 8101^2 \\1800^2 + 80999^2 &:= 810001^2 \\18000^2 + 809999^2 &:= 81000001^2 \\180000^2 + 8099999^2 &:= 8100000001^2\end{aligned}$$

(e)

$$\begin{aligned}144^2 + 108^2 &:= 180^2 \\1440^2 + 1080^2 &:= 1800^2 \\14400^2 + 10800^2 &:= 18000^2 \\144000^2 + 108000^2 &:= 180000^2\end{aligned}$$

(f)

$$\begin{aligned}180^2 + 19^2 &:= 181^2 \\19800^2 + 199^2 &:= 19801^2 \\1998000^2 + 1999^2 &:= 1998001^2 \\199980000^2 + 19999^2 &:= 199980001^2\end{aligned}$$

(g)

$$\begin{aligned}19^2 + 180^2 &:= 181^2 \\9919^2 + 1800^2 &:= 10081^2 \\999919^2 + 18000^2 &:= 1000081^2 \\99999919^2 + 180000^2 &:= 100000081^2\end{aligned}$$

167) Patterns for Number 181

(a)

$$\begin{aligned}180^2 + 19^2 &:= 181^2 \\19800^2 + 199^2 &:= 19801^2 \\1998000^2 + 1999^2 &:= 1998001^2 \\199980000^2 + 19999^2 &:= 199980001^2\end{aligned}$$

(b)

$$\begin{aligned}19^2 + 180^2 &:= 181^2 \\9919^2 + 1800^2 &:= 10081^2 \\999919^2 + 18000^2 &:= 1000081^2 \\99999919^2 + 180000^2 &:= 100000081^2\end{aligned}$$

168) Patterns for Number 182

(a)

$$\begin{aligned}120^2 + 182^2 &:= 218^2 \\1200^2 + 19982^2 &:= 20018^2 \\12000^2 + 1999982^2 &:= 2000018^2 \\120000^2 + 199999982^2 &:= 200000018^2\end{aligned}$$

(b)

$$\begin{aligned}182^2 + 8280^2 &:= 8282^2 \\1820^2 + 82809^2 &:= 828101^2 \\18200^2 + 8280999^2 &:= 82810001^2 \\182000^2 + 828099999^2 &:= 8281000001^2\end{aligned}$$

169) Patterns for Number 183

(a)

$$183^2 + 244^2 := 305^2$$

$$1983^2 + 2644^2 := 3305^2$$

$$19983^2 + 26644^2 := 33305^2$$

$$199983^2 + 266644^2 := 333305^2$$

(a)

$$185^2 + 444^2 := 481^2$$

$$1685^2 + 4044^2 := 4381^2$$

$$16685^2 + 40044^2 := 43381^2$$

$$166685^2 + 400044^2 := 433381^2$$

170) Patterns for Number 184

(a)

$$2112^2 + 184^2 := 2120^2$$

$$217152^2 + 1864^2 := 217160^2$$

$$21771552^2 + 18664^2 := 21771560^2$$

$$2177715552^2 + 186664^2 := 2177715560^2$$

(b)

$$184^2 + 345^2 := 391^2$$

$$1784^2 + 3345^2 := 3791^2$$

$$17784^2 + 33345^2 := 37791^2$$

$$177784^2 + 333345^2 := 377791^2$$

(c)

$$184^2 + 8463^2 := 8465^2$$

$$1840^2 + 846399^2 := 846401^2$$

$$18400^2 + 84639999^2 := 84640001^2$$

$$184000^2 + 8463999999^2 := 8464000001^2$$

(b)

$$185^2 + 672^2 := 697^2$$

$$1685^2 + 56772^2 := 56797^2$$

$$16685^2 + 5567772^2 := 5567797^2$$

$$166685^2 + 555677772^2 := 555677797^2$$

(c)

$$17112^2 + 185^2 := 17113^2$$

$$1970112^2 + 1985^2 := 1970113^2$$

$$199700112^2 + 19985^2 := 199700113^2$$

$$19997000112^2 + 199985^2 := 19997000113^2$$

(d)

$$57^2 + 176^2 := 185^2$$

$$12257^2 + 1776^2 := 12385^2$$

$$1234257^2 + 17776^2 := 1234385^2$$

$$123454257^2 + 177776^2 := 123454385^2$$

171) Patterns for Number 185

172) Patterns for Number 186

(a)

$$\begin{aligned}186^2 + 248^2 &:= 310^2 \\1986^2 + 2648^2 &:= 3310^2 \\19986^2 + 26648^2 &:= 33310^2 \\199986^2 + 266648^2 &:= 333310^2\end{aligned}$$

(b)

$$\begin{aligned}186^2 + 8648^2 &:= 8650^2 \\1860^2 + 86489^2 &:= 864901^2 \\18600^2 + 8648999^2 &:= 86490001^2 \\186000^2 + 864899999^2 &:= 8649000001^2\end{aligned}$$

173) Patterns for Number 187

(a)

$$\begin{aligned}17484^2 + 187^2 &:= 17485^2 \\1974084^2 + 1987^2 &:= 1974085^2 \\199740084^2 + 19987^2 &:= 199740085^2\end{aligned}$$

(b)

$$\begin{aligned}187^2 + 17484^2 &:= 17485^2 \\1987^2 + 1974084^2 &:= 1974085^2 \\19987^2 + 199740084^2 &:= 199740085^2 \\199987^2 + 19997400084^2 &:= 19997400085^2\end{aligned}$$

(c)

$$\begin{aligned}187^2 + 1020^2 &:= 1037^2 \\19987^2 + 109020^2 &:= 110837^2 \\1999987^2 + 10909020^2 &:= 11090837^2 \\199999987^2 + 1090909020^2 &:= 1109090837^2\end{aligned}$$

(d)

$$\begin{aligned}187^2 + 1584^2 &:= 1595^2 \\1887^2 + 15984^2 &:= 16095^2 \\18887^2 + 159984^2 &:= 161095^2 \\188887^2 + 1599984^2 &:= 1611095^2\end{aligned}$$

174) Patterns for Number 188

(a)

$$\begin{aligned}188^2 + 8835^2 &:= 8837^2 \\1888^2 + 891135^2 &:= 891137^2 \\18888^2 + 89189135^2 &:= 89189137^2 \\188888^2 + 8919669135^2 &:= 8919669137^2\end{aligned}$$

(b)

$$\begin{aligned}188^2 + 4416^2 &:= 4420^2 \\1988^2 + 494016^2 &:= 494020^2 \\19988^2 + 49940016^2 &:= 49940020^2 \\199988^2 + 4999400016^2 &:= 4999400020^2\end{aligned}$$

175) Patterns for Number 189

(a)

$$\begin{aligned}1980^2 + 189^2 &:= 1989^2 \\181800^2 + 1809^2 &:= 181809^2 \\18018000^2 + 18009^2 &:= 18018009^2 \\1800180000^2 + 180009^2 &:= 1800180009^2\end{aligned}$$

(b)

$$\begin{aligned} 189^2 + 180^2 &:= 261^2 \\ 23989^2 + 1860^2 &:= 24061^2 \\ 2417989^2 + 18660^2 &:= 2418061^2 \\ 241957989^2 + 186660^2 &:= 241958061^2 \end{aligned}$$

(c)

$$\begin{aligned} 189^2 + 17860^2 &:= 17861^2 \\ 1989^2 + 1978060^2 &:= 1978061^2 \\ 19989^2 + 199780060^2 &:= 199780061^2 \\ 199989^2 + 19997800060^2 &:= 19997800061^2 \end{aligned}$$

(d)

$$\begin{aligned} 189^2 + 1980^2 &:= 1989^2 \\ 1989^2 + 219780^2 &:= 219789^2 \\ 19989^2 + 22197780^2 &:= 22197789^2 \\ 199989^2 + 2221977780^2 &:= 2221977789^2 \end{aligned}$$

176) Patterns for Number 190

(a)

$$\begin{aligned} 9024^2 + 190^2 &:= 9026^2 \\ 990024^2 + 1990^2 &:= 990026^2 \\ 99900024^2 + 19990^2 &:= 99900026^2 \\ 9999000024^2 + 199990^2 &:= 9999000026^2 \end{aligned}$$

(b)

$$\begin{aligned} 9024^2 + 190^2 &:= 9026^2 \\ 912024^2 + 1910^2 &:= 912026^2 \\ 91298024^2 + 19110^2 &:= 91298026^2 \\ 9130758024^2 + 191110^2 &:= 9130758026^2 \end{aligned}$$

(c)

$$\begin{aligned} 190^2 + 9024^2 &:= 9026^2 \\ 1990^2 + 990024^2 &:= 990026^2 \\ 19990^2 + 99900024^2 &:= 99900026^2 \\ 199990^2 + 9999000024^2 &:= 9999000026^2 \end{aligned}$$

(d)

$$\begin{aligned} 190^2 + 456^2 &:= 494^2 \\ 1890^2 + 4536^2 &:= 4914^2 \\ 18890^2 + 45336^2 &:= 49114^2 \\ 188890^2 + 453336^2 &:= 491114^2 \end{aligned}$$

(e)

$$\begin{aligned} 190^2 + 456^2 &:= 494^2 \\ 1690^2 + 4056^2 &:= 4394^2 \\ 16690^2 + 40056^2 &:= 43394^2 \\ 166690^2 + 400056^2 &:= 433394^2 \end{aligned}$$

(f)

$$\begin{aligned} 190^2 + 9024^2 &:= 9026^2 \\ 1900^2 + 902499^2 &:= 902501^2 \\ 19000^2 + 9024999^2 &:= 90250001^2 \\ 190000^2 + 902499999^2 &:= 9025000001^2 \end{aligned}$$

177) Patterns for Number 191

(a)

$$\begin{aligned} 191^2 + 18240^2 &:= 18241^2 \\ 1991^2 + 1982040^2 &:= 1982041^2 \\ 19991^2 + 199820040^2 &:= 199820041^2 \\ 199991^2 + 19998200040^2 &:= 19998200041^2 \end{aligned}$$

178) Patterns for Number 192

(a)

$$\begin{aligned} 192^2 + 9215^2 &:= 9217^2 \\ 1992^2 + 992015^2 &:= 992017^2 \\ 19992^2 + 99920015^2 &:= 99920017^2 \\ 199992^2 + 9999200015^2 &:= 9999200017^2 \end{aligned}$$

(b)

$$\begin{aligned} 192^2 + 256^2 &:= 320^2 \\ 1992^2 + 2656^2 &:= 3320^2 \\ 19992^2 + 26656^2 &:= 33320^2 \\ 199992^2 + 266656^2 &:= 333320^2 \end{aligned}$$

(c)

$$\begin{aligned} 192^2 + 9215^2 &:= 9217^2 \\ 1920^2 + 921599^2 &:= 921601^2 \\ 19200^2 + 92159999^2 &:= 92160001^2 \\ 192000^2 + 9215999999^2 &:= 9216000001^2 \end{aligned}$$

179) Patterns for Number 193

(a)

$$\begin{aligned} 18624^2 + 193^2 &:= 18625^2 \\ 1986024^2 + 1993^2 &:= 1986025^2 \\ 199860024^2 + 19993^2 &:= 199860025^2 \\ 19998600024^2 + 199993^2 &:= 19998600025^2 \end{aligned}$$

(b)

$$\begin{aligned} 193^2 + 18624^2 &:= 18625^2 \\ 1933^2 + 1868244^2 &:= 1868245^2 \\ 19333^2 + 186882444^2 &:= 186882445^2 \\ 193333^2 + 18688824444^2 &:= 18688824445^2 \end{aligned}$$

180) Patterns for Number 194

(a)

$$\begin{aligned} 194^2 + 9408^2 &:= 9410^2 \\ 1994^2 + 994008^2 &:= 994010^2 \\ 19994^2 + 99940008^2 &:= 99940010^2 \\ 199994^2 + 9999400008^2 &:= 9999400010^2 \end{aligned}$$

(b)

$$\begin{aligned} 194^2 + 9408^2 &:= 9410^2 \\ 1940^2 + 940899^2 &:= 940901^2 \\ 19400^2 + 94089999^2 &:= 94090001^2 \\ 194000^2 + 9408999999^2 &:= 9409000001^2 \end{aligned}$$

181) Patterns for Number 195

(a)

$$195^2 + 19012^2 := 19013^2$$

$$1995^2 + 1990012^2 := 1990013^2$$

$$19995^2 + 199900012^2 := 199900013^2$$

$$199995^2 + 19999000012^2 := 19999000013^2$$

(b)

$$195^2 + 260^2 := 325^2$$

$$1995^2 + 2660^2 := 3325^2$$

$$19995^2 + 26660^2 := 33325^2$$

$$199995^2 + 266660^2 := 333325^2$$

182) Patterns for Number 196

(a)

$$196^2 + 9603^2 := 9605^2$$

$$1996^2 + 996003^2 := 996005^2$$

$$19996^2 + 99960003^2 := 99960005^2$$

$$199996^2 + 9999600003^2 := 9999600005^2$$

(b)

$$196^2 + 9603^2 := 9605^2$$

$$1960^2 + 960399^2 := 960401^2$$

$$19600^2 + 96039999^2 := 96040001^2$$

$$196000^2 + 9603999999^2 := 9604000001^2$$

183) Patterns for Number 197

(a)

$$197^2 + 19404^2 := 19405^2$$

$$1997^2 + 1994004^2 := 1994005^2$$

$$19997^2 + 199940004^2 := 199940005^2$$

$$199997^2 + 19999400004^2 := 19999400005^2$$

184) Patterns for Number 198

(a)

$$3264^2 + 198^2 := 3270^2$$

$$332664^2 + 1998^2 := 332670^2$$

$$33326664^2 + 19998^2 := 33326670^2$$

$$3333266664^2 + 199998^2 := 3333266670^2$$

(b)

$$198^2 + 9800^2 := 9802^2$$

$$1998^2 + 998000^2 := 998002^2$$

$$19998^2 + 99980000^2 := 99980002^2$$

$$199998^2 + 9999800000^2 := 9999800002^2$$

(c)

$$1080^2 + 198^2 := 1098^2$$

$$110880^2 + 1998^2 := 110898^2$$

$$11108880^2 + 19998^2 := 11108898^2$$

$$1111088880^2 + 199998^2 := 1111088898^2$$

(d)

$$\begin{aligned} 198^2 + 40^2 &:= 202^2 \\ 19998^2 + 400^2 &:= 20002^2 \\ 1999998^2 + 4000^2 &:= 2000002^2 \\ 199999998^2 + 40000^2 &:= 200000002^2 \end{aligned}$$

(e)

$$\begin{aligned} 40^2 + 198^2 &:= 202^2 \\ 12240^2 + 1998^2 &:= 12402^2 \\ 1234240^2 + 19998^2 &:= 1234402^2 \\ 123454240^2 + 199998^2 &:= 123454402^2 \end{aligned}$$

185) Patterns for Number 199

(a)

$$\begin{aligned} 199^2 + 19800^2 &:= 19801^2 \\ 990199^2 + 198000^2 &:= 1009801^2 \\ 99990199^2 + 1980000^2 &:= 100009801^2 \\ 9999990199^2 + 19800000^2 &:= 10000009801^2 \end{aligned}$$

(b)

$$\begin{aligned} 199^2 + 19800^2 &:= 19801^2 \\ 1999^2 + 1998000^2 &:= 1998001^2 \\ 19999^2 + 199980000^2 &:= 199980001^2 \\ 199999^2 + 19999800000^2 &:= 19999800001^2 \end{aligned}$$

(a)

$$\begin{aligned} 200^2 + 9999^2 &:= 10001^2 \\ 2000^2 + 99999^2 &:= 1000001^2 \\ 20000^2 + 999999^2 &:= 100000001^2 \\ 200000^2 + 9999999^2 &:= 10000000001^2 \end{aligned}$$

(b)

$$\begin{aligned} 1242^2 + 200^2 &:= 1258^2 \\ 124992^2 + 2000^2 &:= 125008^2 \\ 12499992^2 + 20000^2 &:= 12500008^2 \\ 1249999992^2 + 200000^2 &:= 1250000008^2 \end{aligned}$$

(c)

$$\begin{aligned} 200^2 + 150^2 &:= 250^2 \\ 24000^2 + 1550^2 &:= 24050^2 \\ 2418000^2 + 15550^2 &:= 2418050^2 \\ 241958000^2 + 155550^2 &:= 241958050^2 \end{aligned}$$

(d)

$$\begin{aligned} 375^2 + 200^2 &:= 425^2 \\ 39975^2 + 2000^2 &:= 40025^2 \\ 3999975^2 + 20000^2 &:= 4000025^2 \\ 399999975^2 + 200000^2 &:= 400000025^2 \end{aligned}$$

(e)

$$\begin{aligned} 609^2 + 200^2 &:= 641^2 \\ 65009^2 + 2040^2 &:= 65041^2 \\ 6528009^2 + 20440^2 &:= 6528041^2 \\ 653058009^2 + 204440^2 &:= 653058041^2 \end{aligned}$$

186) Patterns for Number 200

(f)

$$\begin{aligned} 2496^2 + 200^2 &:= 2504^2 \\ 249996^2 + 2000^2 &:= 250004^2 \\ 24999996^2 + 20000^2 &:= 25000004^2 \\ 2499999996^2 + 200000^2 &:= 2500000004^2 \end{aligned}$$

2.3 Pattern in Pythagorean Triples: 201 to 300

187) Patterns for Number 201

(a)

$$\begin{aligned} 201^2 + 2240^2 &:= 2249^2 \\ 2001^2 + 222440^2 &:= 222449^2 \\ 20001^2 + 22224440^2 &:= 22224449^2 \\ 200001^2 + 2222244440^2 &:= 2222244449^2 \end{aligned}$$

(b)

$$\begin{aligned} 201^2 + 20200^2 &:= 20201^2 \\ 2001^2 + 2002000^2 &:= 2002001^2 \\ 20001^2 + 200020000^2 &:= 200020001^2 \\ 200001^2 + 20000200000^2 &:= 20000200001^2 \end{aligned}$$

188) Patterns for Number 202

(a)

$$\begin{aligned} 202^2 + 10200^2 &:= 10202^2 \\ 2002^2 + 1002000^2 &:= 1002002^2 \\ 20002^2 + 100020000^2 &:= 100020002^2 \\ 200002^2 + 10000200000^2 &:= 10000200002^2 \end{aligned}$$

(b)

$$\begin{aligned} 198^2 + 40^2 &:= 202^2 \\ 19998^2 + 400^2 &:= 20002^2 \\ 1999998^2 + 4000^2 &:= 2000002^2 \\ 199999998^2 + 40000^2 &:= 200000002^2 \end{aligned}$$

(c)

$$\begin{aligned} 40^2 + 198^2 &:= 202^2 \\ 12240^2 + 1998^2 &:= 12402^2 \\ 1234240^2 + 19998^2 &:= 1234402^2 \\ 123454240^2 + 199998^2 &:= 123454402^2 \end{aligned}$$

189) Patterns for Number 203

(a)

$$\begin{aligned} 203^2 + 20604^2 &:= 20605^2 \\ 2003^2 + 2006004^2 &:= 2006005^2 \\ 20003^2 + 200060004^2 &:= 200060005^2 \\ 200003^2 + 20000600004^2 &:= 20000600005^2 \end{aligned}$$

190) Patterns for Number 204

(a)

$$\begin{aligned} 204^2 + 3465^2 &:= 3471^2 \\ 2004^2 + 334665^2 &:= 334671^2 \\ 20004^2 + 33346665^2 &:= 33346671^2 \\ 200004^2 + 3333466665^2 &:= 3333466671^2 \end{aligned}$$

(b)

$$\begin{aligned} 206^2 + 10608^2 &:= 10610^2 \\ 2060^2 + 1060899^2 &:= 1060901^2 \\ 20600^2 + 106089999^2 &:= 106090001^2 \\ 206000^2 + 10608999999^2 &:= 10609000001^2 \end{aligned}$$

(b)

$$\begin{aligned} 204^2 + 10403^2 &:= 10405^2 \\ 2004^2 + 1004003^2 &:= 1004005^2 \\ 20004^2 + 100040003^2 &:= 100040005^2 \\ 200004^2 + 10000400003^2 &:= 10000400005^2 \end{aligned}$$

193) Patterns for Number 207

(a)

$$\begin{aligned} 207^2 + 920^2 &:= 943^2 \\ 2007^2 + 8920^2 &:= 9143^2 \\ 20007^2 + 88920^2 &:= 91143^2 \\ 200007^2 + 888920^2 &:= 911143^2 \end{aligned}$$

191) Patterns for Number 205

(a)

$$\begin{aligned} 205^2 + 21012^2 &:= 21013^2 \\ 2005^2 + 2010012^2 &:= 2010013^2 \\ 20005^2 + 200100012^2 &:= 200100013^2 \\ 200005^2 + 20001000012^2 &:= 20001000013^2 \end{aligned}$$

(b)

$$\begin{aligned} 207^2 + 276^2 &:= 345^2 \\ 2007^2 + 2676^2 &:= 3345^2 \\ 20007^2 + 26676^2 &:= 33345^2 \\ 200007^2 + 266676^2 &:= 333345^2 \end{aligned}$$

192) Patterns for Number 206

(a)

$$\begin{aligned} 206^2 + 10608^2 &:= 10610^2 \\ 2006^2 + 1006008^2 &:= 1006010^2 \\ 20006^2 + 100060008^2 &:= 100060010^2 \\ 200006^2 + 10000600008^2 &:= 10000600010^2 \end{aligned}$$

(c)

$$\begin{aligned} 207^2 + 21424^2 &:= 21425^2 \\ 2007^2 + 2014024^2 &:= 2014025^2 \\ 20007^2 + 200140024^2 &:= 200140025^2 \\ 200007^2 + 20001400024^2 &:= 20001400025^2 \end{aligned}$$

(d)

$$\begin{aligned}207^2 + 2376^2 &:= 2385^2 \\2007^2 + 223776^2 &:= 223785^2 \\20007^2 + 22237776^2 &:= 22237785^2 \\200007^2 + 2222377776^2 &:= 2222377785^2\end{aligned}$$

194) Patterns for Number 208

(a)

$$\begin{aligned}208^2 + 10815^2 &:= 10817^2 \\2008^2 + 1008015^2 &:= 1008017^2 \\20008^2 + 100080015^2 &:= 100080017^2 \\200008^2 + 10000800015^2 &:= 10000800017^2\end{aligned}$$

(b)

$$\begin{aligned}208^2 + 10815^2 &:= 10817^2 \\2080^2 + 1081599^2 &:= 1081601^2 \\20800^2 + 108159999^2 &:= 108160001^2 \\208000^2 + 10815999999^2 &:= 10816000001^2\end{aligned}$$

195) Patterns for Number 209

(a)

$$\begin{aligned}209^2 + 120^2 &:= 241^2 \\24009^2 + 1240^2 &:= 24041^2 \\2418009^2 + 12440^2 &:= 2418041^2 \\241958009^2 + 124440^2 &:= 241958041^2\end{aligned}$$

196) Patterns for Number 210

(a)

$$\begin{aligned}1216^2 + 210^2 &:= 1234^2 \\112216^2 + 2010^2 &:= 112234^2 \\11122216^2 + 20010^2 &:= 11122234^2 \\1111222216^2 + 20010^2 &:= 1111222234^2\end{aligned}$$

197) Patterns for Number 216

(a)

$$\begin{aligned}216^2 + 90^2 &:= 234^2 \\24016^2 + 930^2 &:= 24034^2 \\2418016^2 + 9330^2 &:= 2418034^2 \\241958016^2 + 93330^2 &:= 241958034^2\end{aligned}$$

198) Patterns for Number 218

(a)

$$\begin{aligned}120^2 + 182^2 &:= 218^2 \\1200^2 + 1998^2 &:= 20018^2 \\12000^2 + 199998^2 &:= 2000018^2 \\120000^2 + 19999998^2 &:= 200000018^2\end{aligned}$$

199) Patterns for Number 220

(a)

$$\begin{aligned}220^2 + 21^2 &:= 221^2 \\20200^2 + 201^2 &:= 20201^2 \\2002000^2 + 2001^2 &:= 2002001^2 \\200020000^2 + 20001^2 &:= 200020001^2\end{aligned}$$

