PROOF OF THE CONTINUED FRACTION CONJECTURE FOR $(a,b)=(z^5+z^4+z, z^2+z)$

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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 $(a,b)=(z^5+z^4+z, z^2+z)$.

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* $(a,b)=(z^5+z^4+z, z^2+z)$*, 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 $\mathrm{CF}(a,b)$*,*

$$\begin{aligned}
p_0(z)&=z^{15}+z^{13}+z^{11}+z^{10}+z^9+z^8+z^3+1,\\
p_1(z)&=z^{20}+z^{19}+z^{18}+z^{16}+z^{15}+z^{12}+z^{11}+z^9+z^5+z^4,\\
p_2(z)&=z^{22}+z^{18}+z^{16}+z^{10}+z^8+z^4,\\
p_3(z)&=z^{20}+z^{19}+z^{18}+z^{16}+z^{15}+z^{12}+z^{11}+z^9+z^5+z^4,\\
p_4(z)&=z^{18}+z^{16}+z^{15}+z^{13}+z^{11}+z^{10}+z^9+z^6+z^4+z^3+1,
\end{aligned}$$

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

$$\begin{aligned}
p_0(z)&=z^{15}+z^{14}+z^{13}+z^{11}+z^9+z^8+z^3+z^2+1,\\
p_1(z)&=z^{20}+z^{19}+z^{18}+z^{16}+z^{15}+z^{12}+z^{11}+z^9+z^5+z^4,\\
p_2(z)&=z^{22}+z^{18}+z^{16}+z^{10}+z^8+z^4,\\
p_3(z)&=z^{20}+z^{19}+z^{18}+z^{16}+z^{15}+z^{12}+z^{11}+z^9+z^5+z^4,\\
p_4(z)&=z^{18}+z^{16}+z^{15}+z^{14}+z^{13}+z^{11}+z^9+z^6+z^4+z^3+z^2+1.
\end{aligned}$$

2. Proof

Define the sequences of polynomials $(P_n(z))_{n\ge0}$ and $(Q_n(z))_{n\ge0}$ 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 $n\ge0$

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

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. $\square$

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.*

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

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

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

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

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 $u = 2^{2k}$,

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

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

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

which can be rewritten as

$$0 = T[[10w]_2] + T[[101w]_2] + T[[111w]_2], \tag{2.7}$$
$$0 = T[[11w]_2] + T[[110w]_2] + T[[1000w]_2], \tag{2.8}$$
$$0 = T[[w]_2] + T[[10w]_2] + T[[100w]_2] + T[[101w]_2] + T[[1001w]_2], \tag{2.9}$$
$$\begin{aligned} 0 = {} & T[[w]_2] + T[[1w]_2] + T[[11w]_2] + T[[101w]_2] + T[[110w]_2] \\ & + T[[1010w]_2], \end{aligned} \tag{2.10}$$
$$0 = T[[1w]_2] + T[[100w]_2] + T[[101w]_2] + T[[110w]_2] + T[[1011w]_2], \tag{2.11}$$
$$0 = T[[w]_2] + T[[110w]_2] + T[[1100w]_2], \tag{2.12}$$
$$0 = T[[1w]_2] + T[[10w]_2] + T[[101w]_2] + T[[1101w]_2], \tag{2.13}$$

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

$$0 = T[[10w]_2] + T[[101w]_2] + T[[111w]_2], \tag{2.14}$$
$$0 = T[[11w]_2] + T[[110w]_2] + T[[1000w]_2], \tag{2.15}$$
$$0 = T[[w]_2] + T[[10w]_2] + T[[100w]_2] + T[[101w]_2] + T[[1001w]_2], \tag{2.16}$$
$$\begin{aligned} 0 = {} & T[[w]_2] + T[[1w]_2] + T[[11w]_2] + T[[101w]_2] + T[[110w]_2] \\ & + T[[1010w]_2], \end{aligned} \tag{2.17}$$
$$0 = T[[1w]_2] + T[[100w]_2] + T[[101w]_2] + T[[110w]_2] + T[[1011w]_2], \tag{2.18}$$
$$0 = T[[w]_2] + T[[110w]_2] + T[[1100w]_2], \tag{2.19}$$
$$0 = T[[1w]_2] + T[[10w]_2] + T[[101w]_2] + T[[1101w]_2], \tag{2.20}$$

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

First we calculate an 2-automaton that generates T from its minimal polynomial and its first terms. This automaton has 2854 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

$$0 = \tau(A(s, 10)) + \tau(A(s, 101)) + \tau(A(s, 111)), \tag{2.21}$$
$$0 = \tau(A(s, 11)) + \tau(A(s, 110)) + \tau(A(s, 1000)), \tag{2.22}$$
$$\begin{aligned} 0 = {} & \tau(A(s, \epsilon)) + \tau(A(s, 10)) + \tau(A(s, 100)) + \tau(A(s, 101)) \\ & + \tau(A(s, 1001)), \end{aligned} \tag{2.23}$$
$$\begin{aligned} 0 = {} & \tau(A(s, \epsilon)) + \tau(A(s, 1)) + \tau(A(s, 11)) + \tau(A(s, 101)) \\ & + \tau(A(s, 110)) + \tau(A(s, 1010)), \end{aligned} \tag{2.24}$$
$$\begin{aligned} 0 = {} & \tau(A(s, 1)) + \tau(A(s, 100)) + \tau(A(s, 101)) + \tau(A(s, 110)) \\ & + \tau(A(s, 1011)), \end{aligned} \tag{2.25}$$
$$0 = \tau(A(s, \epsilon)) + \tau(A(s, 110)) + \tau(A(s, 1100)), \tag{2.26}$$
$$0 = \tau(A(s, 1)) + \tau(A(s, 10)) + \tau(A(s, 101)) + \tau(A(s, 1101)), \tag{2.27}$$

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

$$0 = \tau(A(s, 10)) + \tau(A(s, 101)) + \tau(A(s, 111)), \tag{2.28}$$

$$0 = \tau(A(s,11)) + \tau(A(s,110)) + \tau(A(s,1000)), \tag{2.29}$$

$$\begin{aligned}0 = {} & \tau(A(s,\epsilon)) + \tau(A(s,10)) + \tau(A(s,100)) + \tau(A(s,101)) \\ & + \tau(A(s,1001)),\end{aligned} \tag{2.30}$$

$$\begin{aligned}0 = {} & \tau(A(s,\epsilon)) + \tau(A(s,1)) + \tau(A(s,11)) + \tau(A(s,101)) \\ & + \tau(A(s,110)) + \tau(A(s,1010)),\end{aligned} \tag{2.31}$$

$$\begin{aligned}0 = {} & \tau(A(s,1)) + \tau(A(s,100)) + \tau(A(s,101)) + \tau(A(s,110)) \\ & + \tau(A(s,1011)),\end{aligned} \tag{2.32}$$

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

$$0 = \tau(A(s,1)) + \tau(A(s,10)) + \tau(A(s,101)) + \tau(A(s,1101)), \tag{2.34}$$

for $s = A(i, 0^{2k})$. We find that $(A(i, 0^{46}), E_{46}) = (A(i, 0^{22}), E_{22})$, so that we only have to verify that identities (2.21) through (2.34) hold for $2 \le k \le 23$, 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 $u = 2^{2k-1}$,*

$$\begin{aligned}M_{2k} &= M^e[:7u] + x^{2u} M^e[:5u] + x^{5u} M^e[:2u] + x^{7u} R^e, \\ W_{2k} &= W^e[:7u] + x^{2u} W^e[:5u] + x^{5u} W^e[:2u] + x^{7u} R^e.\end{aligned}$$

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

$$\begin{aligned}M_{2k+1} &= M^o[:7u] + x^{2u} M^o[:5u] + x^{5u} M^o[:2u] + x^{7u} R^o, \\ W_{2k+1} &= W^o[:7u] + x^{2u} W^o[:5u] + x^{5u} W^o[:2u] + x^{7u} R^o.\end{aligned}$$

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

$$\begin{aligned}M_{2k} \wedge W_{2k} &\Rightarrow M_{2k+1} \wedge W_{2k+1}, \\ M_{2k+1} \wedge W_{2k+1} &\Rightarrow M_{2k+2} \wedge W_{2k+2}.\end{aligned}$$

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

$$\begin{aligned}W_{2k} M_{2k} = {} & \big(W^e[:7v] + x^{2v} W^e[:5v] + x^{5v} W^e[:2v] + x^{7u} R^e\big) \times \big(M^e[:7v] \\ & + x^{2v} M^e[:5v] + x^{5v} M^e[:2v] + x^{7u} R^e\big);\end{aligned} \tag{2.35}$$

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

$$W^e[:14v] M^e[:14v] + x^{4v} W^e[:10v] M^e[:10v] + x^{10v} W^e[:4v] M^e[:4v].$$

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

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

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

$$\begin{aligned} q_0(x) &= x^{22} + x^{19} + x^{14} + x^{13} + x^{12} + x^{11} + x^9 + x^7, \\ q_1(x) &= x^{18} + x^{17} + x^{13} + x^{11} + x^{10} + x^7 + x^6 + x^4 + x^3 + x^2, \\ q_2(x) &= x^{18} + x^{14} + x^{12} + x^6 + x^4 + 1, \\ q_3(x) &= x^{18} + x^{17} + x^{13} + x^{11} + x^{10} + x^7 + x^6 + x^4 + x^3 + x^2, \\ q_4(x) &= x^{22} + x^{19} + x^{18} + x^{16} + x^{13} + x^{12} + x^{11} + x^9 + x^7 + x^6 + x^4. \end{aligned}$$

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

$$\begin{aligned}
p_0(x) &= x^{108}+x^{96}+x^{86}+x^{84}+x^{82}+x^{80}+x^{72}+x^{64}+x^{62}+x^{58}+x^{44}\\
&\quad +x^{42}+x^{40}+x^{38}+x^{36}+x^{34}+x^{28}+x^{26}+x^{24},\\
p_3(x) &= x^{92}+x^{90}+x^{86}+x^{82}+x^{78}+x^{76}+x^{72}+x^{62}+x^{60}+x^{58}+x^{56}\\
&\quad +x^{54}+x^{48}+x^{46}+x^{44}+x^{32}+x^{30}+x^{22}+x^{20}+x^{16},\\
p_6(x) &= x^{90}+x^{82}+x^{78}+x^{74}+x^{68}+x^{66}+x^{58}+x^{50}+x^{48}+x^{46}+x^{42}\\
&\quad +x^{36}+x^{30}+x^{26}+x^{24}+x^{22}+x^{20}+x^{18}+x^{16}+x^{14}+x^{12}+x^{10}\\
&\quad +x^{8}+x^{4}+x^{2}+1,\\
p_9(x) &= x^{82}+x^{80}+x^{74}+x^{72}+x^{68}+x^{62}+x^{60}+x^{58}+x^{48}+x^{46}+x^{40}\\
&\quad +x^{32}+x^{30}+x^{28}+x^{26}+x^{22}+x^{8}+x^{4},\\
p_{12}(x) &= x^{80}+x^{74}+x^{66}+x^{58}+x^{50}+x^{48}+x^{16}+x^{10}+x^{2}+1,
\end{aligned}$$

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

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

$$\begin{aligned}
p_0(x) &= x^{117}+x^{116}+x^{114}+x^{112}+x^{110}+x^{109}+x^{108}+x^{105}+x^{104}+x^{102}\\
&\quad +x^{100}+x^{99}+x^{98}+x^{97}+x^{95}+x^{94}+x^{92}+x^{90}+x^{85}+x^{84}+x^{82}\\
&\quad +x^{81}+x^{76}+x^{74}+x^{73}+x^{72}+x^{67}+x^{64}+x^{63}+x^{62}+x^{59}+x^{56}\\
&\quad +x^{49}+x^{48}+x^{46}+x^{44}+x^{40}+x^{39}+x^{38}+x^{37}+x^{36}+x^{35}+x^{33},\\
p_3(x) &= x^{95}+x^{93}+x^{92}+x^{91}+x^{88}+x^{86}+x^{85}+x^{84}+x^{79}+x^{76}+x^{75}\\
&\quad +x^{74}+x^{69}+x^{66}+x^{64}+x^{63}+x^{62}+x^{61}+x^{59}+x^{58}+x^{47}+x^{45}\\
&\quad +x^{44}+x^{43}+x^{40}+x^{38}+x^{37}+x^{36}+x^{29}+x^{26}+x^{24}+x^{23}+x^{22}\\
&\quad +x^{21}+x^{19}+x^{18},\\
p_6(x) &= x^{93}+x^{92}+x^{91}+x^{86}+x^{83}+x^{82}+x^{81}+x^{76}+x^{75}+x^{74}+x^{73}\\
&\quad +x^{71}+x^{70}+x^{69}+x^{68}+x^{64}+x^{63}+x^{62}+x^{61}+x^{59}+x^{58}+x^{55}\\
&\quad +x^{53}+x^{48}+x^{47}+x^{46}+x^{45}+x^{41}+x^{39}+x^{35}+x^{32}+x^{30}+x^{27}\\
&\quad +x^{26}+x^{24}+x^{23}+x^{20}+x^{19}+x^{17}+x^{12},\\
p_9(x) &= x^{91}+x^{88}+x^{86}+x^{85}+x^{84}+x^{73}+x^{71}+x^{70}+x^{69}+x^{66}+x^{65}\\
&\quad +x^{64}+x^{63}+x^{61}+x^{60}+x^{57}+x^{54}+x^{52}+x^{51}+x^{50}+x^{47}+x^{45}\\
&\quad +x^{44}+x^{39}+x^{36}+x^{34}+x^{32}+x^{31}+x^{30}+x^{29}+x^{26}+x^{25}+x^{24}\\
&\quad +x^{17}+x^{15}+x^{14}+x^{11}+x^{8}+x^{7}+x^{6},
\end{aligned}$$

$$\begin{aligned}
p_{12}(x) = {} & x^{89}+x^{88}+x^{86}+x^{85}+x^{82}+x^{80}+x^{77}+x^{76}+x^{74}+x^{73}+x^{70} \\
& +x^{68}+x^{61}+x^{60}+x^{58}+x^{56}+x^{53}+x^{52}+x^{50}+x^{48}+x^{25}+x^{24} \\
& +x^{22}+x^{21}+x^{18}+x^{16}+x^{13}+x^{12}+x^{10}+x^{8}+x^{5}+x^{4}+x^{2}+1,
\end{aligned}$$

