PROOF OF THE CONTINUED FRACTION CONJECTURE FOR $(a,b) = (z^4 + z^3 + z, z^3 + z^2 + z)$

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Abstract. The continued fraction conjecture claims that the continued fraction defined by the (a,b)-Thue-Morse sequence is algebraic over $\mathbb{F}_2(x)$ for all pairs of distinct elements (a,b) in $\mathbb{F}_2[x] \setminus \mathbb{F}_2$. In this paper we prove the conjecture for $(a,b) = (z^4 + z^3 + z, z^3 + z^2 + z)$.

1. Introduction

Let $\mathbb{F}_2$ be the finite field of cardinality 2. Given a sequence of polynomials $\mathbf{a} = (a_0(z), a_1(z), a_2(z), \ldots)$ of elements from $\mathbb{F}_2[z] \setminus \mathbb{F}_2$, we define the infinite continued fraction

$$\mathrm{CF}(\mathbf{a}(z)) = \cfrac{1}{a_0(z) + \cfrac{1}{a_1(z) + \cfrac{1}{a_2(z) + \cfrac{1}{\ddots}}}} \tag{1.1}$$

as the limit of the finite continued fractions

$$\mathrm{CF}_n(\mathbf{a}(z)) = \cfrac{1}{a_0(z) + \cfrac{1}{a_1(z) + \cfrac{1}{\ddots + \cfrac{1}{a_n(z)}}}} \in \mathbb{F}_2((1/z)). \tag{1.2}$$

Conversely, each power series in $\mathbb{F}_2[[1/z]]$ without constant term

$$c_{-1}z^{-1} + c_{-2}z^{-2} + c_{-3}z^{-3} + \cdots \tag{1.3}$$

admits a continued fraction expansion of form (1.1).

Let a and b be two distinct elements from $\mathbb{F}_2[z] \setminus \mathbb{F}_2$. We consider the continued fraction (1.1) associated with the (a,b)-Thue-Morse sequence

$$\mathbf{t} = (t_0(z), t_1(z), t_2(z), \ldots) = (a, b, b, a, b, a, a, b, \ldots)$$

that we shall denote

$$\mathrm{CF}(a,b) := \mathrm{CF}(\mathbf{t}). \tag{1.4}$$

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Theorem 1.1. *When $(a,b)=(z^4+z^3+z, z^3+z^2+z)$, the two power series* $\mathrm{CF}(a,b)$ *and* $\mathrm{CF}(b,a)$ *are algebraic over* $\mathbb{F}_2(z)$, *with minimal polynomials of the form*

$$p_4(z)y^4+p_3(z)y^3+p_2(z)y^2+p_1(z)y+p_0(z)=0$$

where, for $\mathrm{CF}(a,b)$,

$$\begin{aligned}
p_0(z)&=z^{15}+z^{11}+z^{10}+z^9+z^8+z^7+z^6+z^5+z^4+z^3+1,\\
p_1(z)&=z^{19}+z^{17}+z^{15}+z^{14}+z^{12}+z^8+z^5+z^4,\\
p_2(z)&=z^{22}+z^{16}+z^{12}+z^8+z^4,\\
p_3(z)&=z^{19}+z^{17}+z^{15}+z^{14}+z^{12}+z^8+z^5+z^4,\\
p_4(z)&=z^{16}+z^{15}+z^{12}+z^{11}+z^9+z^7+z^5+z^3+1,
\end{aligned}$$

and for $\mathrm{CF}(b,a)$,

$$\begin{aligned}
p_0(z)&=z^{15}+z^{11}+z^9+z^8+z^7+z^6+z^5+z^4+z^3+z^2+1,\\
p_1(z)&=z^{19}+z^{17}+z^{15}+z^{14}+z^{12}+z^8+z^5+z^4,\\
p_2(z)&=z^{22}+z^{16}+z^{12}+z^8+z^4,\\
p_3(z)&=z^{19}+z^{17}+z^{15}+z^{14}+z^{12}+z^8+z^5+z^4,\\
p_4(z)&=z^{16}+z^{15}+z^{12}+z^{11}+z^{10}+z^9+z^7+z^5+z^3+z^2+1.
\end{aligned}$$

2. Proof

Define the sequences of polynomials $(P_n(z))_{n\geq 0}$ and $(Q_n(z))_{n\geq 0}$ by

$$\begin{pmatrix} P_n(z) & Q_n(z)\\ P_{n-1}(z) & Q_{n-1}(z)\end{pmatrix} := \begin{pmatrix} t_n(z) & 1\\ 1 & 0\end{pmatrix}\begin{pmatrix} t_{n-1}(z) & 1\\ 1 & 0\end{pmatrix}\cdots\begin{pmatrix} t_0(z) & 1\\ 1 & 0\end{pmatrix}\begin{pmatrix} 0 & 1\\ 1 & 0\end{pmatrix}.$$

By the basic properties of continued fractions, we have

$$\mathrm{CF}_n(a,b)=\frac{P_n(z)}{Q_n(z)}\in\mathbb{F}_2((1/z)). \tag{2.1}$$

As formula (2.1) is not efficient for calculating $\mathrm{CF}_n(a,b)$, a fast method is to be derived and described as follows. Define

$$\begin{aligned}
M_n(x)&=x^{\deg(t_{2^n-1})}\begin{pmatrix} t_{2^n-1}(1/x) & 1\\ 1 & 0\end{pmatrix}\times x^{\deg(t_{2^n-2})}\begin{pmatrix} t_{2^n-2}(1/x) & 1\\ 1 & 0\end{pmatrix}\times\\
&\qquad\cdots\times x^{\deg(t_0)}\begin{pmatrix} t_0(1/x) & 1\\ 1 & 0\end{pmatrix},\\
W_n(x)&=x^{\deg(\bar t_{2^n-1})}\begin{pmatrix} \bar t_{2^n-1}(1/x) & 1\\ 1 & 0\end{pmatrix}\times x^{\deg(\bar t_{2^n-2})}\begin{pmatrix} \bar t_{2^n-2}(1/x) & 1\\ 1 & 0\end{pmatrix}\times\\
&\qquad\cdots\times x^{\deg(\bar t_0)}\begin{pmatrix} \bar t_0(1/x) & 1\\ 1 & 0\end{pmatrix},
\end{aligned}$$

where $\bar{\mathbf{t}}$ is the (b,a)-Thue-Morse sequence. By the properties of the Thue-Morse sequence, we have for $n\geq 0$

$$\begin{aligned}
M_{n+1}(x)&=W_n(x)\cdot M_n(x),\\
W_{n+1}(x)&=M_n(x)\cdot W_n(x).
\end{aligned}$$

Let $x := 1/z$. For each non-zero polynomial $P(z)$, define $\tilde{P}(x)$ to be $P(1/x)$. Then,

$$\mathrm{CF}_n(a,b) = \frac{P_n(z)}{Q_n(z)} = \frac{\tilde{P}_n(x)}{\tilde{Q}_n(x)} \in \mathbb{F}_2((x)) = \mathbb{F}_2((1/z)).$$

Comparing the definition of $M_n(x)$ with the definition of $P_n(x)$ and $Q_n(x)$, we see that

$$M_n(x)_{0,1} = x^{d_n}\tilde{P}_{2^n-1}(x),$$
$$M_n(x)_{0,0} = x^{d_n}\tilde{Q}_{2^n-1}(x),$$

for some positive integer d_n. Hence,

$$\mathrm{CF}_{2^{2n}-1}(a,b) = \frac{\tilde{P}_{2^{2n}-1}(x)}{\tilde{Q}_{2^{2n}-1}(x)} = \frac{M_{2n}(x)_{0,1}}{M_{2n}(x)_{0,0}}. \tag{2.2}$$

Therefore, by the convergence theorem of continued fraction, the algebraicity of $\mathrm{CF}(a,b)$ will be established if it is shown that both $M_{2n}(x)_{0,1}$ and $M_{2n}(x)_{0,0}$ converge to algebraic series in $\mathbb{F}_2[[x]]$.

Actually, we will prove that for all $0 \le i,j \le 1$ the four sequences $(M_{2n}(x)_{i,j})_n$, $(M_{2n+1}(x)_{i,j})_n$, $(W_{2n}(x)_{i,j})_n$, and $(W_{2n+1}(x)_{i,j})_n$ converge to algebraic series in $\mathbb{F}_2[[x]]$. For this purpose, we define four 2×2 matrices M^e, M^o, W^e, W^o as follows: For each $T \in \{M^e, M^o, W^e, W^o\}$ and $0 \le i,j \le 1$, $T_{i,j}$ is defined to be the unique solution in $\mathbb{F}_2[[x]]$ of the polynomial $\phi(T,i,j)$ under certain initial conditions; the polynomials $\phi(T,i,j)$ and initial conditions are given in Section 3. We will prove that these four matrices, whose components are algebraic by definition, are the limits of $(M_{2n}(x))_n$, $(M_{2n+1}(x))_n$, $(W_{2n}(x))_n$, and $(W_{2n+1}(x))_n$.

Let us explain how the polynomials $\phi(T,i,j)$ and initial conditions are found, and why the solutions exist and are unique. For $0 \le i,j \le 1$, the the coefficients of the polynomial $\phi(M^e,i,j)$ (resp. $\phi(M^o,i,j)$, $\phi(W^e,i,j)$, and $\phi(W^o,i,j)$) are the Padé-Hermite approximants of type

$$(175, 175, 175, 175, 175)$$

of the vector

$$(1, T^3, T^6, T^9, T^{12}),$$

where $T = M_{12,i,j}$ (resp. $M_{11,i,j}$, $W_{12,i,j}$, and $W_{11,i,j}$), found by the Derksen algorithm. We take the first 8 terms of $M_{12,i,j}$ (resp. $M_{11,i,j}$, $W_{12,i,j}$, and $W_{11,i,j}$) as initial conditions for $\phi(M^e,i,j)$ (resp. $\phi(M^o,i,j)$, $\phi(W^e,i,j)$, and $\phi(W^o,i,j)$). The following fact will be used to ensure that the solution exists and is unique: let $P(x,y) \in \mathbb{F}_2[x,y]$ and for each series $f(x) = \sum_{n=0}^{\infty} a_n x^n \in \mathbb{F}_2[[x]]$ denote the partial sum $\sum_{j=0}^{n-1} a_j x^j$ by $f_n(x)$ for $n \ge 0$. If for some $n \ge 0$ and $a_0, a_1, \ldots, a_{n-1} \in \mathbb{F}_2$ $P(x, \sum_{j=0}^{n-1} a_j x^j) = O(x^n)$ and $Q(x,y) := P(x, \sum_{j=0}^{n-1} a_j x^j + x^n y)$ can be written as $x^m \sum_{j=0}^{\infty} q_j(x) y^j$ where $q_j(x)$ are polynomials for $j \ge 0$, $q_1(0) = 1$, and $q_j(0) = 0$ for $j > 1$, then there exists a unique solution $f(x) \in \mathbb{F}_2[[x]]$ of $P(x, f(x)) = 0$ that satisfies the initial condition $f_n(x) = \sum_{j=0}^{n-1} a_j x^j$.

We state two lemmas concerning the four matrices M^e, M^o, W^e, W^o. The first one is about relations between them; the second, about the structure of the each matrix.

Lemma 2.1. *We have*

$$M^e = W^o \cdot M^o, \tag{2.3}$$

$$M^o = W^e \cdot M^e, \tag{2.4}$$

$$W^e = M^o \cdot W^o, \tag{2.5}$$

$$W^o = M^e \cdot W^e. \tag{2.6}$$

Proof. We give the proof of the identity

$$M^e_{0,0} = W^o_{0,0}M^o_{0,0} + W^o_{0,1}M^o_{1,0},$$

the proofs of the others being similar.

First, we compute the minimal polynomials of $W^o_{0,0}M^o_{0,0}$ and $W^o_{0,1}M^o_{1,0}$. We know that

$$P(x,y) = \mathrm{Res}_z \left(\phi(W^o,0,0)(x,z),\ z^{12}\cdot \phi(M^o,0,0)(x,y/z)\right)$$

is an annihilating polynomial of $W^o_{0,0}M^o_{0,0}$. We use Padé-Hermite approximation to find a candidate for the minimal polynomial of $W^o_{0,0}M^o_{0,0}$, that will be called $\phi_0(x,y)$. To prove that $\phi_0(x,y)$ is indeed the minimal polynomial, it suffices to prove that it is an irreducible factor of $P(x,y)$ of multiplicity m and that $Q(x,y) := P(x,y)/\phi_0(x,y)^m$ is not an annihilating polynomial of $W^o_{0,0}M^o_{0,0}$. We verify the first point directly. For the second point, we truncate $W^o_{0,0}M^o_{0,0}$ to order 630 and substitute it for y in $Q(x,y)$. We get a series of valuation less than 630, which proves that $Q(x,y)$ is not an annihilating polynomial of $W^o_{0,0}M^o_{0,0}$. We find the minimal polynomial $\phi_1(x,y)$ of $W^o_{0,1}M^o_{1,0}$ in a similar way.

Now we prove that $\phi(M^e,0,0)$ is the minimal polynomial of $W^o_{0,0}M^o_{0,0}+W^o_{0,1}M^o_{1,0}$. We know that

$$S(x,y) = \mathrm{Res}_z\left(\phi_0(x,z),\ \phi_1(x,y+z)\right)$$

is an annihilating of $W^o_{0,0}M^o_{0,0} + W^o_{0,1}M^o_{1,0}$. We verify that $\phi(M^e,0,0)$ is an irreducible factor of $S(x,y)$ of multiplicity μ, and that $Q(x,y) := S(x,y)/\phi(M^e,0,0)^\mu$ is not an annihilating polynomial of $W^o_{0,0}M^o_{0,0}+W^o_{0,1}M^o_{1,0}$. To see the last point, we truncate $W^o_{0,0}M^o_{0,0} + W^o_{0,1}M^o_{1,0}$ to order 770 and substitute it for y in $Q(x,y)$. We get a series of valuation less than 770, and therefore $Q(x,y)$ is not an annihilating polynomial of $W^o_{0,0}M^o_{0,0} + W^o_{0,1}M^o_{1,0}$.

Finally, the first 16 terms of $M^e_{0,0}$ and $W^o_{0,0}M^o_{0,0} + W^o_{0,1}M^o_{1,0}$ coincide. As these first terms determine a unique solution of $\phi(M^e,0,0)$, we know that the two series are one and the same. □

Define

$$R^e = \begin{pmatrix}1 & 0\\ 0 & 1\end{pmatrix} \qquad \text{and} \qquad R^o = \begin{pmatrix}1 & 0\\ 0 & 1\end{pmatrix}.$$

Lemma 2.2. *For all integers $k \geq 2$ and $u = 2^{2k-1}$, the following identities hold.*

$$\begin{aligned}
M^e[:14u] = {} & M^e[:7u] + x^{4u}M^e[:3u] + x^{5u}M^e[:2u] + x^{6u}M^e[:u] + x^{4u}M^e[:7u]\\
&+ x^{8u}M^e[:3u] + x^{9u}M^e[:2u] + x^{10u}M^e[:u] + x^{5u}M^e[:7u]\\
&+ x^{9u}M^e[:3u] + x^{10u}M^e[:2u] + x^{11u}M^e[:u] + x^{6u}M^e[:7u]\\
&+ x^{10u}M^e[:3u] + x^{11u}M^e[:2u] + x^{12u}M^e[:u] + x^{8u}M^e[:6u]\\
&+ x^{10u}M^e[:4u] + x^{11u}M^e[:3u] + (x^{7u} + x^{11u} + x^{12u} + x^{13u})R^e,\\
W^e[:14u] = {} & W^e[:7u] + x^{4u}W^e[:3u] + x^{5u}W^e[:2u] + x^{6u}W^e[:u] + x^{4u}W^e[:7u]
\end{aligned}$$

$$
\begin{aligned}
&+ x^{8u}W^e[:3u] + x^{9u}W^e[:2u] + x^{10u}W^e[:u] + x^{5u}W^e[:7u] \\
&+ x^{9u}W^e[:3u] + x^{10u}W^e[:2u] + x^{11u}W^e[:u] + x^{6u}W^e[:7u] \\
&+ x^{10u}W^e[:3u] + x^{11u}W^e[:2u] + x^{12u}W^e[:u] + x^{8u}W^e[:6u] \\
&+ x^{10u}W^e[:4u] + x^{11u}W^e[:3u] + (x^{7u} + x^{11u} + x^{12u} + x^{13u})R^e.
\end{aligned}
$$

For all integers $k \geq 2$ and $u = 2^{2k}$, the following identities hold.

$$
\begin{aligned}
M^o[:14u] = {} & M^o[:7u] + x^{4u}M^o[:3u] + x^{5u}M^o[:2u] + x^{6u}M^o[:u] + x^{4u}M^o[:7u] \\
&+ x^{8u}M^o[:3u] + x^{9u}M^o[:2u] + x^{10u}M^o[:u] + x^{5u}M^o[:7u] \\
&+ x^{9u}M^o[:3u] + x^{10u}M^o[:2u] + x^{11u}M^o[:u] + x^{6u}M^o[:7u] \\
&+ x^{10u}M^o[:3u] + x^{11u}M^o[:2u] + x^{12u}M^o[:u] + x^{8u}M^o[:6u] \\
&+ x^{10u}M^o[:4u] + x^{11u}M^o[:3u] + (x^{7u} + x^{11u} + x^{12u} + x^{13u})R^o, \\
W^o[:14u] = {} & W^o[:7u] + x^{4u}W^o[:3u] + x^{5u}W^o[:2u] + x^{6u}W^o[:u] + x^{4u}W^o[:7u] \\
&+ x^{8u}W^o[:3u] + x^{9u}W^o[:2u] + x^{10u}W^o[:u] + x^{5u}W^o[:7u] \\
&+ x^{9u}W^o[:3u] + x^{10u}W^o[:2u] + x^{11u}W^o[:u] + x^{6u}W^o[:7u] \\
&+ x^{10u}W^o[:3u] + x^{11u}W^o[:2u] + x^{12u}W^o[:u] + x^{8u}W^o[:6u] \\
&+ x^{10u}W^o[:4u] + x^{11u}W^o[:3u] + (x^{7u} + x^{11u} + x^{12u} + x^{13u})R^o.
\end{aligned}
$$

Proof. To prove Lemma 2.2 we first construct an automaton for each sequence concerned, and then transform the conditions on infinitely many k's into finitely many conditions on the states of the automaton. In the following, we will prove that for $T = M^o_{0,0}$, for all integer $k \geq 2$ and $u = 2^{2k}$,

$$
\begin{aligned}
T[:14u] = {} & T[:7u] + x^{4u}T[:3u] + x^{5u}T[:2u] + x^{6u}T[:u] + x^{4u}T[:7u] + x^{8u}T[:3u] \\
&+ x^{9u}T[:2u] + x^{10u}T[:u] + x^{5u}T[:7u] + x^{9u}T[:3u] + x^{10u}T[:2u] \\
&+ x^{11u}T[:u] + x^{6u}T[:7u] + x^{10u}T[:3u] + x^{11u}T[:2u] + x^{12u}T[:u] \\
&+ x^{8u}T[:6u] + x^{10u}T[:4u] + x^{11u}T[:3u].
\end{aligned}
$$

The proof of the other 15 cases are similar. We break down the above identity into 7 parts:

$$
\begin{aligned}
0 &= x^{6u}T[u:2u] + x^{5u}T[2u:3u] + x^{4u}T[3u:4u] + T[7u:8u], \\
0 &= x^{6u}T[2u:3u] + x^{5u}T[3u:4u] + x^{4u}T[4u:5u] + T[8u:9u], \\
0 &= x^{6u}T[3u:4u] + x^{5u}T[4u:5u] + x^{4u}T[5u:6u] + T[9u:10u], \\
0 &= x^{6u}T[4u:5u] + x^{5u}T[5u:6u] + x^{4u}T[6u:7u] + T[10u:11u], \\
0 &= x^{11u}T[:u] + x^{10u}T[u:2u] + x^{9u}T[2u:3u] + x^{8u}T[3u:4u] \\
&\quad + x^{6u}T[5u:6u] + x^{5u}T[6u:7u] + T[11u:12u], \\
0 &= x^{12u}T[:u] + x^{8u}T[4u:5u] + x^{6u}T[6u:7u] + T[12u:13u], \\
0 &= x^{11u}T[2u:3u] + x^{10u}T[3u:4u] + x^{8u}T[5u:6u] + T[13u:14u],
\end{aligned}
$$

which can be rewritten as

$$0 = T[[1w]_2] + T[[10w]_2] + T[[11w]_2] + T[[111w]_2], \tag{2.7}$$

$$0 = T[[10w]_2] + T[[11w]_2] + T[[100w]_2] + T[[1000w]_2], \tag{2.8}$$

$$0 = T[[11w]_2] + T[[100w]_2] + T[[101w]_2] + T[[1001w]_2], \tag{2.9}$$

$$0 = T[[100w]_2] + T[[101w]_2] + T[[110w]_2] + T[[1010w]_2], \tag{2.10}$$

$$\begin{aligned} 0 = {} & T[[w]_2] + T[[1w]_2] + T[[10w]_2] + T[[11w]_2] + T[[101w]_2] \\ & + T[[110w]_2] + T[[1011w]_2], \end{aligned} \tag{2.11}$$

$$0 = T[[w]_2] + T[[100w]_2] + T[[110w]_2] + T[[1100w]_2], \tag{2.12}$$

$$0 = T[[10w]_2] + T[[11w]_2] + T[[101w]_2] + T[[1101w]_2], \tag{2.13}$$

for all binary word w of length $2k$ and $w \neq 0^{2k}$, and

$$0 = T[[1w]_2] + T[[10w]_2] + T[[11w]_2] + T[[111w]_2], \tag{2.14}$$

$$0 = T[[10w]_2] + T[[11w]_2] + T[[100w]_2] + T[[1000w]_2], \tag{2.15}$$

$$0 = T[[11w]_2] + T[[100w]_2] + T[[101w]_2] + T[[1001w]_2], \tag{2.16}$$

$$0 = T[[100w]_2] + T[[101w]_2] + T[[110w]_2] + T[[1010w]_2], \tag{2.17}$$

$$\begin{aligned} 0 = {} & T[[w]_2] + T[[1w]_2] + T[[10w]_2] + T[[11w]_2] + T[[101w]_2] \\ & + T[[110w]_2] + T[[1011w]_2], \end{aligned} \tag{2.18}$$

$$0 = T[[w]_2] + T[[100w]_2] + T[[110w]_2] + T[[1100w]_2], \tag{2.19}$$

$$0 = T[[10w]_2] + T[[11w]_2] + T[[101w]_2] + T[[1101w]_2], \tag{2.20}$$

for $w = 0^{2k}$.