(b)

$$\begin{aligned} 192^2 + 220^2 &:= 292^2 \\ 24592^2 + 2220^2 &:= 24692^2 \\ 2468592^2 + 22220^2 &:= 2468692^2 \\ 246908592^2 + 222220^2 &:= 246908692^2 \end{aligned}$$

(c)

$$\begin{aligned} 12099^2 + 220^2 &:= 12101^2 \\ 1232099^2 + 2220^2 &:= 1232101^2 \\ 123432099^2 + 22220^2 &:= 123432101^2 \\ 12345432099^2 + 222220^2 &:= 12345432101^2 \end{aligned}$$

(d)

$$\begin{aligned} 21^2 + 20^2 &:= 29^2 \\ 3021^2 + 220^2 &:= 3029^2 \\ 308021^2 + 2220^2 &:= 308029^2 \\ 30858021^2 + 22220^2 &:= 30858029^2 \end{aligned}$$

(e)

$$\begin{aligned} 21^2 + 220^2 &:= 221^2 \\ 12221^2 + 2220^2 &:= 12421^2 \\ 1234221^2 + 22220^2 &:= 1234421^2 \\ 123454221^2 + 222220^2 &:= 123454421^2 \end{aligned}$$

(f)

$$\begin{aligned} 459^2 + 220^2 &:= 509^2 \\ 46259^2 + 24420^2 &:= 52309^2 \\ 4629259^2 + 2466420^2 &:= 5245309^2 \\ 462959259^2 + 246886420^2 &:= 524675309^2 \end{aligned}$$

200) Patterns for Number 221

(a)

$$\begin{aligned} 221^2 + 60^2 &:= 229^2 \\ 24021^2 + 620^2 &:= 24029^2 \\ 2418021^2 + 6220^2 &:= 2418029^2 \\ 241958021^2 + 62220^2 &:= 241958029^2 \end{aligned}$$

(b)

$$\begin{aligned} 220^2 + 21^2 &:= 221^2 \\ 20200^2 + 201^2 &:= 20201^2 \\ 2002000^2 + 2001^2 &:= 2002001^2 \\ 200020000^2 + 20001^2 &:= 200020001^2 \end{aligned}$$

(c)

$$\begin{aligned} 21^2 + 220^2 &:= 221^2 \\ 12221^2 + 2220^2 &:= 12421^2 \\ 1234221^2 + 22220^2 &:= 1234421^2 \\ 123454221^2 + 222220^2 &:= 123454421^2 \end{aligned}$$

(d)

$$\begin{aligned} 221^2 + 60^2 &:= 229^2 \\ 24021^2 + 620^2 &:= 24029^2 \\ 2418021^2 + 6220^2 &:= 2418029^2 \\ 241958021^2 + 62220^2 &:= 241958029^2 \end{aligned}$$

201) Patterns for Number 222

(a)

$$\begin{aligned}12320^2 + 222^2 &:= 12322^2 \\1234320^2 + 2222^2 &:= 1234322^2 \\123454320^2 + 22222^2 &:= 123454322^2 \\12345654320^2 + 222222^2 &:= 12345654322^2\end{aligned}$$

202) Patterns for Number 224

(a)

$$\begin{aligned}12543^2 + 224^2 &:= 12545^2 \\1236543^2 + 2224^2 &:= 1236545^2 \\123476543^2 + 22224^2 &:= 123476545^2 \\12345876543^2 + 222224^2 &:= 12345876545^2\end{aligned}$$

(b)

$$\begin{aligned}224^2 + 30^2 &:= 226^2 \\24024^2 + 310^2 &:= 24026^2 \\2418024^2 + 3110^2 &:= 2418026^2 \\241958024^2 + 31110^2 &:= 241958026^2\end{aligned}$$

203) Patterns for Number 226

(a)

$$\begin{aligned}224^2 + 30^2 &:= 226^2 \\24024^2 + 310^2 &:= 24026^2 \\2418024^2 + 3110^2 &:= 2418026^2 \\241958024^2 + 31110^2 &:= 241958026^2\end{aligned}$$

204) Patterns for Number 229

(a)

$$\begin{aligned}221^2 + 60^2 &:= 229^2 \\24021^2 + 620^2 &:= 24029^2 \\2418021^2 + 6220^2 &:= 2418029^2 \\241958021^2 + 62220^2 &:= 241958029^2\end{aligned}$$

205) Patterns for Number 231

(a)

$$\begin{aligned}3808^2 + 231^2 &:= 3815^2 \\388108^2 + 2331^2 &:= 388115^2 \\38881108^2 + 23331^2 &:= 38881115^2 \\3888811108^2 + 233331^2 &:= 3888811115^2\end{aligned}$$

(b)

$$\begin{aligned}520^2 + 231^2 &:= 569^2 \\55420^2 + 2331^2 &:= 55469^2 \\5554420^2 + 23331^2 &:= 5554469^2 \\555544420^2 + 233331^2 &:= 555544469^2\end{aligned}$$

(c)

$$\begin{aligned}231^2 + 520^2 &:= 569^2 \\22311^2 + 53200^2 &:= 57689^2 \\2223111^2 + 5332000^2 &:= 5776889^2 \\222231111^2 + 533320000^2 &:= 577768889^2\end{aligned}$$

206) Patterns for Number 233

(a)

$$\begin{aligned}27144^2 + 233^2 &:= 27145^2 \\2721444^2 + 2333^2 &:= 2721445^2 \\272214444^2 + 23333^2 &:= 272214445^2 \\27222144444^2 + 233333^2 &:= 27222144445^2\end{aligned}$$

(d)

$$\begin{aligned}7198^2 + 240^2 &:= 7202^2 \\719998^2 + 2400^2 &:= 720002^2 \\71999998^2 + 24000^2 &:= 72000002^2 \\7199999998^2 + 240000^2 &:= 7200000002^2\end{aligned}$$

207) Patterns for Number 240

(a)

$$\begin{aligned}14399^2 + 240^2 &:= 14401^2 \\143999^2 + 2400^2 &:= 1440001^2 \\14399999^2 + 24000^2 &:= 144000001^2 \\1439999999^2 + 240000^2 &:= 14400000001^2\end{aligned}$$

(b)

$$\begin{aligned}1591^2 + 240^2 &:= 1609^2 \\15991^2 + 2400^2 &:= 160009^2 \\1599991^2 + 24000^2 &:= 16000009^2 \\159999991^2 + 240000^2 &:= 1600000009^2\end{aligned}$$

(c)

$$\begin{aligned}3596^2 + 240^2 &:= 3604^2 \\359996^2 + 2400^2 &:= 360004^2 \\35999996^2 + 24000^2 &:= 36000004^2 \\3599999996^2 + 240000^2 &:= 3600000004^2\end{aligned}$$

(e)

$$\begin{aligned}364^2 + 240^2 &:= 436^2 \\39964^2 + 2400^2 &:= 40036^2 \\3999964^2 + 24000^2 &:= 4000036^2 \\399999964^2 + 240000^2 &:= 400000036^2\end{aligned}$$

(f)

$$\begin{aligned}884^2 + 240^2 &:= 916^2 \\89984^2 + 2400^2 &:= 90016^2 \\8999984^2 + 24000^2 &:= 9000016^2 \\899999984^2 + 240000^2 &:= 900000016^2\end{aligned}$$

208) Patterns for Number 241

(a)

$$\begin{aligned}209^2 + 120^2 &:= 241^2 \\24009^2 + 1240^2 &:= 24041^2 \\2418009^2 + 12440^2 &:= 2418041^2 \\241958009^2 + 124440^2 &:= 241958041^2\end{aligned}$$

209) Patterns for Number 247

(a)

$$\begin{aligned}1596^2 + 247^2 &:= 1615^2 \\168036^2 + 2527^2 &:= 168055^2 \\16880436^2 + 25327^2 &:= 16880455^2 \\1688804436^2 + 253327^2 &:= 1688804455^2\end{aligned}$$

210) Patterns for Number 248

(a)

$$\begin{aligned}248^2 + 1914^2 &:= 1930^2 \\2648^2 + 219114^2 &:= 219130^2 \\26648^2 + 22191114^2 &:= 22191130^2 \\266648^2 + 2221911114^2 &:= 2221911130^2\end{aligned}$$

211) Patterns for Number 250

(a)

$$\begin{aligned}200^2 + 150^2 &:= 250^2 \\24000^2 + 1550^2 &:= 24050^2 \\2418000^2 + 15550^2 &:= 2418050^2 \\241958000^2 + 155550^2 &:= 241958050^2\end{aligned}$$

(b)

$$\begin{aligned}600^2 + 250^2 &:= 650^2 \\65000^2 + 2550^2 &:= 65050^2 \\6528000^2 + 25550^2 &:= 6528050^2 \\653058000^2 + 255550^2 &:= 653058050^2\end{aligned}$$

212) Patterns for Number 251

(a)

$$\begin{aligned}31500^2 + 251^2 &:= 31501^2 \\3127500^2 + 2501^2 &:= 3127501^2 \\312525000^2 + 25001^2 &:= 312525001^2 \\31250250000^2 + 250001^2 &:= 31250250001^2\end{aligned}$$

213) Patterns for Number 252

(a)

$$\begin{aligned}252^2 + 39^2 &:= 255^2 \\26532^2 + 399^2 &:= 26535^2 \\2665332^2 + 3999^2 &:= 2665335^2 \\266653332^2 + 39999^2 &:= 266653335^2\end{aligned}$$

214) Patterns for Number 255

(a)

$$\begin{aligned}252^2 + 39^2 &:= 255^2 \\26532^2 + 399^2 &:= 26535^2 \\2665332^2 + 3999^2 &:= 2665335^2 \\266653332^2 + 39999^2 &:= 266653335^2\end{aligned}$$

(b)

$$\begin{aligned}255^2 + 32^2 &:= 257^2 \\27555^2 + 332^2 &:= 27557^2 \\2775555^2 + 3332^2 &:= 2775557^2 \\277755555^2 + 33332^2 &:= 277755557^2\end{aligned}$$

(c)

$$\begin{aligned}32^2 + 255^2 &:= 257^2 \\320^2 + 25599^2 &:= 25601^2 \\3200^2 + 2559999^2 &:= 2560001^2 \\32000^2 + 255999999^2 &:= 256000001^2\end{aligned}$$

(b)

$$\begin{aligned}32^2 + 255^2 &:= 257^2 \\320^2 + 25599^2 &:= 25601^2 \\3200^2 + 2559999^2 &:= 2560001^2 \\32000^2 + 255999999^2 &:= 256000001^2\end{aligned}$$

215) Patterns for Number 256

(a)

$$\begin{aligned}256^2 + 480^2 &:= 544^2 \\25116^2 + 48800^2 &:= 54884^2 \\2506716^2 + 4888000^2 &:= 5493284^2 \\250622716^2 + 488880000^2 &:= 549377284^2\end{aligned}$$

(b)

$$\begin{aligned}256^2 + 8190^2 &:= 8194^2 \\2656^2 + 881790^2 &:= 881794^2 \\26656^2 + 88817790^2 &:= 88817794^2 \\266656^2 + 8888177790^2 &:= 8888177794^2\end{aligned}$$

216) Patterns for Number 257

(a)

$$\begin{aligned}255^2 + 32^2 &:= 257^2 \\27555^2 + 332^2 &:= 27557^2 \\2775555^2 + 3332^2 &:= 2775557^2 \\277755555^2 + 33332^2 &:= 277755557^2\end{aligned}$$

217) Patterns for Number 260

(a)

$$\begin{aligned}4221^2 + 260^2 &:= 4229^2 \\442221^2 + 2660^2 &:= 442229^2 \\44422221^2 + 26660^2 &:= 44422229^2 \\4444222221^2 + 266660^2 &:= 4444222229^2\end{aligned}$$

(b)

$$\begin{aligned}260^2 + 8448^2 &:= 8452^2 \\2660^2 + 884448^2 &:= 884452^2 \\26660^2 + 88844448^2 &:= 88844452^2 \\266660^2 + 8888444448^2 &:= 8888444452^2\end{aligned}$$

218) Patterns for Number 261

(a)

$$\begin{aligned}189^2 + 180^2 &:= 261^2 \\23989^2 + 1860^2 &:= 24061^2 \\2417989^2 + 18660^2 &:= 2418061^2 \\241957989^2 + 186660^2 &:= 241958061^2\end{aligned}$$

219) Patterns for Number 264

(a)

$$\begin{aligned}4352^2 + 264^2 &:= 4360^2 \\443552^2 + 2664^2 &:= 443560^2 \\44435552^2 + 26664^2 &:= 44435560^2 \\4444355552^2 + 266664^2 &:= 4444355560^2\end{aligned}$$

(b)

$$\begin{aligned}1927^2 + 264^2 &:= 1945^2 \\197127^2 + 2664^2 &:= 197145^2 \\19749127^2 + 26664^2 &:= 19749145^2 \\1975269127^2 + 266664^2 &:= 1975269145^2\end{aligned}$$

(c)

$$\begin{aligned}1073^2 + 264^2 &:= 1105^2 \\110873^2 + 2664^2 &:= 110905^2 \\11108873^2 + 26664^2 &:= 11108905^2 \\1111088873^2 + 266664^2 &:= 1111088905^2\end{aligned}$$

(d)

$$\begin{aligned}2170^2 + 264^2 &:= 2186^2 \\221770^2 + 2664^2 &:= 221786^2 \\22217770^2 + 26664^2 &:= 22217786^2 \\2222177770^2 + 266664^2 &:= 2222177786^2\end{aligned}$$

(e)

$$\begin{aligned}8710^2 + 264^2 &:= 8714^2 \\887110^2 + 2664^2 &:= 887114^2 \\88871110^2 + 26664^2 &:= 88871114^2 \\8888711110^2 + 266664^2 &:= 8888711114^2\end{aligned}$$

(f)

$$\begin{aligned}264^2 + 950^2 &:= 986^2 \\275264^2 + 19950^2 &:= 275986^2 \\30525264^2 + 209950^2 &:= 30525986^2 \\3083025264^2 + 2109950^2 &:= 3083025986^2\end{aligned}$$

(g)

$$\begin{aligned}264^2 + 23^2 &:= 265^2 \\20604^2 + 203^2 &:= 20605^2 \\2006004^2 + 2003^2 &:= 2006005^2 \\200060004^2 + 20003^2 &:= 200060005^2\end{aligned}$$

220) Patterns for Number 265

(a)

$$\begin{aligned}264^2 + 23^2 &:= 265^2 \\20604^2 + 203^2 &:= 20605^2 \\2006004^2 + 2003^2 &:= 2006005^2 \\200060004^2 + 20003^2 &:= 200060005^2\end{aligned}$$

221) Patterns for Number 266

(a)

$$\begin{aligned}17688^2 + 266^2 &:= 17690^2 \\1776888^2 + 2666^2 &:= 1776890^2 \\177768888^2 + 26666^2 &:= 177768890^2 \\17777688888^2 + 266666^2 &:= 17777688890^2\end{aligned}$$

222) Patterns for Number 267

(a)

$$\begin{aligned}35644^2 + 267^2 &:= 35645^2 \\3556444^2 + 2667^2 &:= 3556445^2 \\355564444^2 + 26667^2 &:= 355564445^2 \\35555644444^2 + 266667^2 &:= 35555644445^2\end{aligned}$$

223) Patterns for Number 268

(a)

$$\begin{aligned}268^2 + 8976^2 &:= 8980^2 \\2668^2 + 889776^2 &:= 889780^2 \\26668^2 + 88897776^2 &:= 88897780^2 \\266668^2 + 8888977776^2 &:= 8888977780^2\end{aligned}$$

224) Patterns for Number 270

(a)

$$\begin{aligned}2016^2 + 270^2 &:= 2034^2 \\207016^2 + 2730^2 &:= 207034^2 \\20748016^2 + 27330^2 &:= 20748034^2 \\2075258016^2 + 273330^2 &:= 2075258034^2\end{aligned}$$

225) Patterns for Number 272

(a)

$$\begin{aligned}272^2 + 4620^2 &:= 4628^2 \\2672^2 + 446220^2 &:= 446228^2 \\26672^2 + 44462220^2 &:= 44462228^2 \\266672^2 + 4444622220^2 &:= 4444622228^2\end{aligned}$$

226) Patterns for Number 275

(a)

$$\begin{aligned}275^2 + 1500^2 &:= 1525^2 \\24975^2 + 153000^2 &:= 155025^2 \\2471975^2 + 15330000^2 &:= 15528025^2 \\246941975^2 + 1533300000^2 &:= 1553058025^2\end{aligned}$$

227) Patterns for Number 279

(a)

$$\begin{aligned}279^2 + 440^2 &:= 521^2 \\27679^2 + 44400^2 &:= 52321^2 \\2765679^2 + 4444000^2 &:= 5234321^2 \\276545679^2 + 444440000^2 &:= 523454321^2\end{aligned}$$

228) Patterns for Number 280

(a)

$$\begin{aligned}351^2 + 280^2 &:= 449^2 \\39951^2 + 2800^2 &:= 40049^2 \\3999951^2 + 28000^2 &:= 4000049^2 \\399999951^2 + 280000^2 &:= 400000049^2\end{aligned}$$

(b)

$$\begin{aligned}4896^2 + 280^2 &:= 4904^2 \\489996^2 + 2800^2 &:= 490004^2 \\48999996^2 + 28000^2 &:= 49000004^2 \\4899999996^2 + 280000^2 &:= 4900000004^2\end{aligned}$$

(c)

$$\begin{aligned} 9798^2 + 280^2 &:= 9802^2 \\ 97998^2 + 2800^2 &:= 980002^2 \\ 979998^2 + 28000^2 &:= 98000002^2 \\ 9799998^2 + 280000^2 &:= 9800000002^2 \end{aligned}$$

(d)

$$\begin{aligned} 1209^2 + 280^2 &:= 1241^2 \\ 112209^2 + 2680^2 &:= 112241^2 \\ 11122209^2 + 26680^2 &:= 11122241^2 \\ 1111222209^2 + 26680^2 &:= 1111222241^2 \end{aligned}$$

(e)

$$\begin{aligned} 19599^2 + 280^2 &:= 19601^2 \\ 195999^2 + 2800^2 &:= 1960001^2 \\ 1959999^2 + 28000^2 &:= 196000001^2 \\ 19599999^2 + 280000^2 &:= 19600000001^2 \end{aligned}$$

(f)

$$\begin{aligned} 280^2 + 2442^2 &:= 2458^2 \\ 2680^2 + 224442^2 &:= 224458^2 \\ 26680^2 + 22244442^2 &:= 22244458^2 \\ 266680^2 + 2222444442^2 &:= 2222444458^2 \end{aligned}$$

229) Patterns for Number 288

(a)

$$\begin{aligned} 34^2 + 288^2 &:= 290^2 \\ 340^2 + 2889^2 &:= 28901^2 \\ 3400^2 + 288999^2 &:= 2890001^2 \\ 34000^2 + 28899999^2 &:= 289000001^2 \end{aligned}$$

230) Patterns for Number 290

(a)

$$\begin{aligned} 34^2 + 288^2 &:= 290^2 \\ 340^2 + 2889^2 &:= 28901^2 \\ 3400^2 + 288999^2 &:= 2890001^2 \\ 34000^2 + 28899999^2 &:= 289000001^2 \end{aligned}$$

231) Patterns for Number 292

(a)

$$\begin{aligned} 192^2 + 220^2 &:= 292^2 \\ 24592^2 + 2220^2 &:= 24692^2 \\ 2468592^2 + 22220^2 &:= 2468692^2 \\ 246908592^2 + 222220^2 &:= 246908692^2 \end{aligned}$$

232) Patterns for Number 297

(a)

$$\begin{aligned} 297^2 + 60^2 &:= 303^2 \\ 29997^2 + 600^2 &:= 30003^2 \\ 2999997^2 + 6000^2 &:= 3000003^2 \\ 299999997^2 + 60000^2 &:= 300000003^2 \end{aligned}$$

(b)

$$\begin{aligned} 4896^2 + 297^2 &:= 4905^2 \\ 498996^2 + 2997^2 &:= 499005^2 \\ 49989996^2 + 29997^2 &:= 49990005^2 \\ 4999899996^2 + 299997^2 &:= 4999900005^2 \end{aligned}$$

(c)

$$\begin{aligned} 297^2 + 704^2 &:= 585^2 \\ 2997^2 + 55404^2 &:= 55485^2 \\ 29997^2 + 5554404^2 &:= 5554485^2 \\ 299997^2 + 555544404^2 &:= 555544485^2 \end{aligned}$$

233) Patterns for Number 299

(a)

$$\begin{aligned} 44700^2 + 299^2 &:= 44701^2 \\ 4497000^2 + 2999^2 &:= 4497001^2 \\ 449970000^2 + 29999^2 &:= 449970001^2 \\ 44999700000^2 + 299999^2 &:= 44999700001^2 \end{aligned}$$

234) Patterns for Number 300

(a)

$$\begin{aligned} 22499^2 + 300^2 &:= 22501^2 \\ 224999^2 + 3000^2 &:= 2250001^2 \\ 22499999^2 + 30000^2 &:= 225000001^2 \\ 2249999999^2 + 300000^2 &:= 22500000001^2 \end{aligned}$$

(b)

$$\begin{aligned} 2491^2 + 300^2 &:= 2509^2 \\ 249991^2 + 3000^2 &:= 250009^2 \\ 24999991^2 + 30000^2 &:= 25000009^2 \\ 2499999991^2 + 300000^2 &:= 2500000009^2 \end{aligned}$$

(c)

$$\begin{aligned} 875^2 + 300^2 &:= 925^2 \\ 89975^2 + 3000^2 &:= 90025^2 \\ 8999975^2 + 30000^2 &:= 9000025^2 \\ 899999975^2 + 300000^2 &:= 900000025^2 \end{aligned}$$

(d)

$$\begin{aligned} 125^2 + 300^2 &:= 325^2 \\ 14025^2 + 31000^2 &:= 34025^2 \\ 1418025^2 + 3110000^2 &:= 3418025^2 \\ 141958025^2 + 311100000^2 &:= 341958025^2 \end{aligned}$$

(e)

$$\begin{aligned} 589^2 + 300^2 &:= 661^2 \\ 275589^2 + 6300^2 &:= 275661^2 \\ 30525589^2 + 66300^2 &:= 30525661^2 \\ 3083025589^2 + 666300^2 &:= 3083025661^2 \end{aligned}$$

2.4 Pattern in Pythagorean Triples: 301 to 400

235) Patterns for Number 301

(a)

$$\begin{aligned}45300^2 + 301^2 &:= 45301^2 \\4503000^2 + 3001^2 &:= 4503001^2 \\450030000^2 + 30001^2 &:= 450030001^2 \\45000300000^2 + 300001^2 &:= 45000300001^2\end{aligned}$$

(b)

$$\begin{aligned}301^2 + 900^2 &:= 949^2 \\275301^2 + 18900^2 &:= 275949^2 \\30525301^2 + 198900^2 &:= 30525949^2 \\3083025301^2 + 1998900^2 &:= 3083025949^2\end{aligned}$$

236) Patterns for Number 303

(a)

$$\begin{aligned}297^2 + 60^2 &:= 303^2 \\29997^2 + 600^2 &:= 30003^2 \\2999997^2 + 6000^2 &:= 3000003^2 \\299999997^2 + 60000^2 &:= 300000003^2\end{aligned}$$

(b)

$$\begin{aligned}45904^2 + 303^2 &:= 45905^2 \\4509004^2 + 3003^2 &:= 4509005^2 \\450090004^2 + 30003^2 &:= 450090005^2 \\45000900004^2 + 300003^2 &:= 45000900005^2\end{aligned}$$

237) Patterns for Number 305

(a)

$$\begin{aligned}305^2 + 1848^2 &:= 1873^2 \\3305^2 + 218448^2 &:= 218473^2 \\33305^2 + 22184448^2 &:= 22184473^2 \\333305^2 + 2221844448^2 &:= 2221844473^2\end{aligned}$$

238) Patterns for Number 310

(a)

$$\begin{aligned}224^2 + 30^2 &:= 226^2 \\24024^2 + 310^2 &:= 24026^2 \\2418024^2 + 3110^2 &:= 2418026^2 \\241958024^2 + 31110^2 &:= 241958026^2\end{aligned}$$