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

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

$$\begin{aligned}
p_{0}(x) = {} & x^{117}+x^{116}+x^{114}+x^{112}+x^{110}+x^{109}+x^{108}+x^{105}+x^{104}+x^{102} \\
& +x^{100}+x^{99}+x^{98}+x^{97}+x^{95}+x^{94}+x^{92}+x^{90}+x^{85}+x^{84}+x^{82} \\
& +x^{81}+x^{76}+x^{74}+x^{73}+x^{72}+x^{67}+x^{64}+x^{63}+x^{62}+x^{59}+x^{56} \\
& +x^{49}+x^{48}+x^{46}+x^{44}+x^{40}+x^{39}+x^{38}+x^{37}+x^{36}+x^{35}+x^{33}, \\
p_{3}(x) = {} & x^{95}+x^{93}+x^{92}+x^{91}+x^{88}+x^{86}+x^{85}+x^{84}+x^{79}+x^{76}+x^{75} \\
& +x^{74}+x^{69}+x^{66}+x^{64}+x^{63}+x^{62}+x^{61}+x^{59}+x^{58}+x^{47}+x^{45} \\
& +x^{44}+x^{43}+x^{40}+x^{38}+x^{37}+x^{36}+x^{29}+x^{26}+x^{24}+x^{23}+x^{22} \\
& +x^{21}+x^{19}+x^{18}, \\
p_{6}(x) = {} & x^{93}+x^{92}+x^{91}+x^{86}+x^{83}+x^{82}+x^{81}+x^{76}+x^{75}+x^{74}+x^{73} \\
& +x^{71}+x^{70}+x^{69}+x^{68}+x^{64}+x^{63}+x^{62}+x^{61}+x^{59}+x^{58}+x^{55} \\
& +x^{53}+x^{48}+x^{47}+x^{46}+x^{45}+x^{41}+x^{39}+x^{35}+x^{32}+x^{30}+x^{27} \\
& +x^{26}+x^{24}+x^{23}+x^{20}+x^{19}+x^{17}+x^{12}, \\
p_{9}(x) = {} & x^{91}+x^{88}+x^{86}+x^{85}+x^{84}+x^{73}+x^{71}+x^{70}+x^{69}+x^{66}+x^{65} \\
& +x^{64}+x^{63}+x^{61}+x^{60}+x^{57}+x^{54}+x^{52}+x^{51}+x^{50}+x^{47}+x^{45} \\
& +x^{44}+x^{39}+x^{36}+x^{34}+x^{32}+x^{31}+x^{30}+x^{29}+x^{26}+x^{25}+x^{24} \\
& +x^{17}+x^{15}+x^{14}+x^{11}+x^{8}+x^{7}+x^{6}, \\
p_{12}(x) = {} & x^{89}+x^{88}+x^{86}+x^{85}+x^{82}+x^{80}+x^{77}+x^{76}+x^{74}+x^{73}+x^{70} \\
& +x^{68}+x^{61}+x^{60}+x^{58}+x^{56}+x^{53}+x^{52}+x^{50}+x^{48}+x^{25}+x^{24} \\
& +x^{22}+x^{21}+x^{18}+x^{16}+x^{13}+x^{12}+x^{10}+x^{8}+x^{5}+x^{4}+x^{2}+1,
\end{aligned}$$

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

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

$$\begin{aligned}
p_{0}(x) = {} & x^{126}+x^{124}+x^{120}+x^{116}+x^{114}+x^{110}+x^{100}+x^{96}+x^{86}+x^{84} \\
& +x^{82}+x^{78}+x^{72}+x^{70}+x^{66}+x^{60}+x^{50}+x^{48}+x^{46}+x^{44}+x^{42}, \\
p_{3}(x) = {} & x^{110}+x^{106}+x^{98}+x^{96}+x^{94}+x^{88}+x^{84}+x^{80}+x^{74}+x^{66}+x^{62} \\
& +x^{54}+x^{48}+x^{46}+x^{42}+x^{40}+x^{34}+x^{30}+x^{28}+x^{26}+x^{18}+x^{12}, \\
p_{6}(x) = {} & x^{108}+x^{106}+x^{102}+x^{100}+x^{96}+x^{92}+x^{70}+x^{68}+x^{66}+x^{60}+x^{52} \\
& +x^{50}+x^{46}+x^{44}+x^{42}+x^{34}+x^{22}+x^{20}+x^{18}+x^{14}+x^{8}+x^{4}+x^{2} \\
& +1, \\
p_{9}(x) = {} & x^{100}+x^{96}+x^{94}+x^{92}+x^{90}+x^{86}+x^{84}+x^{82}+x^{78}+x^{72}+x^{66} \\
& +x^{64}+x^{62}+x^{60}+x^{58}+x^{56}+x^{52}+x^{50}+x^{48}+x^{46}+x^{44}+x^{40}
\end{aligned}$$

$$+ x^{34} + x^{32} + x^{30} + x^{26} + x^{22} + x^{20} + x^{14} + x^{12} + x^{8} + x^{4},$$
$$p_{12}(x) = x^{98} + x^{96} + x^{82} + x^{80} + x^{74} + x^{72} + x^{66} + x^{64} + x^{58} + x^{56} + x^{50} + x^{48} + x^{34} + x^{32} + x^{10} + x^{8} + x^{2} + 1,$$

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

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

$$p_0(x) = x^{126} + x^{124} + x^{122} + x^{116} + x^{106} + x^{104} + x^{102} + x^{100} + x^{94} + x^{90} + x^{88} + x^{86} + x^{84} + x^{78} + x^{76} + x^{70} + x^{68} + x^{64} + x^{62} + x^{60} + x^{58} + x^{54} + x^{52} + x^{50} + x^{48} + x^{40} + x^{28} + x^{26} + x^{24},$$
$$p_3(x) = x^{110} + x^{98} + x^{94} + x^{90} + x^{86} + x^{78} + x^{68} + x^{66} + x^{64} + x^{60} + x^{40} + x^{36} + x^{32} + x^{24} + x^{22} + x^{16},$$
$$p_6(x) = x^{108} + x^{106} + x^{104} + x^{92} + x^{90} + x^{88} + x^{82} + x^{78} + x^{74} + x^{68} + x^{66} + x^{64} + x^{62} + x^{58} + x^{56} + x^{54} + x^{52} + x^{50} + x^{48} + x^{44} + x^{38} + x^{34} + x^{26} + x^{24} + x^{22} + x^{16} + x^{10} + x^{4} + x^{2} + 1,$$
$$p_9(x) = x^{100} + x^{96} + x^{94} + x^{92} + x^{90} + x^{86} + x^{84} + x^{82} + x^{78} + x^{72} + x^{66} + x^{64} + x^{62} + x^{60} + x^{58} + x^{56} + x^{52} + x^{50} + x^{48} + x^{46} + x^{44} + x^{40} + x^{34} + x^{32} + x^{30} + x^{26} + x^{22} + x^{20} + x^{14} + x^{12} + x^{8} + x^{4},$$
$$p_{12}(x) = x^{98} + x^{96} + x^{82} + x^{80} + x^{74} + x^{72} + x^{66} + x^{64} + x^{58} + x^{56} + x^{50} + x^{48} + x^{34} + x^{32} + x^{10} + x^{8} + x^{2} + 1,$$

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

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

$$p_0(x) = x^{117} + x^{116} + x^{114} + x^{113} + x^{111} + x^{110} + x^{104} + x^{103} + x^{100} + x^{98} + x^{97} + x^{95} + x^{94} + x^{91} + x^{85} + x^{84} + x^{83} + x^{80} + x^{79} + x^{77} + x^{76} + x^{73} + x^{72} + x^{71} + x^{69} + x^{65} + x^{64} + x^{61} + x^{60} + x^{54} + x^{53} + x^{51} + x^{49} + x^{47} + x^{45} + x^{43} + x^{41} + x^{34} + x^{33},$$
$$p_3(x) = x^{95} + x^{93} + x^{92} + x^{91} + x^{88} + x^{86} + x^{85} + x^{84} + x^{79} + x^{76} + x^{75} + x^{74} + x^{69} + x^{66} + x^{64} + x^{63} + x^{62} + x^{61} + x^{59} + x^{58} + x^{47} + x^{45} + x^{44} + x^{43} + x^{40} + x^{38} + x^{37} + x^{36} + x^{29} + x^{26} + x^{24} + x^{23} + x^{22} + x^{21} + x^{19} + x^{18},$$
$$p_6(x) = x^{93} + x^{92} + x^{91} + x^{86} + x^{83} + x^{82} + x^{81} + x^{76} + x^{75} + x^{74} + x^{73} + x^{71} + x^{70} + x^{69} + x^{68} + x^{64} + x^{63} + x^{62} + x^{61} + x^{59} + x^{58} + x^{55} + x^{53} + x^{48} + x^{47} + x^{46} + x^{45} + x^{41} + x^{39} + x^{35} + x^{32} + x^{30} + x^{27} + x^{26} + x^{24} + x^{23} + x^{20} + x^{19} + x^{17} + x^{12},$$
$$p_9(x) = x^{91} + x^{88} + x^{86} + x^{85} + x^{84} + x^{73} + x^{71} + x^{70} + x^{69} + x^{66} + x^{65} + x^{64} + x^{63} + x^{61} + x^{60} + x^{57} + x^{54} + x^{52} + x^{51} + x^{50} + x^{47} + x^{45} + x^{44} + x^{39} + x^{36} + x^{34} + x^{32} + x^{31} + x^{30} + x^{29} + x^{26} + x^{25} + x^{24}$$

$$
\begin{aligned}
&+ x^{17} + x^{15} + x^{14} + x^{11} + x^{8} + x^{7} + x^{6},\\
p_{12}(x) &= x^{89} + x^{88} + x^{86} + x^{85} + x^{82} + x^{80} + x^{77} + x^{76} + x^{74} + x^{73} + x^{70}\\
&+ x^{68} + x^{61} + x^{60} + x^{58} + x^{56} + x^{53} + x^{52} + x^{50} + x^{48} + x^{25} + x^{24}\\
&+ x^{22} + x^{21} + x^{18} + x^{16} + x^{13} + x^{12} + x^{10} + x^{8} + x^{5} + x^{4} + x^{2} + 1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_{0}(x) &= x^{117} + x^{116} + x^{114} + x^{113} + x^{111} + x^{110} + x^{104} + x^{103} + x^{100} + x^{98}\\
&+ x^{97} + x^{95} + x^{94} + x^{91} + x^{85} + x^{84} + x^{83} + x^{80} + x^{79} + x^{77} + x^{76}\\
&+ x^{73} + x^{72} + x^{71} + x^{69} + x^{65} + x^{64} + x^{61} + x^{60} + x^{54} + x^{53} + x^{51}\\
&+ x^{49} + x^{47} + x^{45} + x^{43} + x^{41} + x^{34} + x^{33},\\
p_{3}(x) &= x^{95} + x^{93} + x^{92} + x^{91} + x^{88} + x^{86} + x^{85} + x^{84} + x^{79} + x^{76} + x^{75}\\
&+ x^{74} + x^{69} + x^{66} + x^{64} + x^{63} + x^{62} + x^{61} + x^{59} + x^{58} + x^{47} + x^{45}\\
&+ x^{44} + x^{43} + x^{40} + x^{38} + x^{37} + x^{36} + x^{29} + x^{26} + x^{24} + x^{23} + x^{22}\\
&+ x^{21} + x^{19} + x^{18},\\
p_{6}(x) &= x^{93} + x^{92} + x^{91} + x^{86} + x^{83} + x^{82} + x^{81} + x^{76} + x^{75} + x^{74} + x^{73}\\
&+ x^{71} + x^{70} + x^{69} + x^{68} + x^{64} + x^{63} + x^{62} + x^{61} + x^{59} + x^{58} + x^{55}\\
&+ x^{53} + x^{48} + x^{47} + x^{46} + x^{45} + x^{41} + x^{39} + x^{35} + x^{32} + x^{30} + x^{27}\\
&+ x^{26} + x^{24} + x^{23} + x^{20} + x^{19} + x^{17} + x^{12},\\
p_{9}(x) &= x^{91} + x^{88} + x^{86} + x^{85} + x^{84} + x^{73} + x^{71} + x^{70} + x^{69} + x^{66} + x^{65}\\
&+ x^{64} + x^{63} + x^{61} + x^{60} + x^{57} + x^{54} + x^{52} + x^{51} + x^{50} + x^{47} + x^{45}\\
&+ x^{44} + x^{39} + x^{36} + x^{34} + x^{32} + x^{31} + x^{30} + x^{29} + x^{26} + x^{25} + x^{24}\\
&+ x^{17} + x^{15} + x^{14} + x^{11} + x^{8} + x^{7} + x^{6},\\
p_{12}(x) &= x^{89} + x^{88} + x^{86} + x^{85} + x^{82} + x^{80} + x^{77} + x^{76} + x^{74} + x^{73} + x^{70}\\
&+ x^{68} + x^{61} + x^{60} + x^{58} + x^{56} + x^{53} + x^{52} + x^{50} + x^{48} + x^{25} + x^{24}\\
&+ x^{22} + x^{21} + x^{18} + x^{16} + x^{13} + x^{12} + x^{10} + x^{8} + x^{5} + x^{4} + x^{2} + 1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_{0}(x) &= x^{108} + x^{104} + x^{98} + x^{94} + x^{92} + x^{88} + x^{78} + x^{76} + x^{74} + x^{72} + x^{60}\\
&+ x^{58} + x^{54} + x^{52} + x^{48} + x^{46} + x^{42},\\
p_{3}(x) &= x^{92} + x^{90} + x^{88} + x^{84} + x^{82} + x^{68} + x^{66} + x^{56} + x^{54} + x^{50} + x^{46}\\
&+ x^{44} + x^{42} + x^{40} + x^{34} + x^{32} + x^{24} + x^{22} + x^{18} + x^{12},\\
p_{6}(x) &= x^{90} + x^{86} + x^{78} + x^{76} + x^{70} + x^{56} + x^{52} + x^{50} + x^{42} + x^{40} + x^{38}\\
&+ x^{36} + x^{32} + x^{30} + x^{26} + x^{16} + x^{12} + x^{4} + x^{2} + 1,\\
p_{9}(x) &= x^{82} + x^{80} + x^{74} + x^{72} + x^{68} + x^{62} + x^{60} + x^{58} + x^{48} + x^{46} + x^{40}\\
&+ x^{32} + x^{30} + x^{28} + x^{26} + x^{22} + x^{8} + x^{4},
\end{aligned}
$$

$$p_{12}(x) = x^{80} + x^{74} + x^{66} + x^{58} + x^{50} + x^{48} + x^{16} + x^{10} + x^2 + 1,$$