First we calculate an 2-automaton that generates T from its minimal polynomial and its first terms. This automaton has 2880 states; its transition function and output function can be found in the annex. Let $A(s, w)$ denote the state reached after reading w from right to left starting from the state s, and τ the output function. Define

$$E_{2k} = \{A(i, w) : |w| = 2k, w \neq 0^{2k}\}.$$

Identities (2.7) through (2.20) can be written as

$$0 = \tau(A(s, 1)) + \tau(A(s, 10)) + \tau(A(s, 11)) + \tau(A(s, 111)), \tag{2.21}$$

$$0 = \tau(A(s, 10)) + \tau(A(s, 11)) + \tau(A(s, 100)) + \tau(A(s, 1000)), \tag{2.22}$$

$$0 = \tau(A(s, 11)) + \tau(A(s, 100)) + \tau(A(s, 101)) + \tau(A(s, 1001)), \tag{2.23}$$

$$0 = \tau(A(s, 100)) + \tau(A(s, 101)) + \tau(A(s, 110)) + \tau(A(s, 1010)), \tag{2.24}$$

$$\begin{aligned} 0 = {} & \tau(A(s, \epsilon)) + \tau(A(s, 1)) + \tau(A(s, 10)) + \tau(A(s, 11)) + \tau(A(s, 101)) \\ & + \tau(A(s, 110)) + \tau(A(s, 1011)), \end{aligned} \tag{2.25}$$

$$0 = \tau(A(s, \epsilon)) + \tau(A(s, 100)) + \tau(A(s, 110)) + \tau(A(s, 1100)), \tag{2.26}$$

$$0 = \tau(A(s, 10)) + \tau(A(s, 11)) + \tau(A(s, 101)) + \tau(A(s, 1101)), \tag{2.27}$$

for all $s \in E_{2k}$, and

$$0 = \tau(A(s, 1)) + \tau(A(s, 10)) + \tau(A(s, 11)) + \tau(A(s, 111)), \tag{2.28}$$

$$0 = \tau(A(s, 10)) + \tau(A(s, 11)) + \tau(A(s, 100)) + \tau(A(s, 1000)), \tag{2.29}$$

$$0 = \tau(A(s, 11)) + \tau(A(s, 100)) + \tau(A(s, 101)) + \tau(A(s, 1001)), \tag{2.30}$$

$$0 = \tau(A(s, 100)) + \tau(A(s, 101)) + \tau(A(s, 110)) + \tau(A(s, 1010)), \tag{2.31}$$

$$\begin{aligned} 0 = {} & \tau(A(s, \epsilon)) + \tau(A(s, 1)) + \tau(A(s, 10)) + \tau(A(s, 11)) + \tau(A(s, 101)) \\ & + \tau(A(s, 110)) + \tau(A(s, 1011)), \end{aligned} \tag{2.32}$$

$$0 = \tau(A(s,\epsilon)) + \tau(A(s,100)) + \tau(A(s,110)) + \tau(A(s,1100)), \tag{2.33}$$

$$0 = \tau(A(s,10)) + \tau(A(s,11)) + \tau(A(s,101)) + \tau(A(s,1101)), \tag{2.34}$$

for $s = A(i, 0^{2k})$. We find that $(A(i, 0^{36}), E_{36}) = (A(i, 0^{24}), E_{24})$, so that we only have to verify that identities (2.21) through (2.34) hold for $2 \le k \le 18$, which turns out to be true. $\square$

In the following lemma, we express M_{2k}, M_{2k+1}, W_{2k}, and W_{2k+1} in terms of M^e, M^o, W^e, and W^o.

Lemma 2.3. *For all integer $k \ge 2$, and $u = 2^{2k-1}$,*

$$M_{2k} = M^e[{:}\,7u] + x^{4u} M^e[{:}\,3u] + x^{5u} M^e[{:}\,2u] + x^{6u} M^e[{:}\,u] + x^{7u} R^e,$$
$$W_{2k} = W^e[{:}\,7u] + x^{4u} W^e[{:}\,3u] + x^{5u} W^e[{:}\,2u] + x^{6u} W^e[{:}\,u] + x^{7u} R^e.$$

For all integer $k \ge 2$, and $u = 2^{2k}$,

$$M_{2k+1} = M^o[{:}\,7u] + x^{4u} M^o[{:}\,3u] + x^{5u} M^o[{:}\,2u] + x^{6u} M^o[{:}\,u] + x^{7u} R^o,$$
$$W_{2k+1} = W^o[{:}\,7u] + x^{4u} W^o[{:}\,3u] + x^{5u} W^o[{:}\,2u] + x^{6u} W^o[{:}\,u] + x^{7u} R^o.$$

Proof. We call the four identities in Lemma 2.3 also by the name M_{2k}, W_{2k}, M_{2k+1}, and W_{2k+1}. For $n = 2$, the identities can be verified directly. For $n \ge 2$, we claim that

$$M_{2k} \wedge W_{2k} \Rightarrow M_{2k+1} \wedge W_{2k+1},$$
$$M_{2k+1} \wedge W_{2k+1} \Rightarrow M_{2k+2} \wedge W_{2k+2}.$$

We give the proof of

$$M_{2k} \wedge W_{2k} \Rightarrow M_{2k+1},$$

the other ones being similar. Set $u = 2^{2k}$ and $v = 2^{2k-1}$. By definition and induction hypothesis, the left side of identity M_{2k+1} is equal to

$$W_{2k} M_{2k} = \big(W^e[{:}\,7v] + x^{4v} W^e[{:}\,3v] + x^{5v} W^e[{:}\,2v] + x^{6v} W^e[{:}\,v] + x^{7u} R^e\big) \times \big($$
$$M^e[{:}\,7v] + x^{4v} M^e[{:}\,3v] + x^{5v} M^e[{:}\,2v] + x^{6v} M^e[{:}\,v] + x^{7u} R^e\big); \tag{2.35}$$

Call this expression lhs. Note that both sides of identity M_{2k+1} have the same term of highest degree $x^{14v} R^o$. Therefore we only need to prove that their difference is $O(x^{14v})$. Using Lemma 2.1 it can be seen that the right side of identity M_{2k+1} is congruent, modulo x^{14v}, to

$$W^e[{:}\,14v] M^e[{:}\,14v] + x^{8v} W^e[{:}\,6v] M^e[{:}\,6v] + x^{10v} W^e[{:}\,4v] M^e[{:}\,4v]$$
$$+ x^{12v} W^e[{:}\,2v] M^e[{:}\,2v].$$

For all $n \le 14$, replace the occurrences of $W^e[{:}\,n \cdot v]$ and $M^e[{:}\,n \cdot v]$ in the above expression by the reduction modulo $x^{n \cdot v}$ of the right side of the corresponding identity in Lemma 2.2 and get a new expression, which we call rhs. Define

$$X := x^v,$$
$$a_n := W^e[n \cdot v : (n+1) \cdot v] / X^n,$$
$$b_n := M^e[n \cdot v : (n+1) \cdot v] / X^n,$$
$$c := R^e.$$

Using the notation introduced above, we can represent the expressions lhs (2.35) and rhs as polynomials in $\mathbb{F}_2[a_1, ..., a_{14}, b_1, ..., b_{14}, c][X]$. Note that it is not a problem that a_j commutes with b_k while W^e does not commute with M^e, because in the expressions concerned, the products of W^e-terms and M^e-terms are always in the same order. We let the computer do the simplification and check that the difference between these two polynomials is indeed $O(X^{14})$, which completes the proof. $\square$

Proof of Theorem 1.1. We prove the theorem for $\mathrm{CF}(a, b)$; for $\mathrm{CF}(b, a)$, the proof is similar. By Lemma 2.3, we have For all $0 \le j, k \le 1$,

$$\begin{aligned}
\lim_{n\to\infty} M_{2n,j,k} &= M^e_{j,k},\\
\lim_{n\to\infty} M_{2n+1,j,k} &= M^o_{j,k},\\
\lim_{n\to\infty} W_{2n,j,k} &= W^e_{j,k},\\
\lim_{n\to\infty} W_{2n+1,j,k} &= W^o_{j,k}.
\end{aligned}$$

Let $z = 1/x$. By the convergence theorem and identity (2.2),

$$\mathrm{CF}(a, b) = \frac{M^e_{0,1}(x)}{M^e_{0,0}(x)}.$$

By definition, $\phi(M^e, 0, 1)$ and $\phi(M^e, 0, 0)$ are minimal polynomials of $M^e_{0,1}$ and $M^e_{0,0}$. Therefore

$$P(x, y) = \mathrm{Res}_t\left(\phi(M^e, 0, 1)(x, t), y^{12}\phi(M^e, 0, 1)(x, t/y)\right)$$

is an annihilating polynomial of $f(x) = M^e_{0,1}/M^e_{0,0}$.

Define

$$Q(x, y) = q_4(x)y^4 + q_3(x)y^3 + q_2(x)y^2 + q_1(x)y + q_0(x),$$

where

$$\begin{aligned}
q_0(x) &= x^{22} + x^{19} + x^{18} + x^{17} + x^{16} + x^{15} + x^{14} + x^{13} + x^{12} + x^{11} + x^7,\\
q_1(x) &= x^{18} + x^{17} + x^{14} + x^{10} + x^8 + x^7 + x^5 + x^3,\\
q_2(x) &= x^{18} + x^{14} + x^{10} + x^6 + 1,\\
q_3(x) &= x^{18} + x^{17} + x^{14} + x^{10} + x^8 + x^7 + x^5 + x^3,\\
q_4(x) &= x^{22} + x^{19} + x^{17} + x^{15} + x^{13} + x^{11} + x^{10} + x^7 + x^6.
\end{aligned}$$

The polynomial $Q(x, y)$ is the candidate for the minimal polynomial of $f(x)$ found by Padé-Hermite approximation. To prove that it is indeed the minimal polynomial of $f(x)$, we only need to prove that it is an irreducible factor of $P(x, y)$ of multiplicity m and $R(x, y) := P(x, y)/Q(x, y)^m$ is not an annihilating polynomial of $f(x)$. We verify the first point directly. For the second point, we find that when we truncate $f(x)$ to order 216, and substitute it for y in $R(z, y)$, we get a series with valuation smaller than 216, which proves that $R(z, y)$ is not an annihilating polynomial of $f(x)$. Finally, $z^{12}Q(1/z, y)$ is the minimal polynomial of $\mathrm{CF}(a, b) = f(1/z)$. $\square$

3. Annexe

All 16 polynomials are of the form

$$p_0(x) + p_3(x)y^3 + p_6(x)y^6 + p_9(x)y^9 + p_{12}(x)y^{12}.$$

The coefficients $p_j(x)$ and the 16 initial terms to determine the solutions uniquely are given below.

For $\phi(M^e, 0, 0)$:

$$\begin{aligned} p_0(x) &= x^{114} + x^{110} + x^{98} + x^{94} + x^{90} + x^{88} + x^{86} + x^{82} + x^{80} + x^{78} + x^{74} \\ &\quad + x^{72} + x^{70} + x^{64} + x^{62} + x^{56} + x^{50} + x^{48} + x^{46} + x^{42} + x^{36}, \\ p_3(x) &= x^{98} + x^{96} + x^{94} + x^{90} + x^{88} + x^{76} + x^{70} + x^{68} + x^{66} + x^{64} + x^{62} \\ &\quad + x^{60} + x^{58} + x^{50} + x^{28} + x^{26} + x^{22} + x^{20}, \\ p_6(x) &= x^{96} + x^{92} + x^{90} + x^{82} + x^{78} + x^{72} + x^{70} + x^{68} + x^{66} + x^{62} + x^{60} \\ &\quad + x^{50} + x^{48} + x^{46} + x^{44} + x^{42} + x^{38} + x^{36} + x^{30} + x^{26} + x^{24} + x^{22} \\ &\quad + x^{20} + x^{18} + x^{14} + x^{12} + x^{2} + 1, \\ p_9(x) &= x^{88} + x^{86} + x^{84} + x^{80} + x^{78} + x^{74} + x^{72} + x^{70} + x^{68} + x^{62} + x^{58} \\ &\quad + x^{56} + x^{54} + x^{52} + x^{50} + x^{48} + x^{46} + x^{42} + x^{38} + x^{36} + x^{30} + x^{24} \\ &\quad + x^{18} + x^{14} + x^{12} + x^{10} + x^{8} + x^{6}, \\ p_{12}(x) &= x^{86} + x^{82} + x^{80} + x^{78} + x^{74} + x^{72} + x^{62} + x^{58} + x^{56} + x^{54} + x^{50} \\ &\quad + x^{48} + x^{22} + x^{18} + x^{16} + x^{14} + x^{10} + x^{8} + x^{6} + x^{2} + 1, \end{aligned}$$

and the initial terms are [1, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0].

For $\phi(M^e, 0, 1)$:

$$\begin{aligned} p_0(x) &= x^{117} + x^{116} + x^{112} + x^{110} + x^{109} + x^{105} + x^{99} + x^{98} + x^{97} + x^{94} \\ &\quad + x^{93} + x^{92} + x^{91} + x^{90} + x^{89} + x^{87} + x^{86} + x^{85} + x^{84} + x^{80} + x^{77} \\ &\quad + x^{75} + x^{74} + x^{71} + x^{65} + x^{62} + x^{59} + x^{56} + x^{52} + x^{49} + x^{48} + x^{44} \\ &\quad + x^{43} + x^{42} + x^{41} + x^{40} + x^{39}, \\ p_3(x) &= x^{95} + x^{93} + x^{91} + x^{89} + x^{77} + x^{75} + x^{69} + x^{67} + x^{61} + x^{59} + x^{55} \\ &\quad + x^{49} + x^{47} + x^{41} + x^{39} + x^{37} + x^{35} + x^{33} + x^{29} + x^{27}, \\ p_6(x) &= x^{93} + x^{92} + x^{91} + x^{90} + x^{88} + x^{86} + x^{85} + x^{84} + x^{80} + x^{75} + x^{74} \\ &\quad + x^{73} + x^{72} + x^{71} + x^{69} + x^{67} + x^{64} + x^{63} + x^{59} + x^{57} + x^{56} + x^{55} \\ &\quad + x^{52} + x^{50} + x^{47} + x^{46} + x^{42} + x^{41} + x^{40} + x^{39} + x^{38} + x^{37} + x^{35} \\ &\quad + x^{33} + x^{30} + x^{28} + x^{27} + x^{26} + x^{23} + x^{18}, \\ p_9(x) &= x^{91} + x^{81} + x^{79} + x^{77} + x^{55} + x^{51} + x^{47} + x^{45} + x^{39} + x^{31} + x^{29} \\ &\quad + x^{25} + x^{21} + x^{13} + x^{11} + x^{9}, \\ p_{12}(x) &= x^{89} + x^{88} + x^{85} + x^{80} + x^{73} + x^{72} + x^{68} + x^{53} + x^{52} + x^{48} + x^{25} \\ &\quad + x^{24} + x^{21} + x^{16} + x^{5} + x^{4} + 1, \end{aligned}$$

and the initial terms are [0, 0, 0, 0, 1, 1, 1, 0, 1, 0, 1, 1, 0, 1, 0, 1].

For $\phi(M^e, 1, 0)$:

$$\begin{aligned} p_0(x) &= x^{117} + x^{116} + x^{112} + x^{110} + x^{109} + x^{105} + x^{99} + x^{98} + x^{97} + x^{94} \\ &\quad + x^{93} + x^{92} + x^{91} + x^{90} + x^{89} + x^{87} + x^{86} + x^{85} + x^{84} + x^{80} + x^{77} \\ &\quad + x^{75} + x^{74} + x^{71} + x^{65} + x^{62} + x^{59} + x^{56} + x^{52} + x^{49} + x^{48} + x^{44} \end{aligned}$$

$$
\begin{aligned}
&+ x^{43} + x^{42} + x^{41} + x^{40} + x^{39},\\
p_3(x) &= x^{95} + x^{93} + x^{91} + x^{89} + x^{77} + x^{75} + x^{69} + x^{67} + x^{61} + x^{59} + x^{55}\\
&\quad + x^{49} + x^{47} + x^{41} + x^{39} + x^{37} + x^{35} + x^{33} + x^{29} + x^{27},\\
p_6(x) &= x^{93} + x^{92} + x^{91} + x^{90} + x^{88} + x^{86} + x^{85} + x^{84} + x^{80} + x^{75} + x^{74}\\
&\quad + x^{73} + x^{72} + x^{71} + x^{69} + x^{67} + x^{64} + x^{63} + x^{59} + x^{57} + x^{56} + x^{55}\\
&\quad + x^{52} + x^{50} + x^{47} + x^{46} + x^{42} + x^{41} + x^{40} + x^{39} + x^{38} + x^{37} + x^{35}\\
&\quad + x^{33} + x^{30} + x^{28} + x^{27} + x^{26} + x^{23} + x^{18},\\
p_9(x) &= x^{91} + x^{81} + x^{79} + x^{77} + x^{55} + x^{51} + x^{47} + x^{45} + x^{39} + x^{31} + x^{29}\\
&\quad + x^{25} + x^{21} + x^{13} + x^{11} + x^{9},\\
p_{12}(x) &= x^{89} + x^{88} + x^{85} + x^{80} + x^{73} + x^{72} + x^{68} + x^{53} + x^{52} + x^{48} + x^{25}\\
&\quad + x^{24} + x^{21} + x^{16} + x^{5} + x^{4} + 1,
\end{aligned}
$$

and the initial terms are [0, 0, 0, 0, 1, 1, 1, 0, 1, 0, 1, 1, 0, 1, 0, 1].

For $\phi(M^e, 1, 1)$:

$$
\begin{aligned}
p_0(x) &= x^{120} + x^{118} + x^{116} + x^{114} + x^{112} + x^{108} + x^{106} + x^{104} + x^{100} + x^{96}\\
&\quad + x^{94} + x^{90} + x^{78} + x^{72} + x^{70} + x^{66} + x^{64} + x^{58} + x^{56} + x^{52} + x^{46}\\
&\quad + x^{44} + x^{42},\\
p_3(x) &= x^{104} + x^{98} + x^{94} + x^{88} + x^{82} + x^{80} + x^{76} + x^{74} + x^{68} + x^{66} + x^{60}\\
&\quad + x^{56} + x^{52} + x^{50} + x^{48} + x^{44} + x^{38} + x^{34} + x^{32} + x^{28} + x^{22} + x^{18},\\
p_6(x) &= x^{102} + x^{100} + x^{98} + x^{90} + x^{84} + x^{80} + x^{78} + x^{66} + x^{58} + x^{56} + x^{54}\\
&\quad + x^{48} + x^{40} + x^{30} + x^{28} + x^{24} + x^{18} + x^{10} + x^{6} + x^{4} + x^{2} + 1,\\
p_9(x) &= x^{94} + x^{88} + x^{86} + x^{84} + x^{82} + x^{78} + x^{74} + x^{72} + x^{70} + x^{66} + x^{64}\\
&\quad + x^{60} + x^{48} + x^{40} + x^{38} + x^{36} + x^{34} + x^{26} + x^{22} + x^{20} + x^{8} + x^{6},\\
p_{12}(x) &= x^{92} + x^{90} + x^{88} + x^{68} + x^{66} + x^{64} + x^{60} + x^{58} + x^{56} + x^{52} + x^{50}\\
&\quad + x^{48} + x^{28} + x^{26} + x^{24} + x^{12} + x^{10} + x^{8} + x^{4} + x^{2} + 1,
\end{aligned}
$$

and the initial terms are [0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 1, 0, 1, 0].