239) Patterns for Number 318

(a)

$$\begin{aligned}318^2 + 25280^2 &:= 25282^2 \\3318^2 + 2752280^2 &:= 2752282^2 \\33318^2 + 277522280^2 &:= 277522282^2 \\333318^2 + 27775222280^2 &:= 27775222282^2\end{aligned}$$

(b)

$$\begin{aligned}318^2 + 25280^2 &:= 25282^2 \\3180^2 + 2528099^2 &:= 2528101^2 \\31800^2 + 252809999^2 &:= 252810001^2 \\318000^2 + 25280999999^2 &:= 25281000001^2\end{aligned}$$

240) Patterns for Number 319

(a)

$$\begin{aligned} 319^2 + 360^2 &:= 481^2 \\ 39919^2 + 3600^2 &:= 40081^2 \\ 3999919^2 + 36000^2 &:= 4000081^2 \\ 399999919^2 + 360000^2 &:= 400000081^2 \end{aligned}$$

(b)

$$\begin{aligned} 319^2 + 50880^2 &:= 50881^2 \\ 3319^2 + 5507880^2 &:= 5507881^2 \\ 33319^2 + 555077880^2 &:= 555077881^2 \\ 333319^2 + 55550777880^2 &:= 55550777881^2 \end{aligned}$$

241) Patterns for Number 320

(a)

$$\begin{aligned} 1584^2 + 320^2 &:= 1616^2 \\ 159984^2 + 3200^2 &:= 160016^2 \\ 1599984^2 + 32000^2 &:= 16000016^2 \\ 15999984^2 + 320000^2 &:= 1600000016^2 \end{aligned}$$

(b)

$$\begin{aligned} 320^2 + 25599^2 &:= 25601^2 \\ 3200^2 + 255999^2 &:= 2560001^2 \\ 32000^2 + 2559999^2 &:= 256000001^2 \\ 320000^2 + 25599999^2 &:= 25600000001^2 \end{aligned}$$

(c)

$$\begin{aligned} 320^2 + 72^2 &:= 328^2 \\ 39200^2 + 792^2 &:= 39208^2 \\ 3992000^2 + 7992^2 &:= 3992008^2 \\ 399920000^2 + 79992^2 &:= 399920008^2 \end{aligned}$$

(d)

$$\begin{aligned} 336^2 + 320^2 &:= 464^2 \\ 39936^2 + 3200^2 &:= 40064^2 \\ 399936^2 + 32000^2 &:= 4000064^2 \\ 3999936^2 + 320000^2 &:= 400000064^2 \end{aligned}$$

(e)

$$\begin{aligned} 6396^2 + 320^2 &:= 6404^2 \\ 63996^2 + 3200^2 &:= 640004^2 \\ 639996^2 + 32000^2 &:= 64000004^2 \\ 6399996^2 + 320000^2 &:= 6400000004^2 \end{aligned}$$

242) Patterns for Number 321

(a)

$$\begin{aligned} 321^2 + 51520^2 &:= 51521^2 \\ 3321^2 + 5514520^2 &:= 5514521^2 \\ 33321^2 + 555144520^2 &:= 555144521^2 \\ 333321^2 + 55551444520^2 &:= 55551444521^2 \end{aligned}$$

243) Patterns for Number 322

(a)

$$322^2 + 25920^2 := 25922^2$$

$$3220^2 + 2592099^2 := 2592101^2$$

$$32200^2 + 259209999^2 := 259210001^2$$

$$322000^2 + 25920999999^2 := 25921000001^2$$

(b)

$$324^2 + 26243^2 := 26245^2$$

$$3240^2 + 2624399^2 := 2624401^2$$

$$32400^2 + 262439999^2 := 262440001^2$$

$$324000^2 + 26243999999^2 := 26244000001^2$$

244) Patterns for Number 323

(a)

$$323^2 + 36^2 := 325^2$$

$$39203^2 + 396^2 := 39205^2$$

$$3992003^2 + 3996^2 := 3992005^2$$

$$399920003^2 + 39996^2 := 399920005^2$$

(b)

$$323^2 + 52164^2 := 52165^2$$

$$3323^2 + 5521164^2 := 5521165^2$$

$$33323^2 + 555211164^2 := 555211165^2$$

$$333323^2 + 55552111164^2 := 55552111165^2$$

(c)

$$324^2 + 26243^2 := 26245^2$$

$$3324^2 + 2762243^2 := 2762245^2$$

$$33324^2 + 277622243^2 := 277622245^2$$

$$333324^2 + 27776222243^2 := 27776222245^2$$

(d)

$$324^2 + 26243^2 + 26245^2$$

$$3324^2 + 2762243^2 + 2762245^2$$

$$33324^2 + 277622243^2 + 277622245^2$$

$$333324^2 + 27776222243^2 + 27776222245^2$$

245) Patterns for Number 324

(a)

$$324^2 + 1440^2 := 1476^2$$

$$39824^2 + 134400^2 := 140176^2$$

$$4053824^2 + 13344000^2 := 13946176^2$$

$$406093824^2 + 1333440000^2 := 1393906176^2$$

246) Patterns for Number 325

(a)

$$323^2 + 36^2 := 325^2$$

$$39203^2 + 396^2 := 39205^2$$

$$3992003^2 + 3996^2 := 3992005^2$$

$$399920003^2 + 39996^2 := 399920005^2$$

(b)

$$125^2 + 300^2 := 325^2$$

$$14025^2 + 31000^2 := 34025^2$$

$$1418025^2 + 3110000^2 := 3418025^2$$

$$141958025^2 + 311100000^2 := 341958025^2$$

(c)

$$325^2 + 2100^2 := 2125^2$$

$$3325^2 + 221100^2 := 221125^2$$

$$33325^2 + 22211100^2 := 22211125^2$$

$$333325^2 + 2222111100^2 := 2222111125^2$$

(d)

$$325^2 + 52812^2 := 52813^2$$

$$3325^2 + 5527812^2 := 5527813^2$$

$$33325^2 + 555277812^2 := 555277813^2$$

$$333325^2 + 55552777812^2 := 55552777813^2$$

247) Patterns for Number 326

(a)

$$326^2 + 26568^2 := 26570^2$$

$$3260^2 + 2656899^2 := 2656901^2$$

$$32600^2 + 265689999^2 := 265690001^2$$

$$326000^2 + 26568999999^2 := 26569000001^2$$

(b)

$$326^2 + 26568^2 := 26570^2$$

$$3326^2 + 2765568^2 := 2765570^2$$

$$33326^2 + 277655568^2 := 277655570^2$$

$$333326^2 + 27776555568^2 := 27776555570^2$$

248) Patterns for Number 327

(a)

$$327^2 + 53464^2 := 53465^2$$

$$3327^2 + 5534464^2 := 5534465^2$$

$$33327^2 + 555344464^2 := 555344465^2$$

$$333327^2 + 55553444464^2 := 55553444465^2$$

249) Patterns for Number 328

(a)

$$320^2 + 72^2 := 328^2$$

$$39200^2 + 792^2 := 39208^2$$

$$3992000^2 + 7992^2 := 3992008^2$$

$$399920000^2 + 79992^2 := 399920008^2$$

(b)

$$328^2 + 26895^2 := 26897^2$$

$$3280^2 + 2689599^2 := 2689601^2$$

$$32800^2 + 268959999^2 := 268960001^2$$

$$328000^2 + 26895999999^2 := 26896000001^2$$

(c)

$$\begin{aligned}328^2 + 26895^2 &:= 26897^2 \\3328^2 + 2768895^2 &:= 2768897^2 \\33328^2 + 277688895^2 &:= 277688897^2 \\333328^2 + 27776888895^2 &:= 27776888897^2\end{aligned}$$

250) Patterns for Number 329

(a)

$$\begin{aligned}329^2 + 54120^2 &:= 54121^2 \\3329^2 + 5541120^2 &:= 5541121^2 \\33329^2 + 555411120^2 &:= 555411121^2 \\333329^2 + 55554111120^2 &:= 55554111121^2\end{aligned}$$

251) Patterns for Number 330

(a)

$$\begin{aligned}1064^2 + 330^2 &:= 1114^2 \\110864^2 + 3330^2 &:= 110914^2 \\11108864^2 + 33330^2 &:= 11108914^2 \\1111088864^2 + 333330^2 &:= 1111088914^2\end{aligned}$$

(b)

$$\begin{aligned}16^2 + 30^2 &:= 34^2 \\3016^2 + 330^2 &:= 3034^2 \\308016^2 + 3330^2 &:= 308034^2 \\30858016^2 + 33330^2 &:= 30858034^2\end{aligned}$$

(c)

$$\begin{aligned}330^2 + 27224^2 &:= 27226^2 \\3300^2 + 2722499^2 &:= 2722501^2 \\33000^2 + 272249999^2 &:= 272250001^2 \\330000^2 + 27224999999^2 &:= 27225000001^2\end{aligned}$$

252) Patterns for Number 331

(a)

$$\begin{aligned}331^2 + 54780^2 &:= 54781^2 \\3331^2 + 5547780^2 &:= 5547781^2 \\33331^2 + 555477780^2 &:= 555477781^2 \\333331^2 + 55554777780^2 &:= 55554777781^2\end{aligned}$$

253) Patterns for Number 332

(a)

$$\begin{aligned}332^2 + 27555^2 &:= 27557^2 \\3332^2 + 2775555^2 &:= 2775557^2 \\33332^2 + 277755555^2 &:= 277755557^2 \\333332^2 + 27777555555^2 &:= 27777555557^2\end{aligned}$$

254) Patterns for Number 333

(a)

$$\begin{aligned}333^2 + 55444^2 &:= 55445^2 \\3333^2 + 5554444^2 &:= 5554445^2 \\33333^2 + 555544444^2 &:= 555544445^2 \\333333^2 + 55555444444^2 &:= 55555444445^2\end{aligned}$$

255) Patterns for Number 334

(a)

$$\begin{aligned} 334^2 + 27888^2 &:= 27890^2 \\ 3334^2 + 2778888^2 &:= 2778890^2 \\ 33334^2 + 277788888^2 &:= 277788890^2 \\ 333334^2 + 27777888888^2 &:= 27777888890^2 \end{aligned}$$

(b)

$$\begin{aligned} 336^2 + 320^2 &:= 464^2 \\ 39936^2 + 3200^2 &:= 40064^2 \\ 3999936^2 + 32000^2 &:= 4000064^2 \\ 399999936^2 + 320000^2 &:= 400000064^2 \end{aligned}$$

256) Patterns for Number 335

(a)

$$\begin{aligned} 335^2 + 56112^2 &:= 56113^2 \\ 3335^2 + 5561112^2 &:= 5561113^2 \\ 33335^2 + 555611112^2 &:= 555611113^2 \\ 333335^2 + 55556111112^2 &:= 55556111113^2 \end{aligned}$$

(c)

$$\begin{aligned} 336^2 + 850^2 &:= 914^2 \\ 275336^2 + 17850^2 &:= 275914^2 \\ 30525336^2 + 187850^2 &:= 30525914^2 \\ 3083025336^2 + 1887850^2 &:= 3083025914^2 \end{aligned}$$

(b)

$$\begin{aligned} 335^2 + 804^2 &:= 871^2 \\ 3335^2 + 8004^2 &:= 8671^2 \\ 33335^2 + 80004^2 &:= 86671^2 \\ 333335^2 + 800004^2 &:= 866671^2 \end{aligned}$$

(d)

$$\begin{aligned} 336^2 + 28223^2 &:= 28225^2 \\ 3336^2 + 2782223^2 &:= 2782225^2 \\ 33336^2 + 277822223^2 &:= 277822225^2 \\ 333336^2 + 27778222223^2 &:= 27778222225^2 \end{aligned}$$

257) Patterns for Number 336

(a)

$$\begin{aligned} 336^2 + 52^2 &:= 340^2 \\ 35376^2 + 532^2 &:= 35380^2 \\ 3553776^2 + 5332^2 &:= 3553780^2 \\ 355537776^2 + 53332^2 &:= 355537780^2 \end{aligned}$$

(e)

$$\begin{aligned} 336^2 + 448^2 &:= 560^2 \\ 3366^2 + 4488^2 &:= 5610^2 \\ 33666^2 + 44888^2 &:= 56110^2 \\ 336666^2 + 448888^2 &:= 561110^2 \end{aligned}$$

(f)

$$\begin{aligned} 336^2 + 28223^2 &:= 28225^2 \\ 3360^2 + 2822399^2 &:= 2822401^2 \\ 33600^2 + 282239999^2 &:= 282240001^2 \\ 336000^2 + 28223999999^2 &:= 28224000001^2 \end{aligned}$$

258) Patterns for Number 337

(a)

$$\begin{aligned}337^2 + 56784^2 &:= 56785^2 \\3337^2 + 5567784^2 &:= 5567785^2 \\33337^2 + 555677784^2 &:= 555677785^2 \\333337^2 + 55556777784^2 &:= 55556777785^2\end{aligned}$$

259) Patterns for Number 338

(a)

$$\begin{aligned}338^2 + 28560^2 &:= 28562^2 \\3338^2 + 2785560^2 &:= 2785562^2 \\33338^2 + 277855560^2 &:= 277855562^2 \\333338^2 + 27778555560^2 &:= 27778555562^2\end{aligned}$$

(b)

$$\begin{aligned}338^2 + 28560^2 &:= 28562^2 \\3380^2 + 2856099^2 &:= 2856101^2 \\33800^2 + 285609999^2 &:= 285610001^2 \\338000^2 + 28560999999^2 &:= 28561000001^2\end{aligned}$$

260) Patterns for Number 339

(a)

$$\begin{aligned}339^2 + 57460^2 &:= 57461^2 \\3399^2 + 5776600^2 &:= 5776601^2 \\33999^2 + 577966000^2 &:= 577966001^2 \\339999^2 + 57799660000^2 &:= 57799660001^2\end{aligned}$$

(b)

$$\begin{aligned}339^2 + 57460^2 &:= 57461^2 \\3339^2 + 5574460^2 &:= 5574461^2 \\33339^2 + 555744460^2 &:= 555744461^2 \\333339^2 + 55557444460^2 &:= 55557444461^2\end{aligned}$$

261) Patterns for Number 340

(a)

$$\begin{aligned}340^2 + 5775^2 &:= 5785^2 \\3340^2 + 557775^2 &:= 557785^2 \\33340^2 + 55577775^2 &:= 55577785^2 \\333340^2 + 5555777775^2 &:= 5555777785^2\end{aligned}$$

(b)

$$\begin{aligned}1683^2 + 340^2 &:= 1717^2 \\169983^2 + 3400^2 &:= 170017^2 \\1699983^2 + 34000^2 &:= 17000017^2 \\16999983^2 + 340000^2 &:= 1700000017^2\end{aligned}$$

(c)

$$\begin{aligned}7221^2 + 340^2 &:= 7229^2 \\783221^2 + 3540^2 &:= 783229^2 \\78943221^2 + 35540^2 &:= 78943229^2 \\7900543221^2 + 355540^2 &:= 7900543229^2\end{aligned}$$

(d)

$$340^2 + 28899^2 := 28901^2$$

$$3400^2 + 288999^2 := 2890001^2$$

$$34000^2 + 28899999^2 := 289000001^2$$

$$340000^2 + 2889999999^2 := 28900000001^2$$

(e)

$$336^2 + 52^2 := 340^2$$

$$35376^2 + 532^2 := 35380^2$$

$$3553776^2 + 5332^2 := 3553780^2$$

$$355537776^2 + 53332^2 := 355537780^2$$

(f)

$$340^2 + 28899^2 := 28901^2$$

$$3340^2 + 2788899^2 := 2788901^2$$

$$33340^2 + 277888899^2 := 277888901^2$$

$$333340^2 + 27778888899^2 := 27778888901^2$$

262) Patterns for Number 341

(a)

$$341^2 + 58140^2 := 58141^2$$

$$3411^2 + 5817460^2 := 5817461^2$$

$$34111^2 + 581780160^2 := 581780161^2$$

$$341111^2 + 58178357160^2 := 58178357161^2$$

(b)

$$341^2 + 58140^2 := 58141^2$$

$$3341^2 + 5581140^2 := 5581141^2$$

$$33341^2 + 555811140^2 := 555811141^2$$

$$333341^2 + 55558111140^2 := 55558111141^2$$

263) Patterns for Number 342

(a)

$$342^2 + 29240^2 := 29242^2$$

$$3442^2 + 2961840^2 := 2961842^2$$

$$34442^2 + 296562840^2 := 296562842^2$$

$$344442^2 + 29660072840^2 := 29660072842^2$$

(b)

$$342^2 + 29240^2 := 29242^2$$

$$3342^2 + 2792240^2 := 2792242^2$$

$$33342^2 + 277922240^2 := 277922242^2$$

$$333342^2 + 27779222240^2 := 27779222242^2$$

(c)

$$342^2 + 29240^2 := 29242^2$$

$$3420^2 + 2924099^2 := 2924101^2$$

$$34200^2 + 292409999^2 := 292410001^2$$

$$342000^2 + 29240999999^2 := 29241000001^2$$

264) Patterns for Number 342

(a)

$$\begin{aligned}343^2 + 58824^2 &:= 58825^2 \\3343^2 + 5587824^2 &:= 5587825^2 \\33343^2 + 555877824^2 &:= 555877825^2 \\333343^2 + 55558777824^2 &:= 55558777825^2\end{aligned}$$

265) Patterns for Number 344

(a)

$$\begin{aligned}344^2 + 29583^2 &:= 29585^2 \\3444^2 + 2965283^2 &:= 2965285^2 \\34444^2 + 296597283^2 &:= 296597285^2 \\344444^2 + 29660417283^2 &:= 29660417285^2\end{aligned}$$

(b)

$$\begin{aligned}344^2 + 29583^2 &:= 29585^2 \\3344^2 + 2795583^2 &:= 2795585^2 \\33344^2 + 277955583^2 &:= 277955585^2 \\333344^2 + 27779555583^2 &:= 27779555585^2\end{aligned}$$

(c)

$$\begin{aligned}344^2 + 29583^2 &:= 29585^2 \\3440^2 + 2958399^2 &:= 2958401^2 \\34400^2 + 295839999^2 &:= 295840001^2 \\344000^2 + 29583999999^2 &:= 29584000001^2\end{aligned}$$

266) Patterns for Number 345

(a)

$$\begin{aligned}345^2 + 59512^2 &:= 59513^2 \\3445^2 + 5934012^2 &:= 5934013^2 \\34445^2 + 593229012^2 &:= 593229013^2 \\344445^2 + 59321179012^2 &:= 59321179013^2\end{aligned}$$

(b)

$$\begin{aligned}184^2 + 345^2 &:= 391^2 \\1784^2 + 3345^2 &:= 3791^2 \\17784^2 + 33345^2 &:= 37791^2 \\177784^2 + 333345^2 &:= 377791^2\end{aligned}$$

(c)

$$\begin{aligned}345^2 + 59512^2 &:= 59513^2 \\3345^2 + 5594512^2 &:= 5594513^2 \\33345^2 + 555944512^2 &:= 555944513^2 \\333345^2 + 55559444512^2 &:= 55559444513^2\end{aligned}$$

267) Patterns for Number 350

(a)

$$\begin{aligned}576^2 + 350^2 &:= 674^2 \\275576^2 + 7350^2 &:= 275674^2 \\30525576^2 + 77350^2 &:= 30525674^2 \\3083025576^2 + 777350^2 &:= 3083025674^2\end{aligned}$$

(b)

$$\begin{aligned}1200^2 + 350^2 &:= 1250^2 \\112200^2 + 3350^2 &:= 112250^2 \\11122200^2 + 33350^2 &:= 11122250^2 \\1111222200^2 + 33350^2 &:= 1111222250^2\end{aligned}$$

268) Patterns for Number 351

(a)

$$\begin{aligned}351^2 + 280^2 &:= 449^2 \\39951^2 + 2800^2 &:= 40049^2 \\3999951^2 + 28000^2 &:= 4000049^2 \\399999951^2 + 280000^2 &:= 400000049^2\end{aligned}$$

269) Patterns for Number 352

(a)

$$\begin{aligned}1920^2 + 352^2 &:= 1952^2 \\197120^2 + 3552^2 &:= 197152^2 \\19749120^2 + 35552^2 &:= 19749152^2 \\1975269120^2 + 355552^2 &:= 1975269152^2\end{aligned}$$

270) Patterns for Number 355

(a)

$$\begin{aligned}355^2 + 2508^2 &:= 2533^2 \\3355^2 + 225108^2 &:= 225133^2 \\33355^2 + 22251108^2 &:= 22251133^2 \\333355^2 + 2222511108^2 &:= 2222511133^2\end{aligned}$$

271) Patterns for Number 360

(a)

$$\begin{aligned}319^2 + 360^2 &:= 481^2 \\39919^2 + 3600^2 &:= 40081^2 \\3999919^2 + 36000^2 &:= 4000081^2 \\399999919^2 + 360000^2 &:= 400000081^2\end{aligned}$$

(b)

$$\begin{aligned}3591^2 + 360^2 &:= 3609^2 \\359991^2 + 3600^2 &:= 360009^2 \\35999991^2 + 36000^2 &:= 36000009^2 \\3599999991^2 + 360000^2 &:= 3600000009^2\end{aligned}$$

(c)

$$\begin{aligned}2009^2 + 360^2 &:= 2041^2 \\207009^2 + 3640^2 &:= 207041^2 \\20748009^2 + 36440^2 &:= 20748041^2 \\2075258009^2 + 364440^2 &:= 2075258041^2\end{aligned}$$

(d)

$$\begin{aligned}8096^2 + 360^2 &:= 8104^2 \\809996^2 + 3600^2 &:= 810004^2 \\80999996^2 + 36000^2 &:= 81000004^2 \\8099999996^2 + 360000^2 &:= 8100000004^2\end{aligned}$$

(e)

$$\begin{aligned}864^2 + 360^2 &:= 936^2 \\89964^2 + 3600^2 &:= 90036^2 \\8999964^2 + 36000^2 &:= 9000036^2 \\899999964^2 + 360000^2 &:= 900000036^2\end{aligned}$$

(f)

$$\begin{aligned}32399^2 + 360^2 &:= 32401^2 \\323999^2 + 3600^2 &:= 3240001^2 \\3239999^2 + 36000^2 &:= 324000001^2 \\32399999^2 + 360000^2 &:= 32400000001^2\end{aligned}$$

(g)

$$\begin{aligned}360^2 + 38^2 &:= 362^2 \\39600^2 + 398^2 &:= 39602^2 \\3996000^2 + 3998^2 &:= 3996002^2 \\399960000^2 + 39998^2 &:= 399960002^2\end{aligned}$$

(h)

$$\begin{aligned}360^2 + 1782^2 &:= 1818^2 \\3960^2 + 217782^2 &:= 217818^2 \\39960^2 + 22177782^2 &:= 22177818^2 \\399960^2 + 2221777782^2 &:= 2221777818^2\end{aligned}$$

272) Patterns for Number 362

(a)

$$\begin{aligned}360^2 + 38^2 &:= 362^2 \\39600^2 + 398^2 &:= 39602^2 \\3996000^2 + 3998^2 &:= 3996002^2 \\399960000^2 + 39998^2 &:= 399960002^2\end{aligned}$$

273) Patterns for Number 364

(a)

$$\begin{aligned}364^2 + 27^2 &:= 365^2 \\35644^2 + 267^2 &:= 35645^2 \\3556444^2 + 2667^2 &:= 3556445^2 \\355564444^2 + 26667^2 &:= 355564445^2\end{aligned}$$

(b)

$$\begin{aligned}364^2 + 240^2 &:= 436^2 \\39964^2 + 2400^2 &:= 40036^2 \\3999964^2 + 24000^2 &:= 4000036^2 \\399999964^2 + 240000^2 &:= 400000036^2\end{aligned}$$

274) Patterns for Number 365

(a)

$$\begin{aligned}364^2 + 27^2 &:= 365^2 \\35644^2 + 267^2 &:= 35645^2 \\3556444^2 + 2667^2 &:= 3556445^2 \\355564444^2 + 26667^2 &:= 355564445^2\end{aligned}$$

