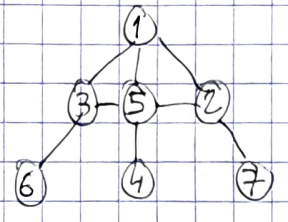


① $opp \rightarrow 5$

② $7 = 1 + 2$



③

L	A	P	I	N
N	I	L	P	A
I	P	N	A	L
P	L	A	N	I
A	N	I	L	P

④

$$B = A + 4$$

$$C = B + 5$$

$$A + B + C = 40$$

$$\rightarrow 3B - 4 + 5 = 40$$

$$\rightarrow B = 13$$

- ⑤ C: ④, ⑥ et ⑦ ou ⑨
- A: ③, ⑤ et ⑦ ou ⑧ ou ⑨
- B: ①, ② et ③
- \rightarrow C: 4, 6 et 7

⑥

3	8	5	6
10	1	11	2
2	9	7	5
4	7	9	3

⑦ $2^k \times 2^k$ ou $2^k \times 2^{k+1}$

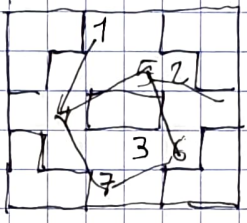
$\rightarrow 32 \times 64 = 2048$

- ⑧ 0, 1, 2, 5, 8

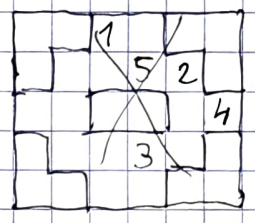
$$\left. \begin{array}{l} 1 \times 1 \rightarrow 5 \\ 2 \times 2 \rightarrow 1 \end{array} \right) \rightarrow \begin{array}{l} \cancel{8} \\ 8 \end{array}$$

⑩

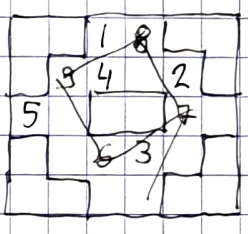
1	2		
13	8	5	
9	2		11 6
10	7	4	
3			



	1		
	6	3	
5	2		8
	7	4	7



	1	8	
9	4		2
11			7
5	10	3	
		6	



⑪ $\overline{ab} \mid \overline{a23b}$

$$100a + 23 - a \equiv 0 \pmod{ab}$$

$$99a + 23 \equiv 0$$

$$9a - 9b + 23 \equiv 0 \neq 0$$

$$19a - 8b + 23 = 0 \rightarrow (3, 10) \text{ non}$$

$$29a - 7b + 23 = 0 \rightarrow \text{non}$$

$$23 - a - 10b = 0 \rightarrow (3, 2) \text{ OK}$$

$$23 - 11a - 11b = 0 \rightarrow \text{non}$$

$$23 - 22a - 12b = 0 \rightarrow \text{non}$$

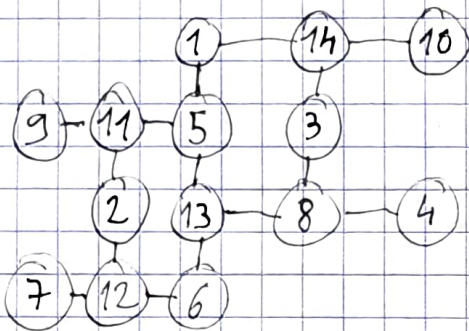
$$3232 \equiv 0 \pmod{32}$$

$\rightarrow 32$

- 69 et 96
- 1091
- 1967

$$12) \quad 9 = 7 \times 15 = 105$$

$$105 - 4 \times 25 = 5 = 2 + 3$$



$$11 + 2 + 12$$

$$11 + 3 + 11$$

$$25 - 3 = 9 + 13 \text{ or } 8 + 14$$

$$25 - 1 = 14 + 10 \text{ or } 13 + 11$$

$$25 - 8 = 13 + 4$$

$$25 - 11 = 5 + 9$$

$$25 - 12 = 6 + 7$$

$$1 + \{5, 9\} + \{4, 13\} + \{6, 7\} = 25$$

$$(5, 13, 6)$$

$$\rightarrow \quad 9 \quad 11 \quad 5$$

$$13 \quad 8 \quad 4$$

$$7 \quad 12 \quad 6$$

13) 2023, 4046, 6069, 8092, 10115, 12138, (14161), 16184
 18207, (20230), (22253), 24276, 26299, (28322),
 30345, 32368, 34391, 36414, 38437, (40460),
 42483, (44506), 46529, 48552, (50575), 52598,
 54621, 56644, 58667, (60690), 62713, (64736),
 66759, 68782

$$10115 + 54621$$

$$2023 + 32368 + 8092 = \underline{\underline{42483}}$$

$$2023 - 22$$

$$(14) \quad 3D \equiv 2A \quad [10]$$

$$2A \leq 3D$$

A	D	u
3	2	1
6	4	2
9	6	3
(7	8)	