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

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

$$\begin{aligned}
p_0(x) &= x^{117} + x^{116} + x^{115} + x^{112} + x^{111} + x^{110} + x^{109} + x^{107} + x^{106} + x^{105} \\
&\quad + x^{103} + x^{92} + x^{90} + x^{85} + x^{82} + x^{81} + x^{74} + x^{72} + x^{71} + x^{70} + x^{65} \\
&\quad + x^{64} + x^{63} + x^{61} + x^{59} + x^{58} + x^{57} + x^{56} + x^{52} + x^{47} + x^{44} + x^{41} \\
&\quad + x^{40} + x^{37} + x^{31} + x^{29} + x^{28} + x^{26} + x^{24}, \\
p_3(x) &= x^{101} + x^{100} + x^{99} + x^{97} + x^{95} + x^{93} + x^{92} + x^{85} + x^{82} + x^{79} + x^{78} \\
&\quad + x^{76} + x^{75} + x^{74} + x^{72} + x^{71} + x^{70} + x^{68} + x^{65} + x^{64} + x^{63} + x^{61} \\
&\quad + x^{59} + x^{57} + x^{56} + x^{55} + x^{54} + x^{53} + x^{52} + x^{47} + x^{44} + x^{42} + x^{41} \\
&\quad + x^{39} + x^{36} + x^{35} + x^{33} + x^{31} + x^{29} + x^{28} + x^{27} + x^{25} + x^{24} + x^{23} \\
&\quad + x^{22} + x^{21} + x^{18} + x^{16}, \\
p_6(x) &= x^{97} + x^{96} + x^{95} + x^{92} + x^{88} + x^{86} + x^{85} + x^{84} + x^{83} + x^{82} + x^{81} \\
&\quad + x^{80} + x^{79} + x^{78} + x^{75} + x^{74} + x^{73} + x^{72} + x^{66} + x^{62} + x^{60} + x^{55} \\
&\quad + x^{54} + x^{52} + x^{51} + x^{50} + x^{49} + x^{48} + x^{46} + x^{45} + x^{44} + x^{42} + x^{41} \\
&\quad + x^{40} + x^{39} + x^{36} + x^{31} + x^{30} + x^{28} + x^{25} + x^{23} + x^{22} + x^{20} + x^{18} \\
&\quad + x^{16} + x^{15} + x^5 + x^4 + x^2 + 1, \\
p_9(x) &= x^{89} + x^{88} + x^{86} + x^{84} + x^{81} + x^{80} + x^{78} + x^{77} + x^{74} + x^{73} + x^{70} \\
&\quad + x^{68} + x^{65} + x^{64} + x^{62} + x^{61} + x^{58} + x^{56} + x^{25} + x^{24} + x^{22} + x^{20} \\
&\quad + x^{17} + x^{16} + x^{14} + x^{13} + x^{10} + x^8, \\
p_{12}(x) &= x^{85} + x^{84} + x^{82} + x^{81} + x^{78} + x^{76} + x^{65} + x^{64} + x^{62} + x^{60} + x^{53} \\
&\quad + x^{52} + x^{50} + x^{48} + x^{21} + x^{20} + x^{18} + x^{17} + x^{14} + x^{12} + x^5 + x^4 + x^2 \\
&\quad + 1,
\end{aligned}$$

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

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

$$\begin{aligned}
p_0(x) &= x^{128} + x^{126} + x^{124} + x^{123} + x^{121} + x^{119} + x^{116} + x^{114} + x^{113} + x^{109} \\
&\quad + x^{106} + x^{103} + x^{95} + x^{94} + x^{93} + x^{89} + x^{87} + x^{86} + x^{83} + x^{82} + x^{80} \\
&\quad + x^{79} + x^{78} + x^{76} + x^{75} + x^{74} + x^{72} + x^{71} + x^{70} + x^{69} + x^{66} + x^{65} \\
&\quad + x^{64} + x^{63} + x^{62} + x^{60} + x^{59} + x^{58} + x^{57} + x^{56} + x^{52} + x^{51} + x^{49} \\
&\quad + x^{48} + x^{46} + x^{45} + x^{43} + x^{38} + x^{36} + x^{33}, \\
p_3(x) &= x^{108} + x^{107} + x^{103} + x^{102} + x^{99} + x^{98} + x^{97} + x^{96} + x^{94} + x^{90} + x^{89} \\
&\quad + x^{87} + x^{86} + x^{85} + x^{83} + x^{80} + x^{79} + x^{78} + x^{77} + x^{73} + x^{70} + x^{69} \\
&\quad + x^{67} + x^{65} + x^{64} + x^{63} + x^{62} + x^{58} + x^{55} + x^{54} + x^{51} + x^{50} + x^{49} \\
&\quad + x^{48} + x^{46} + x^{44} + x^{43} + x^{42} + x^{41} + x^{37} + x^{36} + x^{35} + x^{34} + x^{33} \\
&\quad + x^{30} + x^{29} + x^{27} + x^{25} + x^{24} + x^{23} + x^{22} + x^{20} + x^{19} + x^{18},
\end{aligned}$$

$$
\begin{aligned}
p_6(x) &= x^{104} + x^{102} + x^{94} + x^{90} + x^{88} + x^{84} + x^{78} + x^{76} + x^{70} + x^{62} + x^{60} \\
&\quad + x^{58} + x^{48} + x^{44} + x^{42} + x^{36} + x^{34} + x^{28} + x^{26} + x^{16} + x^{14} + x^{12}, \\
p_9(x) &= x^{100} + x^{99} + x^{98} + x^{97} + x^{95} + x^{94} + x^{93} + x^{92} + x^{91} + x^{89} + x^{88} \\
&\quad + x^{85} + x^{83} + x^{82} + x^{81} + x^{80} + x^{79} + x^{77} + x^{75} + x^{74} + x^{72} + x^{71} \\
&\quad + x^{70} + x^{69} + x^{68} + x^{64} + x^{62} + x^{60} + x^{58} + x^{57} + x^{55} + x^{54} + x^{36} \\
&\quad + x^{35} + x^{34} + x^{33} + x^{31} + x^{30} + x^{29} + x^{28} + x^{27} + x^{25} + x^{24} + x^{21} \\
&\quad + x^{20} + x^{16} + x^{14} + x^{12} + x^{10} + x^{9} + x^{7} + x^{6}, \\
p_{12}(x) &= x^{96} + x^{92} + x^{84} + x^{60} + x^{52} + x^{48} + x^{32} + x^{28} + x^{20} + x^{16} + x^{12} + x^{4} \\
&\quad + 1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_0(x) &= x^{116} + x^{114} + x^{111} + x^{109} + x^{105} + x^{103} + x^{101} + x^{100} + x^{96} + x^{95} \\
&\quad + x^{94} + x^{91} + x^{90} + x^{88} + x^{87} + x^{85} + x^{83} + x^{81} + x^{79} + x^{78} + x^{76} \\
&\quad + x^{74} + x^{70} + x^{69} + x^{67} + x^{66} + x^{65} + x^{64} + x^{63} + x^{61} + x^{56} + x^{53} \\
&\quad + x^{48} + x^{47} + x^{43} + x^{41} + x^{40} + x^{39} + x^{38} + x^{36} + x^{35} + x^{34} + x^{33}, \\
p_3(x) &= x^{96} + x^{95} + x^{92} + x^{90} + x^{85} + x^{81} + x^{80} + x^{79} + x^{78} + x^{77} + x^{76} \\
&\quad + x^{75} + x^{74} + x^{73} + x^{70} + x^{69} + x^{67} + x^{65} + x^{64} + x^{63} + x^{62} + x^{60} \\
&\quad + x^{59} + x^{58} + x^{48} + x^{47} + x^{44} + x^{42} + x^{37} + x^{33} + x^{30} + x^{29} + x^{27} \\
&\quad + x^{25} + x^{24} + x^{23} + x^{22} + x^{20} + x^{19} + x^{18}, \\
p_6(x) &= x^{92} + x^{90} + x^{88} + x^{86} + x^{82} + x^{80} + x^{78} + x^{76} + x^{74} + x^{72} + x^{66} \\
&\quad + x^{64} + x^{62} + x^{60} + x^{56} + x^{52} + x^{50} + x^{48} + x^{46} + x^{44} + x^{42} + x^{38} \\
&\quad + x^{36} + x^{30} + x^{26} + x^{16} + x^{14} + x^{12}, \\
p_9(x) &= x^{88} + x^{87} + x^{86} + x^{85} + x^{84} + x^{80} + x^{78} + x^{76} + x^{74} + x^{73} + x^{72} \\
&\quad + x^{69} + x^{68} + x^{64} + x^{62} + x^{60} + x^{58} + x^{57} + x^{55} + x^{54} + x^{24} + x^{23} \\
&\quad + x^{22} + x^{21} + x^{20} + x^{16} + x^{14} + x^{12} + x^{10} + x^{9} + x^{7} + x^{6}, \\
p_{12}(x) &= x^{84} + x^{76} + x^{64} + x^{60} + x^{52} + x^{48} + x^{20} + x^{12} + x^{4} + 1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_0(x) &= x^{117} + x^{116} + x^{115} + x^{112} + x^{109} + x^{108} + x^{106} + x^{105} + x^{104} + x^{103} \\
&\quad + x^{102} + x^{100} + x^{99} + x^{97} + x^{96} + x^{95} + x^{93} + x^{92} + x^{90} + x^{89} + x^{88} \\
&\quad + x^{83} + x^{82} + x^{81} + x^{80} + x^{78} + x^{75} + x^{74} + x^{71} + x^{69} + x^{68} + x^{67} \\
&\quad + x^{61} + x^{59} + x^{58} + x^{56} + x^{55} + x^{53} + x^{52} + x^{51} + x^{50} + x^{49} + x^{47} \\
&\quad + x^{46} + x^{45} + x^{43} + x^{42}, \\
p_3(x) &= x^{101} + x^{100} + x^{99} + x^{97} + x^{94} + x^{93} + x^{91} + x^{89} + x^{87} + x^{86} + x^{85} \\
&\quad + x^{77} + x^{76} + x^{75} + x^{74} + x^{71} + x^{70} + x^{69} + x^{67} + x^{63} + x^{59} + x^{58}
\end{aligned}
$$

$$+ x^{57} + x^{55} + x^{54} + x^{53} + x^{52} + x^{46} + x^{43} + x^{42} + x^{38} + x^{36} + x^{35} + x^{34} + x^{33} + x^{31} + x^{23} + x^{22},$$

$$p_6(x) = x^{97} + x^{96} + x^{95} + x^{92} + x^{91} + x^{90} + x^{82} + x^{79} + x^{78} + x^{77} + x^{74} + x^{71} + x^{70} + x^{65} + x^{64} + x^{63} + x^{62} + x^{61} + x^{59} + x^{58} + x^{54} + x^{53} + x^{52} + x^{51} + x^{50} + x^{49} + x^{47} + x^{45} + x^{41} + x^{40} + x^{38} + x^{37} + x^{36} + x^{35} + x^{34} + x^{33} + x^{32} + x^{31} + x^{30} + x^{29} + x^{28} + x^{27} + x^{24} + x^{21} + x^{19} + x^{16} + x^{15} + x^{14} + x^{13} + x^{12} + x^{10} + x^{8} + x^{5} + x^{4} + x^{2} + 1,$$

$$p_9(x) = x^{89} + x^{88} + x^{86} + x^{84} + x^{81} + x^{80} + x^{78} + x^{77} + x^{74} + x^{73} + x^{70} + x^{68} + x^{65} + x^{64} + x^{62} + x^{61} + x^{58} + x^{56} + x^{25} + x^{24} + x^{22} + x^{20} + x^{17} + x^{16} + x^{14} + x^{13} + x^{10} + x^{8},$$

$$p_{12}(x) = x^{85} + x^{84} + x^{82} + x^{81} + x^{78} + x^{76} + x^{65} + x^{64} + x^{62} + x^{60} + x^{53} + x^{52} + x^{50} + x^{48} + x^{21} + x^{20} + x^{18} + x^{17} + x^{14} + x^{12} + x^{5} + x^{4} + x^{2} + 1,$$