275) Patterns for Number 369

(a)

$$\begin{aligned}369^2 + 800^2 &:= 881^2 \\275369^2 + 16800^2 &:= 275881^2 \\30525369^2 + 176800^2 &:= 30525881^2 \\3083025369^2 + 1776800^2 &:= 3083025881^2\end{aligned}$$

276) Patterns for Number 371

(a)

$$\begin{aligned}371^2 + 1380^2 &:= 1429^2 \\35711^2 + 139800^2 &:= 144289^2 \\3557111^2 + 13998000^2 &:= 14442889^2 \\355571111^2 + 1399980000^2 &:= 1444428889^2\end{aligned}$$

277) Patterns for Number 375

(a)

$$\begin{aligned}375^2 + 200^2 &:= 425^2 \\39975^2 + 2000^2 &:= 40025^2 \\3999975^2 + 20000^2 &:= 4000025^2 \\39999975^2 + 200000^2 &:= 40000025^2\end{aligned}$$

278) Patterns for Number 376

(a)

$$\begin{aligned}376^2 + 17670^2 &:= 17674^2 \\3976^2 + 1976070^2 &:= 1976074^2 \\39976^2 + 199760070^2 &:= 199760074^2 \\399976^2 + 19997600070^2 &:= 19997600074^2\end{aligned}$$

279) Patterns for Number 380

(a)

$$\begin{aligned}1419^2 + 380^2 &:= 1469^2 \\114219^2 + 3380^2 &:= 114269^2 \\11142219^2 + 33380^2 &:= 11142269^2 \\1111422219^2 + 333380^2 &:= 1111422269^2\end{aligned}$$

(b)

$$\begin{aligned}9021^2 + 380^2 &:= 9029^2 \\990021^2 + 3980^2 &:= 990029^2 \\99900021^2 + 39980^2 &:= 99900029^2 \\9999000021^2 + 399980^2 &:= 9999000029^2\end{aligned}$$

280) Patterns for Number 381

(a)

$$\begin{aligned}381^2 + 8060^2 &:= 8069^2 \\3981^2 + 880460^2 &:= 880469^2 \\39981^2 + 88804460^2 &:= 88804469^2 \\399981^2 + 8888044460^2 &:= 8888044469^2\end{aligned}$$

281) Patterns for Number 384

(a)

$$\begin{aligned}384^2 + 160^2 &:= 416^2 \\39984^2 + 1600^2 &:= 40016^2 \\399984^2 + 16000^2 &:= 4000016^2 \\3999984^2 + 160000^2 &:= 40000016^2\end{aligned}$$

(b)

$$\begin{aligned}384^2 + 440^2 &:= 584^2 \\39284^2 + 44400^2 &:= 59284^2 \\3937284^2 + 4444000^2 &:= 5937284^2 \\393817284^2 + 444440000^2 &:= 593817284^2\end{aligned}$$

(c)

$$\begin{aligned}384^2 + 4600^2 &:= 4616^2 \\300384^2 + 50600^2 &:= 304616^2 \\30800384^2 + 510600^2 &:= 30804616^2 \\3085800384^2 + 5110600^2 &:= 3085804616^2\end{aligned}$$

(d)

$$\begin{aligned}384^2 + 2030^2 &:= 2066^2 \\3984^2 + 220430^2 &:= 220466^2 \\39984^2 + 22204430^2 &:= 22204466^2 \\399984^2 + 2222044430^2 &:= 2222044466^2\end{aligned}$$

282) Patterns for Number 387

(a)

$$\begin{aligned}387^2 + 8316^2 &:= 8325^2 \\3987^2 + 883116^2 &:= 883125^2 \\39987^2 + 88831116^2 &:= 88831125^2 \\399987^2 + 8888311116^2 &:= 8888311125^2\end{aligned}$$

283) Patterns for Number 390

(a)

$$\begin{aligned}4216^2 + 390^2 &:= 4234^2 \\442216^2 + 3990^2 &:= 442234^2 \\44422216^2 + 39990^2 &:= 44422234^2 \\4444222216^2 + 399990^2 &:= 4444222234^2\end{aligned}$$

284) Patterns for Number 391

(a)

$$\begin{aligned}391^2 + 120^2 &:= 409^2 \\39991^2 + 1200^2 &:= 40009^2 \\3999991^2 + 12000^2 &:= 4000009^2 \\399999991^2 + 120000^2 &:= 400000009^2\end{aligned}$$

(b)

$$\begin{aligned}184^2 + 345^2 &:= 391^2 \\1784^2 + 3345^2 &:= 3791^2 \\17784^2 + 33345^2 &:= 37791^2 \\177784^2 + 333345^2 &:= 377791^2\end{aligned}$$

285) Patterns for Number 392

(a)

$$\begin{aligned}392^2 + 19206^2 &:= 19210^2 \\3992^2 + 1992006^2 &:= 1992010^2 \\39992^2 + 199920006^2 &:= 199920010^2 \\399992^2 + 19999200006^2 &:= 19999200010^2\end{aligned}$$

286) Patterns for Number 396

(a)

$$\begin{aligned} 9797^2 + 396^2 &:= 9805^2 \\ 997997^2 + 3996^2 &:= 998005^2 \\ 99979997^2 + 39996^2 &:= 99980005^2 \\ 9999799997^2 + 399996^2 &:= 9999800005^2 \end{aligned}$$

(b)

$$\begin{aligned} 1053^2 + 396^2 &:= 1125^2 \\ 110853^2 + 3996^2 &:= 110925^2 \\ 11108853^2 + 39996^2 &:= 11108925^2 \\ 1111088853^2 + 399996^2 &:= 1111088925^2 \end{aligned}$$

(c)

$$\begin{aligned} 4347^2 + 396^2 &:= 4365^2 \\ 443547^2 + 3996^2 &:= 443565^2 \\ 44435547^2 + 39996^2 &:= 44435565^2 \\ 4444355547^2 + 399996^2 &:= 4444355565^2 \end{aligned}$$

(d)

$$\begin{aligned} 2160^2 + 396^2 &:= 2196^2 \\ 221760^2 + 3996^2 &:= 221796^2 \\ 22217760^2 + 39996^2 &:= 22217796^2 \\ 2222177760^2 + 399996^2 &:= 2222177796^2 \end{aligned}$$

(e)

$$\begin{aligned} 39203^2 + 396^2 &:= 39205^2 \\ 3992003^2 + 3996^2 &:= 3992005^2 \\ 399920003^2 + 39996^2 &:= 399920005^2 \\ 39999200003^2 + 399996^2 &:= 39999200005^2 \end{aligned}$$

(f)

$$\begin{aligned} 396^2 + 80^2 &:= 404^2 \\ 39996^2 + 800^2 &:= 40004^2 \\ 3999996^2 + 8000^2 &:= 4000004^2 \\ 399999996^2 + 80000^2 &:= 400000004^2 \end{aligned}$$

(g)

$$\begin{aligned} 396^2 + 19600^2 &:= 19604^2 \\ 990396^2 + 196000^2 &:= 1009604^2 \\ 99990396^2 + 1960000^2 &:= 100009604^2 \\ 9999990396^2 + 19600000^2 &:= 1000009604^2 \end{aligned}$$

(h)

$$\begin{aligned} 19600^2 + 396^2 &:= 19604^2 \\ 1996000^2 + 3996^2 &:= 1996004^2 \\ 199960000^2 + 39996^2 &:= 199960004^2 \\ 19999600000^2 + 399996^2 &:= 19999600004^2 \end{aligned}$$

287) Patterns for Number 398

(a)

$$\begin{aligned} 39600^2 + 398^2 &:= 39602^2 \\ 3996000^2 + 3998^2 &:= 3996002^2 \\ 399960000^2 + 39998^2 &:= 399960002^2 \\ 39999600000^2 + 399998^2 &:= 39999600002^2 \end{aligned}$$

288) Patterns for Number 399

(a)

$$\begin{aligned} 26532^2 + 399^2 &:= 26535^2 \\ 2665332^2 + 3999^2 &:= 2665335^2 \\ 266653332^2 + 39999^2 &:= 266653335^2 \\ 26666533332^2 + 399999^2 &:= 26666533335^2 \end{aligned}$$

(b)

$$\begin{aligned} 79600^2 + 399^2 &:= 79601^2 \\ 7996000^2 + 3999^2 &:= 7996001^2 \\ 799960000^2 + 39999^2 &:= 799960001^2 \\ 79999600000^2 + 399999^2 &:= 79999600001^2 \end{aligned}$$

(c)

$$\begin{aligned} 399^2 + 40^2 &:= 401^2 \\ 39999^2 + 400^2 &:= 40001^2 \\ 3999999^2 + 4000^2 &:= 4000001^2 \\ 399999999^2 + 40000^2 &:= 400000001^2 \end{aligned}$$

(d)

$$\begin{aligned} 399^2 + 40^2 &:= 401^2 \\ 48399^2 + 440^2 &:= 48401^2 \\ 4080399^2 + 4040^2 &:= 4080401^2 \\ 400800399^2 + 40040^2 &:= 400800401^2 \end{aligned}$$

(a)

$$\begin{aligned} 198^2 + 40^2 &:= 202^2 \\ 19998^2 + 400^2 &:= 20002^2 \\ 1999998^2 + 4000^2 &:= 2000002^2 \\ 199999998^2 + 40000^2 &:= 200000002^2 \end{aligned}$$

(b)

$$\begin{aligned} 400^2 + 750^2 &:= 850^2 \\ 275400^2 + 15750^2 &:= 275850^2 \\ 30525400^2 + 165750^2 &:= 30525850^2 \\ 3083025400^2 + 1665750^2 &:= 3083025850^2 \end{aligned}$$

(c)

$$\begin{aligned} 2484^2 + 400^2 &:= 2516^2 \\ 249984^2 + 4000^2 &:= 250016^2 \\ 24999984^2 + 40000^2 &:= 25000016^2 \\ 2499999984^2 + 400000^2 &:= 2500000016^2 \end{aligned}$$

(d)

$$\begin{aligned} 1575^2 + 400^2 &:= 1625^2 \\ 159975^2 + 4000^2 &:= 160025^2 \\ 15999975^2 + 40000^2 &:= 16000025^2 \\ 1599999975^2 + 400000^2 &:= 1600000025^2 \end{aligned}$$

(e)

$$\begin{aligned} 561^2 + 400^2 &:= 689^2 \\ 275561^2 + 8400^2 &:= 275689^2 \\ 30525561^2 + 88400^2 &:= 30525689^2 \\ 3083025561^2 + 888400^2 &:= 3083025689^2 \end{aligned}$$

289) Patterns for Number 400

(f)

$$\begin{aligned} 399^2 + 40^2 &:= 401^2 \\ 39999^2 + 400^2 &:= 40001^2 \\ 3999999^2 + 4000^2 &:= 4000001^2 \\ 399999999^2 + 40000^2 &:= 400000001^2 \end{aligned}$$

(g)

$$\begin{aligned} 9996^2 + 400^2 &:= 10004^2 \\ 999996^2 + 4000^2 &:= 1000004^2 \\ 99999996^2 + 40000^2 &:= 100000004^2 \\ 9999999996^2 + 400000^2 &:= 10000000004^2 \end{aligned}$$

2.5 Pattern in Pythagorean Triples: 401 to 500

290) Patterns for Number 401

(a)

$$\begin{aligned} 399^2 + 40^2 &:= 401^2 \\ 39999^2 + 400^2 &:= 40001^2 \\ 3999999^2 + 4000^2 &:= 4000001^2 \\ 399999999^2 + 40000^2 &:= 400000001^2 \end{aligned}$$

(b)

$$\begin{aligned} 399^2 + 40^2 &:= 401^2 \\ 48399^2 + 440^2 &:= 48401^2 \\ 4080399^2 + 4040^2 &:= 4080401^2 \\ 400800399^2 + 40040^2 &:= 400800401^2 \end{aligned}$$

(c)

$$\begin{aligned} 80400^2 + 401^2 &:= 80401^2 \\ 8004000^2 + 4001^2 &:= 8004001^2 \\ 800040000^2 + 40001^2 &:= 800040001^2 \\ 80000400000^2 + 400001^2 &:= 80000400001^2 \end{aligned}$$

291) Patterns for Number 402

(a)

$$\begin{aligned} 40400^2 + 402^2 &:= 40402^2 \\ 4004000^2 + 4002^2 &:= 4004002^2 \\ 400040000^2 + 40002^2 &:= 400040002^2 \\ 40000400000^2 + 400002^2 &:= 40000400002^2 \end{aligned}$$

292) Patterns for Number 403

(a)

$$\begin{aligned} 81204^2 + 403^2 &:= 81205^2 \\ 8012004^2 + 4003^2 &:= 8012005^2 \\ 800120004^2 + 40003^2 &:= 800120005^2 \\ 80001200004^2 + 400003^2 &:= 80001200005^2 \end{aligned}$$

293) Patterns for Number 404

(a)

$$\begin{aligned} 396^2 + 80^2 &:= 404^2 \\ 39996^2 + 800^2 &:= 40004^2 \\ 3999996^2 + 8000^2 &:= 4000004^2 \\ 399999996^2 + 80000^2 &:= 400000004^2 \end{aligned}$$

(b)

$$\begin{aligned}40803^2 + 404^2 &:= 40805^2 \\4008003^2 + 4004^2 &:= 4008005^2 \\400080003^2 + 40004^2 &:= 400080005^2 \\40000800003^2 + 400004^2 &:= 40000800005^2\end{aligned}$$

294) Patterns for Number 405

(a)

$$\begin{aligned}82012^2 + 405^2 &:= 82013^2 \\8020012^2 + 4005^2 &:= 8020013^2 \\800200012^2 + 40005^2 &:= 800200013^2 \\80002000012^2 + 400005^2 &:= 80002000013^2\end{aligned}$$

295) Patterns for Number 406

(a)

$$\begin{aligned}41208^2 + 406^2 &:= 41210^2 \\4012008^2 + 4006^2 &:= 4012010^2 \\400120008^2 + 40006^2 &:= 400120010^2 \\40001200008^2 + 400006^2 &:= 40001200010^2\end{aligned}$$

296) Patterns for Number 407

(a)

$$\begin{aligned}407^2 + 82824^2 &:= 82825^2 \\4007^2 + 8028024^2 &:= 8028025^2 \\40007^2 + 800280024^2 &:= 800280025^2 \\400007^2 + 80002800024^2 &:= 80002800025^2\end{aligned}$$

297) Patterns for Number 408

(a)

$$\begin{aligned}408^2 + 6930^2 &:= 6942^2 \\4008^2 + 669330^2 &:= 669342^2 \\40008^2 + 66693330^2 &:= 66693342^2 \\400008^2 + 6666933330^2 &:= 6666933342^2\end{aligned}$$

298) Patterns for Number 409

(a)

$$\begin{aligned}391^2 + 120^2 &:= 409^2 \\39991^2 + 1200^2 &:= 40009^2 \\3999991^2 + 12000^2 &:= 4000009^2 \\399999991^2 + 120000^2 &:= 400000009^2\end{aligned}$$

299) Patterns for Number 413

(a)

$$\begin{aligned}413^2 + 1716^2 &:= 1765^2 \\4613^2 + 217116^2 &:= 217165^2 \\46613^2 + 22171116^2 &:= 22171165^2 \\466613^2 + 2221711116^2 &:= 2221711165^2\end{aligned}$$

300) Patterns for Number 414

(a)

$$\begin{aligned}414^2 + 4752^2 &:= 4770^2 \\4014^2 + 447552^2 &:= 447570^2 \\40014^2 + 44475552^2 &:= 44475570^2 \\400014^2 + 4444755552^2 &:= 4444755570^2\end{aligned}$$

301) Patterns for Number 416

(a)

$$\begin{aligned} 2688^2 + 416^2 &:= 2720^2 \\ 283008^2 + 4256^2 &:= 283040^2 \\ 28430208^2 + 42656^2 &:= 28430240^2 \\ 2844302208^2 + 426656^2 &:= 2844302240^2 \end{aligned}$$

(b)

$$\begin{aligned} 384^2 + 160^2 &:= 416^2 \\ 39984^2 + 1600^2 &:= 40016^2 \\ 3999984^2 + 16000^2 &:= 4000016^2 \\ 39999984^2 + 160000^2 &:= 400000016^2 \end{aligned}$$

(c)

$$\begin{aligned} 416^2 + 1320^2 &:= 1384^2 \\ 40716^2 + 133200^2 &:= 139284^2 \\ 4062716^2 + 13332000^2 &:= 13937284^2 \\ 406182716^2 + 1333320000^2 &:= 1393817284^2 \end{aligned}$$

302) Patterns for Number 420

(a)

$$\begin{aligned} 420^2 + 65^2 &:= 425^2 \\ 44220^2 + 665^2 &:= 44225^2 \\ 4442220^2 + 6665^2 &:= 4442225^2 \\ 444422220^2 + 66665^2 &:= 444422225^2 \end{aligned}$$

(b)

$$\begin{aligned} 851^2 + 420^2 &:= 949^2 \\ 89951^2 + 4200^2 &:= 90049^2 \\ 8999951^2 + 42000^2 &:= 9000049^2 \\ 899999951^2 + 420000^2 &:= 900000049^2 \end{aligned}$$

(c)

$$\begin{aligned} 1189^2 + 420^2 &:= 1261^2 \\ 112189^2 + 4020^2 &:= 112261^2 \\ 11122189^2 + 40020^2 &:= 11122261^2 \\ 1111222189^2 + 40020^2 &:= 1111222261^2 \end{aligned}$$

(d)

$$\begin{aligned} 4891^2 + 420^2 &:= 4909^2 \\ 489991^2 + 4200^2 &:= 490009^2 \\ 48999991^2 + 42000^2 &:= 49000009^2 \\ 4899999991^2 + 420000^2 &:= 4900000009^2 \end{aligned}$$

303) Patterns for Number 425

(a)

$$\begin{aligned} 420^2 + 65^2 &:= 425^2 \\ 44220^2 + 665^2 &:= 44225^2 \\ 4442220^2 + 6665^2 &:= 4442225^2 \\ 444422220^2 + 66665^2 &:= 444422225^2 \end{aligned}$$

(b)

$$425^2 + 3600^2 := 3625^2$$

$$4425^2 + 391600^2 := 391625^2$$

$$44425^2 + 39471600^2 := 39471625^2$$

$$444425^2 + 3950271600^2 := 3950271625^2$$

(c)

$$375^2 + 200^2 := 425^2$$

$$39975^2 + 2000^2 := 40025^2$$

$$3999975^2 + 20000^2 := 4000025^2$$

$$39999975^2 + 200000^2 := 400000025^2$$

304) Patterns for Number 429

(a)

$$7072^2 + 429^2 := 7085^2$$

$$720772^2 + 4329^2 := 720785^2$$

$$72207772^2 + 43329^2 := 72207785^2$$

$$7222077772^2 + 433329^2 := 7222077785^2$$

305) Patterns for Number 436

(a)

$$364^2 + 240^2 := 436^2$$

$$39964^2 + 2400^2 := 40036^2$$

$$3999964^2 + 24000^2 := 4000036^2$$

$$39999964^2 + 240000^2 := 400000036^2$$

306) Patterns for Number 440

(a)

$$440^2 + 42^2 := 442^2$$

$$40400^2 + 402^2 := 40402^2$$

$$4004000^2 + 4002^2 := 4004002^2$$

$$400040000^2 + 40002^2 := 400040002^2$$

(b)

$$1911^2 + 440^2 := 1961^2$$

$$197111^2 + 4440^2 := 197161^2$$

$$19749111^2 + 44440^2 := 19749161^2$$

$$1975269111^2 + 444440^2 := 1975269161^2$$

(c)

$$48399^2 + 440^2 := 48401^2$$

$$4080399^2 + 4040^2 := 4080401^2$$

$$400800399^2 + 40040^2 := 400800401^2$$

$$40008000399^2 + 400040^2 := 40008000401^2$$

(d)

$$279^2 + 440^2 := 521^2$$

$$27679^2 + 44400^2 := 52321^2$$

$$2765679^2 + 4444000^2 := 5234321^2$$

$$276545679^2 + 444440000^2 := 523454321^2$$

(e)

$$384^2 + 440^2 := 584^2$$

$$39284^2 + 44400^2 := 59284^2$$

$$3937284^2 + 4444000^2 := 5937284^2$$

$$393817284^2 + 444440000^2 := 593817284^2$$

(f)

$$\begin{aligned}9^2 + 40^2 &:= 41^2 \\3009^2 + 440^2 &:= 3041^2 \\308009^2 + 4440^2 &:= 308041^2 \\30858009^2 + 44440^2 &:= 30858041^2\end{aligned}$$

307) Patterns for Number 442

(a)

$$\begin{aligned}440^2 + 42^2 &:= 442^2 \\40400^2 + 402^2 &:= 40402^2 \\4004000^2 + 4002^2 &:= 4004002^2 \\400040000^2 + 40002^2 &:= 400040002^2\end{aligned}$$

308) Patterns for Number 443

(a)

$$\begin{aligned}443^2 + 98124^2 &:= 98125^2 \\4443^2 + 9870124^2 &:= 9870125^2 \\44443^2 + 987590124^2 &:= 987590125^2 \\444443^2 + 98764790124^2 &:= 98764790125^2\end{aligned}$$

309) Patterns for Number 444

(a)

$$\begin{aligned}12317^2 + 444^2 &:= 12325^2 \\1234317^2 + 4444^2 &:= 1234325^2 \\123454317^2 + 44444^2 &:= 123454325^2 \\12345654317^2 + 444444^2 &:= 12345654325^2\end{aligned}$$

(b)

$$\begin{aligned}483^2 + 44^2 &:= 485^2 \\49283^2 + 444^2 &:= 49285^2 \\4937283^2 + 4444^2 &:= 4937285^2 \\493817283^2 + 44444^2 &:= 493817285^2\end{aligned}$$

310) Patterns for Number 448

(a)

$$\begin{aligned}448^2 + 60^2 &:= 452^2 \\44998^2 + 600^2 &:= 45002^2 \\4499998^2 + 6000^2 &:= 4500002^2 \\449999998^2 + 60000^2 &:= 450000002^2\end{aligned}$$

311) Patterns for Number 449

(a)

$$\begin{aligned}351^2 + 280^2 &:= 449^2 \\39951^2 + 2800^2 &:= 40049^2 \\3999951^2 + 28000^2 &:= 4000049^2 \\399999951^2 + 280000^2 &:= 400000049^2\end{aligned}$$

312) Patterns for Number 450

(a)

$$\begin{aligned}544^2 + 450^2 &:= 706^2 \\275544^2 + 9450^2 &:= 275706^2 \\30525544^2 + 99450^2 &:= 30525706^2 \\3083025544^2 + 999450^2 &:= 3083025706^2\end{aligned}$$

(b)

$$\begin{aligned}2000^2 + 450^2 &:= 2050^2 \\207000^2 + 4550^2 &:= 207050^2 \\20748000^2 + 45550^2 &:= 20748050^2 \\2075258000^2 + 455550^2 &:= 2075258050^2\end{aligned}$$

313) Patterns for Number 452

(a)

$$\begin{aligned}448^2 + 60^2 &:= 452^2 \\44998^2 + 600^2 &:= 45002^2 \\4499998^2 + 6000^2 &:= 4500002^2 \\449999998^2 + 60000^2 &:= 450000002^2\end{aligned}$$

314) Patterns for Number 456

(a)

$$\begin{aligned}456^2 + 650^2 &:= 794^2 \\275456^2 + 13650^2 &:= 275794^2 \\30525456^2 + 143650^2 &:= 30525794^2 \\3083025456^2 + 1443650^2 &:= 3083025794^2\end{aligned}$$

315) Patterns for Number 459

(a)

$$\begin{aligned}459^2 + 220^2 &:= 509^2 \\46259^2 + 24420^2 &:= 52309^2 \\4629259^2 + 2466420^2 &:= 5245309^2 \\462959259^2 + 246886420^2 &:= 524675309^2\end{aligned}$$