For $\phi(W^e, 0, 0)$:

$$
\begin{aligned}
p_0(x) &= x^{120} + x^{118} + x^{106} + x^{102} + x^{98} + x^{96} + x^{94} + x^{92} + x^{90} + x^{88} + x^{86}\\
&\quad + x^{80} + x^{78} + x^{76} + x^{70} + x^{64} + x^{60} + x^{52} + x^{48} + x^{46} + x^{42} + x^{40}\\
&\quad + x^{36},\\
p_3(x) &= x^{104} + x^{100} + x^{98} + x^{96} + x^{84} + x^{80} + x^{74} + x^{72} + x^{70} + x^{68} + x^{66}\\
&\quad + x^{64} + x^{58} + x^{56} + x^{50} + x^{46} + x^{44} + x^{40} + x^{38} + x^{30} + x^{28} + x^{24}\\
&\quad + x^{22} + x^{20},\\
p_6(x) &= x^{102} + x^{100} + x^{96} + x^{92} + x^{90} + x^{88} + x^{82} + x^{76} + x^{74} + x^{72} + x^{68}\\
&\quad + x^{66} + x^{64} + x^{60} + x^{52} + x^{50} + x^{44} + x^{36} + x^{28} + x^{20} + x^{16} + x^{14}\\
&\quad + x^{12} + x^{10} + x^{6} + x^{4} + x^{2} + 1,
\end{aligned}
$$

$$\begin{aligned}p_9(x) &= x^{94} + x^{88} + x^{86} + x^{84} + x^{82} + x^{78} + x^{74} + x^{72} + x^{70} + x^{66} + x^{64} \\ &\quad + x^{60} + x^{48} + x^{40} + x^{38} + x^{36} + x^{34} + x^{26} + x^{22} + x^{20} + x^{8} + x^{6}, \\ p_{12}(x) &= x^{92} + x^{90} + x^{88} + x^{68} + x^{66} + x^{64} + x^{60} + x^{58} + x^{56} + x^{52} + x^{50} \\ &\quad + x^{48} + x^{28} + x^{26} + x^{24} + x^{12} + x^{10} + x^{8} + x^{4} + x^{2} + 1,\end{aligned}$$

and the initial terms are [1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 1, 0].

For $\phi(W^e, 0, 1)$:

$$\begin{aligned}p_0(x) &= x^{117} + x^{116} + x^{113} + x^{111} + x^{106} + x^{105} + x^{104} + x^{102} + x^{100} + x^{99} \\ &\quad + x^{94} + x^{93} + x^{92} + x^{91} + x^{90} + x^{89} + x^{88} + x^{86} + x^{85} + x^{82} + x^{81} \\ &\quad + x^{79} + x^{78} + x^{76} + x^{75} + x^{73} + x^{69} + x^{68} + x^{67} + x^{66} + x^{65} + x^{61} \\ &\quad + x^{59} + x^{56} + x^{54} + x^{51} + x^{50} + x^{49} + x^{48} + x^{46} + x^{43} + x^{42} + x^{41} \\ &\quad + x^{40} + x^{39}, \\ p_3(x) &= x^{95} + x^{93} + x^{91} + x^{89} + x^{77} + x^{75} + x^{69} + x^{67} + x^{61} + x^{59} + x^{55} \\ &\quad + x^{49} + x^{47} + x^{41} + x^{39} + x^{37} + x^{35} + x^{33} + x^{29} + x^{27}, \\ p_6(x) &= x^{93} + x^{92} + x^{91} + x^{90} + x^{88} + x^{86} + x^{85} + x^{84} + x^{80} + x^{75} + x^{74} \\ &\quad + x^{73} + x^{72} + x^{71} + x^{69} + x^{67} + x^{64} + x^{63} + x^{59} + x^{57} + x^{56} + x^{55} \\ &\quad + x^{52} + x^{50} + x^{47} + x^{46} + x^{42} + x^{41} + x^{40} + x^{39} + x^{38} + x^{37} + x^{35} \\ &\quad + x^{33} + x^{30} + x^{28} + x^{27} + x^{26} + x^{23} + x^{18}, \\ p_9(x) &= x^{91} + x^{81} + x^{79} + x^{77} + x^{55} + x^{51} + x^{47} + x^{45} + x^{39} + x^{31} + x^{29} \\ &\quad + x^{25} + x^{21} + x^{13} + x^{11} + x^{9}, \\ p_{12}(x) &= x^{89} + x^{88} + x^{85} + x^{80} + x^{73} + x^{72} + x^{68} + x^{53} + x^{52} + x^{48} + x^{25} \\ &\quad + x^{24} + x^{21} + x^{16} + x^{5} + x^{4} + 1,\end{aligned}$$

and the initial terms are [0, 0, 0, 1, 1, 0, 1, 1, 0, 1, 0, 0, 0, 1, 0, 0].

For $\phi(W^e, 1, 0)$:

$$\begin{aligned}p_0(x) &= x^{117} + x^{116} + x^{113} + x^{111} + x^{106} + x^{105} + x^{104} + x^{102} + x^{100} + x^{99} \\ &\quad + x^{94} + x^{93} + x^{92} + x^{91} + x^{90} + x^{89} + x^{88} + x^{86} + x^{85} + x^{82} + x^{81} \\ &\quad + x^{79} + x^{78} + x^{76} + x^{75} + x^{73} + x^{69} + x^{68} + x^{67} + x^{66} + x^{65} + x^{61} \\ &\quad + x^{59} + x^{56} + x^{54} + x^{51} + x^{50} + x^{49} + x^{48} + x^{46} + x^{43} + x^{42} + x^{41} \\ &\quad + x^{40} + x^{39}, \\ p_3(x) &= x^{95} + x^{93} + x^{91} + x^{89} + x^{77} + x^{75} + x^{69} + x^{67} + x^{61} + x^{59} + x^{55} \\ &\quad + x^{49} + x^{47} + x^{41} + x^{39} + x^{37} + x^{35} + x^{33} + x^{29} + x^{27}, \\ p_6(x) &= x^{93} + x^{92} + x^{91} + x^{90} + x^{88} + x^{86} + x^{85} + x^{84} + x^{80} + x^{75} + x^{74} \\ &\quad + x^{73} + x^{72} + x^{71} + x^{69} + x^{67} + x^{64} + x^{63} + x^{59} + x^{57} + x^{56} + x^{55} \\ &\quad + x^{52} + x^{50} + x^{47} + x^{46} + x^{42} + x^{41} + x^{40} + x^{39} + x^{38} + x^{37} + x^{35} \\ &\quad + x^{33} + x^{30} + x^{28} + x^{27} + x^{26} + x^{23} + x^{18}, \\ p_9(x) &= x^{91} + x^{81} + x^{79} + x^{77} + x^{55} + x^{51} + x^{47} + x^{45} + x^{39} + x^{31} + x^{29}\end{aligned}$$

$$
\begin{aligned}
&+ x^{25} + x^{21} + x^{13} + x^{11} + x^{9},\\
p_{12}(x) &= x^{89} + x^{88} + x^{85} + x^{80} + x^{73} + x^{72} + x^{68} + x^{53} + x^{52} + x^{48} + x^{25}\\
&+ x^{24} + x^{21} + x^{16} + x^{5} + x^{4} + 1,
\end{aligned}
$$

and the initial terms are [0, 0, 0, 1, 1, 0, 1, 1, 0, 1, 0, 0, 0, 1, 0, 0].

For $\phi(W^e, 1, 1)$:

$$
\begin{aligned}
p_0(x) &= x^{114} + x^{106} + x^{104} + x^{100} + x^{98} + x^{92} + x^{88} + x^{80} + x^{74} + x^{66} + x^{58}\\
&+ x^{54} + x^{48} + x^{44} + x^{42},\\
p_3(x) &= x^{98} + x^{96} + x^{92} + x^{90} + x^{86} + x^{82} + x^{80} + x^{78} + x^{76} + x^{70} + x^{68}\\
&+ x^{62} + x^{54} + x^{52} + x^{38} + x^{36} + x^{32} + x^{18},\\
p_6(x) &= x^{96} + x^{90} + x^{86} + x^{84} + x^{78} + x^{76} + x^{74} + x^{72} + x^{70} + x^{66} + x^{62}\\
&+ x^{58} + x^{54} + x^{52} + x^{50} + x^{48} + x^{42} + x^{38} + x^{24} + x^{18} + x^{2} + 1,\\
p_9(x) &= x^{88} + x^{86} + x^{84} + x^{80} + x^{78} + x^{74} + x^{72} + x^{70} + x^{68} + x^{62} + x^{58}\\
&+ x^{56} + x^{54} + x^{52} + x^{50} + x^{48} + x^{46} + x^{42} + x^{38} + x^{36} + x^{30} + x^{24}\\
&+ x^{18} + x^{14} + x^{12} + x^{10} + x^{8} + x^{6},\\
p_{12}(x) &= x^{86} + x^{82} + x^{80} + x^{78} + x^{74} + x^{72} + x^{62} + x^{58} + x^{56} + x^{54} + x^{50}\\
&+ x^{48} + x^{22} + x^{18} + x^{16} + x^{14} + x^{10} + x^{8} + x^{6} + x^{2} + 1,
\end{aligned}
$$

and the initial terms are [0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 1, 0, 0, 0].

For $\phi(M^o, 0, 0)$:

$$
\begin{aligned}
p_0(x) &= x^{117} + x^{116} + x^{115} + x^{114} + x^{110} + x^{109} + x^{108} + x^{107} + x^{106} + x^{101}\\
&+ x^{99} + x^{98} + x^{96} + x^{95} + x^{94} + x^{92} + x^{91} + x^{90} + x^{87} + x^{86} + x^{82}\\
&+ x^{81} + x^{75} + x^{74} + x^{73} + x^{72} + x^{70} + x^{69} + x^{68} + x^{67} + x^{66} + x^{65}\\
&+ x^{64} + x^{63} + x^{61} + x^{60} + x^{58} + x^{53} + x^{52} + x^{50} + x^{47} + x^{46} + x^{45}\\
&+ x^{42} + x^{41} + x^{38} + x^{36},\\
p_3(x) &= x^{101} + x^{100} + x^{99} + x^{98} + x^{97} + x^{96} + x^{94} + x^{93} + x^{87} + x^{86} + x^{85}\\
&+ x^{84} + x^{83} + x^{80} + x^{79} + x^{78} + x^{77} + x^{76} + x^{75} + x^{74} + x^{72} + x^{71}\\
&+ x^{70} + x^{67} + x^{66} + x^{63} + x^{62} + x^{57} + x^{55} + x^{52} + x^{49} + x^{48} + x^{46}\\
&+ x^{44} + x^{43} + x^{41} + x^{40} + x^{39} + x^{37} + x^{35} + x^{29} + x^{28} + x^{26} + x^{24},\\
p_6(x) &= x^{97} + x^{96} + x^{95} + x^{94} + x^{91} + x^{88} + x^{87} + x^{82} + x^{81} + x^{80} + x^{77}\\
&+ x^{76} + x^{74} + x^{72} + x^{67} + x^{63} + x^{58} + x^{57} + x^{56} + x^{55} + x^{48} + x^{47}\\
&+ x^{46} + x^{44} + x^{43} + x^{41} + x^{36} + x^{33} + x^{27} + x^{26} + x^{25} + x^{24} + x^{23}\\
&+ x^{22} + x^{21} + x^{20} + x^{17} + x^{14} + x^{12} + x^{5} + x^{4} + 1,\\
p_9(x) &= x^{89} + x^{88} + x^{84} + x^{81} + x^{80} + x^{76} + x^{73} + x^{72} + x^{68} + x^{65} + x^{64}\\
&+ x^{60} + x^{25} + x^{24} + x^{20} + x^{17} + x^{16} + x^{12},\\
p_{12}(x) &= x^{85} + x^{84} + x^{81} + x^{76} + x^{65} + x^{64} + x^{60} + x^{53} + x^{52} + x^{48} + x^{21}\\
&+ x^{20} + x^{17} + x^{12} + x^{5} + x^{4} + 1,
\end{aligned}
$$

and the initial terms are [1, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 1, 1, 1, 0, 1].

For $\phi(M^o, 0, 1)$:

$$\begin{aligned}
p_0(x) &= x^{124} + x^{122} + x^{120} + x^{119} + x^{118} + x^{115} + x^{114} + x^{110} + x^{109} + x^{108} \\
&\quad + x^{107} + x^{106} + x^{103} + x^{102} + x^{101} + x^{100} + x^{97} + x^{96} + x^{95} + x^{93} \\
&\quad + x^{89} + x^{87} + x^{86} + x^{83} + x^{81} + x^{78} + x^{73} + x^{71} + x^{68} + x^{67} + x^{66} \\
&\quad + x^{65} + x^{63} + x^{62} + x^{58} + x^{56} + x^{55} + x^{53} + x^{51} + x^{50} + x^{48} + x^{46} \\
&\quad + x^{43} + x^{42} + x^{41} + x^{40} + x^{39}, \\
p_3(x) &= x^{104} + x^{103} + x^{100} + x^{95} + x^{94} + x^{93} + x^{89} + x^{88} + x^{87} + x^{84} + x^{82} \\
&\quad + x^{81} + x^{79} + x^{77} + x^{76} + x^{75} + x^{74} + x^{73} + x^{71} + x^{69} + x^{68} + x^{67} \\
&\quad + x^{66} + x^{65} + x^{64} + x^{61} + x^{59} + x^{58} + x^{57} + x^{56} + x^{55} + x^{54} + x^{51} \\
&\quad + x^{50} + x^{46} + x^{44} + x^{43} + x^{41} + x^{40} + x^{38} + x^{37} + x^{36} + x^{34} + x^{32} \\
&\quad + x^{29} + x^{27}, \\
p_6(x) &= x^{100} + x^{98} + x^{90} + x^{88} + x^{86} + x^{84} + x^{82} + x^{78} + x^{76} + x^{72} + x^{70} \\
&\quad + x^{66} + x^{62} + x^{56} + x^{54} + x^{52} + x^{50} + x^{48} + x^{44} + x^{38} + x^{34} + x^{28} \\
&\quad + x^{26} + x^{18}, \\
p_9(x) &= x^{96} + x^{95} + x^{94} + x^{93} + x^{92} + x^{90} + x^{88} + x^{86} + x^{83} + x^{81} + x^{76} \\
&\quad + x^{75} + x^{74} + x^{73} + x^{72} + x^{70} + x^{67} + x^{65} + x^{64} + x^{63} + x^{62} + x^{61} \\
&\quad + x^{59} + x^{57} + x^{32} + x^{31} + x^{30} + x^{29} + x^{28} + x^{26} + x^{24} + x^{22} + x^{19} \\
&\quad + x^{17} + x^{16} + x^{15} + x^{14} + x^{13} + x^{11} + x^{9}, \\
p_{12}(x) &= x^{92} + x^{88} + x^{84} + x^{76} + x^{72} + x^{64} + x^{52} + x^{48} + x^{28} + x^{24} + x^{20} + x^{4} \\
&\quad + 1,
\end{aligned}$$

and the initial terms are [0, 0, 0, 0, 1, 1, 1, 0, 1, 0, 1, 0, 0, 1, 0, 0].

For $\phi(M^o, 1, 0)$:

$$\begin{aligned}
p_0(x) &= x^{120} + x^{118} + x^{115} + x^{114} + x^{108} + x^{107} + x^{105} + x^{104} + x^{101} + x^{99} \\
&\quad + x^{97} + x^{95} + x^{92} + x^{91} + x^{90} + x^{89} + x^{88} + x^{87} + x^{85} + x^{83} + x^{80} \\
&\quad + x^{79} + x^{75} + x^{70} + x^{69} + x^{67} + x^{66} + x^{65} + x^{63} + x^{61} + x^{60} + x^{58} \\
&\quad + x^{57} + x^{56} + x^{54} + x^{52} + x^{47} + x^{44} + x^{43} + x^{42} + x^{41} + x^{40} + x^{39}, \\
p_3(x) &= x^{100} + x^{99} + x^{95} + x^{92} + x^{91} + x^{90} + x^{89} + x^{87} + x^{86} + x^{81} + x^{80} \\
&\quad + x^{79} + x^{78} + x^{77} + x^{75} + x^{73} + x^{72} + x^{71} + x^{70} + x^{69} + x^{67} + x^{65} \\
&\quad + x^{64} + x^{63} + x^{62} + x^{61} + x^{60} + x^{57} + x^{56} + x^{54} + x^{53} + x^{51} + x^{50} \\
&\quad + x^{48} + x^{47} + x^{45} + x^{43} + x^{42} + x^{41} + x^{38} + x^{36} + x^{35} + x^{34} + x^{32} \\
&\quad + x^{29} + x^{27}, \\
p_6(x) &= x^{96} + x^{94} + x^{92} + x^{90} + x^{86} + x^{84} + x^{80} + x^{78} + x^{76} + x^{70} + x^{66} \\
&\quad + x^{64} + x^{62} + x^{60} + x^{58} + x^{56} + x^{52} + x^{46} + x^{44} + x^{36} + x^{28} + x^{18}, \\
p_9(x) &= x^{92} + x^{91} + x^{90} + x^{89} + x^{87} + x^{85} + x^{80} + x^{79} + x^{78} + x^{77} + x^{76}
\end{aligned}$$

$$+x^{74}+x^{71}+x^{69}+x^{64}+x^{63}+x^{62}+x^{61}+x^{59}+x^{57}+x^{28}+x^{27}+x^{26}+x^{25}+x^{23}+x^{21}+x^{16}+x^{15}+x^{14}+x^{13}+x^{11}+x^{9},$$

$$p_{12}(x)=x^{88}+x^{76}+x^{68}+x^{64}+x^{60}+x^{56}+x^{52}+x^{48}+x^{24}+x^{12}+x^{8}+x^{4}+1,$$

and the initial terms are [0, 0, 0, 1, 1, 0, 1, 1, 0, 0, 0, 0, 0, 1, 1, 0].

For $\phi(M^o,1,1)$:

$$p_0(x)=x^{117}+x^{116}+x^{115}+x^{114}+x^{111}+x^{109}+x^{108}+x^{106}+x^{105}+x^{104}+x^{103}+x^{101}+x^{98}+x^{94}+x^{93}+x^{92}+x^{91}+x^{89}+x^{88}+x^{85}+x^{84}+x^{83}+x^{78}+x^{69}+x^{68}+x^{67}+x^{64}+x^{58}+x^{54}+x^{53}+x^{50}+x^{46}+x^{42},$$

$$p_3(x)=x^{101}+x^{100}+x^{99}+x^{98}+x^{97}+x^{96}+x^{95}+x^{93}+x^{91}+x^{87}+x^{85}+x^{84}+x^{83}+x^{80}+x^{79}+x^{78}+x^{75}+x^{74}+x^{71}+x^{70}+x^{69}+x^{68}+x^{67}+x^{66}+x^{64}+x^{63}+x^{62}+x^{61}+x^{60}+x^{57}+x^{56}+x^{54}+x^{53}+x^{51}+x^{49}+x^{47}+x^{46}+x^{45}+x^{41}+x^{37}+x^{30}+x^{26},$$

$$p_6(x)=x^{97}+x^{96}+x^{95}+x^{94}+x^{90}+x^{88}+x^{87}+x^{86}+x^{82}+x^{81}+x^{80}+x^{77}+x^{76}+x^{75}+x^{73}+x^{71}+x^{69}+x^{64}+x^{59}+x^{58}+x^{57}+x^{56}+x^{53}+x^{52}+x^{50}+x^{44}+x^{43}+x^{42}+x^{41}+x^{39}+x^{38}+x^{37}+x^{35}+x^{30}+x^{29}+x^{24}+x^{22}+x^{21}+x^{18}+x^{16}+x^{14}+x^{5}+x^{4}+1,$$

$$p_9(x)=x^{89}+x^{88}+x^{84}+x^{81}+x^{80}+x^{76}+x^{73}+x^{72}+x^{68}+x^{65}+x^{64}+x^{60}+x^{25}+x^{24}+x^{20}+x^{17}+x^{16}+x^{12},$$

$$p_{12}(x)=x^{85}+x^{84}+x^{81}+x^{76}+x^{65}+x^{64}+x^{60}+x^{53}+x^{52}+x^{48}+x^{21}+x^{20}+x^{17}+x^{12}+x^{5}+x^{4}+1,$$

and the initial terms are [0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 1, 1, 1, 1].