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

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

$$p_0(x) = x^{117} + x^{116} + x^{115} + x^{112} + x^{111} + x^{110} + x^{109} + x^{107} + x^{106} + x^{105} + x^{103} + x^{92} + x^{90} + x^{85} + x^{82} + x^{81} + x^{74} + x^{72} + x^{71} + x^{70} + x^{65} + x^{64} + x^{63} + x^{61} + x^{59} + x^{58} + x^{57} + x^{56} + x^{52} + x^{47} + x^{44} + x^{41} + x^{40} + x^{37} + x^{31} + x^{29} + x^{28} + x^{26} + x^{24},$$

$$p_3(x) = x^{101} + x^{100} + x^{99} + x^{97} + x^{95} + x^{93} + x^{92} + x^{85} + x^{82} + x^{79} + x^{78} + x^{76} + x^{75} + x^{74} + x^{72} + x^{71} + x^{70} + x^{68} + x^{65} + x^{64} + x^{63} + x^{61} + x^{59} + x^{57} + x^{56} + x^{55} + x^{54} + x^{53} + x^{52} + x^{47} + x^{44} + x^{42} + x^{41} + x^{39} + x^{36} + x^{35} + x^{33} + x^{31} + x^{29} + x^{28} + x^{27} + x^{25} + x^{24} + x^{23} + x^{22} + x^{21} + x^{18} + x^{16},$$

$$p_6(x) = x^{97} + x^{96} + x^{95} + x^{92} + x^{88} + x^{86} + x^{85} + x^{84} + x^{83} + x^{82} + x^{81} + x^{80} + x^{79} + x^{78} + x^{75} + x^{74} + x^{73} + x^{72} + x^{66} + x^{62} + x^{60} + x^{55} + x^{54} + x^{52} + x^{51} + x^{50} + x^{49} + x^{48} + x^{46} + x^{45} + x^{44} + x^{42} + x^{41} + x^{40} + x^{39} + x^{36} + x^{31} + x^{30} + x^{28} + x^{25} + x^{23} + x^{22} + x^{20} + x^{18} + x^{16} + x^{15} + x^{5} + x^{4} + x^{2} + 1,$$

$$p_9(x) = x^{89} + x^{88} + x^{86} + x^{84} + x^{81} + x^{80} + x^{78} + x^{77} + x^{74} + x^{73} + x^{70} + x^{68} + x^{65} + x^{64} + x^{62} + x^{61} + x^{58} + x^{56} + x^{25} + x^{24} + x^{22} + x^{20} + x^{17} + x^{16} + x^{14} + x^{13} + x^{10} + x^{8},$$

$$p_{12}(x) = x^{85} + x^{84} + x^{82} + x^{81} + x^{78} + x^{76} + x^{65} + x^{64} + x^{62} + x^{60} + x^{53} + x^{52} + x^{50} + x^{48} + x^{21} + x^{20} + x^{18} + x^{17} + x^{14} + x^{12} + x^{5} + x^{4} + x^{2} + 1,$$

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

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

$$\begin{aligned}
p_0(x) &= x^{116} + x^{114} + x^{111} + x^{109} + x^{105} + x^{103} + x^{101} + x^{100} + x^{96} + x^{95} \\
&\quad + x^{94} + x^{91} + x^{90} + x^{88} + x^{87} + x^{85} + x^{83} + x^{81} + x^{79} + x^{78} + x^{76} \\
&\quad + x^{74} + x^{70} + x^{69} + x^{67} + x^{66} + x^{65} + x^{64} + x^{63} + x^{61} + x^{56} + x^{53} \\
&\quad + x^{48} + x^{47} + x^{43} + x^{41} + x^{40} + x^{39} + x^{38} + x^{36} + x^{35} + x^{34} + x^{33}, \\
p_3(x) &= x^{96} + x^{95} + x^{92} + x^{90} + x^{85} + x^{81} + x^{80} + x^{79} + x^{78} + x^{77} + x^{76} \\
&\quad + x^{75} + x^{74} + x^{73} + x^{70} + x^{69} + x^{67} + x^{65} + x^{64} + x^{63} + x^{62} + x^{60} \\
&\quad + x^{59} + x^{58} + x^{48} + x^{47} + x^{44} + x^{42} + x^{37} + x^{33} + x^{30} + x^{29} + x^{27} \\
&\quad + x^{25} + x^{24} + x^{23} + x^{22} + x^{20} + x^{19} + x^{18}, \\
p_6(x) &= x^{92} + x^{90} + x^{88} + x^{86} + x^{82} + x^{80} + x^{78} + x^{76} + x^{74} + x^{72} + x^{66} \\
&\quad + x^{64} + x^{62} + x^{60} + x^{56} + x^{52} + x^{50} + x^{48} + x^{46} + x^{44} + x^{42} + x^{38} \\
&\quad + x^{36} + x^{30} + x^{26} + x^{16} + x^{14} + x^{12}, \\
p_9(x) &= x^{88} + x^{87} + x^{86} + x^{85} + x^{84} + x^{80} + x^{78} + x^{76} + x^{74} + x^{73} + x^{72} \\
&\quad + x^{69} + x^{68} + x^{64} + x^{62} + x^{60} + x^{58} + x^{57} + x^{55} + x^{54} + x^{24} + x^{23} \\
&\quad + x^{22} + x^{21} + x^{20} + x^{16} + x^{14} + x^{12} + x^{10} + x^{9} + x^{7} + x^{6}, \\
p_{12}(x) &= x^{84} + x^{76} + x^{64} + x^{60} + x^{52} + x^{48} + x^{20} + x^{12} + x^{4} + 1,
\end{aligned}$$

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

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

$$\begin{aligned}
p_0(x) &= x^{128} + x^{126} + x^{124} + x^{123} + x^{121} + x^{119} + x^{116} + x^{114} + x^{113} + x^{109} \\
&\quad + x^{106} + x^{103} + x^{95} + x^{94} + x^{93} + x^{89} + x^{87} + x^{86} + x^{83} + x^{82} + x^{80} \\
&\quad + x^{79} + x^{78} + x^{76} + x^{75} + x^{74} + x^{72} + x^{71} + x^{70} + x^{69} + x^{66} + x^{65} \\
&\quad + x^{64} + x^{63} + x^{62} + x^{60} + x^{59} + x^{58} + x^{57} + x^{56} + x^{52} + x^{51} + x^{49} \\
&\quad + x^{48} + x^{46} + x^{45} + x^{43} + x^{38} + x^{36} + x^{33}, \\
p_3(x) &= x^{108} + x^{107} + x^{103} + x^{102} + x^{99} + x^{98} + x^{97} + x^{96} + x^{94} + x^{90} + x^{89} \\
&\quad + x^{87} + x^{86} + x^{85} + x^{83} + x^{80} + x^{79} + x^{78} + x^{77} + x^{73} + x^{70} + x^{69} \\
&\quad + x^{67} + x^{65} + x^{64} + x^{63} + x^{62} + x^{58} + x^{55} + x^{54} + x^{51} + x^{50} + x^{49} \\
&\quad + x^{48} + x^{46} + x^{44} + x^{43} + x^{42} + x^{41} + x^{37} + x^{36} + x^{35} + x^{34} + x^{33} \\
&\quad + x^{30} + x^{29} + x^{27} + x^{25} + x^{24} + x^{23} + x^{22} + x^{20} + x^{19} + x^{18}, \\
p_6(x) &= x^{104} + x^{102} + x^{94} + x^{90} + x^{88} + x^{84} + x^{78} + x^{76} + x^{70} + x^{62} + x^{60} \\
&\quad + x^{58} + x^{48} + x^{44} + x^{42} + x^{36} + x^{34} + x^{28} + x^{26} + x^{16} + x^{14} + x^{12}, \\
p_9(x) &= x^{100} + x^{99} + x^{98} + x^{97} + x^{95} + x^{94} + x^{93} + x^{92} + x^{91} + x^{89} + x^{88} \\
&\quad + x^{85} + x^{83} + x^{82} + x^{81} + x^{80} + x^{79} + x^{77} + x^{75} + x^{74} + x^{72} + x^{71} \\
&\quad + x^{70} + x^{69} + x^{68} + x^{64} + x^{62} + x^{60} + x^{58} + x^{57} + x^{55} + x^{54} + x^{36} \\
&\quad + x^{35} + x^{34} + x^{33} + x^{31} + x^{30} + x^{29} + x^{28} + x^{27} + x^{25} + x^{24} + x^{21}
\end{aligned}$$

$$
\begin{aligned}
&+ x^{20} + x^{16} + x^{14} + x^{12} + x^{10} + x^9 + x^7 + x^6,\\
p_{12}(x) &= x^{96} + x^{92} + x^{84} + x^{60} + x^{52} + x^{48} + x^{32} + x^{28} + x^{20} + x^{16} + x^{12} + x^4\\
&+ 1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_0(x) &= x^{117} + x^{116} + x^{115} + x^{112} + x^{109} + x^{108} + x^{106} + x^{105} + x^{104} + x^{103}\\
&+ x^{102} + x^{100} + x^{99} + x^{97} + x^{96} + x^{95} + x^{93} + x^{92} + x^{90} + x^{89} + x^{88}\\
&+ x^{83} + x^{82} + x^{81} + x^{80} + x^{78} + x^{75} + x^{74} + x^{71} + x^{69} + x^{68} + x^{67}\\
&+ x^{61} + x^{59} + x^{58} + x^{56} + x^{55} + x^{53} + x^{52} + x^{51} + x^{50} + x^{49} + x^{47}\\
&+ x^{46} + x^{45} + x^{43} + x^{42},\\
p_3(x) &= x^{101} + x^{100} + x^{99} + x^{97} + x^{94} + x^{93} + x^{91} + x^{89} + x^{87} + x^{86} + x^{85}\\
&+ x^{77} + x^{76} + x^{75} + x^{74} + x^{71} + x^{70} + x^{69} + x^{67} + x^{63} + x^{59} + x^{58}\\
&+ x^{57} + x^{55} + x^{54} + x^{53} + x^{52} + x^{46} + x^{43} + x^{42} + x^{38} + x^{36} + x^{35}\\
&+ x^{34} + x^{33} + x^{31} + x^{23} + x^{22},\\
p_6(x) &= x^{97} + x^{96} + x^{95} + x^{92} + x^{91} + x^{90} + x^{82} + x^{79} + x^{78} + x^{77} + x^{74}\\
&+ x^{71} + x^{70} + x^{65} + x^{64} + x^{63} + x^{62} + x^{61} + x^{59} + x^{58} + x^{54} + x^{53}\\
&+ x^{52} + x^{51} + x^{50} + x^{49} + x^{47} + x^{45} + x^{41} + x^{40} + x^{38} + x^{37} + x^{36}\\
&+ x^{35} + x^{34} + x^{33} + x^{32} + x^{31} + x^{30} + x^{29} + x^{28} + x^{27} + x^{24} + x^{21}\\
&+ x^{19} + x^{16} + x^{15} + x^{14} + x^{13} + x^{12} + x^{10} + x^8 + x^5 + x^4 + x^2 + 1,\\
p_9(x) &= x^{89} + x^{88} + x^{86} + x^{84} + x^{81} + x^{80} + x^{78} + x^{77} + x^{74} + x^{73} + x^{70}\\
&+ x^{68} + x^{65} + x^{64} + x^{62} + x^{61} + x^{58} + x^{56} + x^{25} + x^{24} + x^{22} + x^{20}\\
&+ x^{17} + x^{16} + x^{14} + x^{13} + x^{10} + x^8,\\
p_{12}(x) &= x^{85} + x^{84} + x^{82} + x^{81} + x^{78} + x^{76} + x^{65} + x^{64} + x^{62} + x^{60} + x^{53}\\
&+ x^{52} + x^{50} + x^{48} + x^{21} + x^{20} + x^{18} + x^{17} + x^{14} + x^{12} + x^5 + x^4 + x^2\\
&+ 1,
\end{aligned}
$$

and the initial terms are [0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 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]	714	[1099, 1100]	1428	[1790, 1018]	2142	[2392, 579]
1	[3, 4]	715	[1101, 1102]	1429	[1791, 124]	2143	[2393, 992]
2	[5, 6]	716	[1103, 388]	1430	[1792, 1008]	2144	[2394, 1841]
3	[7, 8]	717	[581, 32]	1431	[389, 1068]	2145	[2395, 393]
4	[9, 10]	718	[1104, 123]	1432	[1793, 993]	2146	[2396, 495]
5	[11, 12]	719	[396, 171]	1433	[1794, 1034]	2147	[2397, 456]
6	[13, 14]	720	[1105, 1106]	1434	[400, 1175]	2148	[2398, 1798]
7	[15, 16]	721	[1107, 1108]	1435	[1175, 1795]	2149	[2399, 1129]