(b)

$$\begin{aligned}459^2 + 1260^2 &:= 1341^2 \\41159^2 + 132600^2 &:= 138841^2 \\4067159^2 + 13326000^2 &:= 13932841^2 \\406227159^2 + 1333260000^2 &:= 1393772841^2\end{aligned}$$

316) Patterns for Number 462

(a)

$$\begin{aligned}1040^2 + 462^2 &:= 1138^2 \\110840^2 + 4662^2 &:= 110938^2 \\11108840^2 + 46662^2 &:= 11108938^2 \\1111088840^2 + 466662^2 &:= 1111088938^2\end{aligned}$$

317) Patterns for Number 464

(a)

$$\begin{aligned}336^2 + 320^2 &:= 464^2 \\39936^2 + 3200^2 &:= 40064^2 \\3999936^2 + 32000^2 &:= 4000064^2 \\399999936^2 + 320000^2 &:= 400000064^2\end{aligned}$$

318) Patterns for Number 466

(a)

$$\begin{aligned}54288^2 + 466^2 &:= 54290^2 \\5442888^2 + 4666^2 &:= 5442890^2 \\544428888^2 + 46666^2 &:= 544428890^2 \\54444288888^2 + 466666^2 &:= 54444288890^2\end{aligned}$$

319) Patterns for Number 475

(a)

$$\begin{aligned} 475^2 + 132^2 &:= 493^2 \\ 49275^2 + 1332^2 &:= 49293^2 \\ 4937275^2 + 13332^2 &:= 4937293^2 \\ 493817275^2 + 133332^2 &:= 493817293^2 \end{aligned}$$

(b)

$$\begin{aligned} 475^2 + 4500^2 &:= 4525^2 \\ 300475^2 + 49500^2 &:= 304525^2 \\ 30800475^2 + 499500^2 &:= 30804525^2 \\ 3085800475^2 + 4999500^2 &:= 3085804525^2 \end{aligned}$$

320) Patterns for Number 476

(a)

$$\begin{aligned} 476^2 + 8085^2 &:= 8099^2 \\ 4676^2 + 780885^2 &:= 780899^2 \\ 46676^2 + 77808885^2 &:= 77808899^2 \\ 466676^2 + 7778088885^2 &:= 7778088899^2 \end{aligned}$$

321) Patterns for Number 480

(a)

$$\begin{aligned} 480^2 + 31^2 &:= 481^2 \\ 45300^2 + 301^2 &:= 45301^2 \\ 4503000^2 + 3001^2 &:= 4503001^2 \\ 450030000^2 + 30001^2 &:= 450030001^2 \end{aligned}$$

(b)

$$\begin{aligned} 31^2 + 480^2 &:= 481^2 \\ 331^2 + 54780^2 &:= 54781^2 \\ 3331^2 + 5547780^2 &:= 5547781^2 \\ 33331^2 + 555477780^2 &:= 555477781^2 \end{aligned}$$

(c)

$$\begin{aligned} 836^2 + 480^2 &:= 964^2 \\ 89936^2 + 4800^2 &:= 90064^2 \\ 8999936^2 + 48000^2 &:= 9000064^2 \\ 89999936^2 + 480000^2 &:= 90000064^2 \end{aligned}$$

(d)

$$\begin{aligned} 3584^2 + 480^2 &:= 3616^2 \\ 359984^2 + 4800^2 &:= 360016^2 \\ 35999984^2 + 48000^2 &:= 36000016^2 \\ 359999984^2 + 480000^2 &:= 3600000016^2 \end{aligned}$$

(e)

$$\begin{aligned} 14396^2 + 480^2 &:= 14404^2 \\ 1439996^2 + 4800^2 &:= 1440004^2 \\ 143999996^2 + 48000^2 &:= 144000004^2 \\ 1439999996^2 + 480000^2 &:= 1440000004^2 \end{aligned}$$

(f)

$$\begin{aligned} 28798^2 + 480^2 &:= 28802^2 \\ 2879998^2 + 4800^2 &:= 2880002^2 \\ 287999998^2 + 48000^2 &:= 288000002^2 \\ 2879999998^2 + 480000^2 &:= 2880000002^2 \end{aligned}$$

(g)

$$\begin{aligned} 57599^2 + 480^2 &:= 57601^2 \\ 575999^2 + 4800^2 &:= 5760001^2 \\ 57599999^2 + 48000^2 &:= 576000001^2 \\ 5759999999^2 + 480000^2 &:= 57600000001^2 \end{aligned}$$

(h)

$$\begin{aligned} 6391^2 + 480^2 &:= 6409^2 \\ 639991^2 + 4800^2 &:= 640009^2 \\ 63999991^2 + 48000^2 &:= 64000009^2 \\ 6399999991^2 + 480000^2 &:= 6400000009^2 \end{aligned}$$

(i)

$$\begin{aligned} 1564^2 + 480^2 &:= 1636^2 \\ 159964^2 + 4800^2 &:= 160036^2 \\ 15999964^2 + 48000^2 &:= 16000036^2 \\ 1599999964^2 + 480000^2 &:= 1600000036^2 \end{aligned}$$

322) Patterns for Number 481

(a)

$$\begin{aligned} 319^2 + 360^2 &:= 481^2 \\ 39919^2 + 3600^2 &:= 40081^2 \\ 3999919^2 + 36000^2 &:= 4000081^2 \\ 399999919^2 + 360000^2 &:= 400000081^2 \end{aligned}$$

(b)

$$\begin{aligned} 480^2 + 31^2 &:= 481^2 \\ 45300^2 + 301^2 &:= 45301^2 \\ 4503000^2 + 3001^2 &:= 4503001^2 \\ 450030000^2 + 30001^2 &:= 450030001^2 \end{aligned}$$

(c)

$$\begin{aligned} 31^2 + 480^2 &:= 481^2 \\ 331^2 + 54780^2 &:= 54781^2 \\ 3331^2 + 5547780^2 &:= 5547781^2 \\ 33331^2 + 555477780^2 &:= 555477781^2 \end{aligned}$$

323) Patterns for Number 483

(a)

$$\begin{aligned} 5060 + 483^2 &:= 5083^2 \\ 464600^2 + 4623^2 &:= 464623^2 \\ 46046000^2 + 46023^2 &:= 46046023^2 \\ 4600460000^2 + 460023^2 &:= 4600460023^2 \end{aligned}$$

(b)

$$\begin{aligned} 483^2 + 44^2 &:= 485^2 \\ 40803^2 + 404^2 &:= 40805^2 \\ 4008003^2 + 4004^2 &:= 4008005^2 \\ 400080003^2 + 40004^2 &:= 400080005^2 \end{aligned}$$

324) Patterns for Number 485

(a)

$$\begin{aligned}483^2 + 44^2 &:= 485^2 \\40803^2 + 404^2 &:= 40805^2 \\4008003^2 + 4004^2 &:= 4008005^2 \\400080003^2 + 40004^2 &:= 400080005^2\end{aligned}$$

325) Patterns for Number 488

(a)

$$\begin{aligned}480^2 + 88^2 &:= 488^2 \\49280^2 + 888^2 &:= 49288^2 \\4937280^2 + 8888^2 &:= 4937288^2 \\493817280^2 + 88888^2 &:= 493817288^2\end{aligned}$$

(b)

$$\begin{aligned}488^2 + 915^2 &:= 1037^2 \\4888^2 + 9165^2 &:= 10387^2 \\48888^2 + 91665^2 &:= 103887^2 \\488888^2 + 916665^2 &:= 1038887^2\end{aligned}$$

326) Patterns for Number 490

(a)

$$\begin{aligned}1176^2 + 490^2 &:= 1274^2 \\112176^2 + 4690^2 &:= 112274^2 \\11122176^2 + 46690^2 &:= 11122274^2 \\1111222176^2 + 46690^2 &:= 1111222274^2\end{aligned}$$

327) Patterns for Number 493

(a)

$$\begin{aligned}475^2 + 132^2 &:= 493^2 \\49275^2 + 1332^2 &:= 49293^2 \\4937275^2 + 13332^2 &:= 4937293^2 \\493817275^2 + 133332^2 &:= 493817293^2\end{aligned}$$

328) Patterns for Number 495

(a)

$$\begin{aligned}4888^2 + 495^2 &:= 4913^2 \\498988^2 + 4995^2 &:= 499013^2 \\49989988^2 + 49995^2 &:= 49990013^2 \\4999899988^2 + 499995^2 &:= 4999900013^2\end{aligned}$$

(b)

$$\begin{aligned}495^2 + 100^2 &:= 505^2 \\49995^2 + 1000^2 &:= 50005^2 \\4999995^2 + 10000^2 &:= 5000005^2 \\499999995^2 + 100000^2 &:= 500000005^2\end{aligned}$$

329) Patterns for Number 496

(a)

$$\begin{aligned}496^2 + 1890^2 &:= 1954^2 \\111496^2 + 18090^2 &:= 112954^2 \\11121496^2 + 180090^2 &:= 11122954^2 \\1111221496^2 + 1800090^2 &:= 1111222954^2\end{aligned}$$

330) Patterns for Number 500

(a)

$$31248^2 + 500^2 := 31252^2$$

$$3124998^2 + 5000^2 := 3125002^2$$

$$312499998^2 + 50000^2 := 312500002^2$$

$$31249999998^2 + 500000^2 := 31250000002^2$$

(b)

$$2475^2 + 500^2 := 2525^2$$

$$249975^2 + 5000^2 := 250025^2$$

$$24999975^2 + 50000^2 := 25000025^2$$

$$2499999975^2 + 500000^2 := 2500000025^2$$

(c)

$$525^2 + 500^2 := 725^2$$

$$275525^2 + 10500^2 := 275725^2$$

$$30525525^2 + 110500^2 := 30525725^2$$

$$3083025525^2 + 1110500^2 := 3083025725^2$$

(d)

$$500^2 + 1200^2 := 1300^2$$

$$108500^2 + 13200^2 := 109300^2$$

$$11088500^2 + 133200^2 := 11089300^2$$

$$1110888500^2 + 1333200^2 := 1110889300^2$$

2.6 Pattern in Pythagorean Triples: 501 to 600

331) Patterns for Number 501

(a)

$$125500^2 + 501^2 := 125501^2$$

$$12505000^2 + 5001^2 := 12505001^2$$

$$1250050000^2 + 50001^2 := 1250050001^2$$

$$125000500000^2 + 500001^2 := 125000500001^2$$

332) Patterns for Number 502

(a)

$$63000^2 + 502^2 := 63002^2$$

$$6255000^2 + 5002^2 := 6255002^2$$

$$625050000^2 + 50002^2 := 625050002^2$$

$$62500500000^2 + 500002^2 := 62500500002^2$$

333) Patterns for Number 504

(a)

$$504^2 + 78^2 := 510^2$$

$$53064^2 + 798^2 := 53070^2$$

$$5330664^2 + 7998^2 := 5330670^2$$

$$533306664^2 + 79998^2 := 533306670^2$$

(b)

$$504^2 + 297^2 := 585^2$$

$$55404^2 + 2997^2 := 55485^2$$

$$5554404^2 + 29997^2 := 5554485^2$$

$$555544404^2 + 299997^2 := 555544485^2$$

(c)

$$\begin{aligned}504^2 + 550^2 &:= 746^2 \\275504^2 + 11550^2 &:= 275746^2 \\30525504^2 + 121550^2 &:= 30525746^2 \\3083025504^2 + 1221550^2 &:= 3083025746^2\end{aligned}$$

(d)

$$\begin{aligned}504^2 + 7930^2 &:= 7946^2 \\5304^2 + 879130^2 &:= 879146^2 \\53304^2 + 88791130^2 &:= 88791146^2 \\533304^2 + 8887911130^2 &:= 8887911146^2\end{aligned}$$

334) Patterns for Number 505

(a)

$$\begin{aligned}495^2 + 100^2 &:= 505^2 \\49995^2 + 1000^2 &:= 50005^2 \\4999995^2 + 10000^2 &:= 5000005^2 \\499999995^2 + 100000^2 &:= 500000005^2\end{aligned}$$

335) Patterns for Number 509

(a)

$$\begin{aligned}459^2 + 220^2 &:= 509^2 \\46259^2 + 24420^2 &:= 52309^2 \\4629259^2 + 2466420^2 &:= 5245309^2 \\462959259^2 + 246886420^2 &:= 524675309^2\end{aligned}$$

336) Patterns for Number 510

(a)

$$\begin{aligned}504^2 + 78^2 &:= 510^2 \\53064^2 + 798^2 &:= 53070^2 \\5330664^2 + 7998^2 &:= 5330670^2 \\533306664^2 + 79998^2 &:= 533306670^2\end{aligned}$$

(b)

$$\begin{aligned}7216^2 + 510^2 &:= 7234^2 \\783216^2 + 5310^2 &:= 783234^2 \\78943216^2 + 53310^2 &:= 78943234^2 \\7900543216^2 + 533310^2 &:= 7900543234^2\end{aligned}$$

337) Patterns for Number 512

(a)

$$\begin{aligned}512^2 + 8184^2 &:= 8200^2 \\5312^2 + 881784^2 &:= 881800^2 \\53312^2 + 88817784^2 &:= 88817800^2 \\533312^2 + 8888177784^2 &:= 8888177800^2\end{aligned}$$

(b)

$$\begin{aligned}512^2 + 55^2 &:= 1513^2 \\154012^2 + 555^2 &:= 154013^2 \\15429012^2 + 5555^2 &:= 15429013^2 \\1543179012^2 + 55555^2 &:= 1543179013^2\end{aligned}$$

338) Patterns for Number 520

(a)

$$\begin{aligned} 520^2 + 231^2 &:= 569^2 \\ 55420^2 + 2331^2 &:= 55469^2 \\ 5554420^2 + 23331^2 &:= 5554469^2 \\ 555544420^2 + 233331^2 &:= 555544469^2 \end{aligned}$$

(b)

$$\begin{aligned} 231^2 + 520^2 &:= 569^2 \\ 22311^2 + 53200^2 &:= 57689^2 \\ 2223111^2 + 5332000^2 &:= 5776889^2 \\ 222231111^2 + 533320000^2 &:= 577768889^2 \end{aligned}$$

(c)

$$\begin{aligned} 4209^2 + 520^2 &:= 4241^2 \\ 442209^2 + 5320^2 &:= 442241^2 \\ 44422209^2 + 53320^2 &:= 44422241^2 \\ 4444222209^2 + 533320^2 &:= 4444222241^2 \end{aligned}$$

339) Patterns for Number 521

(a)

$$\begin{aligned} 279^2 + 440^2 &:= 521^2 \\ 27679^2 + 44400^2 &:= 52321^2 \\ 2765679^2 + 4444000^2 &:= 5234321^2 \\ 276545679^2 + 444440000^2 &:= 523454321^2 \end{aligned}$$

340) Patterns for Number 525

(a)

$$\begin{aligned} 525^2 + 500^2 &:= 725^2 \\ 275525^2 + 10500^2 &:= 275725^2 \\ 30525525^2 + 110500^2 &:= 30525725^2 \\ 3083025525^2 + 1110500^2 &:= 3083025725^2 \end{aligned}$$

(b)

$$\begin{aligned} 525^2 + 5500^2 &:= 5525^2 \\ 58025^2 + 555000^2 &:= 558025^2 \\ 5858025^2 + 55550000^2 &:= 55858025^2 \\ 586358025^2 + 5555500000^2 &:= 5586358025^2 \end{aligned}$$

341) Patterns for Number 528

(a)

$$\begin{aligned} 8704^2 + 528^2 &:= 8720^2 \\ 887104^2 + 5328^2 &:= 887120^2 \\ 88871104^2 + 53328^2 &:= 88871120^2 \\ 8888711104^2 + 533328^2 &:= 8888711120^2 \end{aligned}$$

(b)

$$\begin{aligned} 34846^2 + 528^2 &:= 34850^2 \\ 3548446^2 + 5328^2 &:= 3548450^2 \\ 355484446^2 + 53328^2 &:= 355484450^2 \\ 35554844446^2 + 533328^2 &:= 35554844450^2 \end{aligned}$$

(c)

$$\begin{aligned}1900^2 + 528^2 &:= 1972^2 \\197100^2 + 5328^2 &:= 197172^2 \\19749100^2 + 53328^2 &:= 19749172^2 \\1975269100^2 + 533328^2 &:= 1975269172^2\end{aligned}$$

(d)

$$\begin{aligned}4340^2 + 528^2 &:= 4372^2 \\443540^2 + 5328^2 &:= 443572^2 \\44435540^2 + 53328^2 &:= 44435572^2 \\4444355540^2 + 533328^2 &:= 4444355572^2\end{aligned}$$

(e)

$$\begin{aligned}1025^2 + 528^2 &:= 1153^2 \\110825^2 + 5328^2 &:= 110953^2 \\11108825^2 + 53328^2 &:= 11108953^2 \\1111088825^2 + 533328^2 &:= 1111088953^2\end{aligned}$$

(f)

$$\begin{aligned}2146^2 + 528^2 &:= 2210^2 \\221746^2 + 5328^2 &:= 221810^2 \\22217746^2 + 53328^2 &:= 22217810^2 \\2222177746^2 + 533328^2 &:= 2222177810^2\end{aligned}$$

(g)

$$\begin{aligned}17420^2 + 528^2 &:= 17428^2 \\1774220^2 + 5328^2 &:= 1774228^2 \\177742220^2 + 53328^2 &:= 177742228^2 \\17777422220^2 + 533328^2 &:= 17777422228^2\end{aligned}$$

342) Patterns for Number 532

(a)

$$\begin{aligned}35376^2 + 532^2 &:= 35380^2 \\3553776^2 + 5332^2 &:= 3553780^2 \\355537776^2 + 53332^2 &:= 355537780^2 \\35555377776^2 + 533332^2 &:= 35555377780^2\end{aligned}$$

(b)

$$\begin{aligned}532^2 + 165^2 &:= 557^2 \\55432^2 + 1665^2 &:= 55457^2 \\5554432^2 + 16665^2 &:= 5554457^2 \\555544432^2 + 166665^2 &:= 555544457^2\end{aligned}$$

(c)

$$\begin{aligned}70755^2 + 532^2 &:= 70757^2 \\7107555^2 + 5332^2 &:= 7107557^2 \\711075555^2 + 53332^2 &:= 711075557^2 \\71110755555^2 + 533332^2 &:= 71110755557^2\end{aligned}$$

343) Patterns for Number 539

(a)

$$\begin{aligned}539^2 + 1140^2 &:= 1261^2 \\108539^2 + 12540^2 &:= 109261^2 \\11088539^2 + 126540^2 &:= 11089261^2 \\1110888539^2 + 1266540^2 &:= 1110889261^2\end{aligned}$$

344) Patterns for Number 540

(a)

$$540^2 + 99^2 := 549^2$$

$$55440^2 + 999^2 := 55449^2$$

$$5554440^2 + 9999^2 := 5554449^2$$

$$555544440^2 + 99999^2 := 555544449^2$$

(b)

$$544^2 + 9240^2 := 9256^2$$

$$5344^2 + 892440^2 := 892456^2$$

$$53344^2 + 88924440^2 := 88924456^2$$

$$533344^2 + 8889244440^2 := 8889244456^2$$

(b)

$$8091^2 + 540^2 := 8109^2$$

$$809991^2 + 5400^2 := 810009^2$$

$$80999991^2 + 54000^2 := 81000009^2$$

$$8099999991^2 + 540000^2 := 8100000009^2$$

(c)

$$33^2 + 544^2 := 545^2$$

$$330^2 + 27224^2 := 27226^2$$

$$3300^2 + 2722499^2 := 2722501^2$$

$$33000^2 + 272249999^2 := 272250001^2$$

$$330000^2 + 27224999999^2 := 27225000001^2$$

(c)

$$819^2 + 540^2 := 981^2$$

$$89919^2 + 5400^2 := 90081^2$$

$$8999919^2 + 54000^2 := 9000081^2$$

$$899999919^2 + 540000^2 := 900000081^2$$

(d)

$$544^2 + 33^2 := 545^2$$

$$45904^2 + 303^2 := 45905^2$$

$$4509004^2 + 3003^2 := 4509005^2$$

$$450090004^2 + 30003^2 := 450090005^2$$

345) Patterns for Number 544

(a)

$$544^2 + 33^2 := 545^2$$

$$55444^2 + 333^2 := 55445^2$$

$$5554444^2 + 3333^2 := 5554445^2$$

$$555544444^2 + 33333^2 := 555544445^2$$

(e)

$$256^2 + 480^2 := 544^2$$

$$25116^2 + 48800^2 := 54884^2$$

$$2506716^2 + 4888000^2 := 5493284^2$$

$$250622716^2 + 488880000^2 := 549377284^2$$

(f)

$$544^2 + 450^2 := 706^2$$

$$275544^2 + 9450^2 := 275706^2$$

$$30525544^2 + 99450^2 := 30525706^2$$

$$3083025544^2 + 999450^2 := 3083025706^2$$

346) Patterns for Number 545

(a)

$$\begin{aligned}544^2 + 33^2 &:= 545^2 \\55444^2 + 333^2 &:= 55445^2 \\5554444^2 + 3333^2 &:= 5554445^2 \\555544444^2 + 33333^2 &:= 555544445^2\end{aligned}$$

(b)

$$\begin{aligned}544^2 + 33^2 &:= 545^2 \\45904^2 + 303^2 &:= 45905^2 \\4509004^2 + 3003^2 &:= 4509005^2 \\450090004^2 + 30003^2 &:= 450090005^2\end{aligned}$$

(c)

$$\begin{aligned}33^2 + 544^2 &:= 545^2 \\330^2 + 27224^2 &:= 27226^2 \\3300^2 + 2722499^2 &:= 2722501^2 \\33000^2 + 272249999^2 &:= 272250001^2\end{aligned}$$

347) Patterns for Number 549

(a)

$$\begin{aligned}540^2 + 99^2 &:= 549^2 \\55440^2 + 999^2 &:= 55449^2 \\5554440^2 + 9999^2 &:= 5554449^2 \\555544440^2 + 99999^2 &:= 555544449^2\end{aligned}$$

348) Patterns for Number 550

(a)

$$\begin{aligned}504^2 + 550^2 &:= 746^2 \\275504^2 + 11550^2 &:= 275746^2 \\30525504^2 + 121550^2 &:= 30525746^2 \\3083025504^2 + 1221550^2 &:= 3083025746^2\end{aligned}$$

349) Patterns for Number 555

(a)

$$\begin{aligned}48^2 + 55^2 &:= 73^2 \\6148^2 + 555^2 &:= 6173^2 \\617148^2 + 5555^2 &:= 617173^2 \\61727148^2 + 55555^2 &:= 61727173^2\end{aligned}$$

(b)

$$\begin{aligned}512^2 + 55^2 &:= 1513^2 \\154012^2 + 555^2 &:= 154013^2 \\15429012^2 + 5555^2 &:= 15429013^2 \\1543179012^2 + 55555^2 &:= 1543179013^2\end{aligned}$$

350) Patterns for Number 557

(a)

$$\begin{aligned}532^2 + 165^2 &:= 557^2 \\55432^2 + 1665^2 &:= 55457^2 \\5554432^2 + 16665^2 &:= 5554457^2 \\555544432^2 + 166665^2 &:= 555544457^2\end{aligned}$$

351) Patterns for Number 559

(a)

$$\begin{aligned}3612^2 + 559^2 &:= 3655^2 \\380292^2 + 5719^2 &:= 380335^2 \\38203092^2 + 57319^2 &:= 38203135^2 \\3822031092^2 + 573319^2 &:= 3822031135^2\end{aligned}$$

352) Patterns for Number 560

(a)

$$\begin{aligned}1551^2 + 560^2 &:= 1649^2 \\115551^2 + 4760^2 &:= 115649^2 \\11155551^2 + 46760^2 &:= 11155649^2 \\1111555551^2 + 466760^2 &:= 1111555649^2\end{aligned}$$

(b)

$$\begin{aligned}78399^2 + 560^2 &:= 78401^2 \\783999^2 + 5600^2 &:= 7840001^2 \\78399999^2 + 56000^2 &:= 784000001^2 \\7839999999^2 + 560000^2 &:= 78400000001^2\end{aligned}$$