For $\phi(W^o,0,0)$:

$$p_0(x)=x^{117}+x^{116}+x^{115}+x^{114}+x^{110}+x^{109}+x^{108}+x^{107}+x^{106}+x^{101}+x^{99}+x^{98}+x^{96}+x^{95}+x^{94}+x^{92}+x^{91}+x^{90}+x^{87}+x^{86}+x^{82}+x^{81}+x^{75}+x^{74}+x^{73}+x^{72}+x^{70}+x^{69}+x^{68}+x^{67}+x^{66}+x^{65}+x^{64}+x^{63}+x^{61}+x^{60}+x^{58}+x^{53}+x^{52}+x^{50}+x^{47}+x^{46}+x^{45}+x^{42}+x^{41}+x^{38}+x^{36},$$

$$p_3(x)=x^{101}+x^{100}+x^{99}+x^{98}+x^{97}+x^{96}+x^{94}+x^{93}+x^{87}+x^{86}+x^{85}+x^{84}+x^{83}+x^{80}+x^{79}+x^{78}+x^{77}+x^{76}+x^{75}+x^{74}+x^{72}+x^{71}+x^{70}+x^{67}+x^{66}+x^{63}+x^{62}+x^{57}+x^{55}+x^{52}+x^{49}+x^{48}+x^{46}+x^{44}+x^{43}+x^{41}+x^{40}+x^{39}+x^{37}+x^{35}+x^{29}+x^{28}+x^{26}+x^{24},$$

$$p_6(x)=x^{97}+x^{96}+x^{95}+x^{94}+x^{91}+x^{88}+x^{87}+x^{82}+x^{81}+x^{80}+x^{77}+x^{76}+x^{74}+x^{72}+x^{67}+x^{63}+x^{58}+x^{57}+x^{56}+x^{55}+x^{48}+x^{47}$$

$$+ x^{46} + x^{44} + x^{43} + x^{41} + x^{36} + x^{33} + x^{27} + x^{26} + x^{25} + x^{24} + x^{23} + x^{22} + x^{21} + x^{20} + x^{17} + x^{14} + x^{12} + x^{5} + x^{4} + 1,$$

$$p_9(x) = x^{89} + x^{88} + x^{84} + x^{81} + x^{80} + x^{76} + x^{73} + x^{72} + x^{68} + x^{65} + x^{64} + x^{60} + x^{25} + x^{24} + x^{20} + x^{17} + x^{16} + x^{12},$$

$$p_{12}(x) = x^{85} + x^{84} + x^{81} + x^{76} + x^{65} + x^{64} + x^{60} + x^{53} + x^{52} + x^{48} + x^{21} + x^{20} + x^{17} + x^{12} + x^{5} + x^{4} + 1,$$

and the initial terms are [1, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 1, 1, 1, 0, 1].

For $\phi(W^o, 0, 1)$:

$$p_0(x) = x^{120} + x^{118} + x^{115} + x^{114} + x^{108} + x^{107} + x^{105} + x^{104} + x^{101} + x^{99} + x^{97} + x^{95} + x^{92} + x^{91} + x^{90} + x^{89} + x^{88} + x^{87} + x^{85} + x^{83} + x^{80} + x^{79} + x^{75} + x^{70} + x^{69} + x^{67} + x^{66} + x^{65} + x^{63} + x^{61} + x^{60} + x^{58} + x^{57} + x^{56} + x^{54} + x^{52} + x^{47} + x^{44} + x^{43} + x^{42} + x^{41} + x^{40} + x^{39},$$

$$p_3(x) = x^{100} + x^{99} + x^{95} + x^{92} + x^{91} + x^{90} + x^{89} + x^{87} + x^{86} + x^{81} + x^{80} + x^{79} + x^{78} + x^{77} + x^{75} + x^{73} + x^{72} + x^{71} + x^{70} + x^{69} + x^{67} + x^{65} + x^{64} + x^{63} + x^{62} + x^{61} + x^{60} + x^{57} + x^{56} + x^{54} + x^{53} + x^{51} + x^{50} + x^{48} + x^{47} + x^{45} + x^{43} + x^{42} + x^{41} + x^{38} + x^{36} + x^{35} + x^{34} + x^{32} + x^{29} + x^{27},$$

$$p_6(x) = x^{96} + x^{94} + x^{92} + x^{90} + x^{86} + x^{84} + x^{80} + x^{78} + x^{76} + x^{70} + x^{66} + x^{64} + x^{62} + x^{60} + x^{58} + x^{56} + x^{52} + x^{46} + x^{44} + x^{36} + x^{28} + x^{18},$$

$$p_9(x) = x^{92} + x^{91} + x^{90} + x^{89} + x^{87} + x^{85} + x^{80} + x^{79} + x^{78} + x^{77} + x^{76} + x^{74} + x^{71} + x^{69} + x^{64} + x^{63} + x^{62} + x^{61} + x^{59} + x^{57} + x^{28} + x^{27} + x^{26} + x^{25} + x^{23} + x^{21} + x^{16} + x^{15} + x^{14} + x^{13} + x^{11} + x^{9},$$

$$p_{12}(x) = x^{88} + x^{76} + x^{68} + x^{64} + x^{60} + x^{56} + x^{52} + x^{48} + x^{24} + x^{12} + x^{8} + x^{4} + 1,$$

and the initial terms are [0, 0, 0, 1, 1, 0, 1, 1, 0, 0, 0, 0, 0, 1, 1, 0].

For $\phi(W^o, 1, 0)$:

$$p_0(x) = x^{124} + x^{122} + x^{120} + x^{119} + x^{118} + x^{115} + x^{114} + x^{110} + x^{109} + x^{108} + x^{107} + x^{106} + x^{103} + x^{102} + x^{101} + x^{100} + x^{97} + x^{96} + x^{95} + x^{93} + x^{89} + x^{87} + x^{86} + x^{83} + x^{81} + x^{78} + x^{73} + x^{71} + x^{68} + x^{67} + x^{66} + x^{65} + x^{63} + x^{62} + x^{58} + x^{56} + x^{55} + x^{53} + x^{51} + x^{50} + x^{48} + x^{46} + x^{43} + x^{42} + x^{41} + x^{40} + x^{39},$$

$$p_3(x) = x^{104} + x^{103} + x^{100} + x^{95} + x^{94} + x^{93} + x^{89} + x^{88} + x^{87} + x^{84} + x^{82} + x^{81} + x^{79} + x^{77} + x^{76} + x^{75} + x^{74} + x^{73} + x^{71} + x^{69} + x^{68} + x^{67} + x^{66} + x^{65} + x^{64} + x^{61} + x^{59} + x^{58} + x^{57} + x^{56} + x^{55} + x^{54} + x^{51} + x^{50} + x^{46} + x^{44} + x^{43} + x^{41} + x^{40} + x^{38} + x^{37} + x^{36} + x^{34} + x^{32}$$

$$
\begin{aligned}
&+ x^{29} + x^{27},\\
p_6(x) &= x^{100} + x^{98} + x^{90} + x^{88} + x^{86} + x^{84} + x^{82} + x^{78} + x^{76} + x^{72} + x^{70}\\
&+ x^{66} + x^{62} + x^{56} + x^{54} + x^{52} + x^{50} + x^{48} + x^{44} + x^{38} + x^{34} + x^{28}\\
&+ x^{26} + x^{18},\\
p_9(x) &= x^{96} + x^{95} + x^{94} + x^{93} + x^{92} + x^{90} + x^{88} + x^{86} + x^{83} + x^{81} + x^{76}\\
&+ x^{75} + x^{74} + x^{73} + x^{72} + x^{70} + x^{67} + x^{65} + x^{64} + x^{63} + x^{62} + x^{61}\\
&+ x^{59} + x^{57} + x^{32} + x^{31} + x^{30} + x^{29} + x^{28} + x^{26} + x^{24} + x^{22} + x^{19}\\
&+ x^{17} + x^{16} + x^{15} + x^{14} + x^{13} + x^{11} + x^{9},\\
p_{12}(x) &= x^{92} + x^{88} + x^{84} + x^{76} + x^{72} + x^{64} + x^{52} + x^{48} + x^{28} + x^{24} + x^{20} + x^{4}\\
&+ 1,
\end{aligned}
$$

and the initial terms are [0, 0, 0, 0, 1, 1, 1, 0, 1, 0, 1, 0, 0, 1, 0, 0].

For $\phi(W^o, 1, 1)$:

$$
\begin{aligned}
p_0(x) &= x^{117} + x^{116} + x^{115} + x^{114} + x^{111} + x^{109} + x^{108} + x^{106} + x^{105} + x^{104}\\
&+ x^{103} + x^{101} + x^{98} + x^{94} + x^{93} + x^{92} + x^{91} + x^{89} + x^{88} + x^{85} + x^{84}\\
&+ x^{83} + x^{78} + x^{69} + x^{68} + x^{67} + x^{64} + x^{58} + x^{54} + x^{53} + x^{50} + x^{46}\\
&+ x^{42},\\
p_3(x) &= x^{101} + x^{100} + x^{99} + x^{98} + x^{97} + x^{96} + x^{95} + x^{93} + x^{91} + x^{87} + x^{85}\\
&+ x^{84} + x^{83} + x^{80} + x^{79} + x^{78} + x^{75} + x^{74} + x^{71} + x^{70} + x^{69} + x^{68}\\
&+ x^{67} + x^{66} + x^{64} + x^{63} + x^{62} + x^{61} + x^{60} + x^{57} + x^{56} + x^{54} + x^{53}\\
&+ x^{51} + x^{49} + x^{47} + x^{46} + x^{45} + x^{41} + x^{37} + x^{30} + x^{26},\\
p_6(x) &= x^{97} + x^{96} + x^{95} + x^{94} + x^{90} + x^{88} + x^{87} + x^{86} + x^{82} + x^{81} + x^{80}\\
&+ x^{77} + x^{76} + x^{75} + x^{73} + x^{71} + x^{69} + x^{64} + x^{59} + x^{58} + x^{57} + x^{56}\\
&+ x^{53} + x^{52} + x^{50} + x^{44} + x^{43} + x^{42} + x^{41} + x^{39} + x^{38} + x^{37} + x^{35}\\
&+ x^{30} + x^{29} + x^{24} + x^{22} + x^{21} + x^{18} + x^{16} + x^{14} + x^{5} + x^{4} + 1,\\
p_9(x) &= x^{89} + x^{88} + x^{84} + x^{81} + x^{80} + x^{76} + x^{73} + x^{72} + x^{68} + x^{65} + x^{64}\\
&+ x^{60} + x^{25} + x^{24} + x^{20} + x^{17} + x^{16} + x^{12},\\
p_{12}(x) &= x^{85} + x^{84} + x^{81} + x^{76} + x^{65} + x^{64} + x^{60} + x^{53} + x^{52} + x^{48} + x^{21}\\
&+ x^{20} + x^{17} + x^{12} + x^{5} + x^{4} + 1,
\end{aligned}
$$

and the initial terms are [0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 1, 1, 1, 1].

Below is the transition function and output function of an 2-automaton that generates $T = M^o_{0,0}$:

Transition function $(n, j) \mapsto \delta(n, j)$ $(\Lambda(n) := [\delta(n, 0), \delta(n, 1)])$:

n	$\Lambda(n)$	n	$\Lambda(n)$	n	$\Lambda(n)$	n	$\Lambda(n)$
0	[1, 2]	721	[1094, 1095]	1442	[1818, 1497]	2163	[2425, 2426]
1	[3, 4]	722	[1096, 629]	1443	[1819, 1820]	2164	[2427, 2426]
2	[5, 6]	723	[1097, 1098]	1444	[1821, 1588]	2165	[2428, 1188]
3	[7, 8]	724	[1099, 1100]	1445	[1822, 298]	2166	[1436, 1121]

4	[9, 10]	725	[524, 1101]	1446	[1823, 1488]	2167	[2429, 1227]
5	[11, 12]	726	[1102, 1103]	1447	[1824, 811]	2168	[2430, 1438]
6	[13, 14]	727	[1104, 1105]	1448	[1825, 270]	2169	[2431, 614]
7	[15, 16]	728	[1106, 1107]	1449	[1826, 1600]	2170	[2432, 1334]
8	[17, 18]	729	[1108, 570]	1450	[970, 1062]	2171	[2433, 1259]
9	[19, 20]	730	[131, 1097]	1451	[1827, 1828]	2172	[2434, 1272]
10	[21, 22]	731	[1109, 574]	1452	[1829, 1756]	2173	[2435, 1926]
11	[23, 24]	732	[673, 191]	1453	[1830, 1831]	2174	[2436, 559]
12	[25, 26]	733	[1110, 496]	1454	[802, 1832]	2175	[2437, 709]
13	[27, 28]	734	[1111, 1112]	1455	[1833, 826]	2176	[592, 1897]
14	[29, 30]	735	[427, 1113]	1456	[1478, 838]	2177	[2438, 488]
15	[31, 32]	736	[1114, 1105]	1457	[1834, 101]	2178	[2439, 226]
16	[33, 34]	737	[1115, 563]	1458	[744, 373]	2179	[593, 1382]
17	[35, 36]	738	[1116, 1117]	1459	[1835, 1251]	2180	[2440, 629]
18	[37, 38]	739	[693, 1118]	1460	[1836, 1100]	2181	[2441, 1294]
19	[39, 40]	740	[1119, 1120]	1461	[639, 1434]	2182	[2442, 132]
20	[41, 42]	741	[1121, 661]	1462	[46, 552]	2183	[2443, 1353]
21	[43, 44]	742	[1122, 159]	1463	[1837, 670]	2184	[2444, 1226]
22	[45, 46]	743	[1123, 644]	1464	[1838, 1160]	2185	[2445, 1153]
23	[47, 48]	744	[50, 132]	1465	[1839, 1122]	2186	[544, 583]
24	[49, 50]	745	[518, 1124]	1466	[1840, 1841]	2187	[682, 1976]
25	[51, 52]	746	[561, 572]	1467	[1842, 186]	2188	[2446, 650]
26	[53, 54]	747	[1125, 1126]	1468	[1112, 1202]	2189	[2447, 576]
27	[55, 56]	748	[1127, 484]	1469	[1843, 1844]	2190	[2448, 1148]
28	[57, 58]	749	[653, 696]	1470	[1845, 529]	2191	[2449, 1267]
29	[59, 36]	750	[1128, 621]	1471	[1846, 553]	2192	[709, 1945]
30	[60, 61]	751	[556, 1129]	1472	[1266, 1844]	2193	[2450, 1190]
31	[62, 63]	752	[198, 1130]	1473	[1105, 1239]	2194	[2451, 649]
32	[64, 65]	753	[1131, 671]	1474	[459, 1420]	2195	[2452, 700]
33	[66, 67]	754	[540, 1132]	1475	[1847, 709]	2196	[2453, 1198]
34	[68, 69]	755	[1133, 1098]	1476	[1334, 1156]	2197	[2454, 52]
35	[70, 71]	756	[1134, 1135]	1477	[1848, 1098]	2198	[2455, 631]
36	[72, 73]	757	[1136, 1137]	1478	[1158, 1350]	2199	[207, 1176]
37	[74, 18]	758	[1138, 223]	1479	[1849, 708]	2200	[2456, 1402]
38	[75, 76]	759	[1139, 1140]	1480	[1850, 1283]	2201	[2457, 1268]
39	[77, 78]	760	[1141, 1142]	1481	[1851, 1157]	2202	[2458, 1213]
40	[79, 80]	761	[687, 520]	1482	[1852, 1853]	2203	[2459, 511]
41	[81, 82]	762	[12, 486]	1483	[624, 638]	2204	[2460, 1393]
42	[83, 84]	763	[1143, 45]	1484	[1854, 540]	2205	[2461, 1350]
43	[85, 86]	764	[1144, 1145]	1485	[1855, 624]	2206	[194, 1294]
44	[87, 88]	765	[1146, 561]	1486	[1856, 56]	2207	[1880, 1970]
45	[89, 90]	766	[1147, 660]	1487	[1857, 1858]	2208	[2462, 169]
46	[91, 92]	767	[573, 1148]	1488	[1859, 1248]	2209	[2463, 451]
47	[93, 94]	768	[474, 1149]	1489	[1860, 1297]	2210	[2464, 221]

48	[95, 96]	769	[1150, 166]	1490	[1861, 658]	2211	[2465, 1136]
49	[97, 98]	770	[1151, 1124]	1491	[1862, 643]	2212	[2466, 171]
50	[99, 100]	771	[1152, 1117]	1492	[153, 1315]	2213	[2467, 565]
51	[101, 102]	772	[175, 1153]	1493	[1347, 186]	2214	[2468, 178]
52	[103, 68]	773	[1154, 508]	1494	[1863, 1295]	2215	[2469, 1085]
53	[104, 105]	774	[1155, 1156]	1495	[1236, 1438]	2216	[2470, 181]
54	[106, 107]	775	[1157, 1158]	1496	[1118, 1236]	2217	[2471, 1232]
55	[108, 109]	776	[1159, 1160]	1497	[1439, 1450]	2218	[2472, 1251]
56	[110, 111]	777	[1161, 600]	1498	[1864, 588]	2219	[2473, 492]
57	[112, 113]	778	[1162, 1163]	1499	[1865, 1430]	2220	[2474, 628]
58	[114, 115]	779	[582, 1164]	1500	[531, 1866]	2221	[2475, 50]
59	[116, 117]	780	[627, 1165]	1501	[1126, 545]	2222	[1876, 526]
60	[118, 119]	781	[1166, 1167]	1502	[1867, 217]	2223	[2476, 472]
61	[120, 121]	782	[1168, 199]	1503	[1868, 1869]	2224	[2477, 1844]
62	[122, 123]	783	[1169, 134]	1504	[1870, 661]	2225	[2478, 1926]
63	[124, 125]	784	[196, 1170]	1505	[1871, 1135]	2226	[2479, 1963]
64	[126, 127]	785	[40, 463]	1506	[1872, 582]	2227	[1400, 600]
65	[128, 129]	786	[1171, 645]	1507	[1873, 539]	2228	[2480, 1137]
66	[130, 131]	787	[157, 196]	1508	[1874, 1369]	2229	[2481, 1404]
67	[132, 133]	788	[1172, 1173]	1509	[1875, 1318]	2230	[2482, 487]
68	[134, 135]	789	[1174, 505]	1510	[436, 1876]	2231	[2483, 571]
69	[136, 137]	790	[1175, 1176]	1511	[1877, 1878]	2232	[2484, 450]
70	[138, 139]	791	[1177, 1178]	1512	[1879, 1436]	2233	[2485, 549]
71	[140, 141]	792	[1179, 142]	1513	[1225, 1880]	2234	[2486, 139]
72	[142, 143]	793	[219, 203]	1514	[1129, 1404]	2235	[2487, 1103]
73	[144, 145]	794	[1180, 1181]	1515	[617, 1353]	2236	[2488, 1415]
74	[146, 54]	795	[1182, 32]	1516	[1881, 1882]	2237	[2489, 1322]
75	[147, 148]	796	[1183, 135]	1517	[1883, 170]	2238	[215, 1338]
76	[48, 149]	797	[1184, 1185]	1518	[1884, 1113]	2239	[2490, 2054]
77	[150, 151]	798	[1186, 1121]	1519	[1885, 49]	2240	[2491, 533]
78	[152, 153]	799	[1187, 1188]	1520	[183, 1882]	2241	[2492, 1440]
79	[154, 155]	800	[1189, 1190]	1521	[514, 1311]	2242	[2493, 45]
80	[156, 157]	801	[1191, 1192]	1522	[1886, 178]	2243	[2494, 48]
81	[158, 43]	802	[1135, 1193]	1523	[1887, 209]	2244	[2495, 1371]
82	[159, 160]	803	[1194, 534]	1524	[1370, 1380]	2245	[2496, 531]
83	[161, 162]	804	[503, 596]	1525	[1888, 498]	2246	[2497, 1225]
84	[163, 151]	805	[1195, 1107]	1526	[645, 185]	2247	[2498, 610]
85	[164, 165]	806	[1196, 136]	1527	[1889, 686]	2248	[2499, 1223]
86	[166, 167]	807	[1197, 521]	1528	[1890, 1334]	2249	[2500, 440]
87	[168, 169]	808	[227, 1135]	1529	[1891, 1441]	2250	[2501, 1345]
88	[170, 171]	809	[1198, 193]	1530	[1892, 53]	2251	[2502, 558]
89	[172, 173]	810	[1199, 1200]	1531	[1893, 1458]	2252	[1402, 1386]
90	[174, 175]	811	[1201, 517]	1532	[1894, 637]	2253	[2503, 560]
91	[176, 177]	812	[1202, 202]	1533	[1895, 1317]	2254	[2504, 1182]