8	[17, 18]	722	[1053, 478]	1436	[1796, 401]	2150	[2400, 1928]
9	[19, 20]	723	[120, 1109]	1437	[1795, 1796]	2151	[2401, 604]
10	[21, 22]	724	[1110, 1111]	1438	[1797, 1798]	2152	[1065, 1054]
11	[23, 24]	725	[1047, 497]	1439	[1799, 176]	2153	[2402, 30]
12	[25, 26]	726	[412, 1112]	1440	[1244, 433]	2154	[2403, 410]
13	[27, 28]	727	[1113, 995]	1441	[1800, 140]	2155	[2404, 171]
14	[14, 14]	728	[1114, 1115]	1442	[452, 548]	2156	[2405, 577]
15	[29, 30]	729	[362, 183]	1443	[1801, 490]	2157	[1213, 158]
16	[31, 32]	730	[1116, 429]	1444	[1802, 430]	2158	[2406, 114]
17	[33, 34]	731	[1117, 1118]	1445	[1738, 125]	2159	[2407, 381]
18	[35, 36]	732	[1119, 1120]	1446	[1803, 1102]	2160	[2408, 1898]
19	[37, 38]	733	[1121, 509]	1447	[1028, 1309]	2161	[2409, 377]
20	[39, 40]	734	[1122, 1123]	1448	[189, 412]	2162	[536, 438]
21	[41, 42]	735	[1124, 997]	1449	[1804, 1805]	2163	[2410, 1005]
22	[43, 44]	736	[445, 120]	1450	[1806, 1252]	2164	[2411, 369]
23	[45, 46]	737	[424, 1125]	1451	[1807, 391]	2165	[2412, 47]
24	[47, 48]	738	[1126, 1127]	1452	[1808, 1763]	2166	[2413, 1929]
25	[49, 50]	739	[1128, 1129]	1453	[1809, 410]	2167	[2414, 1964]
26	[48, 51]	740	[1130, 1131]	1454	[1810, 144]	2168	[2415, 1093]
27	[52, 53]	741	[1132, 531]	1455	[1811, 1250]	2169	[2416, 1747]
28	[54, 55]	742	[1133, 1134]	1456	[1812, 1739]	2170	[2417, 1051]
29	[56, 57]	743	[1135, 113]	1457	[366, 1266]	2171	[2418, 1821]
30	[58, 59]	744	[1136, 1137]	1458	[1813, 542]	2172	[2419, 1179]
31	[60, 61]	745	[1138, 583]	1459	[1814, 1037]	2173	[2420, 1145]
32	[62, 63]	746	[427, 1007]	1460	[1815, 1779]	2174	[2421, 2027]
33	[64, 65]	747	[1139, 574]	1461	[1816, 448]	2175	[2422, 1942]
34	[66, 67]	748	[1140, 1115]	1462	[1817, 609]	2176	[499, 1805]
35	[68, 69]	749	[1141, 1142]	1463	[1818, 172]	2177	[2423, 529]
36	[70, 71]	750	[1143, 1003]	1464	[1819, 1250]	2178	[2424, 396]
37	[72, 73]	751	[1144, 1145]	1465	[1820, 1789]	2179	[2425, 1114]
38	[26, 64]	752	[1146, 116]	1466	[1821, 560]	2180	[2426, 539]
39	[74, 75]	753	[1147, 1148]	1467	[1822, 1266]	2181	[2427, 1122]
40	[76, 77]	754	[574, 521]	1468	[1823, 1205]	2182	[2428, 1888]
41	[78, 79]	755	[1149, 409]	1469	[1824, 1259]	2183	[2429, 1250]
42	[80, 81]	756	[1150, 518]	1470	[1825, 1336]	2184	[2430, 463]
43	[82, 83]	757	[1151, 608]	1471	[1826, 1301]	2185	[2431, 1126]
44	[84, 85]	758	[1152, 1153]	1472	[1827, 1176]	2186	[2432, 1805]
45	[86, 87]	759	[1154, 515]	1473	[1798, 1122]	2187	[2433, 451]
46	[88, 89]	760	[1155, 1156]	1474	[1828, 1779]	2188	[2434, 1143]
47	[90, 91]	761	[1157, 1158]	1475	[1829, 508]	2189	[2435, 449]
48	[92, 93]	762	[1159, 1160]	1476	[515, 131]	2190	[2436, 1204]
49	[94, 95]	763	[1005, 554]	1477	[1830, 1831]	2191	[2437, 190]
50	[96, 97]	764	[1161, 1031]	1478	[1832, 1304]	2192	[2438, 1068]
51	[98, 99]	765	[1030, 1162]	1479	[434, 1833]	2193	[2439, 108]

52	[100, 101]	766	[1163, 382]	1480	[1834, 1308]	2194	[131, 524]
53	[102, 77]	767	[404, 1164]	1481	[1197, 552]	2195	[2440, 1037]
54	[103, 104]	768	[1165, 1079]	1482	[1835, 1195]	2196	[2441, 163]
55	[105, 106]	769	[1166, 585]	1483	[1836, 161]	2197	[2442, 366]
56	[107, 108]	770	[604, 36]	1484	[1837, 1112]	2198	[2443, 1160]
57	[109, 110]	771	[1167, 129]	1485	[1838, 499]	2199	[2444, 40]
58	[111, 112]	772	[495, 1168]	1486	[1839, 1243]	2200	[2445, 1205]
59	[113, 114]	773	[588, 1108]	1487	[1840, 1309]	2201	[2446, 156]
60	[115, 116]	774	[1169, 1170]	1488	[1841, 1170]	2202	[2447, 2341]
61	[117, 118]	775	[1171, 505]	1489	[579, 465]	2203	[1323, 2316]
62	[119, 120]	776	[1172, 1173]	1490	[1842, 1796]	2204	[2448, 1029]
63	[121, 122]	777	[1174, 1175]	1491	[1843, 424]	2205	[2449, 175]
64	[123, 124]	778	[1176, 1153]	1492	[1844, 1090]	2206	[2450, 591]
65	[125, 126]	779	[1177, 579]	1493	[1845, 474]	2207	[2451, 1159]
66	[30, 127]	780	[1178, 1033]	1494	[1846, 1011]	2208	[2452, 425]
67	[128, 129]	781	[533, 170]	1495	[1051, 1721]	2209	[2453, 475]
68	[130, 131]	782	[1179, 1161]	1496	[1007, 544]	2210	[2454, 539]
69	[132, 133]	783	[616, 1158]	1497	[1847, 1284]	2211	[571, 1179]
70	[134, 135]	784	[501, 1036]	1498	[1848, 1099]	2212	[2455, 1212]
71	[136, 137]	785	[1180, 615]	1499	[1849, 36]	2213	[2456, 567]
72	[138, 139]	786	[1181, 617]	1500	[1850, 510]	2214	[2457, 1771]
73	[140, 141]	787	[1182, 395]	1501	[1156, 1118]	2215	[1125, 116]
74	[142, 50]	788	[1118, 1183]	1502	[1851, 449]	2216	[2458, 1164]
75	[143, 144]	789	[1184, 421]	1503	[1852, 1128]	2217	[2459, 1744]
76	[145, 146]	790	[1185, 1186]	1504	[1853, 116]	2218	[2460, 2461]
77	[147, 148]	791	[364, 1185]	1505	[1854, 134]	2219	[1306, 416]
78	[149, 10]	792	[1187, 433]	1506	[1855, 1024]	2220	[2462, 488]
79	[150, 151]	793	[1188, 1062]	1507	[1856, 1065]	2221	[2463, 456]
80	[42, 152]	794	[1189, 1190]	1508	[1857, 160]	2222	[2464, 1966]
81	[44, 153]	795	[1191, 168]	1509	[1858, 172]	2223	[2465, 536]
82	[154, 155]	796	[1192, 153]	1510	[1859, 180]	2224	[2466, 2027]
83	[156, 157]	797	[1193, 171]	1511	[1860, 1282]	2225	[2467, 177]
84	[158, 159]	798	[1194, 595]	1512	[1789, 1861]	2226	[2468, 107]
85	[160, 161]	799	[468, 155]	1513	[378, 1156]	2227	[2469, 175]
86	[162, 163]	800	[413, 1195]	1514	[1108, 1063]	2228	[2470, 1160]
87	[164, 165]	801	[1196, 1197]	1515	[1862, 479]	2229	[2471, 416]
88	[166, 167]	802	[163, 1198]	1516	[1863, 122]	2230	[2472, 462]
89	[151, 168]	803	[1055, 1199]	1517	[1864, 1831]	2231	[420, 997]
90	[169, 170]	804	[1158, 1102]	1518	[1865, 426]	2232	[2473, 2474]
91	[171, 172]	805	[1200, 1081]	1519	[1866, 1241]	2233	[2475, 1852]
92	[173, 174]	806	[1201, 570]	1520	[1308, 39]	2234	[2476, 1303]
93	[175, 176]	807	[1202, 38]	1521	[1867, 456]	2235	[2477, 177]
94	[177, 178]	808	[544, 109]	1522	[1868, 1255]	2236	[2478, 1205]
95	[179, 180]	809	[1203, 988]	1523	[1190, 368]	2237	[2479, 1115]

96	[181, 182]	810	[191, 1204]	1524	[1869, 500]	2238	[2480, 1334]
97	[183, 184]	811	[471, 1205]	1525	[1870, 51]	2239	[2481, 1190]
98	[185, 186]	812	[1206, 618]	1526	[1871, 156]	2240	[2482, 1195]
99	[40, 187]	813	[1207, 373]	1527	[1872, 198]	2241	[2483, 1220]
100	[188, 189]	814	[547, 1071]	1528	[1873, 610]	2242	[2484, 1064]
101	[190, 191]	815	[1073, 118]	1529	[1874, 1125]	2243	[2485, 575]
102	[192, 193]	816	[146, 602]	1530	[443, 1783]	2244	[2486, 1122]
103	[194, 195]	817	[601, 193]	1531	[1875, 450]	2245	[2487, 448]
104	[196, 197]	818	[1208, 401]	1532	[1325, 53]	2246	[2488, 1231]
105	[198, 186]	819	[1173, 617]	1533	[1876, 410]	2247	[2489, 459]
106	[180, 199]	820	[1209, 179]	1534	[1877, 1047]	2248	[2490, 479]
107	[200, 95]	821	[1210, 1211]	1535	[1878, 1344]	2249	[2491, 1131]
108	[201, 202]	822	[1212, 1213]	1536	[133, 1259]	2250	[2492, 49]
109	[203, 204]	823	[1214, 1106]	1537	[1879, 1880]	2251	[2493, 1011]
110	[205, 206]	824	[32, 138]	1538	[1881, 393]	2252	[608, 487]
111	[207, 208]	825	[1215, 427]	1539	[1882, 1123]	2253	[2494, 2495]
112	[209, 210]	826	[1216, 1137]	1540	[1883, 12]	2254	[2496, 1093]
113	[211, 212]	827	[1217, 992]	1541	[1304, 1884]	2255	[2497, 1186]
114	[213, 214]	828	[1218, 1043]	1542	[1885, 111]	2256	[1728, 2027]
115	[215, 216]	829	[1219, 378]	1543	[1886, 409]	2257	[2498, 582]
116	[217, 218]	830	[172, 46]	1544	[1757, 1757]	2258	[2341, 490]
117	[219, 220]	831	[541, 1220]	1545	[1887, 1888]	2259	[2499, 1719]
118	[221, 222]	832	[1221, 1151]	1546	[1889, 1047]	2260	[2500, 1045]
119	[223, 224]	833	[1222, 1059]	1547	[1890, 1100]	2261	[2501, 1759]
120	[225, 226]	834	[490, 49]	1548	[1891, 1153]	2262	[2502, 369]
121	[227, 228]	835	[161, 388]	1549	[1892, 1063]	2263	[2503, 1122]
122	[229, 230]	836	[1223, 138]	1550	[486, 1831]	2264	[2504, 539]
123	[231, 226]	837	[1224, 505]	1551	[1893, 171]	2265	[2505, 1284]
124	[232, 233]	838	[1225, 550]	1552	[165, 398]	2266	[2506, 147]
125	[234, 235]	839	[1226, 1199]	1553	[1894, 1031]	2267	[2507, 2339]
126	[236, 88]	840	[1227, 1228]	1554	[1895, 1128]	2268	[2508, 519]
127	[57, 237]	841	[1229, 546]	1555	[1896, 1795]	2269	[2509, 1334]
128	[238, 239]	842	[1093, 1005]	1556	[1897, 1898]	2270	[2510, 34]
129	[240, 241]	843	[1230, 1021]	1557	[1022, 147]	2271	[2511, 148]
130	[242, 243]	844	[1231, 987]	1558	[1899, 1726]	2272	[2512, 1290]
131	[244, 245]	845	[1024, 1232]	1559	[1900, 1164]	2273	[2513, 1928]
132	[246, 247]	846	[1233, 476]	1560	[1901, 571]	2274	[2514, 1213]
133	[248, 249]	847	[1170, 409]	1561	[1902, 1785]	2275	[2515, 1011]
134	[250, 251]	848	[1234, 1235]	1562	[1903, 1161]	2276	[2516, 1800]
135	[252, 202]	849	[1236, 1066]	1563	[385, 1904]	2277	[2517, 2495]
136	[253, 254]	850	[50, 540]	1564	[1905, 381]	2278	[2518, 1259]
137	[255, 256]	851	[1237, 1043]	1565	[1906, 1126]	2279	[2519, 1239]
138	[257, 258]	852	[1153, 1026]	1566	[1907, 1328]	2280	[2520, 1054]
139	[259, 260]	853	[1238, 606]	1567	[1908, 486]	2281	[2521, 1029]