(c)

$$\begin{aligned}39198^2 + 560^2 &:= 39202^2 \\3919998^2 + 5600^2 &:= 3920002^2 \\391999998^2 + 56000^2 &:= 392000002^2 \\39199999998^2 + 560000^2 &:= 39200000002^2\end{aligned}$$

(d)

$$\begin{aligned}19596^2 + 560^2 &:= 19604^2 \\1959996^2 + 5600^2 &:= 1960004^2 \\195999996^2 + 56000^2 &:= 196000004^2 \\19599999996^2 + 560000^2 &:= 19600000004^2\end{aligned}$$

(e)

$$\begin{aligned}560^2 + 1518^2 &:= 1618^2 \\56600^2 + 155178^2 &:= 165178^2 \\5666000^2 + 15551778^2 &:= 16551778^2 \\566660000^2 + 1555517778^2 &:= 1655517778^2\end{aligned}$$

(f)

$$\begin{aligned}1161^2 + 560^2 &:= 1289^2 \\112161^2 + 5360^2 &:= 112289^2 \\11122161^2 + 53360^2 &:= 11122289^2 \\1111222161^2 + 53360^2 &:= 1111222289^2\end{aligned}$$

(g)

$$\begin{aligned}1551^2 + 560^2 &:= 1649^2 \\159951^2 + 5600^2 &:= 160049^2 \\15999951^2 + 56000^2 &:= 16000049^2 \\1599999951^2 + 560000^2 &:= 1600000049^2\end{aligned}$$

(h)

$$\begin{aligned}4884^2 + 560^2 &:= 4916^2 \\489984^2 + 5600^2 &:= 490016^2 \\48999984^2 + 56000^2 &:= 49000016^2 \\4899999984^2 + 560000^2 &:= 4900000016^2\end{aligned}$$

353) Patterns for Number 561

(a)

$$\begin{aligned}561^2 + 400^2 &:= 689^2 \\275561^2 + 8400^2 &:= 275689^2 \\30525561^2 + 88400^2 &:= 30525689^2 \\3083025561^2 + 888400^2 &:= 3083025689^2\end{aligned}$$

(b)

$$\begin{aligned}561^2 + 17480^2 &:= 17489^2 \\5961^2 + 1974080^2 &:= 1974089^2 \\59961^2 + 199740080^2 &:= 199740089^2 \\599961^2 + 19997400080^2 &:= 19997400089^2\end{aligned}$$

354) Patterns for Number 564

(a)

$$\begin{aligned}564^2 + 4400^2 &:= 4436^2 \\300564^2 + 48400^2 &:= 304436^2 \\30800564^2 + 488400^2 &:= 30804436^2 \\3085800564^2 + 4888400^2 &:= 3085804436^2\end{aligned}$$

355) Patterns for Number 569

(a)

$$\begin{aligned}520^2 + 231^2 &:= 569^2 \\55420^2 + 2331^2 &:= 55469^2 \\5554420^2 + 23331^2 &:= 5554469^2 \\555544420^2 + 233331^2 &:= 555544469^2\end{aligned}$$

(b)

$$\begin{aligned}231^2 + 520^2 &:= 569^2 \\22311^2 + 53200^2 &:= 57689^2 \\2223111^2 + 5332000^2 &:= 5776889^2 \\222231111^2 + 533320000^2 &:= 577768889^2\end{aligned}$$

356) Patterns for Number 570

(a)

$$\begin{aligned}9016^2 + 570^2 &:= 9034^2 \\990016^2 + 5970^2 &:= 990034^2 \\99900016^2 + 59970^2 &:= 99900034^2 \\9999000016^2 + 599970^2 &:= 9999000034^2\end{aligned}$$

357) Patterns for Number 576

(a)

$$\begin{aligned}576^2 + 350^2 &:= 674^2 \\275576^2 + 7350^2 &:= 275674^2 \\30525576^2 + 77350^2 &:= 30525674^2 \\3083025576^2 + 777350^2 &:= 3083025674^2\end{aligned}$$

(b)

$$\begin{aligned}576^2 + 1080^2 &:= 1224^2 \\108576^2 + 11880^2 &:= 109224^2 \\11088576^2 + 119880^2 &:= 11089224^2 \\1110888576^2 + 1199880^2 &:= 1110889224^2\end{aligned}$$

358) Patterns for Number 580

(a)

$$\begin{aligned}2871^2 + 580^2 &:= 2929^2 \\289971^2 + 5800^2 &:= 290029^2 \\28999971^2 + 58000^2 &:= 29000029^2 \\2899999971^2 + 580000^2 &:= 2900000029^2\end{aligned}$$

359) Patterns for Number 584

(a)

$$\begin{aligned}384^2 + 440^2 &:= 584^2 \\39284^2 + 44400^2 &:= 59284^2 \\3937284^2 + 4444000^2 &:= 5937284^2 \\393817284^2 + 444440000^2 &:= 593817284^2\end{aligned}$$

360) Patterns for Number 585

(a)

$$\begin{aligned}297^2 + 704^2 &:= 585^2 \\2997^2 + 55404^2 &:= 55485^2 \\29997^2 + 5554404^2 &:= 5554485^2 \\299997^2 + 555544404^2 &:= 555544485^2\end{aligned}$$

(b)

$$\begin{aligned}504^2 + 297^2 &:= 585^2 \\55404^2 + 2997^2 &:= 55485^2 \\5554404^2 + 29997^2 &:= 5554485^2 \\555544404^2 + 299997^2 &:= 555544485^2\end{aligned}$$

(c)

$$\begin{aligned}585^2 + 19008^2 &:= 19017^2 \\5985^2 + 1990008^2 &:= 1990017^2 \\59985^2 + 199900008^2 &:= 199900017^2 \\599985^2 + 19999000008^2 &:= 19999000017^2\end{aligned}$$

361) Patterns for Number 589

(a)

$$\begin{aligned}589^2 + 300^2 &:= 661^2 \\275589^2 + 6300^2 &:= 275661^2 \\30525589^2 + 66300^2 &:= 30525661^2 \\3083025589^2 + 666300^2 &:= 3083025661^2\end{aligned}$$

362) Patterns for Number 591

(a)

$$\begin{aligned}591^2 + 19400^2 &:= 19409^2 \\990591^2 + 194000^2 &:= 1009409^2 \\99990591^2 + 1940000^2 &:= 100009409^2 \\9999990591^2 + 19400000^2 &:= 10000009409^2\end{aligned}$$

363) Patterns for Number 594

(a)

$$\begin{aligned}9792^2 + 594^2 &:= 9810^2 \\997992^2 + 5994^2 &:= 998010^2 \\99979992^2 + 59994^2 &:= 99980010^2 \\9999799992^2 + 599994^2 &:= 9999800010^2\end{aligned}$$

(b)

$$\begin{aligned}594^2 + 120^2 &:= 606^2 \\59994^2 + 1200^2 &:= 60006^2 \\5999994^2 + 12000^2 &:= 6000006^2 \\599999994^2 + 120000^2 &:= 600000006^2\end{aligned}$$

(c)

$$\begin{aligned}1008^2 + 594^2 &:= 1170^2 \\110808^2 + 5994^2 &:= 110970^2 \\11108808^2 + 59994^2 &:= 11108970^2 \\1111088808^2 + 599994^2 &:= 1111088970^2\end{aligned}$$

364) Patterns for Number 598

(a)

$$\begin{aligned}840^2 + 58^2 &:= 842^2 \\89400^2 + 598^2 &:= 89402^2 \\8994000^2 + 5998^2 &:= 8994002^2 \\899940000^2 + 59998^2 &:= 899940002^2\end{aligned}$$

365) Patterns for Number 599

(a)

$$\begin{aligned}1740^2 + 59^2 &:= 1741^2 \\179400^2 + 599^2 &:= 179401^2 \\17994000^2 + 5999^2 &:= 17994001^2 \\1799940000^2 + 59999^2 &:= 1799940001^2\end{aligned}$$

366) Patterns for Number 600

(a)

$$\begin{aligned}29997^2 + 600^2 &:= 30003^2 \\299997^2 + 6000^2 &:= 300003^2 \\2999997^2 + 60000^2 &:= 30000003^2 \\29999997^2 + 600000^2 &:= 3000000003^2\end{aligned}$$

(b)

$$\begin{aligned}3575^2 + 600^2 &:= 3625^2 \\359975^2 + 6000^2 &:= 360025^2 \\3599975^2 + 60000^2 &:= 36000025^2 \\35999975^2 + 600000^2 &:= 3600000025^2\end{aligned}$$

(c)

$$\begin{aligned}800^2 + 600^2 &:= 1000^2 \\108800^2 + 6600^2 &:= 109000^2 \\11088800^2 + 66600^2 &:= 11089000^2 \\1110888800^2 + 666600^2 &:= 1110889000^2\end{aligned}$$

(d)

$$\begin{aligned}44998^2 + 600^2 &:= 45002^2 \\449998^2 + 6000^2 &:= 4500002^2 \\4499998^2 + 60000^2 &:= 450000002^2 \\44999998^2 + 600000^2 &:= 45000000002^2\end{aligned}$$

(e)

$$\begin{aligned}4982^2 + 600^2 &:= 5018^2 \\499982^2 + 6000^2 &:= 500018^2 \\4999982^2 + 60000^2 &:= 50000018^2 \\49999982^2 + 600000^2 &:= 5000000018^2\end{aligned}$$

(f)

$$\begin{aligned} 175^2 + 600^2 &:= 625^2 \\ 15975^2 + 62000^2 &:= 64025^2 \\ 1581975^2 + 6220000^2 &:= 6418025^2 \\ 158041975^2 + 622200000^2 &:= 641958025^2 \end{aligned}$$

(g)

$$\begin{aligned} 91^2 + 60^2 &:= 109^2 \\ 9991^2 + 600^2 &:= 10009^2 \\ 999991^2 + 6000^2 &:= 1000009^2 \\ 99999991^2 + 60000^2 &:= 100000009^2 \end{aligned}$$

(h)

$$\begin{aligned} 899^2 + 60^2 &:= 901^2 \\ 89999^2 + 600^2 &:= 90001^2 \\ 8999999^2 + 6000^2 &:= 9000001^2 \\ 899999999^2 + 60000^2 &:= 900000001^2 \end{aligned}$$

(i)

$$\begin{aligned} 600^2 + 250^2 &:= 650^2 \\ 65000^2 + 2550^2 &:= 65050^2 \\ 6528000^2 + 25550^2 &:= 6528050^2 \\ 653058000^2 + 255550^2 &:= 653058050^2 \end{aligned}$$

(j)

$$\begin{aligned} 481^2 + 600^2 &:= 769^2 \\ 275481^2 + 12600^2 &:= 275769^2 \\ 30525481^2 + 132600^2 &:= 30525769^2 \\ 3083025481^2 + 1332600^2 &:= 3083025769^2 \end{aligned}$$

(k)

$$\begin{aligned} 2464^2 + 600^2 &:= 2536^2 \\ 249964^2 + 6000^2 &:= 250036^2 \\ 24999964^2 + 60000^2 &:= 25000036^2 \\ 2499999964^2 + 600000^2 &:= 2500000036^2 \end{aligned}$$

(l)

$$\begin{aligned} 600^2 + 1750^2 &:= 1850^2 \\ 111600^2 + 16750^2 &:= 112850^2 \\ 11121600^2 + 166750^2 &:= 11122850^2 \\ 1111221600^2 + 1666750^2 &:= 1111222850^2 \end{aligned}$$

2.7 Pattern in Pythagorean Triples: 601 to 700

367) Patterns for Number 601

(a)

$$\begin{aligned} 1860^2 + 61^2 &:= 1861^2 \\ 180600^2 + 601^2 &:= 180601^2 \\ 18006000^2 + 6001^2 &:= 18006001^2 \\ 1800060000^2 + 60001^2 &:= 1800060001^2 \end{aligned}$$

368) Patterns for Number 603

(a)

$$\begin{aligned}60600^2 + 603^2 &:= 60603^2 \\6006000^2 + 6003^2 &:= 6006003^2 \\600060000^2 + 60003^2 &:= 600060003^2 \\60000600000^2 + 600003^2 &:= 60000600003^2\end{aligned}$$

(b)

$$\begin{aligned}181804^2 + 603^2 &:= 181805^2 \\18018004^2 + 6003^2 &:= 18018005^2 \\1800180004^2 + 60003^2 &:= 1800180005^2 \\180001800004^2 + 600003^2 &:= 180001800005^2\end{aligned}$$

369) Patterns for Number 605

(a)

$$\begin{aligned}183012^2 + 605^2 &:= 183013^2 \\18030012^2 + 6005^2 &:= 18030013^2 \\1800300012^2 + 60005^2 &:= 1800300013^2 \\180003000012^2 + 600005^2 &:= 180003000013^2\end{aligned}$$

370) Patterns for Number 606

(a)

$$\begin{aligned}91808^2 + 606^2 &:= 91810^2 \\9018008^2 + 6006^2 &:= 9018010^2 \\900180008^2 + 60006^2 &:= 900180010^2 \\90001800008^2 + 600006^2 &:= 90001800010^2\end{aligned}$$

(b)

$$\begin{aligned}594^2 + 120^2 &:= 606^2 \\59994^2 + 1200^2 &:= 60006^2 \\5999994^2 + 12000^2 &:= 6000006^2 \\599999994^2 + 120000^2 &:= 600000006^2\end{aligned}$$

371) Patterns for Number 607

(a)

$$\begin{aligned}184224^2 + 607^2 &:= 184225^2 \\18042024^2 + 6007^2 &:= 18042025^2 \\1800420024^2 + 60007^2 &:= 1800420025^2 \\180004200024^2 + 600007^2 &:= 180004200025^2\end{aligned}$$

372) Patterns for Number 608

(a)

$$\begin{aligned}92415^2 + 608^2 &:= 92417^2 \\9024015^2 + 6008^2 &:= 9024017^2 \\900240015^2 + 60008^2 &:= 900240017^2 \\90002400015^2 + 600008^2 &:= 90002400017^2\end{aligned}$$

373) Patterns for Number 609

(a)

$$\begin{aligned}609^2 + 200^2 &:= 641^2 \\65009^2 + 2040^2 &:= 65041^2 \\6528009^2 + 20440^2 &:= 6528041^2 \\653058009^2 + 204440^2 &:= 653058041^2\end{aligned}$$

374) Patterns for Number 611

(a)

$$\begin{aligned}611^2 + 1020^2 &:= 1189^2 \\108611^2 + 11220^2 &:= 109189^2 \\11088611^2 + 113220^2 &:= 11089189^2 \\1110888611^2 + 1133220^2 &:= 1110889189^2\end{aligned}$$

375) Patterns for Number 612

(a)

$$\begin{aligned}612^2 + 10395^2 &:= 10413^2 \\6012^2 + 1003995^2 &:= 1004013^2 \\60012^2 + 100039995^2 &:= 100040013^2 \\600012^2 + 10000399995^2 &:= 10000400013^2\end{aligned}$$

376) Patterns for Number 616

(a)

$$\begin{aligned}616^2 + 150^2 &:= 634^2 \\65016^2 + 1530^2 &:= 65034^2 \\6528016^2 + 15330^2 &:= 6528034^2 \\653058016^2 + 153330^2 &:= 653058034^2\end{aligned}$$

377) Patterns for Number 621

(a)

$$\begin{aligned}221^2 + 60^2 &:= 229^2 \\24021^2 + 620^2 &:= 24029^2 \\2418021^2 + 6220^2 &:= 2418029^2 \\241958021^2 + 62220^2 &:= 241958029^2\end{aligned}$$

(b)

$$\begin{aligned}621^2 + 100^2 &:= 629^2 \\65021^2 + 1020^2 &:= 65029^2 \\6528021^2 + 10220^2 &:= 6528029^2 \\653058021^2 + 102220^2 &:= 653058029^2\end{aligned}$$

378) Patterns for Number 624

(a)

$$\begin{aligned}624^2 + 50^2 &:= 626^2 \\65024^2 + 510^2 &:= 65026^2 \\6528024^2 + 5110^2 &:= 6528026^2 \\653058024^2 + 51110^2 &:= 653058026^2\end{aligned}$$

379) Patterns for Number 625

(a)

$$\begin{aligned}175^2 + 600^2 &:= 625^2 \\15975^2 + 62000^2 &:= 64025^2 \\1581975^2 + 6220000^2 &:= 6418025^2 \\158041975^2 + 622200000^2 &:= 641958025^2\end{aligned}$$

(b)

$$\begin{aligned}625^2 + 7800^2 &:= 7825^2 \\6625^2 + 877800^2 &:= 877825^2 \\66625^2 + 88777800^2 &:= 88777825^2 \\666625^2 + 8887777800^2 &:= 8887777825^2\end{aligned}$$

380) Patterns for Number 626

(a)

$$\begin{aligned}624^2 + 50^2 &:= 626^2 \\65024^2 + 510^2 &:= 65026^2 \\6528024^2 + 5110^2 &:= 6528026^2 \\653058024^2 + 51110^2 &:= 653058026^2\end{aligned}$$

381) Patterns for Number 629

(a)

$$\begin{aligned}621^2 + 100^2 &:= 629^2 \\65021^2 + 1020^2 &:= 65029^2 \\6528021^2 + 10220^2 &:= 6528029^2 \\653058021^2 + 102220^2 &:= 653058029^2\end{aligned}$$

382) Patterns for Number 630

(a)

$$\begin{aligned}1144^2 + 630^2 &:= 1306^2 \\112144^2 + 6030^2 &:= 112306^2 \\11122144^2 + 60030^2 &:= 11122306^2 \\1111222144^2 + 60030^2 &:= 1111222306^2\end{aligned}$$

383) Patterns for Number 634

(a)

$$\begin{aligned}616^2 + 150^2 &:= 634^2 \\65016^2 + 1530^2 &:= 65034^2 \\6528016^2 + 15330^2 &:= 6528034^2 \\653058016^2 + 153330^2 &:= 653058034^2\end{aligned}$$

384) Patterns for Number 635

(a)

$$\begin{aligned}635^2 + 8052^2 &:= 8077^2 \\6635^2 + 880452^2 &:= 880477^2 \\66635^2 + 88804452^2 &:= 88804477^2 \\666635^2 + 8888044452^2 &:= 8888044477^2\end{aligned}$$

385) Patterns for Number 639

(a)

$$\begin{aligned}639^2 + 2480^2 &:= 2561^2 \\63279^2 + 248800^2 &:= 256721^2 \\6321679^2 + 24888000^2 &:= 25678321^2 \\632105679^2 + 2488880000^2 &:= 2567894321^2\end{aligned}$$

386) Patterns for Number 640

(a)

$$\begin{aligned}3168^2 + 640^2 &:= 3232^2 \\319968^2 + 6400^2 &:= 320032^2 \\31999968^2 + 64000^2 &:= 32000032^2 \\319999968^2 + 640000^2 &:= 3200000032^2\end{aligned}$$

(b)

$$\begin{aligned}102399^2 + 640^2 &:= 102401^2 \\10239999^2 + 6400^2 &:= 10240001^2 \\1023999999^2 + 64000^2 &:= 1024000001^2 \\102399999999^2 + 640000^2 &:= 102400000001^2\end{aligned}$$

(c)

$$144^2 + 640^2 := 656^2$$

$$12444^2 + 66400^2 := 67556^2$$

$$1224444^2 + 6664000^2 := 6775556^2$$

$$122244444^2 + 666640000^2 := 677755556^2$$

(d)

$$6384^2 + 640^2 := 6416^2$$

$$639984^2 + 6400^2 := 640016^2$$

$$63999984^2 + 64000^2 := 64000016^2$$

$$639999984^2 + 640000^2 := 6400000016^2$$

(e)

$$1536^2 + 640^2 := 1664^2$$

$$159936^2 + 6400^2 := 160064^2$$

$$15999936^2 + 64000^2 := 16000064^2$$

$$159999936^2 + 640000^2 := 1600000064^2$$

387) Patterns for Number 641

(a)

$$609^2 + 200^2 := 641^2$$

$$65009^2 + 2040^2 := 65041^2$$

$$6528009^2 + 20440^2 := 6528041^2$$

$$653058009^2 + 204440^2 := 653058041^2$$

388) Patterns for Number 649

(a)

$$649^2 + 1680^2 := 1801^2$$

$$111649^2 + 16080^2 := 112801^2$$

$$11121649^2 + 160080^2 := 11122801^2$$

$$1111221649^2 + 1600080^2 := 1111222801^2$$

389) Patterns for Number 650

(a)

$$600^2 + 250^2 := 650^2$$

$$65000^2 + 2550^2 := 65050^2$$

$$6528000^2 + 25550^2 := 6528050^2$$

$$653058000^2 + 255550^2 := 653058050^2$$

(b)

$$456^2 + 650^2 := 794^2$$

$$275456^2 + 13650^2 := 275794^2$$

$$30525456^2 + 143650^2 := 30525794^2$$

$$3083025456^2 + 1443650^2 := 3083025794^2$$

(c)

$$4200^2 + 650^2 := 4250^2$$

$$442200^2 + 6650^2 := 442250^2$$

$$44422200^2 + 66650^2 := 44422250^2$$

$$4444222200^2 + 666650^2 := 4444222250^2$$

390) Patterns for Number 651

(a)

$$\begin{aligned}651^2 + 4300^2 &:= 4349^2 \\300651^2 + 47300^2 &:= 304349^2 \\30800651^2 + 477300^2 &:= 30804349^2 \\3085800651^2 + 4777300^2 &:= 3085804349^2\end{aligned}$$

391) Patterns for Number 656

(a)

$$\begin{aligned}1617^2 + 656^2 &:= 1745^2 \\116217^2 + 5456^2 &:= 116345^2 \\11162217^2 + 53456^2 &:= 11162345^2 \\1111622217^2 + 533456^2 &:= 1111622345^2\end{aligned}$$

(b)

$$\begin{aligned}144^2 + 640^2 &:= 656^2 \\12444^2 + 66400^2 &:= 67556^2 \\1224444^2 + 6664000^2 &:= 6775556^2 \\122244444^2 + 666640000^2 &:= 677755556^2\end{aligned}$$

392) Patterns for Number 660

(a)

$$\begin{aligned}660^2 + 63^2 &:= 663^2 \\60600^2 + 603^2 &:= 60603^2 \\6006000^2 + 6003^2 &:= 6006003^2 \\600060000^2 + 60003^2 &:= 600060003^2\end{aligned}$$

(b)

$$\begin{aligned}4331^2 + 660^2 &:= 4381^2 \\443531^2 + 6660^2 &:= 443581^2 \\44435531^2 + 66660^2 &:= 44435581^2 \\4444355531^2 + 666660^2 &:= 4444355581^2\end{aligned}$$

393) Patterns for Number 661

(a)

$$\begin{aligned}589^2 + 300^2 &:= 661^2 \\275589^2 + 6300^2 &:= 275661^2 \\30525589^2 + 66300^2 &:= 30525661^2 \\3083025589^2 + 666300^2 &:= 3083025661^2\end{aligned}$$

394) Patterns for Number 663

(a)

$$\begin{aligned}660^2 + 63^2 &:= 663^2 \\60600^2 + 603^2 &:= 60603^2 \\6006000^2 + 6003^2 &:= 6006003^2 \\600060000^2 + 60003^2 &:= 600060003^2\end{aligned}$$

(b)

$$\begin{aligned}219784^2 + 663^2 &:= 219785^2 \\22197784^2 + 6663^2 &:= 22197785^2 \\2221977784^2 + 66663^2 &:= 2221977785^2 \\222219777784^2 + 666663^2 &:= 222219777785^2\end{aligned}$$

395) Patterns for Number 664

(a)

$$\begin{aligned}110223^2 + 664^2 &:= 110225^2 \\11102223^2 + 6664^2 &:= 11102225^2 \\1111022223^2 + 66664^2 &:= 1111022225^2 \\111110222223^2 + 666664^2 &:= 111110222225^2\end{aligned}$$

396) Patterns for Number 665

(a)

$$\begin{aligned}44220^2 + 665^2 &:= 44225^2 \\4442220^2 + 6665^2 &:= 4442225^2 \\444422220^2 + 66665^2 &:= 444422225^2 \\44444222220^2 + 666665^2 &:= 44444222225^2\end{aligned}$$