$$3002u \times 23 + (BCD) \times 23 = 2003u \times 32 + (C8D) \times 32$$

$$69046u + BCD \times 23 = 64096u + C8D \times 32$$

$$5046 - 96 = 495$$

$$495u = 32\overline{CB} - 23\overline{BC}$$

$$320 - 23 = 297$$

$$= 297C - 198B$$

$$230 - 32 = 198$$

$$45u = 27C - 18B$$

$$5u = 3C - 2B$$

$$u = 1 \rightarrow 3C - 2B = 5$$

$$C = 3, B = 2 \quad \text{imp.}$$

$$C = 5, B = 5 \quad \text{imp.}$$

$$C = 7, B = 8 \quad \text{OK}$$

$$u = 2 \rightarrow 3C - 2B = 10$$

$$C = 4, B = 1 \quad \text{imp.}$$

$$C = 6, B = 4 \quad \text{imp.}$$

$$C = 8, B = 7 \quad \text{OK}$$

$$u = 3 \rightarrow 3C - 2B = 15$$

$$C = 5, B = 0 \quad \text{OK}$$

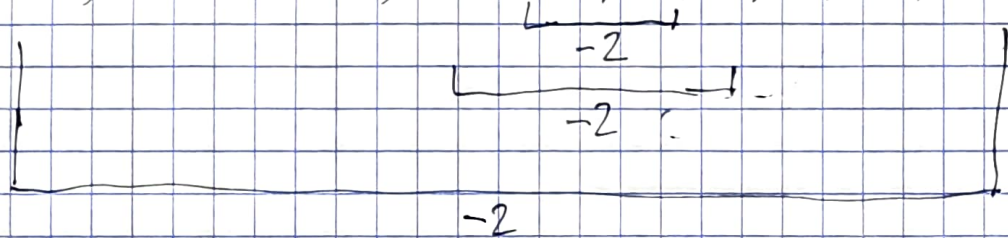
$$C = 7, B = 3 \quad \text{OK}$$

$$C = 9, B = 6 \quad \text{imp.}$$

$$3872, 6784, 9056, 9376 \quad (4 \text{ sol}^{\circ})$$

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-2023, -2019, ..., -7, -3, 1, 5, 9, ..., 2021, 2025



$$(-2) \times \frac{2024}{4} = -1012$$

$$-1012 + 2025 = 1013$$

$$\frac{2024}{2} + 1 = 1013$$

17

$$\sqrt{23 \times 44484 + x} = x$$

$$x^2 - x - 23 \times 44484 = 0$$

$$x = \frac{1 + \sqrt{\Delta}}{2}$$

$$\Delta = 1 + 4 \times 23 \times 44484$$

$$44484 = 4 \times 11121 = 4 \times 3 \times 3707$$

$$\Delta = 1 + 4^2 \times 23 \times 11121$$

$$\begin{array}{r} 11121 \\ \times 23 \\ \hline 33363 \\ 22242 \\ \hline 255783 \end{array}$$

$$\begin{array}{r} 506 \\ \times 506 \\ \hline 256036 \end{array}$$

$$51^2 = 2601$$

$$505^2 = 25 \times 10201 = 255025$$

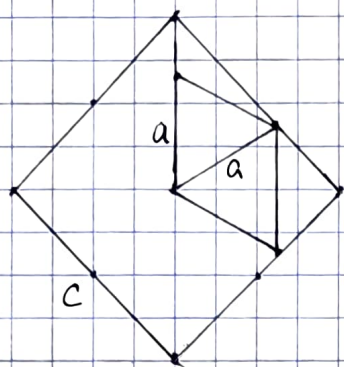
$$506^2 = 256036$$

$$\Delta \approx (4 \times 506)^2$$

$$2020 \rightarrow 2024$$

$$\frac{1 + 2023}{2} = \underline{\underline{1012}}$$

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$$c^2 = 6 \left(a^2 \frac{\sqrt{3}}{4} \right) + \frac{a}{2} \left(c \frac{\sqrt{2}}{2} - a \frac{\sqrt{3}}{2} \right) \times 2$$

$$+ \left(c \frac{\sqrt{2}}{2} - a \right) a \frac{\sqrt{3}}{2} \times 2$$

$$c^2 = a^2 \left(\frac{3\sqrt{3}}{2} - \frac{\sqrt{3}}{2} - \sqrt{3} \right) + ac \left(\frac{\sqrt{2}}{2} + \frac{\sqrt{6}}{2} \right)$$

0

$$c = a \frac{\sqrt{2}}{2} (1 + \sqrt{3})$$

$$\frac{c^2}{a^2} = \frac{1}{2} (1 + \sqrt{3})^2$$

$$1 - x = \frac{3\sqrt{3}}{2} \frac{a^2}{c^2} = 3\sqrt{3} / (1 + \sqrt{3})^2$$

$$\frac{1}{1 + \sqrt{3}} = \frac{\sqrt{3} - 1}{2}$$

$$1 - x = 3\sqrt{3} \frac{(\sqrt{3} - 1)^2}{4}$$

$$= 3\sqrt{3} \frac{4 - 2\sqrt{3}}{4}$$

$$1 - x = 3\sqrt{3} - 9/2$$

$$x = 1 + 9/2 - 3\sqrt{3} \approx 5,5 - 5,196 \approx 0,304 = 30,4\%$$