140	[218, 261]	854	[1239, 594]	1568	[1909, 198]	2282	[2522, 1259]
141	[262, 66]	855	[566, 578]	1569	[1910, 1135]	2283	[2523, 107]
142	[263, 264]	856	[1240, 525]	1570	[1911, 562]	2284	[2524, 2316]
143	[265, 266]	857	[382, 451]	1571	[141, 421]	2285	[2525, 184]
144	[267, 268]	858	[585, 549]	1572	[1912, 1237]	2286	[2526, 1846]
145	[269, 270]	859	[1241, 111]	1573	[1913, 158]	2287	[2527, 2461]
146	[271, 272]	860	[1242, 1243]	1574	[1914, 1255]	2288	[2528, 1271]
147	[56, 273]	861	[2, 541]	1575	[1915, 1290]	2289	[2529, 416]
148	[274, 275]	862	[590, 1244]	1576	[1916, 570]	2290	[2530, 448]
149	[276, 277]	863	[1245, 179]	1577	[1917, 609]	2291	[2531, 1019]
150	[278, 279]	864	[1246, 1074]	1578	[1918, 1034]	2292	[2532, 184]
151	[280, 281]	865	[1247, 136]	1579	[398, 1053]	2293	[2533, 997]
152	[79, 282]	866	[1248, 362]	1580	[430, 456]	2294	[2534, 1726]
153	[83, 283]	867	[1249, 1250]	1581	[1129, 454]	2295	[2461, 1777]
154	[284, 285]	868	[1251, 112]	1582	[1919, 524]	2296	[2535, 134]
155	[286, 287]	869	[1252, 1253]	1583	[1920, 1190]	2297	[2536, 378]
156	[288, 59]	870	[1254, 140]	1584	[1921, 505]	2298	[2135, 2290]
157	[289, 290]	871	[1255, 526]	1585	[1922, 506]	2299	[2537, 1607]
158	[291, 292]	872	[1256, 613]	1586	[1923, 1805]	2300	[93, 289]
159	[293, 294]	873	[1257, 389]	1587	[1924, 591]	2301	[2538, 741]
160	[295, 296]	874	[1258, 1028]	1588	[1925, 398]	2302	[1647, 931]
161	[260, 273]	875	[1259, 1245]	1589	[1926, 1336]	2303	[2539, 2540]
162	[297, 298]	876	[139, 160]	1590	[1927, 1904]	2304	[2541, 727]
163	[235, 299]	877	[1260, 199]	1591	[1898, 1928]	2305	[2542, 786]
164	[300, 301]	878	[1261, 365]	1592	[1929, 372]	2306	[795, 1581]
165	[302, 303]	879	[1262, 562]	1593	[1148, 1255]	2307	[2543, 664]
166	[304, 305]	880	[1263, 529]	1594	[1930, 1249]	2308	[2544, 915]
167	[215, 206]	881	[1264, 1001]	1595	[1931, 1887]	2309	[19, 979]
168	[306, 307]	882	[1137, 190]	1596	[1932, 1929]	2310	[1439, 1545]
169	[308, 309]	883	[1265, 527]	1597	[1933, 1186]	2311	[2545, 104]
170	[310, 14]	884	[1266, 175]	1598	[1934, 1884]	2312	[2546, 318]
171	[305, 88]	885	[1267, 199]	1599	[1935, 391]	2313	[875, 862]
172	[311, 312]	886	[1268, 109]	1600	[1936, 1312]	2314	[2547, 865]
173	[313, 314]	887	[1160, 1092]	1601	[1937, 1753]	2315	[2548, 2549]
174	[315, 254]	888	[1269, 542]	1602	[1938, 513]	2316	[2151, 834]
175	[316, 317]	889	[511, 1086]	1603	[1939, 1940]	2317	[2548, 2210]
176	[318, 319]	890	[1270, 1253]	1604	[1941, 1942]	2318	[321, 2252]
177	[320, 321]	891	[1115, 133]	1605	[1943, 1159]	2319	[783, 803]
178	[322, 323]	892	[1271, 448]	1606	[438, 1845]	2320	[2550, 1347]
179	[324, 325]	893	[1272, 402]	1607	[1944, 129]	2321	[1689, 1586]
180	[326, 327]	894	[989, 37]	1608	[1945, 121]	2322	[914, 2551]
181	[328, 329]	895	[1273, 1056]	1609	[1946, 517]	2323	[2552, 827]
182	[330, 331]	896	[1017, 1072]	1610	[1947, 515]	2324	[1558, 2553]
183	[214, 332]	897	[1274, 601]	1611	[1948, 488]	2325	[2554, 1389]

184	[333, 334]	898	[1102, 609]	1612	[1949, 1833]	2326	[983, 862]
185	[335, 336]	899	[1127, 440]	1613	[1950, 413]	2327	[2555, 2240]
186	[337, 338]	900	[1020, 1120]	1614	[1951, 615]	2328	[2206, 339]
187	[339, 340]	901	[1275, 152]	1615	[1952, 514]	2329	[978, 2258]
188	[4, 341]	902	[1276, 466]	1616	[1953, 459]	2330	[2556, 656]
189	[342, 343]	903	[1277, 1071]	1617	[1954, 462]	2331	[2557, 203]
190	[344, 250]	904	[1278, 1081]	1618	[1106, 1040]	2332	[255, 274]
191	[345, 249]	905	[1111, 1279]	1619	[1955, 540]	2333	[2558, 1675]
192	[346, 347]	906	[1280, 507]	1620	[1956, 398]	2334	[2559, 883]
193	[348, 349]	907	[1281, 113]	1621	[1957, 178]	2335	[2560, 1365]
194	[350, 351]	908	[440, 1176]	1622	[1958, 483]	2336	[2561, 2182]
195	[352, 353]	909	[1120, 1282]	1623	[1959, 1861]	2337	[718, 2562]
196	[354, 355]	910	[1283, 987]	1624	[1960, 564]	2338	[940, 2563]
197	[356, 357]	911	[410, 1284]	1625	[1961, 1017]	2339	[2295, 1532]
198	[358, 359]	912	[1285, 1286]	1626	[1068, 418]	2340	[2564, 1487]
199	[360, 91]	913	[1287, 434]	1627	[1962, 141]	2341	[2565, 833]
200	[361, 362]	914	[148, 528]	1628	[1963, 385]	2342	[705, 2566]
201	[363, 364]	915	[1288, 419]	1629	[1964, 1965]	2343	[1376, 973]
202	[365, 366]	916	[1289, 1235]	1630	[1966, 522]	2344	[2567, 1575]
203	[367, 368]	917	[1232, 988]	1631	[1967, 1033]	2345	[2267, 1418]
204	[369, 370]	918	[450, 1290]	1632	[1968, 1319]	2346	[2568, 724]
205	[371, 372]	919	[168, 1134]	1633	[1969, 433]	2347	[2569, 2570]
206	[373, 374]	920	[1291, 121]	1634	[1970, 1051]	2348	[2571, 2572]
207	[375, 376]	921	[1292, 568]	1635	[1971, 1173]	2349	[1465, 2118]
208	[377, 378]	922	[114, 408]	1636	[1972, 184]	2350	[2573, 1378]
209	[379, 380]	923	[1293, 1048]	1637	[1973, 441]	2351	[2574, 872]
210	[381, 382]	924	[1205, 1294]	1638	[1974, 548]	2352	[766, 2219]
211	[383, 384]	925	[1295, 1099]	1639	[1975, 1207]	2353	[2575, 809]
212	[370, 385]	926	[1296, 191]	1640	[1976, 1115]	2354	[2576, 2577]
213	[386, 387]	927	[1297, 1179]	1641	[1977, 114]	2355	[2284, 1529]
214	[388, 389]	928	[1298, 615]	1642	[1978, 159]	2356	[907, 58]
215	[390, 157]	929	[997, 590]	1643	[1979, 1779]	2357	[1628, 750]
216	[391, 392]	930	[1198, 495]	1644	[1980, 1753]	2358	[21, 1466]
217	[393, 394]	931	[1299, 1183]	1645	[1981, 1162]	2359	[2578, 1481]
218	[395, 396]	932	[1199, 1197]	1646	[1982, 1085]	2360	[826, 2579]
219	[397, 398]	933	[112, 1211]	1647	[1983, 1185]	2361	[2580, 931]
220	[399, 34]	934	[1300, 1301]	1648	[1984, 552]	2362	[2232, 2266]
221	[118, 400]	935	[1302, 1073]	1649	[1294, 189]	2363	[2581, 291]
222	[401, 402]	936	[1303, 1304]	1650	[1985, 1231]	2364	[2582, 2583]
223	[403, 404]	937	[1305, 1306]	1651	[1986, 388]	2365	[2584, 1418]
224	[405, 406]	938	[576, 1189]	1652	[1987, 1245]	2366	[353, 20]
225	[407, 408]	939	[1307, 1189]	1653	[1988, 1186]	2367	[1619, 888]
226	[409, 410]	940	[426, 1308]	1654	[1989, 110]	2368	[764, 2585]
227	[411, 412]	941	[1309, 1303]	1655	[506, 539]	2369	[2586, 2570]

228	[406, 413]	942	[46, 1056]	1656	[1990, 571]	2370	[2587, 1621]
229	[414, 415]	943	[1310, 1286]	1657	[1991, 1212]	2371	[2560, 92]
230	[416, 369]	944	[1311, 523]	1658	[1123, 510]	2372	[955, 1666]
231	[417, 418]	945	[1168, 1312]	1659	[1992, 466]	2373	[2588, 2589]
232	[419, 420]	946	[1313, 138]	1660	[1993, 579]	2374	[2291, 1522]
233	[421, 34]	947	[1314, 1232]	1661	[1994, 143]	2375	[2590, 2591]
234	[422, 423]	948	[1204, 123]	1662	[1112, 47]	2376	[2550, 1531]
235	[53, 424]	949	[1315, 1162]	1663	[1995, 429]	2377	[2552, 2579]
236	[425, 426]	950	[1316, 577]	1664	[1996, 564]	2378	[2592, 96]
237	[108, 427]	951	[1317, 147]	1665	[1997, 143]	2379	[2593, 881]
238	[428, 370]	952	[1318, 30]	1666	[1739, 1091]	2380	[2283, 203]
239	[429, 430]	953	[467, 1151]	1667	[1998, 1118]	2381	[2594, 2045]
240	[431, 432]	954	[1211, 1319]	1668	[1999, 591]	2382	[2595, 2227]
241	[433, 434]	955	[1320, 576]	1669	[2000, 1269]	2383	[1650, 1402]
242	[435, 436]	956	[195, 1321]	1670	[2001, 1294]	2384	[1566, 1654]
243	[437, 438]	957	[1322, 1323]	1671	[2002, 1279]	2385	[2108, 2125]
244	[439, 440]	958	[1324, 1092]	1672	[1888, 1826]	2386	[2044, 2596]
245	[144, 441]	959	[159, 1325]	1673	[2003, 445]	2387	[1412, 972]
246	[442, 443]	960	[182, 514]	1674	[2004, 577]	2388	[345, 2597]
247	[444, 445]	961	[1326, 1066]	1675	[2005, 1153]	2389	[1587, 2293]
248	[446, 447]	962	[1327, 499]	1676	[2006, 499]	2390	[2598, 841]
249	[448, 445]	963	[562, 1328]	1677	[2007, 1030]	2391	[2243, 2566]
250	[449, 450]	964	[1329, 1150]	1678	[2008, 459]	2392	[2112, 787]
251	[451, 452]	965	[485, 461]	1679	[129, 538]	2393	[295, 1523]
252	[453, 454]	966	[1330, 1082]	1680	[1097, 195]	2394	[2599, 2600]
253	[455, 374]	967	[1331, 1168]	1681	[2009, 131]	2395	[2601, 676]
254	[456, 457]	968	[1332, 1148]	1682	[2010, 1940]	2396	[2084, 2602]
255	[458, 127]	969	[1333, 1334]	1683	[1109, 1966]	2397	[2173, 342]
256	[459, 383]	970	[1335, 1014]	1684	[2011, 2012]	2398	[763, 2603]
257	[460, 461]	971	[1336, 1099]	1685	[2013, 1255]	2399	[2604, 2254]
258	[462, 463]	972	[199, 587]	1686	[2014, 1019]	2400	[2605, 1670]
259	[464, 465]	973	[368, 447]	1687	[2015, 1126]	2401	[2606, 2589]
260	[466, 467]	974	[1337, 430]	1688	[110, 1736]	2402	[1450, 2120]
261	[394, 468]	975	[1338, 1244]	1689	[2016, 1212]	2403	[2101, 1701]
262	[469, 128]	976	[1339, 1306]	1690	[2017, 430]	2404	[631, 311]
263	[470, 471]	977	[1340, 1056]	1691	[2018, 1880]	2405	[1349, 1414]
264	[472, 141]	978	[1341, 1038]	1692	[2019, 1826]	2406	[2169, 2607]
265	[473, 474]	979	[517, 1258]	1693	[2020, 507]	2407	[2608, 866]
266	[475, 476]	980	[1342, 603]	1694	[380, 1846]	2408	[2609, 690]
267	[477, 478]	981	[126, 30]	1695	[2021, 1271]	2409	[205, 216]
268	[479, 425]	982	[1343, 139]	1696	[2022, 1880]	2410	[1353, 2610]
269	[480, 129]	983	[1100, 605]	1697	[2023, 1887]	2411	[1572, 2611]
270	[481, 482]	984	[1036, 1344]	1698	[2024, 1845]	2412	[2056, 92]
271	[483, 484]	985	[1345, 1258]	1699	[2025, 487]	2413	[2157, 211]

272	[170, 485]	986	[1346, 935]	1700	[2026, 2027]	2414	[2612, 2613]
273	[465, 486]	987	[1347, 1348]	1701	[2028, 167]	2415	[1443, 2131]
274	[487, 136]	988	[1349, 1350]	1702	[2029, 37]	2416	[850, 2614]
275	[127, 488]	989	[948, 26]	1703	[2030, 1176]	2417	[2537, 1506]
276	[489, 490]	990	[1351, 1352]	1704	[2031, 463]	2418	[2615, 2540]
277	[491, 384]	991	[1353, 1354]	1705	[441, 1763]	2419	[2259, 1531]
278	[492, 493]	992	[93, 1355]	1706	[2032, 143]	2420	[2616, 832]
279	[494, 495]	993	[958, 1356]	1707	[2033, 511]	2421	[2605, 2617]
280	[496, 497]	994	[1357, 890]	1708	[2034, 37]	2422	[2279, 2127]
281	[498, 499]	995	[1358, 908]	1709	[1090, 1041]	2423	[649, 1358]
282	[10, 500]	996	[1359, 339]	1710	[2035, 482]	2424	[2618, 2288]
283	[155, 501]	997	[1360, 1361]	1711	[2036, 989]	2425	[2619, 1480]
284	[502, 161]	998	[1362, 901]	1712	[2037, 1323]	2426	[2620, 280]
285	[503, 485]	999	[1363, 1364]	1713	[2038, 522]	2427	[2621, 243]
286	[504, 394]	1000	[1365, 93]	1714	[2039, 522]	2428	[2622, 2262]
287	[505, 506]	1001	[723, 1366]	1715	[2040, 1965]	2429	[1700, 1671]
288	[507, 508]	1002	[1367, 1368]	1716	[712, 1679]	2430	[736, 722]
289	[187, 509]	1003	[1369, 804]	1717	[2041, 2042]	2431	[664, 2203]
290	[510, 511]	1004	[948, 905]	1718	[237, 1550]	2432	[1642, 94]
291	[512, 513]	1005	[1370, 1371]	1719	[1629, 1399]	2433	[2623, 766]
292	[514, 515]	1006	[1372, 893]	1720	[2043, 352]	2434	[2624, 2591]
293	[516, 517]	1007	[1373, 287]	1721	[71, 322]	2435	[796, 2602]
294	[518, 519]	1008	[1364, 661]	1722	[2044, 2045]	2436	[2272, 1613]
295	[520, 521]	1009	[1374, 1375]	1723	[2046, 2047]	2437	[1479, 2625]
296	[522, 523]	1010	[689, 815]	1724	[761, 2048]	2438	[2626, 1711]
297	[524, 525]	1011	[1376, 71]	1725	[1547, 2049]	2439	[2627, 264]
298	[526, 527]	1012	[1377, 98]	1726	[1671, 2050]	2440	[2592, 1404]
299	[528, 529]	1013	[22, 80]	1727	[2051, 733]	2441	[2628, 2577]
300	[530, 531]	1014	[1378, 1379]	1728	[2052, 788]	2442	[1560, 345]
301	[532, 533]	1015	[1380, 1381]	1729	[2053, 1404]	2443	[1508, 2629]
302	[534, 535]	1016	[1382, 795]	1730	[2054, 2055]	2444	[2554, 947]
303	[493, 536]	1017	[647, 1383]	1731	[204, 211]	2445	[104, 1666]
304	[537, 538]	1018	[687, 221]	1732	[2056, 1365]	2446	[2630, 2613]
305	[539, 151]	1019	[228, 726]	1733	[2057, 721]	2447	[1495, 2603]
306	[540, 541]	1020	[1384, 1379]	1734	[2058, 678]	2448	[722, 1396]
307	[542, 482]	1021	[1385, 70]	1735	[2059, 2060]	2449	[267, 2631]
308	[543, 544]	1022	[1386, 1387]	1736	[1649, 1445]	2450	[744, 881]
309	[545, 519]	1023	[1388, 1389]	1737	[1459, 1693]	2451	[1553, 1530]
310	[546, 547]	1024	[1390, 981]	1738	[2049, 983]	2452	[2179, 727]
311	[548, 395]	1025	[1391, 213]	1739	[1510, 105]	2453	[2632, 2633]
312	[549, 550]	1026	[1392, 1369]	1740	[870, 72]	2454	[2634, 225]
313	[551, 552]	1027	[1393, 295]	1741	[2061, 731]	2455	[1400, 1581]
314	[553, 554]	1028	[1394, 643]	1742	[355, 2062]	2456	[749, 666]
315	[555, 392]	1029	[1395, 819]	1743	[2063, 825]	2457	[2635, 2197]