397) Patterns for Number 666

(a)

$$\begin{aligned}12312^2 + 666^2 &:= 12330^2 \\1234312^2 + 6666^2 &:= 1234330^2 \\123454312^2 + 66666^2 &:= 123454330^2 \\12345654312^2 + 666666^2 &:= 12345654330^2\end{aligned}$$

(b)

$$\begin{aligned}110888^2 + 666^2 &:= 110890^2 \\11108888^2 + 6666^2 &:= 11108890^2 \\1111088888^2 + 66666^2 &:= 1111088890^2 \\111110888888^2 + 666666^2 &:= 111110888890^2\end{aligned}$$

398) Patterns for Number 667

(a)

$$\begin{aligned}667^2 + 222444^2 &:= 222445^2 \\6667^2 + 22224444^2 &:= 22224445^2 \\66667^2 + 2222244444^2 &:= 2222244445^2 \\666667^2 + 222222444444^2 &:= 222222444445^2\end{aligned}$$

399) Patterns for Number 668

(a)

$$\begin{aligned}668^2 + 111555^2 &:= 111557^2 \\6668^2 + 11115555^2 &:= 11115557^2 \\66668^2 + 1111155555^2 &:= 1111155557^2 \\666668^2 + 111111555555^2 &:= 111111555557^2\end{aligned}$$

400) Patterns for Number 671

(a)

$$\begin{aligned}671^2 + 225120^2 &:= 225121^2 \\6671^2 + 22251120^2 &:= 22251121^2 \\66671^2 + 2222511120^2 &:= 2222511121^2 \\666671^2 + 222225111120^2 &:= 222225111121^2\end{aligned}$$

401) Patterns for Number 672

(a)

$$\begin{aligned}672^2 + 104^2 &:= 680^2 \\70752^2 + 1064^2 &:= 70760^2 \\7107552^2 + 10664^2 &:= 7107560^2 \\711075552^2 + 106664^2 &:= 711075560^2\end{aligned}$$

402) Patterns for Number 673

(a)

$$\begin{aligned}226464^2 + 673^2 &:= 226465^2 \\22264464^2 + 6673^2 &:= 22264465^2 \\2222644464^2 + 66673^2 &:= 2222644465^2 \\222226444464^2 + 666673^2 &:= 222226444465^2\end{aligned}$$

403) Patterns for Number 674

(a)

$$\begin{aligned}576^2 + 350^2 &:= 674^2 \\275576^2 + 7350^2 &:= 275674^2 \\30525576^2 + 77350^2 &:= 30525674^2 \\3083025576^2 + 777350^2 &:= 3083025674^2\end{aligned}$$

404) Patterns for Number 675

(a)

$$\begin{aligned}675^2 + 900^2 &:= 1125^2 \\108675^2 + 9900^2 &:= 109125^2 \\11088675^2 + 99900^2 &:= 11089125^2 \\1110888675^2 + 999900^2 &:= 1110889125^2\end{aligned}$$

405) Patterns for Number 676

(a)

$$\begin{aligned}676^2 + 114243^2 &:= 114245^2 \\6676^2 + 11142243^2 &:= 11142245^2 \\66676^2 + 1111422243^2 &:= 1111422245^2 \\666676^2 + 111114222243^2 &:= 111114222245^2\end{aligned}$$

406) Patterns for Number 679

(a)

$$\begin{aligned}230520^2 + 679^2 &:= 230521^2 \\22304520^2 + 6679^2 &:= 22304521^2 \\2223044520^2 + 66679^2 &:= 2223044521^2 \\222230444520^2 + 666679^2 &:= 222230444521^2\end{aligned}$$

407) Patterns for Number 680

(a)

$$\begin{aligned}672^2 + 104^2 &:= 680^2 \\70752^2 + 1064^2 &:= 70760^2 \\7107552^2 + 10664^2 &:= 7107560^2 \\711075552^2 + 106664^2 &:= 711075560^2\end{aligned}$$

(b)

$$\begin{aligned}7209^2 + 680^2 &:= 7241^2 \\783209^2 + 7080^2 &:= 783241^2 \\78943209^2 + 71080^2 &:= 78943241^2 \\7900543209^2 + 711080^2 &:= 7900543241^2\end{aligned}$$

408) Patterns for Number 685

(a)

$$\begin{aligned}685^2 + 9372^2 &:= 9397^2 \\6685^2 + 893772^2 &:= 893797^2 \\66685^2 + 88937772^2 &:= 88937797^2 \\666685^2 + 8889377772^2 &:= 888937797^2\end{aligned}$$

409) Patterns for Number 689

(a)

$$561^2 + 400^2 := 689^2$$

$$275561^2 + 8400^2 := 275689^2$$

$$30525561^2 + 88400^2 := 30525689^2$$

$$3083025561^2 + 888400^2 := 3083025689^2$$

410) Patterns for Number 693

(a)

$$693^2 + 140^2 := 707^2$$

$$69993^2 + 1400^2 := 70007^2$$

$$6999993^2 + 14000^2 := 7000007^2$$

$$699999993^2 + 140000^2 := 700000007^2$$

(b)

$$4876^2 + 693^2 := 4925^2$$

$$498976^2 + 6993^2 := 499025^2$$

$$49989976^2 + 69993^2 := 49990025^2$$

$$4999899976^2 + 699993^2 := 4999900025^2$$

411) Patterns for Number 700

2.8 Pattern in Pythagorean Triples: 701 to 800

412) Patterns for Number 706

(a)

$$122499^2 + 700^2 := 122501^2$$

$$12249999^2 + 7000^2 := 12250001^2$$

$$1224999999^2 + 70000^2 := 1225000001^2$$

$$122499999999^2 + 700000^2 := 122500000001^2$$

(b)

$$2451^2 + 700^2 := 2549^2$$

$$249951^2 + 7000^2 := 250049^2$$

$$24999951^2 + 70000^2 := 25000049^2$$

$$2499999951^2 + 700000^2 := 2500000049^2$$

(c)

$$1125^2 + 700^2 := 1325^2$$

$$112125^2 + 6700^2 := 112325^2$$

$$11122125^2 + 66700^2 := 11122325^2$$

$$1111222125^2 + 66700^2 := 1111222325^2$$

(d)

$$4875^2 + 700^2 := 4925^2$$

$$489975^2 + 7000^2 := 490025^2$$

$$48999975^2 + 70000^2 := 49000025^2$$

$$4899999975^2 + 700000^2 := 4900000025^2$$

(a)

$$\begin{aligned}544^2 + 450^2 &:= 706^2 \\275544^2 + 9450^2 &:= 275706^2 \\30525544^2 + 99450^2 &:= 30525706^2 \\3083025544^2 + 999450^2 &:= 3083025706^2\end{aligned}$$

413) Patterns for Number 707

(a)

$$\begin{aligned}693^2 + 140^2 &:= 707^2 \\69993^2 + 1400^2 &:= 70007^2 \\6999993^2 + 14000^2 &:= 7000007^2 \\699999993^2 + 140000^2 &:= 700000007^2\end{aligned}$$

414) Patterns for Number 720

(a)

$$\begin{aligned}129599^2 + 720^2 &:= 129601^2 \\1295999^2 + 7200^2 &:= 12960001^2 \\129599999^2 + 72000^2 &:= 1296000001^2 \\12959999999^2 + 720000^2 &:= 129600000001^2\end{aligned}$$

(b)

$$\begin{aligned}3564^2 + 720^2 &:= 3636^2 \\359964^2 + 7200^2 &:= 360036^2 \\35999964^2 + 72000^2 &:= 36000036^2 \\3599999964^2 + 720000^2 &:= 3600000036^2\end{aligned}$$

(c)

$$\begin{aligned}8084^2 + 720^2 &:= 8116^2 \\809984^2 + 7200^2 &:= 810016^2 \\80999984^2 + 72000^2 &:= 81000016^2 \\8099999984^2 + 720000^2 &:= 8100000016^2\end{aligned}$$

(d)

$$\begin{aligned}756^2 + 720^2 &:= 1044^2 \\108756^2 + 7920^2 &:= 109044^2 \\11088756^2 + 79920^2 &:= 11089044^2 \\1110888756^2 + 799920^2 &:= 1110889044^2\end{aligned}$$

(e)

$$\begin{aligned}1519^2 + 720^2 &:= 1681^2 \\159919^2 + 7200^2 &:= 160081^2 \\15999919^2 + 72000^2 &:= 16000081^2 \\1599999919^2 + 720000^2 &:= 1600000081^2\end{aligned}$$

415) Patterns for Number 725

(a)

$$\begin{aligned}525^2 + 500^2 &:= 725^2 \\275525^2 + 10500^2 &:= 275725^2 \\30525525^2 + 110500^2 &:= 30525725^2 \\3083025525^2 + 1110500^2 &:= 3083025725^2\end{aligned}$$

416) Patterns for Number 736

(a)

$$\begin{aligned}736^2 + 4200^2 &:= 4264^2 \\300736^2 + 46200^2 &:= 304264^2 \\30800736^2 + 466200^2 &:= 30804264^2 \\3085800736^2 + 4666200^2 &:= 3085804264^2\end{aligned}$$

417) Patterns for Number 740

(a)

$$\begin{aligned}68448^2 + 740^2 &:= 68452^2 \\6844998^2 + 7400^2 &:= 6845002^2 \\684499998^2 + 74000^2 &:= 684500002^2 \\68449999998^2 + 740000^2 &:= 68450000002^2\end{aligned}$$

418) Patterns for Number 744

(a)

$$\begin{aligned}744^2 + 7670^2 &:= 7706^2 \\7944^2 + 876470^2 &:= 876506^2 \\79944^2 + 88764470^2 &:= 88764506^2 \\799944^2 + 8887644470^2 &:= 8887644506^2\end{aligned}$$

419) Patterns for Number 746

(a)

$$\begin{aligned}504^2 + 550^2 &:= 746^2 \\275504^2 + 11550^2 &:= 275746^2 \\30525504^2 + 121550^2 &:= 30525746^2 \\3083025504^2 + 1221550^2 &:= 3083025746^2\end{aligned}$$

420) Patterns for Number 748

(a)

$$\begin{aligned}748^2 + 12705 &:= 12727^2 \\7348^2 + 1227105 &:= 1227127^2 \\73348^2 + 122271105 &:= 122271127^2 \\733348^2 + 12222711105 &:= 12222711127^2\end{aligned}$$

421) Patterns for Number 750

(a)

$$\begin{aligned}400^2 + 750^2 &:= 850^2 \\275400^2 + 15750^2 &:= 275850^2 \\30525400^2 + 165750^2 &:= 30525850^2 \\3083025400^2 + 1665750^2 &:= 3083025850^2\end{aligned}$$

422) Patterns for Number 756

(a)

$$\begin{aligned}756^2 + 117^2 &:= 765^2 \\79596^2 + 1197^2 &:= 79605^2 \\7995996^2 + 11997^2 &:= 7996005^2 \\799959996^2 + 119997^2 &:= 799960005^2\end{aligned}$$

(b)

$$\begin{aligned}756^2 + 720^2 &:= 1044^2 \\108756^2 + 7920^2 &:= 109044^2 \\11088756^2 + 79920^2 &:= 11089044^2 \\1110888756^2 + 799920^2 &:= 1110889044^2\end{aligned}$$

(c)

$$\begin{aligned}756^2 + 7920^2 &:= 7956^2 \\7956^2 + 879120^2 &:= 879156^2 \\79956^2 + 88791120^2 &:= 88791156^2 \\799956^2 + 8887911120^2 &:= 8887911156^2\end{aligned}$$

423) Patterns for Number 760

(a)

$$\begin{aligned}760^2 + 39^2 &:= 761^2 \\79600^2 + 399^2 &:= 79601^2 \\7996000^2 + 3999^2 &:= 7996001^2 \\799960000^2 + 39999^2 &:= 799960001^2\end{aligned}$$

(b)

$$\begin{aligned}9009^2 + 760^2 &:= 9041^2 \\990009^2 + 7960^2 &:= 990041^2 \\99900009^2 + 79960^2 &:= 99900041^2 \\9999000009^2 + 799960^2 &:= 9999000041^2\end{aligned}$$

424) Patterns for Number 761

(a)

$$\begin{aligned}39^2 + 760^2 &:= 761^2 \\399^2 + 79600^2 &:= 79601^2 \\3999^2 + 7996000^2 &:= 7996001^2 \\39999^2 + 799960000^2 &:= 799960001^2\end{aligned}$$

425) Patterns for Number 765

(a)

$$\begin{aligned}756^2 + 117^2 &:= 765^2 \\79596^2 + 1197^2 &:= 79605^2 \\7995996^2 + 11997^2 &:= 7996005^2 \\799959996^2 + 119997^2 &:= 799960005^2\end{aligned}$$

426) Patterns for Number 769

(a)

$$\begin{aligned}481^2 + 600^2 &:= 769^2 \\275481^2 + 12600^2 &:= 275769^2 \\30525481^2 + 132600^2 &:= 30525769^2 \\3083025481^2 + 1332600^2 &:= 3083025769^2\end{aligned}$$

427) Patterns for Number 770

(a)

$$\begin{aligned}1104^2 + 770^2 &:= 1346^2 \\112104^2 + 7370^2 &:= 112346^2 \\11122104^2 + 73370^2 &:= 11122346^2 \\1111222104^2 + 73370^2 &:= 1111222346^2\end{aligned}$$

428) Patterns for Number 776

(a)

$$\begin{aligned}776^2 + 18810^2 &:= 18826^2 \\7976^2 + 1988010^2 &:= 1988026^2 \\79976^2 + 199880010^2 &:= 199880026^2 \\799976^2 + 19998800010^2 &:= 19998800026^2\end{aligned}$$

429) Patterns for Number 780

(a)

$$\begin{aligned}4189^2 + 780^2 &:= 4261^2 \\442189^2 + 7980^2 &:= 442261^2 \\44422189^2 + 79980^2 &:= 44422261^2 \\4444222189^2 + 799980^2 &:= 4444222261^2\end{aligned}$$

430) Patterns for Number 784

(a)

$$\begin{aligned}784^2 + 19200^2 &:= 19216^2 \\990784^2 + 192000^2 &:= 1009216^2 \\99990784^2 + 1920000^2 &:= 100009216^2 \\9999990784^2 + 19200000^2 &:= 10000009216^2\end{aligned}$$

(b)

$$\begin{aligned}784^2 + 1470^2 &:= 1666^2 \\111784^2 + 14070^2 &:= 112666^2 \\11121784^2 + 140070^2 &:= 11122666^2 \\1111221784^2 + 1400070^2 &:= 1111222666^2\end{aligned}$$

431) Patterns for Number 792

(a)

$$\begin{aligned}792^2 + 160^2 &:= 808^2 \\79992^2 + 1600^2 &:= 80008^2 \\7999992^2 + 16000^2 &:= 8000008^2 \\79999992^2 + 160000^2 &:= 800000008^2\end{aligned}$$

(b)

$$\begin{aligned}19594^2 + 792^2 &:= 19610^2 \\1995994^2 + 7992^2 &:= 1996010^2 \\199959994^2 + 79992^2 &:= 199960010^2 \\19999599994^2 + 799992^2 &:= 19999600010^2\end{aligned}$$

(c)

$$\begin{aligned}78406^2 + 792^2 &:= 78410^2 \\7984006^2 + 7992^2 &:= 7984010^2 \\799840006^2 + 79992^2 &:= 799840010^2 \\79998400006^2 + 799992^2 &:= 79998400010^2\end{aligned}$$

(d)

$$\begin{aligned}4320^2 + 792^2 &:= 4392^2 \\443520^2 + 7992^2 &:= 443592^2 \\44435520^2 + 79992^2 &:= 44435592^2 \\4444355520^2 + 799992^2 &:= 4444355592^2\end{aligned}$$

(e)

$$\begin{aligned}17415^2 + 792^2 &:= 17433^2 \\1774215^2 + 7992^2 &:= 1774233^2 \\177742215^2 + 79992^2 &:= 177742233^2 \\17777422215^2 + 799992^2 &:= 17777422233^2\end{aligned}$$

(f)

$$\begin{aligned}39200^2 + 792^2 &:= 39208^2 \\3992000^2 + 7992^2 &:= 3992008^2 \\399920000^2 + 79992^2 &:= 399920008^2 \\39999200000^2 + 799992^2 &:= 39999200008^2\end{aligned}$$

(g)

$$\begin{aligned}9785^2 + 792^2 &:= 9817^2 \\997985^2 + 7992^2 &:= 998017^2 \\99979985^2 + 79992^2 &:= 99980017^2 \\9999799985^2 + 799992^2 &:= 9999800017^2\end{aligned}$$

(h)

$$\begin{aligned}156815^2 + 792^2 &:= 156817^2 \\15968015^2 + 7992^2 &:= 15968017^2 \\1599680015^2 + 79992^2 &:= 1599680017^2 \\159996800015^2 + 799992^2 &:= 159996800017^2\end{aligned}$$

(i)

$$\begin{aligned}9785^2 + 792^2 &:= 9817^2 \\997985^2 + 7992^2 &:= 998017^2 \\99979985^2 + 79992^2 &:= 99980017^2 \\9999799985^2 + 799992^2 &:= 9999800017^2\end{aligned}$$

(j)

$$\begin{aligned}17415^2 + 792^2 &:= 17433^2 \\1774215^2 + 7992^2 &:= 1774233^2 \\177742215^2 + 79992^2 &:= 177742233^2 \\17777422215^2 + 799992^2 &:= 17777422233^2\end{aligned}$$

432) Patterns for Number 794

(a)

$$\begin{aligned}456^2 + 650^2 &:= 794^2 \\275456^2 + 13650^2 &:= 275794^2 \\30525456^2 + 143650^2 &:= 30525794^2 \\3083025456^2 + 1443650^2 &:= 3083025794^2\end{aligned}$$

433) Patterns for Number 798

(a)

$$\begin{aligned}159200^2 + 798^2 &:= 159202^2 \\15992000^2 + 7998^2 &:= 15992002^2 \\1599920000^2 + 79998^2 &:= 1599920002^2 \\159999200000^2 + 799998^2 &:= 159999200002^2\end{aligned}$$

434) Patterns for Number 799

(a)

$$\begin{aligned}799^2 + 319200^2 &:= 319201^2 \\7999^2 + 31992000^2 &:= 31992001^2 \\79999^2 + 3199920000^2 &:= 3199920001^2 \\799999^2 + 319999200000^2 &:= 319999200001^2\end{aligned}$$

435) Patterns for Number 800

(a)

$$\begin{aligned}396^2 + 80^2 &:= 404^2 \\39996^2 + 800^2 &:= 40004^2 \\3999996^2 + 8000^2 &:= 4000004^2 \\399999996^2 + 80000^2 &:= 400000004^2\end{aligned}$$

(b)

$$\begin{aligned}369^2 + 800^2 &:= 881^2 \\275369^2 + 16800^2 &:= 275881^2 \\30525369^2 + 176800^2 &:= 30525881^2 \\3083025369^2 + 1776800^2 &:= 3083025881^2\end{aligned}$$

(c)

$$\begin{aligned}2436^2 + 800^2 &:= 2564^2 \\249936^2 + 8000^2 &:= 250064^2 \\24999936^2 + 80000^2 &:= 25000064^2 \\2499999936^2 + 800000^2 &:= 2500000064^2\end{aligned}$$

(d)

$$\begin{aligned}159999^2 + 800^2 &:= 160001^2 \\1599999^2 + 8000^2 &:= 16000001^2 \\15999999^2 + 80000^2 &:= 1600000001^2 \\159999999^2 + 800000^2 &:= 160000000001^2\end{aligned}$$

(e)

$$\begin{aligned}9984^2 + 800^2 &:= 10016^2 \\99984^2 + 8000^2 &:= 1000016^2 \\999984^2 + 80000^2 &:= 100000016^2 \\9999984^2 + 800000^2 &:= 10000000016^2\end{aligned}$$

(f)

$$\begin{aligned}6375^2 + 800^2 &:= 6425^2 \\639975^2 + 8000^2 &:= 640025^2 \\63999975^2 + 80000^2 &:= 64000025^2 \\6399999975^2 + 800000^2 &:= 6400000025^2\end{aligned}$$

(g)

$$\begin{aligned}800^2 + 600^2 &:= 1000^2 \\108800^2 + 6600^2 &:= 109000^2 \\1108800^2 + 66600^2 &:= 11089000^2 \\111088800^2 + 666600^2 &:= 1110889000^2\end{aligned}$$

(h)

$$\begin{aligned}1500^2 + 800^2 &:= 1700^2 \\159900^2 + 8000^2 &:= 160100^2 \\1599900^2 + 80000^2 &:= 16000100^2 \\15999900^2 + 800000^2 &:= 1600000100^2\end{aligned}$$

2.9 Pattern in Pythagorean Triples: 801 to 900

436) Patterns for Number 801

(a)

$$\begin{aligned}320800^2 + 801^2 &:= 320801^2 \\32008000^2 + 8001^2 &:= 32008001^2 \\3200080000^2 + 80001^2 &:= 3200080001^2 \\320000800000^2 + 800001^2 &:= 320000800001^2\end{aligned}$$

437) Patterns for Number 802

(a)

$$\begin{aligned}160800^2 + 802^2 &:= 160802^2 \\16008000^2 + 8002^2 &:= 16008002^2 \\1600080000^2 + 80002^2 &:= 1600080002^2 \\160000800000^2 + 800002^2 &:= 160000800002^2\end{aligned}$$

438) Patterns for Number 804

(a)

$$\begin{aligned}80800^2 + 804^2 &:= 80804^2 \\8008000^2 + 8004^2 &:= 8008004^2 \\800080000^2 + 80004^2 &:= 800080004^2 \\80000800000^2 + 800004^2 &:= 80000800004^2\end{aligned}$$

439) Patterns for Number 808

(a)

$$\begin{aligned}792^2 + 160^2 &:= 808^2 \\79992^2 + 1600^2 &:= 80008^2 \\7999992^2 + 16000^2 &:= 8000008^2 \\799999992^2 + 160000^2 &:= 800000008^2\end{aligned}$$

(b)

$$\begin{aligned}163215^2 + 808^2 &:= 163217^2 \\16032015^2 + 8008^2 &:= 16032017^2 \\1600320015^2 + 80008^2 &:= 1600320017^2 \\160003200015^2 + 800008^2 &:= 160003200017^2\end{aligned}$$

440) Patterns for Number 812

(a)

$$\begin{aligned}812^2 + 125^2 &:= 7813^2 \\877812^2 + 1325^2 &:= 877813^2 \\88777812^2 + 13325^2 &:= 88777813^2 \\8887777812^2 + 133325^2 &:= 8887777813^2\end{aligned}$$

441) Patterns for Number 819

(a)

$$\begin{aligned}819^2 + 4100^2 &:= 4181^2 \\300819^2 + 45100^2 &:= 304181^2 \\30800819^2 + 455100^2 &:= 30804181^2 \\3085800819^2 + 4555100^2 &:= 3085804181^2\end{aligned}$$

(b)

$$\begin{aligned}819^2 + 540^2 &:= 981^2 \\89919^2 + 5400^2 &:= 90081^2 \\8999919^2 + 54000^2 &:= 9000081^2 \\899999919^2 + 540000^2 &:= 900000081^2\end{aligned}$$

442) Patterns for Number 821

(a)

$$\begin{aligned}429^2 + 700^2 &:= 821^2 \\275429^2 + 14700^2 &:= 275821^2 \\30525429^2 + 154700^2 &:= 30525821^2 \\3083025429^2 + 1554700^2 &:= 3083025821^2\end{aligned}$$

443) Patterns for Number 824

(a)

$$\begin{aligned}10593^2 + 824^2 &:= 10625^2 \\1005993^2 + 8024^2 &:= 1006025^2 \\100059993^2 + 80024^2 &:= 100060025^2 \\10000599993^2 + 800024^2 &:= 10000600025^2\end{aligned}$$

444) Patterns for Number 825

(a)

$$\begin{aligned}825^2 + 1400^2 &:= 1625^2 \\111825^2 + 13400^2 &:= 112625^2 \\11121825^2 + 133400^2 &:= 11122625^2 \\1111221825^2 + 133400^2 &:= 1111222625^2\end{aligned}$$