92	[178, 179]	813	[511, 1159]	1534	[1896, 603]	2255	[2505, 696]
93	[180, 181]	814	[1091, 1203]	1535	[1897, 1375]	2256	[489, 2054]
94	[182, 183]	815	[1204, 165]	1536	[1898, 1282]	2257	[2506, 46]
95	[184, 185]	816	[1205, 1206]	1537	[1899, 43]	2258	[2507, 135]
96	[186, 187]	817	[32, 543]	1538	[1900, 469]	2259	[2508, 129]
97	[188, 189]	818	[1207, 575]	1539	[477, 1424]	2260	[2509, 640]
98	[141, 190]	819	[1208, 561]	1540	[1901, 583]	2261	[2510, 202]
99	[191, 192]	820	[1209, 1210]	1541	[499, 181]	2262	[2511, 1253]
100	[193, 194]	821	[1211, 1212]	1542	[1902, 614]	2263	[2512, 506]
101	[195, 196]	822	[1185, 1213]	1543	[1430, 488]	2264	[2513, 553]
102	[197, 198]	823	[1214, 1174]	1544	[1903, 1439]	2265	[2514, 157]
103	[199, 200]	824	[1215, 1108]	1545	[1904, 208]	2266	[2515, 434]
104	[201, 160]	825	[1178, 1142]	1546	[708, 1100]	2267	[2516, 501]
105	[202, 60]	826	[1216, 1217]	1547	[1905, 1364]	2268	[2517, 1163]
106	[203, 204]	827	[546, 209]	1548	[1426, 1279]	2269	[2518, 534]
107	[149, 205]	828	[1218, 1117]	1549	[1906, 219]	2270	[1165, 162]
108	[206, 207]	829	[1219, 1154]	1550	[1907, 204]	2271	[2519, 611]
109	[208, 199]	830	[1220, 612]	1551	[1908, 1354]	2272	[1433, 1345]
110	[209, 210]	831	[1221, 1187]	1552	[430, 1429]	2273	[2520, 544]
111	[211, 212]	832	[446, 1082]	1553	[1909, 1185]	2274	[2521, 1149]
112	[213, 193]	833	[1222, 1223]	1554	[1910, 1389]	2275	[2522, 231]
113	[214, 215]	834	[566, 467]	1555	[1911, 1429]	2276	[629, 1167]
114	[216, 217]	835	[1224, 1225]	1556	[1912, 1200]	2277	[2523, 693]
115	[218, 219]	836	[1226, 512]	1557	[1913, 198]	2278	[2524, 593]
116	[220, 221]	837	[450, 1227]	1558	[1914, 535]	2279	[1380, 1226]
117	[222, 223]	838	[1098, 1228]	1559	[1120, 140]	2280	[2525, 665]
118	[224, 225]	839	[1107, 1229]	1560	[1915, 692]	2281	[2526, 510]
119	[226, 227]	840	[1230, 1231]	1561	[1916, 1213]	2282	[2527, 665]
120	[228, 229]	841	[696, 1232]	1562	[662, 636]	2283	[2528, 1093]
121	[230, 231]	842	[1210, 1233]	1563	[1917, 1121]	2284	[2529, 554]
122	[232, 233]	843	[1163, 173]	1564	[1918, 615]	2285	[2530, 1377]
123	[234, 235]	844	[1234, 191]	1565	[1919, 576]	2286	[2531, 469]
124	[236, 237]	845	[1235, 1236]	1566	[1920, 1230]	2287	[2532, 514]
125	[238, 239]	846	[1237, 1101]	1567	[1921, 692]	2288	[2533, 1355]
126	[240, 241]	847	[1238, 1239]	1568	[442, 1878]	2289	[2534, 1193]
127	[242, 243]	848	[479, 1240]	1569	[1922, 1254]	2290	[2535, 1880]
128	[244, 245]	849	[1241, 231]	1570	[1923, 1220]	2291	[2536, 1869]
129	[246, 247]	850	[491, 1242]	1571	[1924, 574]	2292	[2537, 1084]
130	[248, 249]	851	[7, 498]	1572	[173, 1265]	2293	[2538, 210]
131	[250, 251]	852	[1243, 1202]	1573	[1925, 682]	2294	[1283, 427]
132	[252, 253]	853	[1244, 505]	1574	[1318, 1926]	2295	[2539, 2068]
133	[254, 255]	854	[1245, 565]	1575	[1927, 133]	2296	[2540, 509]
134	[256, 257]	855	[1246, 460]	1576	[1928, 42]	2297	[2541, 661]
135	[258, 259]	856	[123, 442]	1577	[1929, 1108]	2298	[2542, 1120]

136	[260, 261]	857	[1247, 1248]	1578	[1140, 631]	2299	[2543, 137]
137	[22, 262]	858	[1249, 1250]	1579	[700, 478]	2300	[2544, 1254]
138	[263, 264]	859	[1101, 1251]	1580	[1930, 1430]	2301	[2545, 145]
139	[265, 25]	860	[1252, 1253]	1581	[1931, 10]	2302	[2546, 203]
140	[266, 267]	861	[586, 1254]	1582	[680, 1932]	2303	[2547, 508]
141	[268, 269]	862	[1255, 563]	1583	[1933, 1363]	2304	[2548, 167]
142	[270, 271]	863	[1256, 1257]	1584	[703, 215]	2305	[2549, 1140]
143	[272, 273]	864	[1258, 1259]	1585	[1229, 515]	2306	[2550, 1178]
144	[274, 239]	865	[1130, 703]	1586	[1934, 627]	2307	[2551, 163]
145	[275, 105]	866	[1260, 147]	1587	[1935, 1936]	2308	[2552, 601]
146	[276, 277]	867	[1261, 230]	1588	[1937, 33]	2309	[2553, 687]
147	[278, 279]	868	[611, 574]	1589	[1424, 653]	2310	[2554, 445]
148	[280, 281]	869	[1262, 134]	1590	[1938, 1233]	2311	[2555, 1177]
149	[94, 282]	870	[1263, 1230]	1591	[1858, 1367]	2312	[2556, 605]
150	[283, 284]	871	[1264, 1112]	1592	[1939, 199]	2313	[2557, 140]
151	[285, 286]	872	[1265, 667]	1593	[1940, 594]	2314	[2558, 53]
152	[287, 288]	873	[1100, 1266]	1594	[1941, 12]	2315	[2559, 594]
153	[289, 290]	874	[521, 438]	1595	[1942, 1404]	2316	[2560, 584]
154	[291, 282]	875	[1164, 445]	1596	[1943, 212]	2317	[2561, 1311]
155	[292, 293]	876	[559, 1267]	1597	[1944, 1945]	2318	[2562, 1286]
156	[294, 295]	877	[1268, 1269]	1598	[1946, 1866]	2319	[2563, 34]
157	[296, 297]	878	[1270, 537]	1599	[1947, 1276]	2320	[2054, 498]
158	[298, 299]	879	[1271, 639]	1600	[1948, 1158]	2321	[2564, 174]
159	[293, 300]	880	[42, 541]	1601	[1949, 1287]	2322	[2565, 1291]
160	[301, 302]	881	[1113, 1272]	1602	[1950, 1880]	2323	[2566, 636]
161	[303, 304]	882	[1273, 129]	1603	[1951, 144]	2324	[1231, 1373]
162	[305, 306]	883	[1274, 218]	1604	[1952, 1315]	2325	[2567, 477]
163	[307, 308]	884	[1275, 1276]	1605	[1953, 1129]	2326	[2568, 162]
164	[309, 310]	885	[1277, 1157]	1606	[1954, 206]	2327	[2569, 208]
165	[311, 312]	886	[1181, 670]	1607	[1955, 691]	2328	[2570, 142]
166	[313, 73]	887	[1278, 1279]	1608	[1956, 1897]	2329	[2571, 705]
167	[314, 315]	888	[1269, 12]	1609	[1373, 563]	2330	[2572, 1285]
168	[316, 317]	889	[1280, 1212]	1610	[1285, 1230]	2331	[2573, 484]
169	[318, 67]	890	[1281, 1093]	1611	[1957, 1958]	2332	[2574, 1456]
170	[319, 320]	891	[1282, 1283]	1612	[1959, 1338]	2333	[2575, 1206]
171	[321, 322]	892	[1284, 1285]	1613	[1458, 664]	2334	[2576, 1318]
172	[323, 91]	893	[516, 1286]	1614	[1960, 189]	2335	[2577, 1876]
173	[324, 325]	894	[1272, 1206]	1615	[1961, 40]	2336	[2578, 675]
174	[326, 327]	895	[177, 225]	1616	[1962, 450]	2337	[2579, 1458]
175	[328, 329]	896	[650, 1264]	1617	[1354, 1963]	2338	[2580, 648]
176	[330, 331]	897	[1092, 1287]	1618	[1440, 1964]	2339	[2581, 664]
177	[332, 333]	898	[1288, 431]	1619	[1965, 592]	2340	[2582, 559]
178	[334, 82]	899	[1289, 1122]	1620	[1966, 650]	2341	[2583, 638]
179	[335, 336]	900	[1090, 1126]	1621	[1967, 591]	2342	[2584, 1367]

180	[337, 338]	901	[1148, 139]	1622	[1968, 1177]	2343	[2585, 705]
181	[339, 340]	902	[1290, 1291]	1623	[1969, 570]	2344	[2586, 1091]
182	[341, 342]	903	[225, 1223]	1624	[1970, 1936]	2345	[2587, 1366]
183	[343, 344]	904	[1149, 51]	1625	[205, 1177]	2346	[2588, 1375]
184	[345, 346]	905	[1292, 1082]	1626	[1971, 1179]	2347	[1311, 1157]
185	[347, 348]	906	[1293, 1294]	1627	[1972, 1231]	2348	[2589, 468]
186	[349, 350]	907	[1295, 169]	1628	[1973, 196]	2349	[2590, 520]
187	[351, 352]	908	[576, 223]	1629	[1974, 34]	2350	[2591, 524]
188	[353, 354]	909	[1124, 492]	1630	[1975, 1976]	2351	[2592, 1309]
189	[239, 355]	910	[1296, 1297]	1631	[1977, 611]	2352	[2593, 225]
190	[356, 290]	911	[1287, 682]	1632	[1978, 1174]	2353	[2594, 509]
191	[357, 358]	912	[1298, 536]	1633	[1979, 657]	2354	[2595, 1370]
192	[359, 360]	913	[1299, 446]	1634	[1980, 210]	2355	[2596, 1153]
193	[361, 362]	914	[1300, 1301]	1635	[1964, 1250]	2356	[2597, 128]
194	[363, 364]	915	[1302, 447]	1636	[1450, 1428]	2357	[2598, 641]
195	[365, 366]	916	[1303, 1240]	1637	[1981, 1305]	2358	[2599, 662]
196	[367, 30]	917	[508, 549]	1638	[1982, 1386]	2359	[2600, 541]
197	[368, 369]	918	[1304, 1305]	1639	[165, 1285]	2360	[2601, 476]
198	[370, 312]	919	[1306, 1268]	1640	[1983, 632]	2361	[664, 1958]
199	[371, 265]	920	[1233, 668]	1641	[1984, 1373]	2362	[2602, 157]
200	[372, 373]	921	[1307, 698]	1642	[1985, 1986]	2363	[2603, 461]
201	[374, 375]	922	[1308, 1309]	1643	[529, 208]	2364	[2604, 1108]
202	[376, 377]	923	[626, 174]	1644	[1987, 140]	2365	[2605, 1434]
203	[378, 379]	924	[1310, 1311]	1645	[1988, 591]	2366	[2606, 538]
204	[380, 381]	925	[1312, 1170]	1646	[1989, 1220]	2367	[2607, 50]
205	[382, 383]	926	[1313, 628]	1647	[155, 1122]	2368	[2608, 131]
206	[384, 385]	927	[1314, 1315]	1648	[1990, 1389]	2369	[2609, 1083]
207	[386, 387]	928	[1316, 515]	1649	[1991, 571]	2370	[2610, 1412]
208	[388, 389]	929	[1305, 58]	1650	[1992, 151]	2371	[2611, 1354]
209	[390, 391]	930	[434, 1182]	1651	[1993, 1286]	2372	[1095, 1174]
210	[387, 392]	931	[1317, 1318]	1652	[603, 678]	2373	[2612, 1876]
211	[393, 394]	932	[1319, 1113]	1653	[1841, 53]	2374	[2613, 1269]
212	[395, 90]	933	[1320, 1232]	1654	[1994, 535]	2375	[2614, 1116]
213	[396, 397]	934	[1321, 448]	1655	[1995, 1442]	2376	[2615, 1240]
214	[398, 399]	935	[1240, 1322]	1656	[1996, 453]	2377	[223, 1200]
215	[283, 297]	936	[1323, 439]	1657	[1997, 1858]	2378	[2616, 1148]
216	[400, 401]	937	[1324, 1325]	1658	[1998, 478]	2379	[2617, 452]
217	[402, 403]	938	[1326, 651]	1659	[1999, 669]	2380	[2618, 177]
218	[404, 405]	939	[1322, 1327]	1660	[2000, 1382]	2381	[2619, 615]
219	[406, 407]	940	[8, 499]	1661	[1190, 1154]	2382	[1217, 533]
220	[408, 409]	941	[1328, 149]	1662	[2001, 626]	2383	[2620, 1386]
221	[410, 411]	942	[1329, 488]	1663	[2002, 642]	2384	[2621, 475]
222	[412, 413]	943	[1330, 688]	1664	[2003, 143]	2385	[2622, 546]
223	[276, 260]	944	[1331, 494]	1665	[2004, 1439]	2386	[2623, 160]

224	[414, 304]	945	[1332, 636]	1666	[58, 464]	2387	[2624, 575]
225	[331, 256]	946	[1333, 166]	1667	[452, 14]	2388	[2625, 562]
226	[415, 416]	947	[594, 1248]	1668	[2005, 1426]	2389	[2626, 621]
227	[417, 418]	948	[615, 1334]	1669	[2006, 2007]	2390	[2627, 211]
228	[419, 420]	949	[1335, 546]	1670	[2008, 2007]	2391	[2628, 141]
229	[421, 422]	950	[1336, 566]	1671	[2009, 171]	2392	[2629, 465]
230	[423, 311]	951	[549, 644]	1672	[2010, 444]	2393	[2630, 1156]
231	[424, 425]	952	[1337, 1338]	1673	[2011, 2012]	2394	[2631, 643]
232	[426, 427]	953	[501, 447]	1674	[2013, 58]	2395	[2632, 141]
233	[428, 49]	954	[1339, 1266]	1675	[2014, 1963]	2396	[2633, 1936]
234	[429, 430]	955	[1340, 227]	1676	[2015, 486]	2397	[2634, 1932]
235	[431, 432]	956	[129, 1304]	1677	[2016, 1841]	2398	[2635, 1203]
236	[433, 434]	957	[1341, 432]	1678	[2017, 211]	2399	[2636, 1097]
237	[435, 436]	958	[1342, 1095]	1679	[2018, 142]	2400	[2637, 1282]
238	[437, 438]	959	[1343, 1142]	1680	[2019, 533]	2401	[2638, 1322]
239	[439, 440]	960	[1344, 578]	1681	[2020, 190]	2402	[2639, 1203]
240	[441, 442]	961	[1345, 692]	1682	[2021, 179]	2403	[2640, 479]
241	[443, 444]	962	[610, 1136]	1683	[2022, 1132]	2404	[2641, 1295]
242	[445, 446]	963	[1346, 1347]	1684	[2023, 671]	2405	[1228, 1869]
243	[447, 448]	964	[1348, 662]	1685	[455, 1441]	2406	[2642, 203]
244	[449, 133]	965	[1349, 573]	1686	[2024, 155]	2407	[2643, 552]
245	[217, 450]	966	[1350, 688]	1687	[2025, 1429]	2408	[2644, 1363]
246	[451, 452]	967	[1351, 503]	1688	[2026, 1215]	2409	[1257, 128]
247	[453, 431]	968	[1352, 202]	1689	[2027, 545]	2410	[2645, 1084]
248	[454, 455]	969	[1353, 1354]	1690	[14, 1412]	2411	[2646, 458]
249	[456, 457]	970	[1355, 1116]	1691	[2028, 227]	2412	[2647, 619]
250	[458, 459]	971	[1356, 453]	1692	[2029, 1964]	2413	[2648, 1130]
251	[460, 461]	972	[1357, 1126]	1693	[2030, 638]	2414	[2649, 641]
252	[462, 463]	973	[1103, 1162]	1694	[2031, 468]	2415	[2650, 491]
253	[464, 465]	974	[1358, 545]	1695	[2032, 1242]	2416	[2651, 464]
254	[466, 467]	975	[1359, 1236]	1696	[2033, 2034]	2417	[2652, 1371]
255	[468, 469]	976	[1360, 1198]	1697	[2035, 163]	2418	[2653, 2654]
256	[470, 471]	977	[1361, 641]	1698	[2036, 527]	2419	[1568, 990]
257	[472, 144]	978	[1362, 587]	1699	[2037, 1202]	2420	[335, 2179]
258	[473, 474]	979	[1363, 1364]	1700	[2038, 1158]	2421	[2655, 1638]
259	[10, 475]	980	[1365, 1366]	1701	[125, 457]	2422	[1833, 950]
260	[471, 476]	981	[1367, 1083]	1702	[1413, 1198]	2423	[2656, 382]
261	[137, 477]	982	[1368, 583]	1703	[2039, 699]	2424	[1594, 2657]
262	[478, 479]	983	[1176, 178]	1704	[2040, 708]	2425	[908, 319]
263	[480, 481]	984	[1369, 1370]	1705	[2041, 691]	2426	[943, 789]
264	[482, 483]	985	[575, 680]	1706	[2042, 1400]	2427	[2658, 2337]
265	[484, 485]	986	[651, 527]	1707	[2043, 673]	2428	[2659, 2288]
266	[486, 487]	987	[212, 453]	1708	[2044, 41]	2429	[2660, 1776]
267	[488, 489]	988	[1170, 1371]	1709	[2045, 1370]	2430	[2386, 968]

268	[490, 491]	989	[1372, 1373]	1710	[2046, 586]	2431	[917, 793]
269	[492, 49]	990	[1213, 36]	1711	[2047, 477]	2432	[2325, 1538]
270	[493, 494]	991	[1374, 1375]	1712	[1160, 539]	2433	[902, 1069]
271	[495, 496]	992	[1376, 1377]	1713	[162, 587]	2434	[2275, 1460]
272	[497, 481]	993	[1378, 1355]	1714	[2048, 669]	2435	[2661, 1795]
273	[498, 499]	994	[1379, 1380]	1715	[2049, 564]	2436	[2662, 252]
274	[500, 501]	995	[1381, 1382]	1716	[2050, 511]	2437	[342, 1030]
275	[502, 503]	996	[1366, 1085]	1717	[2012, 1181]	2438	[2663, 1729]
276	[504, 137]	997	[1383, 1226]	1718	[2051, 200]	2439	[2664, 976]
277	[505, 506]	998	[1384, 1215]	1719	[2052, 1415]	2440	[1643, 404]
278	[507, 508]	999	[1385, 558]	1720	[2053, 2054]	2441	[22, 1034]
279	[509, 510]	1000	[1386, 1225]	1721	[2055, 668]	2442	[2348, 254]
280	[494, 511]	1001	[1387, 1274]	1722	[2056, 438]	2443	[959, 2214]
281	[512, 513]	1002	[1377, 614]	1723	[2057, 699]	2444	[1477, 837]
282	[181, 514]	1003	[1388, 623]	1724	[2058, 207]	2445	[2665, 934]
283	[515, 516]	1004	[667, 1389]	1725	[2059, 1269]	2446	[1821, 1650]
284	[517, 518]	1005	[534, 1140]	1726	[2060, 1304]	2447	[1007, 2666]
285	[519, 431]	1006	[1390, 1164]	1727	[2061, 459]	2448	[1728, 2667]
286	[520, 521]	1007	[1391, 1392]	1728	[2062, 1173]	2449	[2180, 1547]
287	[522, 518]	1008	[465, 1103]	1729	[2063, 1327]	2450	[2291, 1574]
288	[523, 524]	1009	[1393, 1190]	1730	[2064, 42]	2451	[2668, 878]
289	[525, 526]	1010	[1394, 198]	1731	[2065, 1112]	2452	[2669, 790]
290	[527, 170]	1011	[562, 1095]	1732	[1409, 1442]	2453	[926, 361]
291	[528, 529]	1012	[1395, 667]	1733	[2066, 1082]	2454	[2296, 278]
292	[530, 513]	1013	[1338, 578]	1734	[2067, 2068]	2455	[2670, 2671]
293	[34, 531]	1014	[1396, 1361]	1735	[1325, 2012]	2456	[1032, 1666]
294	[532, 470]	1015	[1397, 451]	1736	[2069, 1279]	2457	[1030, 2672]
295	[533, 534]	1016	[1398, 14]	1737	[2070, 1118]	2458	[2673, 2674]
296	[535, 536]	1017	[1399, 1393]	1738	[139, 468]	2459	[2675, 790]
297	[537, 538]	1018	[1259, 1400]	1739	[444, 1409]	2460	[1694, 2676]
298	[539, 540]	1019	[1401, 1402]	1740	[1963, 221]	2461	[2677, 1054]
299	[541, 529]	1020	[1403, 499]	1741	[2071, 572]	2462	[1461, 1005]
300	[513, 542]	1021	[1404, 230]	1742	[2072, 439]	2463	[2678, 2410]
301	[543, 544]	1022	[1382, 434]	1743	[2073, 516]	2464	[755, 2679]
302	[545, 546]	1023	[1156, 460]	1744	[2074, 1145]	2465	[2318, 2313]
303	[547, 125]	1024	[1405, 1361]	1745	[2075, 1412]	2466	[776, 1462]
304	[548, 549]	1025	[1406, 33]	1746	[2076, 2077]	2467	[361, 2680]
305	[550, 61]	1026	[1407, 1228]	1747	[2078, 592]	2468	[721, 1043]
306	[151, 551]	1027	[1408, 1409]	1748	[2079, 459]	2469	[971, 2274]
307	[552, 553]	1028	[1410, 542]	1749	[2080, 1932]	2470	[2286, 272]
308	[554, 123]	1029	[1411, 218]	1750	[2081, 471]	2471	[2681, 734]
309	[555, 556]	1030	[1412, 1308]	1751	[2082, 543]	2472	[1765, 361]
310	[557, 554]	1031	[1286, 1402]	1752	[2083, 588]	2473	[2191, 1592]
311	[558, 559]	1032	[1315, 1413]	1753	[2084, 197]	2474	[71, 2682]