316	[550, 556]	1030	[1396, 1366]	1744	[833, 757]	2458	[732, 316]
317	[557, 558]	1031	[1397, 357]	1745	[2064, 1417]	2459	[1701, 2636]
318	[559, 560]	1032	[1398, 829]	1746	[2065, 1368]	2460	[1606, 1426]
319	[561, 562]	1033	[743, 1399]	1747	[1592, 283]	2461	[206, 650]
320	[563, 39]	1034	[1400, 674]	1748	[2066, 2067]	2462	[899, 1358]
321	[564, 565]	1035	[1401, 1386]	1749	[737, 1396]	2463	[2637, 774]
322	[135, 566]	1036	[1402, 844]	1750	[2068, 952]	2464	[2638, 102]
323	[447, 567]	1037	[1403, 251]	1751	[2069, 215]	2465	[2639, 2640]
324	[568, 128]	1038	[1404, 97]	1752	[2070, 1432]	2466	[2641, 2047]
325	[418, 365]	1039	[1405, 872]	1753	[2071, 681]	2467	[2642, 2633]
326	[569, 457]	1040	[1355, 290]	1754	[755, 231]	2468	[2643, 201]
327	[570, 571]	1041	[1406, 894]	1755	[2072, 98]	2469	[2249, 291]
328	[572, 36]	1042	[966, 72]	1756	[2073, 1615]	2470	[2581, 1458]
329	[573, 574]	1043	[254, 1407]	1757	[2074, 689]	2471	[1429, 633]
330	[575, 576]	1044	[1408, 1409]	1758	[673, 984]	2472	[2095, 784]
331	[527, 577]	1045	[1410, 922]	1759	[1350, 1415]	2473	[290, 2614]
332	[578, 579]	1046	[1411, 835]	1760	[2075, 304]	2474	[2644, 813]
333	[580, 581]	1047	[336, 858]	1761	[2076, 1528]	2475	[340, 298]
334	[582, 583]	1048	[1412, 358]	1762	[2077, 102]	2476	[2645, 2553]
335	[584, 585]	1049	[236, 668]	1763	[2078, 319]	2477	[1392, 803]
336	[586, 420]	1050	[1413, 893]	1764	[1515, 2060]	2478	[2622, 2226]
337	[587, 415]	1051	[1414, 1415]	1765	[2079, 302]	2479	[1461, 248]
338	[457, 588]	1052	[1416, 314]	1766	[1673, 724]	2480	[2646, 2175]
339	[589, 590]	1053	[1417, 887]	1767	[2080, 873]	2481	[74, 2562]
340	[591, 535]	1054	[334, 634]	1768	[2081, 1634]	2482	[2647, 1628]
341	[592, 195]	1055	[1418, 1419]	1769	[659, 722]	2483	[958, 101]
342	[593, 594]	1056	[87, 802]	1770	[2082, 270]	2484	[2648, 277]
343	[34, 595]	1057	[1420, 233]	1771	[907, 288]	2485	[2649, 224]
344	[596, 597]	1058	[1421, 1422]	1772	[1541, 2083]	2486	[2639, 2650]
345	[598, 137]	1059	[1423, 323]	1773	[2084, 797]	2487	[2209, 2549]
346	[599, 507]	1060	[1424, 215]	1774	[2085, 1373]	2488	[923, 2636]
347	[600, 153]	1061	[1425, 694]	1775	[2086, 2055]	2489	[2278, 1475]
348	[484, 601]	1062	[1426, 1427]	1776	[2087, 1484]	2490	[227, 725]
349	[602, 603]	1063	[1428, 778]	1777	[1445, 1448]	2491	[2651, 1480]
350	[523, 604]	1064	[1429, 334]	1778	[1598, 874]	2492	[2541, 967]
351	[605, 606]	1065	[1430, 884]	1779	[2088, 671]	2493	[1364, 929]
352	[607, 608]	1066	[874, 1431]	1780	[2089, 982]	2494	[212, 2215]
353	[609, 610]	1067	[905, 625]	1781	[2090, 234]	2495	[2609, 106]
354	[611, 366]	1068	[1432, 321]	1782	[2091, 1704]	2496	[1537, 2652]
355	[612, 605]	1069	[1433, 766]	1783	[1448, 941]	2497	[1524, 1671]
356	[606, 613]	1070	[1434, 1383]	1784	[2092, 1691]	2498	[1447, 940]
357	[594, 614]	1071	[1435, 684]	1785	[297, 638]	2499	[2653, 921]
358	[615, 616]	1072	[1436, 221]	1786	[2093, 1588]	2500	[2644, 794]
359	[617, 618]	1073	[1383, 684]	1787	[2094, 642]	2501	[2654, 2247]

360	[619, 400]	1074	[1437, 349]	1788	[782, 1392]	2502	[2655, 846]
361	[620, 214]	1075	[1438, 1439]	1789	[2095, 235]	2503	[825, 1488]
362	[621, 622]	1076	[698, 1440]	1790	[2096, 1375]	2504	[248, 2597]
363	[623, 624]	1077	[1441, 1442]	1791	[2097, 664]	2505	[628, 772]
364	[625, 626]	1078	[1443, 1444]	1792	[2098, 2099]	2506	[1656, 2656]
365	[321, 627]	1079	[887, 1445]	1793	[2100, 980]	2507	[2657, 921]
366	[628, 629]	1080	[1446, 897]	1794	[2101, 923]	2508	[723, 2658]
367	[630, 631]	1081	[845, 942]	1795	[2102, 646]	2509	[2659, 2660]
368	[632, 340]	1082	[1447, 1448]	1796	[2103, 688]	2510	[103, 955]
369	[633, 634]	1083	[1449, 1352]	1797	[2104, 1487]	2511	[1692, 1460]
370	[635, 343]	1084	[1450, 1451]	1798	[1628, 854]	2512	[2545, 955]
371	[636, 637]	1085	[204, 350]	1799	[2105, 1641]	2513	[2641, 2661]
372	[638, 639]	1086	[1452, 327]	1800	[1489, 1431]	2514	[1529, 2631]
373	[640, 641]	1087	[1453, 910]	1801	[2106, 2107]	2515	[2659, 1605]
374	[642, 643]	1088	[1454, 244]	1802	[2108, 2109]	2516	[1705, 337]
375	[644, 645]	1089	[1455, 1456]	1803	[786, 972]	2517	[2662, 1619]
376	[646, 647]	1090	[355, 1457]	1804	[2110, 2107]	2518	[2634, 231]
377	[648, 649]	1091	[64, 626]	1805	[1525, 2050]	2519	[2663, 2583]
378	[216, 650]	1092	[1458, 292]	1806	[244, 2111]	2520	[2593, 745]
379	[651, 652]	1093	[844, 649]	1807	[2112, 672]	2521	[2664, 2269]
380	[653, 260]	1094	[1459, 1460]	1808	[2113, 1611]	2522	[2620, 1613]
381	[654, 655]	1095	[1461, 345]	1809	[2114, 1654]	2523	[2665, 1378]
382	[656, 657]	1096	[1462, 352]	1810	[853, 750]	2524	[2565, 756]
383	[658, 659]	1097	[1407, 338]	1811	[830, 2115]	2525	[83, 1593]
384	[660, 661]	1098	[1463, 1464]	1812	[2116, 693]	2526	[2666, 2154]
385	[634, 662]	1099	[1465, 822]	1813	[2117, 2042]	2527	[2667, 2668]
386	[663, 301]	1100	[1466, 80]	1814	[821, 2118]	2528	[2207, 761]
387	[664, 665]	1101	[1467, 1468]	1815	[2119, 1475]	2529	[2595, 2172]
388	[666, 667]	1102	[983, 876]	1816	[832, 756]	2530	[2110, 2669]
389	[668, 89]	1103	[1469, 1451]	1817	[70, 973]	2531	[277, 2152]
390	[669, 670]	1104	[1470, 1409]	1818	[1469, 2120]	2532	[2265, 840]
391	[61, 671]	1105	[1471, 917]	1819	[2121, 2122]	2533	[1388, 947]
392	[672, 673]	1106	[256, 275]	1820	[2123, 806]	2534	[2670, 2147]
393	[674, 675]	1107	[1472, 1428]	1821	[16, 66]	2535	[2643, 252]
394	[676, 657]	1108	[1439, 1473]	1822	[2124, 2125]	2536	[25, 905]
395	[677, 305]	1109	[757, 294]	1823	[2126, 2127]	2537	[2671, 1294]
396	[678, 679]	1110	[1474, 907]	1824	[840, 2048]	2538	[2672, 514]
397	[238, 680]	1111	[1475, 869]	1825	[1441, 1709]	2539	[2673, 1171]
398	[301, 681]	1112	[705, 1476]	1826	[956, 706]	2540	[2674, 1011]
399	[682, 683]	1113	[1477, 1478]	1827	[760, 1523]	2541	[2675, 1312]
400	[684, 685]	1114	[1479, 67]	1828	[2128, 658]	2542	[2676, 487]
401	[686, 687]	1115	[1480, 228]	1829	[2129, 966]	2543	[2677, 190]
402	[688, 689]	1116	[858, 1481]	1830	[2130, 2131]	2544	[2678, 1143]
403	[105, 690]	1117	[1482, 1483]	1831	[673, 218]	2545	[2679, 1821]

404	[691, 629]	1118	[1484, 83]	1832	[1521, 2132]	2546	[2680, 561]
405	[692, 693]	1119	[1485, 79]	1833	[737, 723]	2547	[2681, 1294]
406	[694, 695]	1120	[726, 800]	1834	[2133, 978]	2548	[2682, 529]
407	[696, 697]	1121	[1486, 759]	1835	[330, 2134]	2549	[2683, 524]
408	[698, 699]	1122	[1487, 714]	1836	[2135, 2136]	2550	[2684, 482]
409	[700, 701]	1123	[1488, 746]	1837	[2137, 6]	2551	[1904, 1779]
410	[702, 703]	1124	[910, 1381]	1838	[2121, 244]	2552	[2685, 55]
411	[704, 705]	1125	[873, 1489]	1839	[2138, 1565]	2553	[2686, 416]
412	[706, 707]	1126	[1490, 898]	1840	[2139, 1597]	2554	[2687, 393]
413	[708, 709]	1127	[1491, 659]	1841	[2140, 700]	2555	[2688, 373]
414	[710, 711]	1128	[350, 212]	1842	[2141, 780]	2556	[2689, 2474]
415	[712, 679]	1129	[1492, 700]	1843	[2142, 873]	2557	[2690, 369]
416	[713, 714]	1130	[1493, 1494]	1844	[2143, 980]	2558	[2691, 377]
417	[715, 716]	1131	[1495, 1496]	1845	[745, 882]	2559	[2692, 1266]
418	[89, 709]	1132	[1497, 1498]	1846	[652, 845]	2560	[2693, 1179]
419	[717, 325]	1133	[1499, 61]	1847	[2144, 2145]	2561	[2694, 1888]
420	[718, 75]	1134	[1500, 1473]	1848	[2146, 2147]	2562	[1034, 1942]
421	[261, 719]	1135	[296, 1501]	1849	[314, 1414]	2563	[1279, 1785]
422	[720, 721]	1136	[1502, 344]	1850	[2148, 2149]	2564	[2695, 1928]
423	[722, 723]	1137	[1503, 627]	1851	[218, 764]	2565	[2696, 1332]
424	[724, 210]	1138	[1504, 329]	1852	[679, 1680]	2566	[595, 1212]
425	[725, 726]	1139	[1505, 1506]	1853	[1497, 2150]	2567	[2697, 501]
426	[727, 728]	1140	[1507, 1508]	1854	[2151, 2152]	2568	[2698, 381]
427	[95, 729]	1141	[1509, 1510]	1855	[1359, 632]	2569	[2699, 1328]
428	[730, 731]	1142	[933, 1427]	1856	[683, 1530]	2570	[2700, 2316]
429	[732, 703]	1143	[1511, 105]	1857	[2153, 2154]	2571	[2701, 1068]
430	[733, 734]	1144	[900, 1512]	1858	[260, 57]	2572	[2702, 1252]
431	[735, 220]	1145	[1513, 1514]	1859	[2155, 360]	2573	[2703, 1747]
432	[685, 688]	1146	[1515, 1516]	1860	[2156, 207]	2574	[2704, 1188]
433	[736, 737]	1147	[1517, 640]	1861	[2157, 350]	2575	[2705, 191]
434	[738, 739]	1148	[1518, 282]	1862	[2158, 2159]	2576	[2706, 1123]
435	[740, 741]	1149	[812, 702]	1863	[2158, 247]	2577	[2707, 138]
436	[742, 743]	1150	[1519, 858]	1864	[1528, 1370]	2578	[1066, 2012]
437	[744, 745]	1151	[1520, 765]	1865	[2160, 2067]	2579	[2708, 126]
438	[266, 746]	1152	[1521, 1522]	1866	[2161, 207]	2580	[2709, 1077]
439	[747, 748]	1153	[1523, 1501]	1867	[1487, 2162]	2581	[2710, 514]
440	[749, 99]	1154	[1524, 1525]	1868	[2128, 1491]	2582	[2711, 2309]
441	[750, 356]	1155	[1526, 1484]	1869	[1707, 888]	2583	[2712, 1861]
442	[751, 752]	1156	[649, 900]	1870	[2163, 2099]	2584	[2713, 153]
443	[753, 754]	1157	[1527, 1464]	1871	[1658, 289]	2585	[137, 1286]
444	[755, 225]	1158	[1528, 808]	1872	[2164, 2165]	2586	[2714, 506]
445	[756, 757]	1159	[1529, 268]	1873	[2166, 336]	2587	[2715, 1249]
446	[758, 759]	1160	[1530, 655]	1874	[2167, 1578]	2588	[2716, 1304]
447	[760, 296]	1161	[1531, 1348]	1875	[2168, 849]	2589	[2717, 595]