(b)

$$\begin{aligned}3551^2 + 840^2 &:= 3649^2 \\359951^2 + 8400^2 &:= 360049^2 \\35999951^2 + 84000^2 &:= 36000049^2 \\3599999951^2 + 840000^2 &:= 3600000049^2\end{aligned}$$

445) Patterns for Number 828

(a)

$$\begin{aligned}828^2 + 9504^2 &:= 9540^2 \\8028^2 + 895104^2 &:= 895140^2 \\80028^2 + 88951104^2 &:= 88951140^2 \\800028^2 + 8889511104^2 &:= 8889511140^2\end{aligned}$$

(c)

$$\begin{aligned}4864^2 + 840^2 &:= 4936^2 \\489964^2 + 8400^2 &:= 490036^2 \\48999964^2 + 84000^2 &:= 49000036^2 \\4899999964^2 + 840000^2 &:= 4900000036^2\end{aligned}$$

446) Patterns for Number 836

(a)

$$\begin{aligned}836^2 + 480^2 &:= 964^2 \\89936^2 + 4800^2 &:= 90064^2 \\8999936^2 + 48000^2 &:= 9000064^2 \\899999936^2 + 480000^2 &:= 900000064^2\end{aligned}$$

(d)

$$\begin{aligned}840^2 + 58^2 &:= 842^2 \\89400^2 + 598^2 &:= 89402^2 \\8994000^2 + 5998^2 &:= 8994002^2 \\899940000^2 + 59998^2 &:= 899940002^2\end{aligned}$$

447) Patterns for Number 840

(a)

$$\begin{aligned}840^2 + 41^2 &:= 841^2 \\80400^2 + 401^2 &:= 80401^2 \\8004000^2 + 4001^2 &:= 8004001^2 \\800040000^2 + 40001^2 &:= 800040001^2\end{aligned}$$

(e)

$$\begin{aligned}1081^2 + 840^2 &:= 1369^2 \\112081^2 + 8040^2 &:= 112369^2 \\11122081^2 + 80040^2 &:= 11122369^2 \\1111222081^2 + 80040^2 &:= 1111222369^2\end{aligned}$$

448) Patterns for Number 841

(a)

$$\begin{aligned}840^2 + 41^2 &:= 841^2 \\80400^2 + 401^2 &:= 80401^2 \\8004000^2 + 4001^2 &:= 8004001^2 \\800040000^2 + 40001^2 &:= 800040001^2\end{aligned}$$

449) Patterns for Number 842

(a)

$$\begin{aligned}840^2 + 58^2 &:= 842^2 \\89400^2 + 598^2 &:= 89402^2 \\8994000^2 + 5998^2 &:= 8994002^2 \\899940000^2 + 59998^2 &:= 899940002^2\end{aligned}$$

450) Patterns for Number 850

(a)

$$\begin{aligned}400^2 + 750^2 &:= 850^2 \\275400^2 + 15750^2 &:= 275850^2 \\30525400^2 + 165750^2 &:= 30525850^2 \\3083025400^2 + 1665750^2 &:= 3083025850^2\end{aligned}$$

(b)

$$\begin{aligned}336^2 + 850^2 &:= 914^2 \\275336^2 + 17850^2 &:= 275914^2 \\30525336^2 + 187850^2 &:= 30525914^2 \\3083025336^2 + 1887850^2 &:= 3083025914^2\end{aligned}$$

(c)

$$\begin{aligned}7200^2 + 850^2 &:= 7250^2 \\783200^2 + 8850^2 &:= 783250^2 \\78943200^2 + 88850^2 &:= 78943250^2 \\7900543200^2 + 888850^2 &:= 7900543250^2\end{aligned}$$

451) Patterns for Number 851

(a)

$$\begin{aligned}851^2 + 420^2 &:= 949^2 \\89951^2 + 4200^2 &:= 90049^2 \\8999951^2 + 42000^2 &:= 9000049^2 \\899999951^2 + 420000^2 &:= 900000049^2\end{aligned}$$

452) Patterns for Number 864

(a)

$$\begin{aligned}864^2 + 360^2 &:= 936^2 \\89964^2 + 3600^2 &:= 90036^2 \\8999964^2 + 36000^2 &:= 9000036^2 \\899999964^2 + 360000^2 &:= 900000036^2\end{aligned}$$

453) Patterns for Number 875

(a)

$$\begin{aligned}875^2 + 300^2 &:= 925^2 \\89975^2 + 3000^2 &:= 90025^2 \\8999975^2 + 30000^2 &:= 9000025^2 \\899999975^2 + 300000^2 &:= 900000025^2\end{aligned}$$

454) Patterns for Number 880

(a)

$$\begin{aligned}880^2 + 84^2 &:= 884^2 \\80800^2 + 804^2 &:= 80804^2 \\8008000^2 + 8004^2 &:= 8008004^2 \\800080000^2 + 80004^2 &:= 800080004^2\end{aligned}$$

455) Patterns for Number 881

(a)

$$\begin{aligned}369^2 + 800^2 &:= 881^2 \\275369^2 + 16800^2 &:= 275881^2 \\30525369^2 + 176800^2 &:= 30525881^2 \\3083025369^2 + 1776800^2 &:= 3083025881^2\end{aligned}$$

456) Patterns for Number 884

(a)

$$\begin{aligned}880^2 + 84^2 &:= 884^2 \\80800^2 + 804^2 &:= 80804^2 \\8008000^2 + 8004^2 &:= 8008004^2 \\800080000^2 + 80004^2 &:= 800080004^2\end{aligned}$$

(b)

$$\begin{aligned}884^2 + 240^2 &:= 916^2 \\89984^2 + 2400^2 &:= 90016^2 \\8999984^2 + 24000^2 &:= 9000016^2 \\899999984^2 + 240000^2 &:= 900000016^2\end{aligned}$$

457) Patterns for Number 888

(a)

$$\begin{aligned}12305^2 + 888^2 &:= 12337^2 \\1234305^2 + 8888^2 &:= 1234337^2 \\123454305^2 + 88888^2 &:= 123454337^2 \\12345654305^2 + 888888^2 &:= 12345654337^2\end{aligned}$$

458) Patterns for Number 891

(a)

$$\begin{aligned}891^2 + 180^2 &:= 909^2 \\89991^2 + 1800^2 &:= 90009^2 \\8999991^2 + 18000^2 &:= 9000009^2 \\899999991^2 + 180000^2 &:= 900000009^2\end{aligned}$$

(b)

$$\begin{aligned}4860^2 + 891^2 &:= 4941^2 \\498960^2 + 8991^2 &:= 499041^2 \\49989960^2 + 89991^2 &:= 49990041^2 \\4999899960^2 + 899991^2 &:= 4999900041^2\end{aligned}$$

459) Patterns for Number 896

(a)

$$\begin{aligned}896^2 + 120^2 &:= 904^2 \\89996^2 + 1200^2 &:= 90004^2 \\8999996^2 + 12000^2 &:= 9000004^2 \\899999996^2 + 120000^2 &:= 900000004^2\end{aligned}$$

460) Patterns for Number 899

(a)

$$\begin{aligned}899^2 + 60^2 &:= 901^2 \\8999^2 + 600^2 &:= 90001^2 \\89999^2 + 6000^2 &:= 9000001^2 \\899999^2 + 60000^2 &:= 900000001^2\end{aligned}$$

(e)

$$\begin{aligned}22491^2 + 900^2 &:= 22509^2 \\224991^2 + 9000^2 &:= 2250009^2 \\2249991^2 + 90000^2 &:= 225000009^2 \\22499991^2 + 900000^2 &:= 2250000009^2\end{aligned}$$

461) Patterns for Number 900

(a)

$$\begin{aligned}8075^2 + 900^2 &:= 8125^2 \\809975^2 + 9000^2 &:= 810025^2 \\80999975^2 + 90000^2 &:= 81000025^2 \\809999975^2 + 900000^2 &:= 810000025^2\end{aligned}$$

(f)

$$\begin{aligned}101248^2 + 900^2 &:= 101252^2 \\10124998^2 + 9000^2 &:= 10125002^2 \\101249998^2 + 90000^2 &:= 1012500002^2 \\10124999998^2 + 900000^2 &:= 101250000002^2\end{aligned}$$

(b)

$$\begin{aligned}202499^2 + 900^2 &:= 202501^2 \\2024999^2 + 9000^2 &:= 20250001^2 \\20249999^2 + 90000^2 &:= 2025000001^2 \\202499999^2 + 900000^2 &:= 202500000001^2\end{aligned}$$

(g)

$$\begin{aligned}301^2 + 900^2 &:= 949^2 \\275301^2 + 18900^2 &:= 275949^2 \\30525301^2 + 198900^2 &:= 30525949^2 \\3083025301^2 + 1998900^2 &:= 3083025949^2\end{aligned}$$

(c)

$$\begin{aligned}2419^2 + 900^2 &:= 2581^2 \\249919^2 + 9000^2 &:= 250081^2 \\24999919^2 + 90000^2 &:= 25000081^2 \\249999919^2 + 900000^2 &:= 2500000081^2\end{aligned}$$

(h)

$$\begin{aligned}675^2 + 900^2 &:= 1125^2 \\108675^2 + 9900^2 &:= 109125^2 \\11088675^2 + 99900^2 &:= 11089125^2 \\1110888675^2 + 999900^2 &:= 1110889125^2\end{aligned}$$

(d)

$$\begin{aligned}900^2 + 4000^2 &:= 4100^2 \\300900^2 + 44000^2 &:= 304100^2 \\30800900^2 + 444000^2 &:= 30804100^2 \\3085800900^2 + 4444000^2 &:= 3085804100^2\end{aligned}$$

2.10 Pattern in Pythagorean Triples: 901 to 1000

462) Patterns for Number 901

(a)

$$\begin{aligned} 899^2 + 60^2 &:= 901^2 \\ 8999^2 + 600^2 &:= 90001^2 \\ 89999^2 + 6000^2 &:= 9000001^2 \\ 899999^2 + 60000^2 &:= 900000001^2 \end{aligned}$$

(b)

$$\begin{aligned} 901^2 + 1260^2 &:= 1549^2 \\ 111901^2 + 12060^2 &:= 112549^2 \\ 11121901^2 + 120060^2 &:= 11122549^2 \\ 1111221901^2 + 120060^2 &:= 1111222549^2 \end{aligned}$$

463) Patterns for Number 904

(a)

$$\begin{aligned} 896^2 + 120^2 &:= 904^2 \\ 89996^2 + 1200^2 &:= 90004^2 \\ 8999996^2 + 12000^2 &:= 9000004^2 \\ 899999996^2 + 120000^2 &:= 900000004^2 \end{aligned}$$

464) Patterns for Number 909

(a)

$$\begin{aligned} 891^2 + 180^2 &:= 909^2 \\ 89991^2 + 1800^2 &:= 90009^2 \\ 8999991^2 + 18000^2 &:= 9000009^2 \\ 899999991^2 + 180000^2 &:= 900000009^2 \end{aligned}$$

(b)

$$\begin{aligned} 909^2 + 5060^2 &:= 5141^2 \\ 109109^2 + 495060^2 &:= 506941^2 \\ 11091109^2 + 49395060^2 &:= 50624941^2 \\ 1110911109^2 + 4938395060^2 &:= 5061804941^2 \end{aligned}$$

465) Patterns for Number 910

(a)

$$\begin{aligned} 1056^2 + 910^2 &:= 1394^2 \\ 112056^2 + 8710^2 &:= 112394^2 \\ 11122056^2 + 86710^2 &:= 11122394^2 \\ 1111222056^2 + 86710^2 &:= 1111222394^2 \end{aligned}$$

(b)

$$\begin{aligned} 4176^2 + 910^2 &:= 4274^2 \\ 442176^2 + 9310^2 &:= 442274^2 \\ 44422176^2 + 93310^2 &:= 44422274^2 \\ 4444222176^2 + 933310^2 &:= 4444222274^2 \end{aligned}$$

466) Patterns for Number 914

(a)

$$\begin{aligned} 336^2 + 850^2 &:= 914^2 \\ 275336^2 + 17850^2 &:= 275914^2 \\ 30525336^2 + 187850^2 &:= 30525914^2 \\ 3083025336^2 + 1887850^2 &:= 3083025914^2 \end{aligned}$$

467) Patterns for Number 915

(a)

$$\begin{aligned}488^2 + 915^2 &:= 1037^2 \\4888^2 + 9165^2 &:= 10387^2 \\48888^2 + 91665^2 &:= 103887^2 \\488888^2 + 916665^2 &:= 1038887^2\end{aligned}$$

470) Patterns for Number 925

(a)

$$\begin{aligned}925^2 + 17100^2 &:= 17125^2 \\9925^2 + 1970100^2 &:= 1970125^2 \\99925^2 + 199700100^2 &:= 199700125^2 \\999925^2 + 19997000100^2 &:= 19997000125^2\end{aligned}$$

468) Patterns for Number 916

(a)

$$\begin{aligned}884^2 + 240^2 &:= 916^2 \\89984^2 + 2400^2 &:= 90016^2 \\899984^2 + 24000^2 &:= 9000016^2 \\8999984^2 + 240000^2 &:= 900000016^2\end{aligned}$$

(b)

$$\begin{aligned}875^2 + 300^2 &:= 925^2 \\89975^2 + 3000^2 &:= 90025^2 \\899975^2 + 30000^2 &:= 9000025^2 \\8999975^2 + 300000^2 &:= 900000025^2\end{aligned}$$

469) Patterns for Number 924

(a)

$$\begin{aligned}4307^2 + 924^2 &:= 4405^2 \\443507^2 + 9324^2 &:= 443605^2 \\44435507^2 + 93324^2 &:= 44435605^2 \\4444355507^2 + 933324^2 &:= 4444355605^2\end{aligned}$$

(c)

$$\begin{aligned}43^2 + 924^2 &:= 925^2 \\443^2 + 98124^2 &:= 98125^2 \\4443^2 + 9870124^2 &:= 9870125^2 \\44443^2 + 987590124^2 &:= 987590125^2\end{aligned}$$

471) Patterns for Number 930

(b)

$$\begin{aligned}43^2 + 924^2 &:= 925^2 \\443^2 + 98124^2 &:= 98125^2 \\4443^2 + 9870124^2 &:= 9870125^2 \\44443^2 + 987590124^2 &:= 987590125^2\end{aligned}$$

(a)

$$\begin{aligned}216^2 + 90^2 &:= 234^2 \\24016^2 + 930^2 &:= 24034^2 \\2418016^2 + 9330^2 &:= 2418034^2 \\241958016^2 + 93330^2 &:= 241958034^2\end{aligned}$$

472) Patterns for Number 931

(a)

$$\begin{aligned}61908^2 + 931^2 &:= 61915^2 \\6219108^2 + 9331^2 &:= 6219115^2 \\622191108^2 + 93331^2 &:= 622191115^2 \\62221911108^2 + 933331^2 &:= 62221911115^2\end{aligned}$$

473) Patterns for Number 936

(a)

$$\begin{aligned}864^2 + 360^2 &:= 936^2 \\89964^2 + 3600^2 &:= 90036^2 \\8999964^2 + 36000^2 &:= 9000036^2 \\899999964^2 + 360000^2 &:= 900000036^2\end{aligned}$$

(b)

$$\begin{aligned}936^2 + 1190^2 &:= 1514^2 \\111936^2 + 11390^2 &:= 112514^2 \\11121936^2 + 113390^2 &:= 11122514^2 \\1111221936^2 + 113390^2 &:= 1111222514^2\end{aligned}$$

474) Patterns for Number 949

(a)

$$\begin{aligned}301^2 + 900^2 &:= 949^2 \\275301^2 + 18900^2 &:= 275949^2 \\30525301^2 + 198900^2 &:= 30525949^2 \\3083025301^2 + 1998900^2 &:= 3083025949^2\end{aligned}$$

(b)

$$\begin{aligned}851^2 + 420^2 &:= 949^2 \\89951^2 + 4200^2 &:= 90049^2 \\8999951^2 + 42000^2 &:= 9000049^2 \\899999951^2 + 420000^2 &:= 900000049^2\end{aligned}$$

475) Patterns for Number 950

(a)

$$\begin{aligned}264^2 + 950^2 &:= 986^2 \\275264^2 + 19950^2 &:= 275986^2 \\30525264^2 + 209950^2 &:= 30525986^2 \\3083025264^2 + 2109950^2 &:= 3083025986^2\end{aligned}$$

(b)

$$\begin{aligned}9000^2 + 950^2 &:= 9050^2 \\990000^2 + 9950^2 &:= 990050^2 \\99900000^2 + 99950^2 &:= 99900050^2 \\9999000000^2 + 999950^2 &:= 9999000050^2\end{aligned}$$

476) Patterns for Number 960

(a)

$$\begin{aligned}57596^2 + 960^2 &:= 57604^2 \\5759996^2 + 9600^2 &:= 5760004^2 \\575999996^2 + 96000^2 &:= 576000004^2 \\57599999996^2 + 960000^2 &:= 57600000004^2\end{aligned}$$

(b)

$$\begin{aligned}3536^2 + 960^2 &:= 3664^2 \\359936^2 + 9600^2 &:= 360064^2 \\35999936^2 + 96000^2 &:= 36000064^2 \\3599999936^2 + 960000^2 &:= 3600000064^2\end{aligned}$$

(c)

$$\begin{aligned}28792^2 + 960^2 &:= 28808^2 \\2879992^2 + 9600^2 &:= 2880008^2 \\287999992^2 + 96000^2 &:= 288000008^2 \\28799999992^2 + 960000^2 &:= 28800000008^2\end{aligned}$$

(d)

$$\begin{aligned}6364^2 + 960^2 &:= 6436^2 \\639964^2 + 9600^2 &:= 640036^2 \\63999964^2 + 96000^2 &:= 64000036^2 \\6399999964^2 + 960000^2 &:= 6400000036^2\end{aligned}$$

477) Patterns for Number 964

(a)

$$\begin{aligned}836^2 + 480^2 &:= 964^2 \\89936^2 + 4800^2 &:= 90064^2 \\8999936^2 + 48000^2 &:= 9000064^2 \\899999936^2 + 480000^2 &:= 900000064^2\end{aligned}$$

478) Patterns for Number 965

(a)

$$\begin{aligned}965^2 + 18612^2 &:= 18637^2 \\9965^2 + 1986012^2 &:= 1986037^2 \\99965^2 + 199860012^2 &:= 199860037^2 \\999965^2 + 19998600012^2 &:= 19998600037^2\end{aligned}$$

479) Patterns for Number 975

(a)

$$\begin{aligned}975^2 + 19000^2 &:= 19025^2 \\990975^2 + 190000^2 &:= 1009025^2 \\99990975^2 + 1900000^2 &:= 100009025^2 \\9999990975^2 + 19000000^2 &:= 10000009025^2\end{aligned}$$

480) Patterns for Number 976

(a)

$$\begin{aligned}976^2 + 7410^2 &:= 7474^2 \\131976^2 + 740810^2 &:= 752474^2 \\13541976^2 + 74074810^2 &:= 75302474^2 \\1357641976^2 + 7407414810^2 &:= 7530802474^2\end{aligned}$$

481) Patterns for Number 979

(a)

$$\begin{aligned}979^2 + 3900^2 &:= 4021^2 \\90799^2 + 399000^2 &:= 409201^2 \\9007999^2 + 39990000^2 &:= 40992001^2 \\900079999^2 + 3999900000^2 &:= 4099920001^2\end{aligned}$$

482) Patterns for Number 980

(a)

$$\begin{aligned}1029^2 + 980^2 &:= 1421^2 \\112029^2 + 9380^2 &:= 112421^2 \\11122029^2 + 93380^2 &:= 11122421^2 \\1111222029^2 + 93380^2 &:= 1111222421^2\end{aligned}$$

(b)

$$\begin{aligned}4851^2 + 980^2 &:= 4949^2 \\489951^2 + 9800^2 &:= 490049^2 \\48999951^2 + 98000^2 &:= 49000049^2 \\4899999951^2 + 980000^2 &:= 4900000049^2\end{aligned}$$

483) Patterns for Number 981

(a)

$$\begin{aligned}819^2 + 540^2 &:= 981^2 \\89919^2 + 5400^2 &:= 90081^2 \\8999919^2 + 54000^2 &:= 9000081^2 \\899999919^2 + 540000^2 &:= 900000081^2\end{aligned}$$

484) Patterns for Number 986

(a)

$$\begin{aligned}264^2 + 950^2 &:= 986^2 \\275264^2 + 19950^2 &:= 275986^2 \\30525264^2 + 209950^2 &:= 30525986^2 \\3083025264^2 + 2109950^2 &:= 3083025986^2\end{aligned}$$

485) Patterns for Number 990

(a)

$$\begin{aligned}9776^2 + 990^2 &:= 9826^2 \\997976^2 + 9990^2 &:= 998026^2 \\99979976^2 + 99990^2 &:= 99980026^2 \\9999799976^2 + 999990^2 &:= 9999800026^2\end{aligned}$$

486) Patterns for Number 999

(a)

$$\begin{aligned}499000^2 + 999^2 &:= 499001^2 \\49990000^2 + 9999^2 &:= 49990001^2 \\4999900000^2 + 99999^2 &:= 4999900001^2 \\499999000000^2 + 999999^2 &:= 499999000001^2\end{aligned}$$

(b)

$$\begin{aligned}166332^2 + 999^2 &:= 166335^2 \\16663332^2 + 9999^2 &:= 16663335^2 \\1666633332^2 + 99999^2 &:= 1666633335^2 \\166666333332^2 + 999999^2 &:= 166666333335^2\end{aligned}$$

487) Patterns for Number 1000

(a)

$$\begin{aligned}2499^2 + 100^2 &:= 2501^2 \\249999^2 + 1000^2 &:= 250001^2 \\24999999^2 + 10000^2 &:= 25000001^2 \\2499999999^2 + 100000^2 &:= 2500000001^2\end{aligned}$$

(b)

$$\begin{aligned}2400^2 + 1000^2 &:= 2600^2 \\249900^2 + 10000^2 &:= 250100^2 \\24999900^2 + 100000^2 &:= 25000100^2 \\2499999900^2 + 1000000^2 &:= 2500000100^2\end{aligned}$$

(c)

$$\begin{aligned}49995^2 + 1000^2 &:= 50005^2 \\499995^2 + 10000^2 &:= 500005^2 \\4999995^2 + 100000^2 &:= 50000005^2 \\49999995^2 + 1000000^2 &:= 5000000005^2\end{aligned}$$

(d)

$$\begin{aligned}9975^2 + 1000^2 &:= 10025^2 \\99975^2 + 10000^2 &:= 100025^2 \\999975^2 + 100000^2 &:= 10000025^2 \\9999975^2 + 1000000^2 &:= 1000000025^2\end{aligned}$$

(e)

$$\begin{aligned}9975^2 + 1000^2 &:= 10025^2 \\1209975^2 + 11000^2 &:= 1210025^2 \\123209975^2 + 111000^2 &:= 123210025^2 \\12343209975^2 + 1111000^2 &:= 12343210025^2\end{aligned}$$

(f)

$$\begin{aligned}1000^2 + 4950^2 &:= 5050^2 \\11000^2 + 604950^2 &:= 605050^2 \\111000^2 + 61604950^2 &:= 61605050^2 \\1111000^2 + 6171604950^2 &:= 6171605050^2\end{aligned}$$

(g)

$$\begin{aligned}1000^2 + 1050^2 &:= 1450^2 \\112000^2 + 10050^2 &:= 112450^2 \\11122000^2 + 100050^2 &:= 11122450^2 \\1111222000^2 + 100050^2 &:= 1111222450^2\end{aligned}$$

(h)

$$\begin{aligned}225^2 + 1000^2 &:= 1025^2 \\25025^2 + 102000^2 &:= 105025^2 \\2528025^2 + 10220000^2 &:= 10528025^2 \\253058025^2 + 1022200000^2 &:= 1053058025^2\end{aligned}$$

(i)

$$\begin{aligned}800^2 + 600^2 &:= 1000^2 \\108800^2 + 6600^2 &:= 109000^2 \\11088800^2 + 66600^2 &:= 11089000^2 \\1110888800^2 + 666600^2 &:= 1110889000^2\end{aligned}$$

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