312	[560, 561]	1033	[1414, 1264]	1754	[2085, 154]	2475	[2236, 1038]
313	[135, 562]	1034	[1206, 1415]	1755	[2086, 430]	2476	[268, 2347]
314	[563, 564]	1035	[1416, 622]	1756	[2087, 1897]	2477	[2683, 798]
315	[565, 566]	1036	[1417, 1317]	1757	[2088, 1309]	2478	[788, 406]
316	[567, 38]	1037	[1418, 1092]	1758	[2089, 1162]	2479	[2684, 2685]
317	[568, 156]	1038	[1419, 128]	1759	[2090, 476]	2480	[736, 2685]
318	[569, 556]	1039	[1420, 470]	1760	[2091, 552]	2481	[761, 2686]
319	[570, 571]	1040	[1421, 1274]	1761	[2092, 513]	2482	[2687, 6]
320	[572, 573]	1041	[1422, 186]	1762	[2093, 1233]	2483	[2402, 367]
321	[574, 575]	1042	[1423, 1424]	1763	[2094, 205]	2484	[2688, 1480]
322	[483, 576]	1043	[1425, 1426]	1764	[2095, 1164]	2485	[2689, 2690]
323	[577, 578]	1044	[1153, 586]	1765	[2096, 194]	2486	[92, 2682]
324	[579, 580]	1045	[1427, 1428]	1766	[2097, 1090]	2487	[2691, 1611]
325	[487, 206]	1046	[1429, 451]	1767	[2098, 445]	2488	[2692, 1581]
326	[581, 582]	1047	[1232, 1295]	1768	[2099, 1250]	2489	[2693, 1711]
327	[583, 584]	1048	[145, 1430]	1769	[2100, 573]	2490	[839, 242]
328	[585, 586]	1049	[1431, 207]	1770	[2101, 158]	2491	[807, 873]
329	[587, 588]	1050	[1432, 1433]	1771	[2102, 183]	2492	[1533, 2340]
330	[589, 470]	1051	[463, 127]	1772	[2103, 1367]	2493	[978, 2694]
331	[590, 472]	1052	[588, 439]	1773	[2104, 1392]	2494	[1028, 2324]
332	[591, 592]	1053	[1434, 1282]	1774	[2105, 642]	2495	[2695, 2291]
333	[440, 593]	1054	[1435, 673]	1775	[2106, 1442]	2496	[2683, 2165]
334	[56, 594]	1055	[542, 229]	1776	[2107, 427]	2497	[364, 2696]
335	[595, 596]	1056	[605, 1436]	1777	[2108, 1181]	2498	[2697, 1812]
336	[52, 147]	1057	[1437, 446]	1778	[2109, 489]	2499	[1734, 16]
337	[597, 218]	1058	[1438, 617]	1779	[1882, 131]	2500	[2306, 2698]
338	[598, 209]	1059	[1250, 455]	1780	[2110, 159]	2501	[2201, 2699]
339	[599, 158]	1060	[1301, 1439]	1781	[2111, 1878]	2502	[767, 900]
340	[600, 601]	1061	[1137, 1440]	1782	[2112, 192]	2503	[1043, 2238]
341	[602, 603]	1062	[1441, 1433]	1783	[2113, 1165]	2504	[2700, 2291]
342	[604, 605]	1063	[1442, 1301]	1784	[2114, 154]	2505	[2701, 328]
343	[606, 212]	1064	[1443, 457]	1785	[2115, 1976]	2506	[758, 1742]
344	[192, 607]	1065	[1444, 1272]	1786	[2116, 600]	2507	[1773, 2260]
345	[608, 44]	1066	[1445, 1364]	1787	[2117, 1325]	2508	[2268, 1690]
346	[609, 610]	1067	[1446, 1210]	1788	[2118, 159]	2509	[2702, 317]
347	[607, 611]	1068	[1447, 1304]	1789	[2119, 1165]	2510	[2703, 118]
348	[612, 166]	1069	[1239, 197]	1790	[2120, 551]	2511	[1720, 2199]
349	[613, 190]	1070	[1448, 1179]	1791	[1117, 1355]	2512	[2704, 1594]
350	[614, 615]	1071	[1449, 1450]	1792	[2121, 580]	2513	[2705, 2244]
351	[204, 226]	1072	[1451, 1265]	1793	[2122, 516]	2514	[2417, 997]
352	[457, 189]	1073	[1452, 1231]	1794	[2123, 156]	2515	[2197, 1512]
353	[616, 617]	1074	[1453, 465]	1795	[2124, 1409]	2516	[64, 2657]
354	[618, 155]	1075	[1364, 158]	1796	[2125, 52]	2517	[2706, 324]
355	[438, 619]	1076	[1454, 1257]	1797	[1200, 136]	2518	[1521, 1647]

356	[620, 187]	1077	[1455, 540]	1798	[2126, 492]	2519	[1810, 921]
357	[621, 622]	1078	[1251, 1456]	1799	[2127, 1176]	2520	[1601, 2707]
358	[623, 624]	1079	[1457, 1149]	1800	[2128, 687]	2521	[2225, 1632]
359	[625, 626]	1080	[448, 1458]	1801	[2129, 543]	2522	[1482, 1022]
360	[189, 627]	1081	[38, 458]	1802	[2130, 51]	2523	[2400, 2654]
361	[148, 509]	1082	[1459, 778]	1803	[1248, 1377]	2524	[2708, 1760]
362	[628, 629]	1083	[1460, 1000]	1804	[630, 698]	2525	[2709, 833]
363	[580, 630]	1084	[1461, 1052]	1805	[2131, 1092]	2526	[2164, 2710]
364	[631, 632]	1085	[863, 260]	1806	[2132, 686]	2527	[1041, 95]
365	[633, 537]	1086	[711, 1462]	1807	[2133, 1170]	2528	[2373, 887]
366	[634, 631]	1087	[1463, 1464]	1808	[2134, 486]	2529	[1803, 2696]
367	[635, 54]	1088	[388, 930]	1809	[538, 156]	2530	[2205, 965]
368	[636, 637]	1089	[1465, 359]	1810	[2135, 1308]	2531	[1815, 370]
369	[638, 639]	1090	[861, 299]	1811	[2136, 1347]	2532	[2378, 2385]
370	[640, 603]	1091	[1005, 1053]	1812	[2137, 505]	2533	[1684, 2711]
371	[641, 642]	1092	[1466, 106]	1813	[1254, 2034]	2534	[2712, 1695]
372	[210, 643]	1093	[1467, 1468]	1814	[2138, 607]	2535	[2713, 905]
373	[644, 645]	1094	[1469, 1459]	1815	[2139, 510]	2536	[2714, 975]
374	[646, 640]	1095	[259, 768]	1816	[2140, 1162]	2537	[2715, 285]
375	[647, 648]	1096	[1470, 1471]	1817	[691, 610]	2538	[2396, 1028]
376	[649, 650]	1097	[1472, 1473]	1818	[1428, 444]	2539	[826, 2716]
377	[167, 651]	1098	[251, 1474]	1819	[2141, 1154]	2540	[2717, 833]
378	[652, 653]	1099	[1078, 779]	1820	[2142, 1305]	2541	[302, 2176]
379	[54, 654]	1100	[1475, 1476]	1821	[2143, 1424]	2542	[1543, 266]
380	[655, 147]	1101	[1477, 1478]	1822	[2144, 541]	2543	[1478, 2718]
381	[187, 56]	1102	[1479, 1480]	1823	[2145, 191]	2544	[2719, 2335]
382	[656, 657]	1103	[768, 901]	1824	[2146, 639]	2545	[2301, 1820]
383	[551, 658]	1104	[1481, 1482]	1825	[2147, 495]	2546	[1736, 294]
384	[659, 539]	1105	[1483, 368]	1826	[2148, 644]	2547	[1783, 876]
385	[467, 649]	1106	[1484, 19]	1827	[2149, 1229]	2548	[2720, 2721]
386	[36, 660]	1107	[1485, 981]	1828	[2150, 518]	2549	[2722, 233]
387	[661, 662]	1108	[1486, 791]	1829	[2151, 520]	2550	[2223, 1758]
388	[663, 664]	1109	[1487, 1488]	1830	[2152, 219]	2551	[2280, 794]
389	[622, 665]	1110	[1489, 1490]	1831	[2153, 1970]	2552	[2397, 2723]
390	[666, 667]	1111	[1491, 66]	1832	[1142, 1363]	2553	[2662, 2335]
391	[668, 669]	1112	[271, 752]	1833	[2154, 452]	2554	[2724, 2698]
392	[670, 671]	1113	[710, 1492]	1834	[2155, 197]	2555	[91, 71]
393	[672, 170]	1114	[920, 1493]	1835	[2156, 1747]	2556	[389, 2725]
394	[596, 673]	1115	[1494, 906]	1836	[2157, 870]	2557	[1798, 268]
395	[674, 675]	1116	[1063, 1495]	1837	[2158, 2159]	2558	[2726, 2258]
396	[676, 32]	1117	[1496, 1063]	1838	[1469, 777]	2559	[1707, 1632]
397	[677, 678]	1118	[1061, 1497]	1839	[753, 20]	2560	[1575, 2690]
398	[679, 680]	1119	[1498, 714]	1840	[2160, 884]	2561	[2170, 1540]
399	[681, 682]	1120	[1499, 1500]	1841	[2161, 106]	2562	[973, 2409]

400	[683, 474]	1121	[840, 243]	1842	[2162, 1554]	2563	[2688, 1583]
401	[684, 478]	1122	[1501, 301]	1843	[2163, 1029]	2564	[2727, 328]
402	[685, 515]	1123	[1502, 1003]	1844	[2164, 119]	2565	[244, 357]
403	[658, 686]	1124	[852, 273]	1845	[2165, 2166]	2566	[2728, 2729]
404	[642, 163]	1125	[1503, 87]	1846	[2158, 2167]	2567	[363, 1803]
405	[461, 10]	1126	[1504, 886]	1847	[2168, 1561]	2568	[897, 108]
406	[481, 687]	1127	[1505, 801]	1848	[2169, 1017]	2569	[2730, 2731]
407	[688, 591]	1128	[1506, 933]	1849	[2170, 1475]	2570	[851, 272]
408	[689, 194]	1129	[389, 931]	1850	[2171, 1605]	2571	[1721, 1592]
409	[690, 148]	1130	[716, 886]	1851	[886, 1541]	2572	[2727, 1612]
410	[221, 691]	1131	[1507, 1508]	1852	[2172, 324]	2573	[1776, 2252]
411	[692, 693]	1132	[1509, 832]	1853	[2173, 1055]	2574	[2720, 2732]
412	[694, 612]	1133	[20, 1510]	1854	[1057, 1509]	2575	[2733, 1532]
413	[695, 696]	1134	[1511, 1512]	1855	[2174, 342]	2576	[1735, 1584]
414	[697, 460]	1135	[1513, 1514]	1856	[2175, 326]	2577	[2734, 2346]
415	[698, 699]	1136	[1059, 1515]	1857	[246, 2176]	2578	[882, 2666]
416	[171, 700]	1137	[962, 411]	1858	[306, 1492]	2579	[1489, 2735]
417	[701, 495]	1138	[1516, 1065]	1859	[2177, 2178]	2580	[1725, 2736]
418	[506, 211]	1139	[1517, 989]	1860	[1512, 2179]	2581	[939, 2270]
419	[702, 703]	1140	[1518, 327]	1861	[2180, 1669]	2582	[2403, 1038]
420	[704, 617]	1141	[1519, 1482]	1862	[2181, 1054]	2583	[2737, 2414]
421	[143, 705]	1142	[1520, 1521]	1863	[2182, 318]	2584	[2738, 1588]
422	[706, 556]	1143	[1522, 91]	1864	[347, 1585]	2585	[2739, 97]
423	[707, 560]	1144	[1523, 1003]	1865	[2183, 994]	2586	[2691, 867]
424	[44, 708]	1145	[1524, 1047]	1866	[2165, 799]	2587	[798, 2166]
425	[619, 709]	1146	[1525, 1526]	1867	[809, 749]	2588	[396, 2740]
426	[78, 710]	1147	[1527, 1528]	1868	[910, 110]	2589	[996, 776]
427	[711, 712]	1148	[920, 877]	1869	[1474, 405]	2590	[2181, 2173]
428	[713, 714]	1149	[783, 103]	1870	[2184, 1024]	2591	[289, 2405]
429	[715, 716]	1150	[1529, 1530]	1871	[2185, 722]	2592	[2741, 1754]
430	[717, 718]	1151	[1531, 1532]	1872	[333, 2186]	2593	[1572, 108]
431	[90, 719]	1152	[1533, 1534]	1873	[2187, 749]	2594	[2374, 95]
432	[720, 300]	1153	[1535, 977]	1874	[2188, 1754]	2595	[2173, 2294]
433	[721, 722]	1154	[1536, 802]	1875	[2189, 2190]	2596	[2715, 1756]
434	[308, 723]	1155	[1537, 763]	1876	[1822, 861]	2597	[987, 246]
435	[724, 423]	1156	[1538, 1539]	1877	[2191, 390]	2598	[2738, 1650]
436	[725, 262]	1157	[1540, 1476]	1878	[2192, 792]	2599	[2742, 995]
437	[726, 727]	1158	[1541, 392]	1879	[2193, 1793]	2600	[1583, 2743]
438	[728, 729]	1159	[1542, 762]	1880	[2194, 103]	2601	[2717, 1753]
439	[310, 730]	1160	[1543, 881]	1881	[1619, 2195]	2602	[2744, 367]
440	[731, 732]	1161	[1544, 1545]	1882	[342, 1652]	2603	[412, 2674]
441	[733, 734]	1162	[1480, 1546]	1883	[264, 321]	2604	[2745, 995]
442	[233, 735]	1163	[1547, 1548]	1884	[2196, 1657]	2605	[2253, 2282]
443	[736, 737]	1164	[1549, 730]	1885	[327, 266]	2606	[2745, 380]

444	[738, 739]	1165	[355, 333]	1886	[2197, 335]	2607	[2719, 252]
445	[740, 741]	1166	[1550, 1551]	1887	[340, 334]	2608	[727, 1472]
446	[742, 81]	1167	[302, 247]	1888	[2198, 1607]	2609	[2177, 2317]
447	[743, 744]	1168	[743, 372]	1889	[1711, 2199]	2610	[2746, 1698]
448	[745, 746]	1169	[4, 258]	1890	[2200, 1007]	2611	[2747, 756]
449	[747, 748]	1170	[1552, 723]	1891	[2201, 1790]	2612	[822, 1803]
450	[749, 100]	1171	[1553, 1554]	1892	[2202, 2203]	2613	[1018, 776]
451	[750, 102]	1172	[1555, 63]	1893	[2204, 1682]	2614	[2234, 2381]
452	[751, 752]	1173	[1525, 1539]	1894	[2205, 976]	2615	[259, 900]
453	[753, 754]	1174	[1556, 880]	1895	[293, 2206]	2616	[2748, 2349]
454	[755, 756]	1175	[1557, 945]	1896	[1627, 831]	2617	[2744, 29]
455	[757, 739]	1176	[1558, 922]	1897	[2207, 1520]	2618	[105, 1056]
456	[758, 759]	1177	[282, 1520]	1898	[2208, 1642]	2619	[2693, 1720]
457	[760, 761]	1178	[71, 895]	1899	[1517, 87]	2620	[331, 1609]
458	[18, 379]	1179	[1559, 817]	1900	[2209, 2210]	2621	[889, 2749]
459	[6, 762]	1180	[1560, 1561]	1901	[2211, 1706]	2622	[2739, 899]
460	[763, 21]	1181	[1562, 1032]	1902	[2212, 816]	2623	[1652, 2672]
461	[764, 293]	1182	[1512, 336]	1903	[2213, 2214]	2624	[2185, 1043]
462	[765, 766]	1183	[1563, 905]	1904	[2215, 2216]	2625	[112, 1631]
463	[78, 306]	1184	[1564, 727]	1905	[2217, 1551]	2626	[103, 1639]
464	[767, 768]	1185	[1565, 21]	1906	[2218, 998]	2627	[1467, 2736]
465	[769, 403]	1186	[1566, 1567]	1907	[1648, 2219]	2628	[2750, 356]
466	[770, 771]	1187	[15, 1559]	1908	[2220, 2221]	2629	[2192, 824]
467	[772, 773]	1188	[1568, 26]	1909	[95, 2222]	2630	[1001, 1667]
468	[774, 775]	1189	[1569, 19]	1910	[2223, 2224]	2631	[2415, 1638]
469	[776, 712]	1190	[1570, 344]	1911	[2225, 731]	2632	[2712, 978]
470	[777, 778]	1191	[1571, 788]	1912	[2226, 1072]	2633	[2751, 921]
471	[779, 780]	1192	[1572, 871]	1913	[262, 2227]	2634	[2335, 2752]
472	[781, 255]	1193	[722, 1044]	1914	[2228, 829]	2635	[2677, 2173]
473	[782, 783]	1194	[1573, 258]	1915	[2229, 1807]	2636	[1527, 2753]
474	[784, 111]	1195	[393, 1574]	1916	[1064, 2230]	2637	[948, 1832]
475	[20, 785]	1196	[1575, 1576]	1917	[774, 1022]	2638	[2231, 268]
476	[786, 787]	1197	[1577, 728]	1918	[2231, 1026]	2639	[2655, 849]
477	[788, 789]	1198	[1578, 363]	1919	[2232, 1036]	2640	[2245, 1622]
478	[790, 385]	1199	[104, 814]	1920	[2233, 958]	2641	[2692, 399]
479	[791, 792]	1200	[1579, 22]	1921	[2234, 2235]	2642	[2742, 380]
480	[235, 793]	1201	[1580, 1070]	1922	[2236, 847]	2643	[382, 1813]
481	[794, 795]	1202	[1581, 1582]	1923	[2237, 963]	2644	[830, 1584]
482	[796, 797]	1203	[1583, 1546]	1924	[379, 1591]	2645	[2665, 794]
483	[798, 799]	1204	[1584, 1585]	1925	[963, 985]	2646	[2675, 384]
484	[800, 325]	1205	[1586, 1587]	1926	[1521, 352]	2647	[1763, 2754]
485	[801, 802]	1206	[1588, 1589]	1927	[722, 2238]	2648	[1066, 1074]
486	[24, 76]	1207	[1511, 335]	1928	[2239, 1525]	2649	[2383, 999]
487	[803, 296]	1208	[1590, 919]	1929	[2240, 916]	2650	[107, 1624]

488	[105, 804]	1209	[1080, 1591]	1930	[863, 277]	2651	[2289, 1540]
489	[719, 80]	1210	[1592, 391]	1931	[2241, 1673]	2652	[2704, 64]
490	[805, 806]	1211	[1593, 763]	1932	[1042, 96]	2653	[2755, 1192]
491	[807, 808]	1212	[1594, 65]	1933	[2242, 2190]	2654	[2756, 1091]
492	[809, 99]	1213	[1595, 383]	1934	[2243, 2244]	2655	[2757, 1228]
493	[810, 811]	1214	[791, 824]	1935	[2245, 1499]	2656	[2758, 551]
494	[812, 322]	1215	[775, 1023]	1936	[2187, 99]	2657	[2426, 1392]
495	[813, 301]	1216	[1596, 1597]	1937	[2246, 1015]	2658	[2759, 173]
496	[814, 804]	1217	[1598, 75]	1938	[1494, 1028]	2659	[2760, 1970]
497	[815, 816]	1218	[1599, 1600]	1939	[2247, 915]	2660	[2761, 230]
498	[80, 422]	1219	[1601, 1602]	1940	[2248, 101]	2661	[2762, 175]
499	[16, 817]	1220	[1603, 313]	1941	[2249, 2250]	2662	[2763, 637]
500	[818, 275]	1221	[1604, 1605]	1942	[2251, 423]	2663	[2764, 688]
501	[819, 745]	1222	[1606, 1607]	1943	[120, 2252]	2664	[2765, 1227]
502	[820, 821]	1223	[108, 872]	1944	[2253, 2254]	2665	[2766, 1182]
503	[822, 364]	1224	[1608, 234]	1945	[973, 1473]	2666	[1958, 1291]
504	[823, 788]	1225	[1609, 257]	1946	[2255, 1570]	2667	[2767, 680]
505	[824, 825]	1226	[1610, 839]	1947	[260, 2256]	2668	[2768, 698]
506	[826, 827]	1227	[1611, 868]	1948	[924, 2164]	2669	[2769, 467]
507	[828, 829]	1228	[1017, 350]	1949	[2257, 2258]	2670	[2770, 136]
508	[344, 830]	1229	[19, 754]	1950	[2259, 2260]	2671	[2771, 479]
509	[831, 832]	1230	[1612, 329]	1951	[2261, 275]	2672	[160, 1274]
510	[833, 834]	1231	[86, 416]	1952	[1680, 888]	2673	[2772, 2012]
511	[835, 836]	1232	[1067, 1075]	1953	[2262, 2263]	2674	[2773, 192]
512	[837, 838]	1233	[1591, 1613]	1954	[2264, 2265]	2675	[2774, 1167]
513	[839, 840]	1234	[1614, 359]	1955	[1826, 2266]	2676	[637, 621]
514	[338, 115]	1235	[1615, 1616]	1956	[760, 314]	2677	[2775, 542]
515	[841, 107]	1236	[1617, 1618]	1957	[2267, 1723]	2678	[2776, 660]
516	[754, 785]	1237	[1619, 1620]	1958	[2268, 842]	2679	[2777, 1266]
517	[842, 843]	1238	[1621, 806]	1959	[2269, 366]	2680	[1145, 1426]
518	[844, 809]	1239	[1482, 775]	1960	[938, 985]	2681	[2778, 1129]
519	[845, 846]	1240	[1622, 1500]	1961	[985, 2270]	2682	[1276, 2426]
520	[847, 848]	1241	[1623, 1567]	1962	[2271, 1611]	2683	[2779, 1187]
521	[849, 850]	1242	[1624, 1625]	1963	[2272, 2077]	2684	[2780, 489]
522	[851, 852]	1243	[1626, 28]	1964	[411, 757]	2685	[2781, 471]
523	[853, 854]	1244	[1627, 1509]	1965	[2273, 2274]	2686	[1192, 1217]
524	[855, 856]	1245	[1628, 910]	1966	[2275, 999]	2687	[2782, 127]
525	[857, 858]	1246	[1629, 764]	1967	[833, 2276]	2688	[2783, 593]
526	[262, 859]	1247	[1630, 1631]	1968	[2277, 117]	2689	[2784, 623]
527	[860, 861]	1248	[1632, 732]	1969	[1703, 2278]	2690	[2785, 1132]
528	[862, 863]	1249	[1633, 1634]	1970	[2260, 956]	2691	[2786, 215]
529	[864, 865]	1250	[1635, 1636]	1971	[772, 2279]	2692	[2787, 1327]
530	[866, 23]	1251	[856, 251]	1972	[2280, 934]	2693	[2788, 1160]
531	[867, 868]	1252	[1637, 1466]	1973	[730, 1552]	2694	[1294, 2007]

532	[869, 870]	1253	[1638, 850]	1974	[2271, 867]	2695	[2789, 596]
533	[871, 872]	1254	[1639, 69]	1975	[2281, 2282]	2696	[485, 535]
534	[873, 874]	1255	[1640, 1019]	1976	[761, 315]	2697	[2790, 651]
535	[875, 746]	1256	[1641, 1642]	1977	[2283, 1499]	2698	[2791, 1420]
536	[876, 877]	1257	[1643, 1474]	1978	[2284, 1831]	2699	[2792, 41]
537	[789, 407]	1258	[1644, 764]	1979	[754, 1510]	2700	[2793, 1436]
538	[878, 296]	1259	[1645, 729]	1980	[2285, 1001]	2701	[2794, 1242]
539	[879, 880]	1260	[836, 280]	1981	[2286, 852]	2702	[2795, 653]
540	[881, 267]	1261	[1646, 1597]	1982	[2287, 2288]	2703	[2796, 226]
541	[882, 883]	1262	[351, 1647]	1983	[2289, 1475]	2704	[2797, 1239]
542	[23, 75]	1263	[1648, 1649]	1984	[271, 1513]	2705	[2798, 1866]
543	[63, 856]	1264	[1650, 1589]	1985	[2290, 864]	2706	[2799, 487]
544	[884, 744]	1265	[1651, 1652]	1986	[2291, 394]	2707	[2800, 1130]
545	[885, 735]	1266	[1081, 1613]	1987	[2292, 1711]	2708	[2801, 506]
546	[886, 387]	1267	[1038, 848]	1988	[2293, 926]	2709	[2802, 1217]
547	[887, 888]	1268	[1653, 25]	1989	[1054, 2294]	2710	[571, 640]
548	[889, 890]	1269	[375, 808]	1990	[2295, 397]	2711	[2803, 622]
549	[802, 891]	1270	[1654, 878]	1991	[2296, 997]	2712	[2804, 1283]
550	[892, 797]	1271	[1655, 1656]	1992	[2297, 1767]	2713	[2805, 1188]
551	[284, 893]	1272	[1657, 809]	1993	[2298, 1734]	2714	[2806, 1159]
552	[894, 355]	1273	[1658, 346]	1994	[919, 876]	2715	[2807, 564]
553	[92, 895]	1274	[1659, 983]	1995	[2299, 2300]	2716	[632, 217]
554	[808, 874]	1275	[1660, 23]	1996	[2301, 2302]	2717	[2808, 566]
555	[884, 372]	1276	[1661, 1011]	1997	[2303, 1024]	2718	[671, 491]
556	[896, 897]	1277	[1662, 1663]	1998	[2304, 2278]	2719	[2809, 464]
557	[898, 234]	1278	[1664, 1665]	1999	[2305, 274]	2720	[2810, 153]
558	[899, 98]	1279	[1666, 369]	2000	[296, 284]	2721	[2811, 668]
559	[900, 901]	1280	[1019, 1667]	2001	[871, 109]	2722	[2812, 229]
560	[902, 903]	1281	[1668, 1669]	2002	[2306, 2307]	2723	[2813, 60]
561	[748, 904]	1282	[996, 711]	2003	[2308, 1796]	2724	[2814, 1945]
562	[905, 741]	1283	[1642, 717]	2004	[1811, 2309]	2725	[657, 1187]
563	[416, 377]	1284	[1670, 1074]	2005	[1483, 1666]	2726	[2815, 1101]
564	[906, 907]	1285	[1671, 86]	2006	[2310, 771]	2727	[2816, 587]
565	[908, 909]	1286	[107, 1047]	2007	[364, 1804]	2728	[2817, 512]
566	[910, 784]	1287	[854, 761]	2008	[349, 1008]	2729	[2818, 632]
567	[404, 911]	1288	[292, 720]	2009	[2311, 1070]	2730	[2819, 485]
568	[912, 913]	1289	[1672, 1673]	2010	[2312, 2313]	2731	[2820, 43]
569	[914, 915]	1290	[1674, 1675]	2011	[2314, 2315]	2732	[2821, 1267]
570	[916, 295]	1291	[909, 320]	2012	[1778, 973]	2733	[2822, 654]
571	[917, 918]	1292	[1676, 1663]	2013	[2316, 2317]	2734	[2823, 624]
572	[919, 920]	1293	[1677, 942]	2014	[2318, 2319]	2735	[2824, 2034]
573	[904, 265]	1294	[1678, 784]	2015	[1011, 2279]	2736	[1084, 481]
574	[921, 922]	1295	[235, 918]	2016	[781, 2320]	2737	[2825, 630]
575	[923, 780]	1296	[1679, 728]	2017	[2321, 395]	2738	[2826, 185]

576	[797, 313]	1297	[1680, 1051]	2018	[2322, 338]	2739	[2827, 179]
577	[924, 118]	1298	[1681, 1682]	2019	[2323, 420]	2740	[2828, 1308]
578	[297, 893]	1299	[1683, 1556]	2020	[906, 2324]	2741	[2829, 700]
579	[925, 926]	1300	[1684, 1616]	2021	[2325, 1525]	2742	[2830, 187]
580	[927, 865]	1301	[1685, 970]	2022	[2326, 356]	2743	[1878, 558]
581	[928, 85]	1302	[1686, 1687]	2023	[720, 2206]	2744	[2831, 60]
582	[245, 358]	1303	[1688, 1689]	2024	[2327, 2328]	2745	[2832, 526]
583	[929, 830]	1304	[1690, 843]	2025	[1834, 750]	2746	[2833, 1420]
584	[930, 931]	1305	[811, 1461]	2026	[319, 1702]	2747	[2834, 436]
585	[932, 933]	1306	[1691, 375]	2027	[2264, 2329]	2748	[2835, 1369]
586	[934, 795]	1307	[1692, 1693]	2028	[751, 1513]	2749	[2836, 531]
587	[333, 425]	1308	[1694, 787]	2029	[1076, 2300]	2750	[2837, 527]
588	[935, 718]	1309	[1695, 979]	2030	[2257, 2330]	2751	[2838, 678]
589	[360, 779]	1310	[1696, 769]	2031	[2331, 2332]	2752	[705, 1210]
590	[936, 274]	1311	[340, 81]	2032	[2333, 2250]	2753	[2839, 1193]
591	[937, 813]	1312	[1697, 1698]	2033	[2334, 2165]	2754	[2840, 174]
592	[938, 939]	1313	[1699, 264]	2034	[2335, 253]	2755	[837, 2718]
593	[730, 308]	1314	[1700, 237]	2035	[1829, 285]	2756	[1479, 1583]
594	[940, 259]	1315	[288, 745]	2036	[2336, 2337]	2757	[301, 246]
595	[941, 942]	1316	[764, 720]	2037	[86, 376]	2758	[2285, 1019]
596	[821, 842]	1317	[1701, 1521]	2038	[1731, 1725]	2759	[1695, 2694]
597	[943, 406]	1318	[1508, 983]	2039	[2338, 2159]	2760	[2841, 2404]
598	[944, 945]	1319	[909, 1702]	2040	[1696, 402]	2761	[355, 424]
599	[946, 85]	1320	[1703, 1704]	2041	[2339, 2340]	2762	[1718, 2671]
600	[947, 897]	1321	[1705, 1706]	2042	[2341, 2342]	2763	[1759, 417]
601	[948, 891]	1322	[792, 825]	2043	[1003, 357]	2764	[950, 2716]
602	[949, 950]	1323	[1707, 731]	2044	[2343, 786]	2765	[2842, 254]
603	[918, 951]	1324	[1708, 382]	2045	[2344, 963]	2766	[2356, 64]
604	[952, 860]	1325	[1709, 904]	2046	[1797, 1639]	2767	[2709, 1753]
605	[953, 840]	1326	[1710, 860]	2047	[2345, 2346]	2768	[237, 837]
606	[954, 801]	1327	[1711, 1712]	2048	[1026, 2347]	2769	[1017, 1008]
607	[955, 956]	1328	[1638, 1713]	2049	[2348, 781]	2770	[2843, 2749]
608	[957, 958]	1329	[1714, 1715]	2050	[5, 1542]	2771	[2751, 1558]
609	[959, 960]	1330	[1716, 937]	2051	[1714, 2349]	2772	[2844, 2358]
610	[961, 962]	1331	[840, 1717]	2052	[2182, 66]	2773	[2713, 740]
611	[360, 923]	1332	[1718, 1719]	2053	[2350, 766]	2774	[860, 298]
612	[963, 939]	1333	[854, 314]	2054	[2351, 256]	2775	[719, 421]
613	[964, 94]	1334	[1720, 1712]	2055	[2352, 1029]	2776	[2845, 2721]
614	[965, 966]	1335	[1721, 390]	2056	[1042, 2222]	2777	[2703, 2164]
615	[793, 951]	1336	[1722, 1723]	2057	[2243, 2353]	2778	[2846, 2723]
616	[967, 968]	1337	[307, 1552]	2058	[2283, 1622]	2779	[1653, 1568]
617	[969, 970]	1338	[399, 1582]	2059	[2354, 2332]	2780	[988, 2680]
618	[971, 972]	1339	[1724, 1725]	2060	[242, 1717]	2781	[2746, 83]
619	[727, 973]	1340	[1726, 1727]	2061	[957, 2355]	2782	[1642, 935]

620	[974, 975]	1341	[1728, 1729]	2062	[847, 1039]	2783	[2664, 965]
621	[976, 966]	1342	[1730, 1556]	2063	[2356, 1594]	2784	[118, 2710]
622	[977, 281]	1343	[876, 1493]	2064	[1040, 882]	2785	[2408, 978]
623	[978, 979]	1344	[1731, 1467]	2065	[398, 1581]	2786	[1491, 318]
624	[980, 981]	1345	[1732, 1062]	2066	[386, 1541]	2787	[2700, 393]
625	[982, 326]	1346	[1733, 1734]	2067	[2357, 937]	2788	[1730, 879]
626	[983, 984]	1347	[1735, 347]	2068	[1669, 1548]	2789	[725, 1034]
627	[985, 986]	1348	[1736, 916]	2069	[305, 710]	2790	[930, 2725]
628	[987, 302]	1349	[1737, 1545]	2070	[1744, 1762]	2791	[1816, 777]
629	[264, 812]	1350	[1725, 1468]	2071	[2215, 2358]	2792	[1697, 83]
630	[926, 988]	1351	[744, 1738]	2072	[2248, 750]	2793	[79, 421]
631	[989, 88]	1352	[1724, 1467]	2073	[2359, 2360]	2794	[1598, 24]
632	[327, 881]	1353	[1618, 1636]	2074	[1813, 2361]	2795	[1624, 1048]
633	[25, 990]	1354	[1739, 1515]	2075	[2362, 1694]	2796	[2708, 417]
634	[991, 992]	1355	[1740, 757]	2076	[2220, 409]	2797	[1524, 1624]
635	[993, 994]	1356	[1741, 1742]	2077	[2077, 2077]	2798	[786, 2676]
636	[995, 381]	1357	[232, 885]	2078	[2363, 2364]	2799	[2669, 384]
637	[836, 977]	1358	[1743, 1073]	2079	[2365, 2219]	2800	[2701, 1612]
638	[70, 92]	1359	[1744, 1745]	2080	[2366, 288]	2801	[2695, 393]
639	[981, 996]	1360	[1746, 1747]	2081	[2362, 786]	2802	[332, 424]
640	[997, 279]	1361	[350, 1009]	2082	[2367, 884]	2803	[2292, 1720]
641	[998, 340]	1362	[1748, 241]	2083	[2368, 310]	2804	[265, 1568]
642	[999, 1000]	1363	[1749, 812]	2084	[2369, 2210]	2805	[2351, 1609]
643	[1001, 1002]	1364	[1584, 348]	2085	[2370, 919]	2806	[991, 2729]
644	[830, 347]	1365	[1750, 863]	2086	[1034, 2227]	2807	[2847, 120]
645	[1003, 245]	1366	[1751, 813]	2087	[2371, 1530]	2808	[1661, 772]
646	[1004, 1005]	1367	[1752, 1461]	2088	[1611, 2372]	2809	[2848, 769]
647	[1006, 395]	1368	[1036, 930]	2089	[2373, 1680]	2810	[252, 2752]
648	[1007, 883]	1369	[1753, 834]	2090	[2374, 1042]	2811	[2334, 798]
649	[1008, 1009]	1370	[1754, 896]	2091	[2375, 1656]	2812	[375, 873]
650	[1010, 271]	1371	[1698, 84]	2092	[277, 2256]	2813	[2842, 781]
651	[73, 1011]	1372	[1755, 1727]	2093	[1640, 1001]	2814	[2849, 2850]
652	[1012, 783]	1373	[1756, 286]	2094	[2363, 2328]	2815	[2851, 2707]
653	[1013, 984]	1374	[1757, 1758]	2095	[1563, 740]	2816	[1806, 935]
654	[277, 261]	1375	[939, 986]	2096	[2376, 331]	2817	[2393, 2850]
655	[1014, 1015]	1376	[1759, 1760]	2097	[368, 2377]	2818	[2848, 402]
656	[1016, 1017]	1377	[1004, 1052]	2098	[2378, 2379]	2819	[1686, 2852]
657	[1018, 711]	1378	[1761, 1762]	2099	[2380, 2381]	2820	[2722, 885]
658	[1019, 1002]	1379	[1763, 1764]	2100	[801, 948]	2821	[2853, 1680]
659	[1020, 401]	1380	[1765, 988]	2101	[424, 2186]	2822	[2262, 2360]
660	[383, 1021]	1381	[1766, 1767]	2102	[1547, 2382]	2823	[1669, 2382]
661	[1022, 1023]	1382	[1760, 418]	2103	[2383, 1460]	2824	[2352, 902]
662	[1024, 836]	1383	[1768, 1693]	2104	[1659, 1013]	2825	[2314, 2731]
663	[1025, 78]	1384	[1769, 1657]	2105	[2384, 2385]	2826	[821, 1690]

664	[746, 909]	1385	[1770, 1689]	2106	[2386, 2387]	2827	[2200, 882]
665	[1026, 269]	1386	[1047, 1625]	2107	[2388, 1665]	2828	[2326, 289]
666	[1027, 249]	1387	[1771, 1471]	2108	[1651, 1030]	2829	[2687, 1542]
667	[325, 363]	1388	[1772, 980]	2109	[2389, 910]	2830	[1678, 110]
668	[1028, 907]	1389	[1652, 1031]	2110	[2390, 1490]	2831	[2660, 120]
669	[1029, 903]	1390	[1773, 955]	2111	[2391, 899]	2832	[1749, 321]
670	[1030, 1031]	1391	[1774, 1775]	2112	[2259, 955]	2833	[1683, 879]
671	[1032, 368]	1392	[1011, 773]	2113	[2392, 821]	2834	[314, 2686]
672	[1033, 858]	1393	[1776, 121]	2114	[1538, 1526]	2835	[867, 2372]
673	[1034, 859]	1394	[1777, 716]	2115	[2393, 2394]	2836	[2163, 902]
674	[1035, 1036]	1395	[1778, 1472]	2116	[1536, 948]	2837	[746, 319]
675	[1037, 896]	1396	[80, 1779]	2117	[849, 1713]	2838	[2239, 1538]
676	[1038, 1039]	1397	[1780, 1781]	2118	[1681, 2395]	2839	[2750, 289]
677	[1040, 1007]	1398	[415, 376]	2119	[372, 1738]	2840	[1670, 1067]
678	[950, 827]	1399	[1782, 1570]	2120	[2396, 906]	2841	[2854, 1456]
679	[1041, 1042]	1400	[1783, 920]	2121	[1753, 2276]	2842	[2855, 645]
680	[1043, 1044]	1401	[1784, 1785]	2122	[2397, 2398]	2843	[2856, 1163]
681	[1045, 354]	1402	[1734, 1559]	2123	[2399, 2265]	2844	[2857, 1400]
682	[1046, 996]	1403	[1474, 911]	2124	[2400, 2401]	2845	[2858, 61]
683	[1047, 1048]	1404	[897, 871]	2125	[2402, 29]	2846	[2859, 483]
684	[733, 1049]	1405	[1786, 998]	2126	[2391, 97]	2847	[2860, 1958]
685	[1050, 846]	1406	[1535, 280]	2127	[742, 334]	2848	[2861, 658]
686	[887, 1051]	1407	[1787, 1788]	2128	[2403, 847]	2849	[2862, 1853]
687	[1052, 1053]	1408	[1789, 1790]	2129	[254, 2320]	2850	[2863, 132]
688	[1054, 1055]	1409	[1791, 1685]	2130	[1586, 2404]	2851	[2864, 1265]
689	[814, 1056]	1410	[1792, 1793]	2131	[356, 2405]	2852	[2865, 123]
690	[1057, 831]	1411	[1794, 1795]	2132	[2406, 1466]	2853	[2866, 463]
691	[1058, 1059]	1412	[752, 1514]	2133	[2343, 1694]	2854	[2867, 2753]
692	[1060, 1061]	1413	[237, 1478]	2134	[2407, 270]	2855	[1520, 351]
693	[1062, 1063]	1414	[1780, 1796]	2135	[2408, 1695]	2856	[1698, 2868]
694	[1064, 1065]	1415	[1797, 68]	2136	[1472, 2409]	2857	[2869, 2754]
695	[1066, 1067]	1416	[1798, 1026]	2137	[949, 826]	2858	[1509, 2870]
696	[1068, 235]	1417	[1799, 1508]	2138	[1463, 2410]	2859	[831, 2870]
697	[1029, 1069]	1418	[1800, 854]	2139	[2411, 980]	2860	[73, 772]
698	[865, 1032]	1419	[1801, 1788]	2140	[1668, 1547]	2861	[2853, 887]
699	[988, 362]	1420	[379, 1081]	2141	[2412, 2195]	2862	[83, 2868]
700	[1070, 791]	1421	[251, 404]	2142	[337, 114]	2863	[2847, 1776]
701	[1071, 1072]	1422	[1701, 351]	2143	[1508, 1013]	2864	[2871, 2852]
702	[912, 1073]	1423	[1802, 1775]	2144	[2413, 864]	2865	[1503, 989]
703	[1074, 1075]	1424	[1803, 1804]	2145	[1666, 2377]	2866	[953, 242]
704	[1076, 1077]	1425	[1805, 1785]	2146	[1595, 1813]	2867	[2872, 1986]
705	[1078, 923]	1426	[1806, 717]	2147	[275, 814]	2868	[1415, 33]
706	[1036, 389]	1427	[1633, 1807]	2148	[383, 2361]	2869	[2873, 1380]
707	[1079, 748]	1428	[1495, 962]	2149	[2202, 2414]	2870	[1936, 1120]

708	[1080, 1081]	1429	[1808, 360]	2150	[2322, 114]	2871	[2874, 706]
709	[729, 839]	1430	[1809, 719]	2151	[2415, 849]	2872	[1480, 2743]
710	[1082, 41]	1431	[1810, 1558]	2152	[421, 1779]	2873	[2875, 2876]
711	[1083, 1084]	1432	[1811, 1812]	2153	[1531, 2416]	2874	[2341, 2876]
712	[1085, 495]	1433	[739, 1061]	2154	[2417, 278]	2875	[2877, 1413]
713	[1086, 517]	1434	[1813, 1021]	2155	[423, 370]	2876	[2, 458]
714	[1087, 143]	1435	[1814, 1675]	2156	[2418, 1345]	2877	[1827, 2878]
715	[1088, 448]	1436	[1815, 311]	2157	[2419, 649]	2878	[2879, 538]
716	[1089, 1090]	1437	[1816, 1459]	2158	[2420, 521]	2879	[2240, 294]
717	[169, 1091]	1438	[1497, 1618]	2159	[2421, 1350]		
718	[686, 1092]	1439	[1817, 1495]	2160	[2422, 148]		
719	[675, 706]	1440	[1515, 1685]	2161	[2423, 149]		
720	[578, 1093]	1441	[1636, 1059]	2162	[2424, 144]		

Output function $n \mapsto \tau(n)$:

n	$\tau(n)$	n	$\tau(n)$	n	$\tau(n)$	n	$\tau(n)$	n	$\tau(n)$	n	$\tau(n)$
0	0	481	0	962	0	1443	0	1924	1	2405	0
1	0	482	0	963	1	1444	0	1925	1	2406	0
2	0	483	0	964	1	1445	0	1926	1	2407	1
3	0	484	1	965	1	1446	0	1927	1	2408	0
4	0	485	1	966	1	1447	0	1928	1	2409	1
5	0	486	0	967	0	1448	0	1929	0	2410	0
6	1	487	1	968	1	1449	0	1930	1	2411	1
7	0	488	0	969	1	1450	1	1931	0	2412	0
8	1	489	0	970	1	1451	1	1932	0	2413	0
9	0	490	0	971	0	1452	0	1933	0	2414	0
10	1	491	0	972	0	1453	1	1934	0	2415	0
11	0	492	0	973	0	1454	1	1935	0	2416	1
12	0	493	1	974	0	1455	1	1936	1	2417	1
13	1	494	0	975	1	1456	0	1937	1	2418	1
14	1	495	1	976	0	1457	0	1938	0	2419	1
15	0	496	1	977	1	1458	0	1939	0	2420	0
16	0	497	1	978	0	1459	1	1940	1	2421	1
17	1	498	0	979	1	1460	1	1941	0	2422	1
18	0	499	0	980	0	1461	0	1942	0	2423	0
19	0	500	1	981	0	1462	0	1943	1	2424	0
20	0	501	0	982	0	1463	0	1944	0	2425	1
21	1	502	0	983	0	1464	1	1945	0	2426	0
22	1	503	1	984	0	1465	1	1946	1	2427	1
23	0	504	0	985	0	1466	1	1947	1	2428	1
24	0	505	0	986	1	1467	0	1948	1	2429	0
25	0	506	1	987	0	1468	1	1949	1	2430	1
26	1	507	1	988	1	1469	1	1950	0	2431	0
27	1	508	0	989	1	1470	1	1951	0	2432	0

28	0	509	0	990	0	1471	0	1952	0	2433	1
29	1	510	1	991	1	1472	1	1953	1	2434	1
30	0	511	1	992	1	1473	0	1954	1	2435	1
31	0	512	1	993	0	1474	1	1955	0	2436	1
32	1	513	1	994	0	1475	1	1956	1	2437	1
33	0	514	1	995	1	1476	1	1957	1	2438	0
34	0	515	0	996	0	1477	0	1958	0	2439	1
35	1	516	1	997	0	1478	0	1959	1	2440	1
36	1	517	0	998	1	1479	0	1960	0	2441	1
37	0	518	0	999	0	1480	1	1961	0	2442	0
38	1	519	0	1000	0	1481	0	1962	0	2443	1
39	0	520	1	1001	0	1482	1	1963	1	2444	0
40	1	521	1	1002	1	1483	0	1964	0	2445	0
41	0	522	0	1003	0	1484	0	1965	1	2446	0
42	1	523	1	1004	1	1485	1	1966	1	2447	1
43	1	524	0	1005	1	1486	1	1967	1	2448	1
44	0	525	1	1006	1	1487	1	1968	0	2449	1
45	1	526	0	1007	1	1488	0	1969	1	2450	1
46	0	527	1	1008	0	1489	1	1970	1	2451	1
47	0	528	1	1009	0	1490	1	1971	0	2452	0
48	1	529	1	1010	0	1491	1	1972	1	2453	0
49	0	530	0	1011	1	1492	1	1973	0	2454	0
50	0	531	0	1012	1	1493	1	1974	0	2455	0
51	0	532	0	1013	1	1494	0	1975	1	2456	1
52	1	533	0	1014	0	1495	1	1976	0	2457	0
53	1	534	1	1015	0	1496	0	1977	1	2458	1
54	1	535	1	1016	1	1497	0	1978	0	2459	1
55	1	536	1	1017	0	1498	0	1979	1	2460	0
56	1	537	1	1018	1	1499	1	1980	0	2461	0
57	0	538	0	1019	1	1500	0	1981	1	2462	0
58	0	539	0	1020	1	1501	0	1982	0	2463	1
59	1	540	1	1021	1	1502	0	1983	1	2464	0
60	0	541	0	1022	1	1503	1	1984	1	2465	0
61	1	542	0	1023	1	1504	0	1985	1	2466	0
62	0	543	1	1024	0	1505	0	1986	1	2467	0
63	1	544	1	1025	1	1506	1	1987	1	2468	1
64	1	545	0	1026	1	1507	1	1988	1	2469	0
65	1	546	0	1027	1	1508	0	1989	0	2470	1
66	0	547	1	1028	0	1509	1	1990	1	2471	0
67	0	548	1	1029	0	1510	0	1991	0	2472	1
68	0	549	1	1030	0	1511	1	1992	0	2473	1
69	1	550	1	1031	0	1512	1	1993	0	2474	0
70	1	551	0	1032	1	1513	1	1994	0	2475	1
71	0	552	1	1033	0	1514	1	1995	0	2476	0

72	1	553	1	1034	1	1515	1	1996	1	2477	0
73	1	554	0	1035	0	1516	1	1997	1	2478	1
74	0	555	1	1036	0	1517	0	1998	0	2479	1
75	1	556	0	1037	0	1518	0	1999	1	2480	0
76	1	557	0	1038	0	1519	1	2000	1	2481	0
77	0	558	1	1039	1	1520	1	2001	0	2482	1
78	0	559	1	1040	0	1521	1	2002	0	2483	1
79	1	560	1	1041	0	1522	0	2003	1	2484	1
80	0	561	0	1042	0	1523	1	2004	1	2485	0
81	0	562	1	1043	0	1524	1	2005	0	2486	1
82	0	563	1	1044	1	1525	0	2006	1	2487	1
83	1	564	1	1045	1	1526	0	2007	1	2488	1
84	1	565	1	1046	1	1527	0	2008	1	2489	0
85	1	566	1	1047	0	1528	1	2009	0	2490	1
86	0	567	0	1048	0	1529	0	2010	1	2491	0
87	0	568	1	1049	0	1530	1	2011	0	2492	0
88	1	569	1	1050	1	1531	0	2012	1	2493	0
89	1	570	1	1051	0	1532	0	2013	1	2494	0
90	1	571	0	1052	0	1533	0	2014	0	2495	0
91	0	572	0	1053	1	1534	1	2015	1	2496	0
92	1	573	0	1054	0	1535	1	2016	1	2497	1
93	0	574	1	1055	0	1536	0	2017	0	2498	0
94	0	575	0	1056	0	1537	0	2018	1	2499	1
95	1	576	1	1057	0	1538	1	2019	0	2500	0
96	1	577	1	1058	0	1539	1	2020	1	2501	0
97	0	578	1	1059	0	1540	0	2021	0	2502	0
98	0	579	0	1060	0	1541	0	2022	1	2503	0
99	0	580	0	1061	0	1542	0	2023	1	2504	1
100	0	581	1	1062	1	1543	0	2024	1	2505	1
101	0	582	1	1063	1	1544	0	2025	0	2506	1
102	1	583	1	1064	0	1545	0	2026	1	2507	1
103	1	584	0	1065	0	1546	0	2027	1	2508	0
104	1	585	0	1066	0	1547	0	2028	0	2509	1
105	0	586	1	1067	0	1548	0	2029	1	2510	0
106	1	587	1	1068	0	1549	1	2030	1	2511	1
107	0	588	0	1069	1	1550	1	2031	0	2512	1
108	1	589	0	1070	0	1551	0	2032	1	2513	1
109	1	590	0	1071	0	1552	1	2033	1	2514	1
110	1	591	1	1072	1	1553	1	2034	1	2515	0
111	0	592	0	1073	0	1554	0	2035	0	2516	1
112	0	593	0	1074	1	1555	1	2036	0	2517	0
113	0	594	1	1075	1	1556	1	2037	0	2518	1
114	0	595	0	1076	1	1557	0	2038	0	2519	0
115	0	596	1	1077	1	1558	0	2039	1	2520	1

116	1	597	0	1078	1	1559	1	2040	1	2521	1
117	0	598	1	1079	0	1560	0	2041	1	2522	1
118	0	599	0	1080	0	1561	0	2042	0	2523	0
119	1	600	1	1081	1	1562	0	2043	0	2524	0
120	1	601	0	1082	1	1563	0	2044	1	2525	1
121	0	602	0	1083	1	1564	1	2045	1	2526	1
122	0	603	1	1084	0	1565	1	2046	0	2527	0
123	1	604	1	1085	1	1566	0	2047	0	2528	1
124	1	605	0	1086	1	1567	1	2048	1	2529	0
125	0	606	1	1087	0	1568	1	2049	0	2530	0
126	1	607	0	1088	1	1569	1	2050	0	2531	1
127	0	608	1	1089	1	1570	0	2051	1	2532	0
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129	1	610	0	1091	1	1572	0	2053	1	2534	1
130	0	611	0	1092	1	1573	1	2054	1	2535	1
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132	0	613	1	1094	1	1575	1	2056	0	2537	1
133	0	614	1	1095	1	1576	1	2057	0	2538	1
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135	0	616	0	1097	1	1578	0	2059	1	2540	0
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137	1	618	0	1099	1	1580	1	2061	1	2542	0
138	1	619	0	1100	1	1581	0	2062	1	2543	0
139	1	620	0	1101	0	1582	0	2063	0	2544	0
140	0	621	0	1102	0	1583	0	2064	0	2545	1
141	0	622	1	1103	0	1584	1	2065	0	2546	1
142	1	623	0	1104	0	1585	0	2066	1	2547	1
143	1	624	0	1105	0	1586	0	2067	1	2548	0
144	1	625	0	1106	0	1587	0	2068	1	2549	1
145	0	626	0	1107	1	1588	1	2069	1	2550	0
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147	1	628	0	1109	1	1590	0	2071	0	2552	1
148	0	629	0	1110	1	1591	0	2072	1	2553	1
149	0	630	0	1111	1	1592	0	2073	0	2554	1
150	0	631	1	1112	1	1593	1	2074	1	2555	0
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152	0	633	0	1114	0	1595	0	2076	0	2557	0
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155	0	636	1	1117	0	1598	1	2079	0	2560	1
156	0	637	0	1118	0	1599	1	2080	1	2561	0
157	1	638	1	1119	0	1600	1	2081	0	2562	0
158	0	639	0	1120	1	1601	1	2082	0	2563	1
159	0	640	0	1121	1	1602	0	2083	0	2564	0

160	1	641	1	1122	0	1603	0	2084	0	2565	1
161	1	642	0	1123	0	1604	0	2085	1	2566	0
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163	1	644	0	1125	1	1606	1	2087	1	2568	1
164	1	645	0	1126	0	1607	0	2088	1	2569	1
165	1	646	1	1127	0	1608	1	2089	1	2570	0
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175	0	656	1	1137	0	1618	1	2099	0	2580	1
176	0	657	1	1138	1	1619	1	2100	1	2581	1
177	1	658	1	1139	0	1620	1	2101	0	2582	0
178	1	659	1	1140	0	1621	1	2102	0	2583	0
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180	0	661	1	1142	1	1623	1	2104	1	2585	1
181	0	662	0	1143	0	1624	1	2105	1	2586	1
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186	1	667	1	1148	0	1629	0	2110	0	2591	1
187	0	668	0	1149	0	1630	1	2111	0	2592	1
188	0	669	0	1150	0	1631	1	2112	0	2593	0
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190	0	671	1	1152	0	1633	1	2114	1	2595	1
191	0	672	0	1153	1	1634	0	2115	0	2596	1
192	0	673	1	1154	0	1635	0	2116	0	2597	0
193	0	674	0	1155	0	1636	1	2117	1	2598	1
194	0	675	0	1156	1	1637	1	2118	1	2599	0
195	0	676	0	1157	0	1638	0	2119	1	2600	0
196	0	677	0	1158	0	1639	1	2120	1	2601	0
197	1	678	0	1159	0	1640	1	2121	0	2602	0
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200	1	681	1	1162	1	1643	1	2124	0	2605	0
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202	0	683	0	1164	1	1645	1	2126	0	2607	0
203	1	684	1	1165	0	1646	0	2127	0	2608	0

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205	1	686	1	1167	0	1648	1	2129	0	2610	1
206	1	687	0	1168	0	1649	0	2130	0	2611	1
207	1	688	0	1169	0	1650	0	2131	0	2612	1
208	1	689	1	1170	1	1651	0	2132	0	2613	1
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214	0	695	0	1176	0	1657	1	2138	0	2619	0
215	0	696	0	1177	0	1658	0	2139	1	2620	0
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217	1	698	1	1179	1	1660	1	2141	0	2622	1
218	0	699	1	1180	0	1661	0	2142	0	2623	1
219	0	700	0	1181	0	1662	0	2143	0	2624	0
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225	0	706	0	1187	0	1668	0	2149	1	2630	0
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228	1	709	1	1190	0	1671	0	2152	1	2633	1
229	1	710	1	1191	1	1672	1	2153	0	2634	1
230	0	711	1	1192	0	1673	0	2154	1	2635	0
231	0	712	1	1193	1	1674	1	2155	0	2636	0
232	0	713	1	1194	1	1675	0	2156	1	2637	0
233	1	714	0	1195	0	1676	1	2157	1	2638	1
234	1	715	1	1196	1	1677	1	2158	0	2639	1
235	1	716	1	1197	0	1678	0	2159	1	2640	0
236	1	717	1	1198	0	1679	1	2160	1	2641	1
237	1	718	1	1199	1	1680	0	2161	0	2642	0
238	0	719	0	1200	0	1681	1	2162	0	2643	1
239	0	720	1	1201	1	1682	0	2163	1	2644	0
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242	0	723	1	1204	1	1685	0	2166	1	2647	0
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244	1	725	0	1206	1	1687	0	2168	1	2649	0
245	1	726	0	1207	1	1688	1	2169	0	2650	0
246	1	727	0	1208	0	1689	1	2170	0	2651	1
247	1	728	0	1209	0	1690	1	2171	1	2652	1

248	0	729	1	1210	0	1691	0	2172	1	2653	1
249	1	730	0	1211	1	1692	1	2173	1	2654	0
250	0	731	1	1212	0	1693	1	2174	1	2655	1
251	0	732	1	1213	0	1694	0	2175	1	2656	0
252	0	733	1	1214	0	1695	1	2176	0	2657	0
253	0	734	1	1215	0	1696	1	2177	0	2658	1
254	0	735	1	1216	1	1697	0	2178	1	2659	1
255	0	736	0	1217	1	1698	0	2179	0	2660	0
256	0	737	0	1218	1	1699	0	2180	1	2661	1
257	1	738	1	1219	1	1700	0	2181	1	2662	1
258	0	739	1	1220	0	1701	0	2182	0	2663	0
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260	1	741	1	1222	1	1703	1	2184	0	2665	0
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263	1	744	0	1225	1	1706	0	2187	1	2668	1
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270	1	751	0	1232	0	1713	1	2194	1	2675	1
271	1	752	0	1233	0	1714	1	2195	0	2676	0
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273	0	754	1	1235	0	1716	0	2197	0	2678	1
274	1	755	0	1236	1	1717	1	2198	0	2679	0
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276	0	757	0	1238	1	1719	0	2200	1	2681	0
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281	1	762	0	1243	0	1724	1	2205	0	2686	0
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300	1	781	1	1262	0	1743	0	2224	0	2705	1
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307	1	788	1	1269	1	1750	0	2231	1	2712	1
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326	1	807	0	1288	0	1769	1	2250	0	2731	1
327	1	808	0	1289	1	1770	0	2251	0	2732	0
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339	0	820	0	1301	0	1782	0	2263	1	2744	0
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389	1	870	1	1351	0	1832	1	2313	0	2794	1
390	1	871	0	1352	1	1833	1	2314	0	2795	1
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402	1	883	1	1364	1	1845	1	2326	1	2807	1
403	1	884	1	1365	0	1846	0	2327	1	2808	0
404	0	885	0	1366	0	1847	1	2328	0	2809	0
405	1	886	0	1367	0	1848	0	2329	0	2810	0
406	0	887	1	1368	0	1849	0	2330	0	2811	1
407	0	888	1	1369	0	1850	1	2331	0	2812	1
408	1	889	1	1370	1	1851	0	2332	0	2813	1
409	0	890	0	1371	0	1852	1	2333	1	2814	1
410	1	891	0	1372	1	1853	1	2334	1	2815	0
411	0	892	1	1373	1	1854	0	2335	1	2816	0
412	0	893	1	1374	1	1855	1	2336	0	2817	0
413	0	894	1	1375	1	1856	1	2337	1	2818	0
414	0	895	1	1376	1	1857	1	2338	1	2819	1
415	1	896	0	1377	1	1858	0	2339	1	2820	1
416	1	897	1	1378	0	1859	0	2340	0	2821	0
417	0	898	0	1379	0	1860	1	2341	0	2822	1
418	1	899	1	1380	1	1861	1	2342	1	2823	1
419	1	900	1	1381	1	1862	1	2343	1	2824	0
420	1	901	0	1382	1	1863	0	2344	1	2825	0
421	1	902	1	1383	0	1864	0	2345	0	2826	1
422	0	903	0	1384	1	1865	1	2346	0	2827	1
423	0	904	0	1385	0	1866	1	2347	1	2828	1

424	0	905	1	1386	0	1867	0	2348	0	2829	1
425	0	906	1	1387	0	1868	1	2349	1	2830	0
426	0	907	1	1388	0	1869	1	2350	1	2831	0
427	1	908	1	1389	1	1870	0	2351	1	2832	1
428	1	909	0	1390	1	1871	0	2352	0	2833	1
429	1	910	1	1391	1	1872	1	2353	1	2834	1
430	1	911	0	1392	1	1873	1	2354	1	2835	0
431	1	912	1	1393	0	1874	0	2355	1	2836	1
432	1	913	1	1394	0	1875	1	2356	0	2837	0
433	1	914	1	1395	1	1876	0	2357	1	2838	1
434	0	915	1	1396	0	1877	1	2358	0	2839	0
435	1	916	1	1397	0	1878	1	2359	0	2840	1
436	0	917	0	1398	1	1879	1	2360	0	2841	1
437	0	918	1	1399	0	1880	1	2361	0	2842	1
438	0	919	0	1400	1	1881	1	2362	0	2843	0
439	0	920	0	1401	1	1882	1	2363	0	2844	1
440	1	921	1	1402	1	1883	0	2364	1	2845	1
441	1	922	0	1403	1	1884	0	2365	0	2846	0
442	1	923	0	1404	1	1885	1	2366	1	2847	1
443	0	924	1	1405	0	1886	0	2367	0	2848	0
444	1	925	0	1406	1	1887	1	2368	0	2849	1
445	0	926	0	1407	1	1888	0	2369	0	2850	1
446	0	927	0	1408	1	1889	0	2370	1	2851	0
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454	0	935	0	1416	0	1897	1	2378	0	2859	0
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456	1	937	1	1418	0	1899	0	2380	0	2861	0
457	1	938	0	1419	0	1900	1	2381	0	2862	1
458	0	939	1	1420	1	1901	0	2382	1	2863	1
459	1	940	1	1421	0	1902	0	2383	0	2864	0
460	0	941	0	1422	0	1903	0	2384	1	2865	1
461	1	942	1	1423	0	1904	0	2385	1	2866	0
462	0	943	0	1424	0	1905	0	2386	1	2867	1
463	0	944	1	1425	0	1906	1	2387	0	2868	0
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465	0	946	0	1427	1	1908	0	2389	1	2870	1
466	0	947	1	1428	1	1909	1	2390	0	2871	0
467	0	948	0	1429	1	1910	0	2391	0	2872	1

468	0	949	0	1430	0	1911	1	2392	1	2873	1
469	0	950	0	1431	0	1912	1	2393	0	2874	0
470	0	951	1	1432	1	1913	0	2394	0	2875	1
471	1	952	1	1433	1	1914	0	2395	1	2876	0
472	1	953	0	1434	1	1915	0	2396	1	2877	1
473	0	954	1	1435	0	1916	0	2397	1	2878	0
474	0	955	0	1436	1	1917	0	2398	0	2879	0
475	0	956	1	1437	0	1918	1	2399	0		
476	1	957	1	1438	0	1919	1	2400	0		
477	1	958	0	1439	0	1920	0	2401	1		
478	0	959	1	1440	1	1921	1	2402	1		
479	0	960	0	1441	1	1922	1	2403	0		
480	1	961	0	1442	1	1923	0	2404	1		

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