448	[761, 762]	1162	[819, 1532]	1876	[743, 1630]	2590	[2718, 498]
449	[637, 763]	1163	[1533, 1534]	1877	[2169, 950]	2591	[2719, 1785]
450	[764, 719]	1164	[1535, 1536]	1878	[2170, 1665]	2592	[2720, 183]
451	[655, 765]	1165	[1537, 1468]	1879	[2171, 2172]	2593	[2721, 55]
452	[766, 767]	1166	[1538, 1354]	1880	[2122, 245]	2594	[2722, 1739]
453	[768, 769]	1167	[1539, 642]	1881	[2122, 2111]	2595	[2723, 195]
454	[212, 770]	1168	[639, 331]	1882	[2173, 635]	2596	[2724, 1160]
455	[771, 652]	1169	[1540, 769]	1883	[2174, 2175]	2597	[1880, 381]
456	[772, 773]	1170	[1427, 954]	1884	[783, 1369]	2598	[2725, 1093]
457	[774, 775]	1171	[1541, 332]	1885	[1698, 2176]	2599	[2726, 1312]
458	[776, 670]	1172	[217, 984]	1886	[2177, 825]	2600	[2727, 433]
459	[777, 778]	1173	[661, 930]	1887	[104, 956]	2601	[2728, 1033]
460	[779, 780]	1174	[1542, 1543]	1888	[2178, 1536]	2602	[2729, 1286]
461	[781, 222]	1175	[1544, 817]	1889	[211, 351]	2603	[152, 1126]
462	[782, 783]	1176	[659, 737]	1890	[2179, 967]	2604	[2730, 365]
463	[784, 299]	1177	[1500, 1545]	1891	[643, 1392]	2605	[2731, 1056]
464	[785, 786]	1178	[1546, 1429]	1892	[2180, 304]	2606	[2732, 1188]
465	[787, 673]	1179	[922, 324]	1893	[2181, 2182]	2607	[2733, 377]
466	[788, 232]	1180	[1547, 982]	1894	[2183, 958]	2608	[2734, 1195]
467	[789, 790]	1181	[1548, 861]	1895	[2184, 1492]	2609	[1243, 1142]
468	[675, 791]	1182	[1549, 678]	1896	[2185, 309]	2610	[2735, 1753]
469	[792, 240]	1183	[1493, 1550]	1897	[2186, 1535]	2611	[500, 1013]
470	[793, 794]	1184	[1551, 913]	1898	[2187, 250]	2612	[2736, 49]
471	[795, 674]	1185	[802, 1552]	1899	[2188, 1668]	2613	[2737, 552]
472	[796, 797]	1186	[1553, 654]	1900	[2189, 2190]	2614	[167, 531]
473	[798, 238]	1187	[1554, 738]	1901	[1480, 725]	2615	[2738, 614]
474	[799, 800]	1188	[808, 1371]	1902	[1612, 274]	2616	[2739, 550]
475	[801, 802]	1189	[1380, 911]	1903	[2191, 2192]	2617	[2740, 134]
476	[803, 804]	1190	[1555, 208]	1904	[2193, 665]	2618	[2741, 463]
477	[805, 806]	1191	[1556, 326]	1905	[1567, 2194]	2619	[2742, 406]
478	[807, 808]	1192	[953, 1557]	1906	[2195, 1491]	2620	[2743, 498]
479	[809, 810]	1193	[1558, 1559]	1907	[344, 1403]	2621	[2744, 406]
480	[302, 811]	1194	[1560, 248]	1908	[2196, 2197]	2622	[2745, 488]
481	[812, 732]	1195	[695, 1442]	1909	[254, 337]	2623	[2746, 404]
482	[793, 813]	1196	[1561, 935]	1910	[2198, 2199]	2624	[2747, 1290]
483	[814, 815]	1197	[1562, 971]	1911	[2200, 1701]	2625	[558, 1024]
484	[816, 348]	1198	[298, 639]	1912	[2201, 962]	2626	[2748, 1719]
485	[817, 646]	1199	[1563, 918]	1913	[2202, 838]	2627	[2749, 366]
486	[786, 358]	1200	[1564, 1565]	1914	[2193, 2203]	2628	[2750, 1013]
487	[818, 241]	1201	[1566, 1567]	1915	[2204, 683]	2629	[122, 1019]
488	[670, 819]	1202	[1568, 1510]	1916	[2200, 923]	2630	[2751, 1054]
489	[820, 94]	1203	[1569, 1570]	1917	[2205, 1699]	2631	[1164, 591]
490	[821, 822]	1204	[1571, 232]	1918	[2114, 1567]	2632	[2752, 409]
491	[823, 748]	1205	[1572, 734]	1919	[1654, 2194]	2633	[2753, 462]

492	[819, 824]	1206	[298, 330]	1920	[2206, 632]	2634	[2754, 2755]
493	[825, 266]	1207	[1573, 239]	1921	[2207, 840]	2635	[2756, 378]
494	[826, 827]	1208	[1574, 1575]	1922	[2188, 2208]	2636	[1928, 134]
495	[721, 754]	1209	[1576, 326]	1923	[2209, 2210]	2637	[2757, 1171]
496	[828, 829]	1210	[1577, 1578]	1924	[883, 2211]	2638	[2758, 1319]
497	[338, 699]	1211	[631, 1579]	1925	[1539, 1394]	2639	[2759, 1129]
498	[830, 831]	1212	[1508, 1580]	1926	[2212, 1465]	2640	[2760, 1013]
499	[832, 833]	1213	[1581, 675]	1927	[2213, 1625]	2641	[2761, 1047]
500	[277, 834]	1214	[1582, 1583]	1928	[2214, 230]	2642	[2762, 2755]
501	[285, 835]	1215	[1584, 1373]	1929	[1387, 739]	2643	[2763, 365]
502	[98, 666]	1216	[338, 1440]	1930	[351, 2215]	2644	[1759, 1097]
503	[836, 28]	1217	[1351, 1585]	1931	[2216, 229]	2645	[2764, 191]
504	[837, 838]	1218	[68, 1586]	1932	[2217, 2199]	2646	[2765, 500]
505	[839, 22]	1219	[1587, 1588]	1933	[1454, 2122]	2647	[2766, 1239]
506	[840, 762]	1220	[6, 1361]	1934	[2218, 1492]	2648	[2767, 122]
507	[841, 842]	1221	[1589, 970]	1935	[934, 2219]	2649	[2768, 1034]
508	[843, 844]	1222	[1590, 695]	1936	[2220, 691]	2650	[2769, 1123]
509	[23, 845]	1223	[1562, 1591]	1937	[2221, 315]	2651	[2770, 436]
510	[846, 775]	1224	[1592, 1593]	1938	[2222, 763]	2652	[2771, 536]
511	[746, 847]	1225	[1594, 1483]	1939	[2223, 2224]	2653	[2772, 114]
512	[848, 849]	1226	[1595, 910]	1940	[1471, 1694]	2654	[2773, 441]
513	[850, 851]	1227	[1596, 1597]	1941	[2225, 2226]	2655	[2774, 614]
514	[852, 831]	1228	[1598, 1489]	1942	[1567, 1655]	2656	[2775, 131]
515	[853, 854]	1229	[1599, 1600]	1943	[2171, 2227]	2657	[2776, 443]
516	[855, 662]	1230	[1601, 1386]	1944	[2228, 886]	2658	[384, 12]
517	[856, 303]	1231	[1602, 306]	1945	[2229, 229]	2659	[2777, 144]
518	[857, 622]	1232	[1389, 948]	1946	[2230, 1625]	2660	[2778, 1284]
519	[858, 859]	1233	[1603, 624]	1947	[802, 2231]	2661	[2779, 1826]
520	[860, 861]	1234	[1604, 1605]	1948	[2232, 1632]	2662	[2780, 1129]
521	[862, 863]	1235	[1606, 933]	1949	[2233, 637]	2663	[2781, 183]
522	[864, 842]	1236	[1505, 1607]	1950	[2234, 1422]	2664	[2782, 561]
523	[865, 70]	1237	[314, 1350]	1951	[890, 2176]	2665	[2783, 1162]
524	[854, 356]	1238	[1608, 978]	1952	[2235, 691]	2666	[2784, 1800]
525	[866, 867]	1239	[1609, 353]	1953	[2195, 658]	2667	[2785, 438]
526	[868, 869]	1240	[1610, 1611]	1954	[2236, 2224]	2668	[2786, 1041]
527	[870, 871]	1241	[100, 1356]	1955	[2237, 890]	2669	[2787, 441]
528	[273, 237]	1242	[887, 1447]	1956	[2228, 1417]	2670	[2788, 361]
529	[872, 793]	1243	[871, 73]	1957	[2238, 716]	2671	[713, 2162]
530	[873, 874]	1244	[1612, 256]	1958	[2239, 2240]	2672	[708, 2789]
531	[875, 876]	1245	[1613, 281]	1959	[1715, 58]	2673	[1423, 2790]
532	[877, 878]	1246	[1614, 1615]	1960	[210, 917]	2674	[2646, 2791]
533	[349, 817]	1247	[1616, 255]	1961	[2241, 1645]	2675	[1627, 853]
534	[879, 880]	1248	[1617, 697]	1962	[638, 330]	2676	[2792, 653]
535	[881, 882]	1249	[1618, 1552]	1963	[2242, 705]	2677	[1507, 975]

536	[883, 884]	1250	[1619, 1602]	1964	[1579, 312]	2678	[71, 1423]
537	[885, 255]	1251	[1620, 631]	1965	[1694, 857]	2679	[1445, 940]
538	[886, 887]	1252	[703, 317]	1966	[2243, 1476]	2680	[2793, 915]
539	[888, 306]	1253	[1621, 867]	1967	[857, 1688]	2681	[2655, 774]
540	[889, 707]	1254	[15, 262]	1968	[2181, 2244]	2682	[1482, 2794]
541	[890, 891]	1255	[1622, 936]	1969	[2245, 1657]	2683	[2587, 866]
542	[863, 85]	1256	[1623, 1428]	1970	[2205, 928]	2684	[2177, 265]
543	[326, 892]	1257	[1624, 1432]	1971	[2246, 2247]	2685	[261, 2585]
544	[893, 894]	1258	[1625, 258]	1972	[2248, 1529]	2686	[2571, 2282]
545	[895, 795]	1259	[1626, 324]	1973	[2249, 1458]	2687	[2608, 1621]
546	[222, 272]	1260	[1373, 963]	1974	[2250, 787]	2688	[856, 811]
547	[896, 685]	1261	[1627, 1628]	1975	[2251, 640]	2689	[2795, 1642]
548	[897, 898]	1262	[1629, 1630]	1976	[1503, 2252]	2690	[2270, 635]
549	[899, 900]	1263	[1631, 1632]	1977	[2253, 2254]	2691	[2796, 2150]
550	[901, 743]	1264	[1633, 1634]	1978	[2255, 302]	2692	[702, 316]
551	[902, 653]	1265	[1635, 1636]	1979	[1518, 2256]	2693	[2580, 789]
552	[903, 641]	1266	[975, 1580]	1980	[970, 1591]	2694	[2126, 2280]
553	[904, 694]	1267	[1637, 843]	1981	[2257, 1429]	2695	[2052, 1571]
554	[905, 64]	1268	[1638, 1364]	1982	[1684, 311]	2696	[2797, 355]
555	[906, 907]	1269	[1639, 793]	1983	[2204, 1553]	2697	[1452, 892]
556	[900, 908]	1270	[1640, 1641]	1984	[62, 2258]	2698	[2601, 656]
557	[909, 729]	1271	[1642, 200]	1985	[2259, 1347]	2699	[1669, 2617]
558	[910, 911]	1272	[1643, 347]	1986	[305, 668]	2700	[2106, 2669]
559	[912, 913]	1273	[26, 625]	1987	[2260, 2192]	2701	[692, 2798]
560	[290, 851]	1274	[1644, 1645]	1988	[852, 2115]	2702	[2556, 676]
561	[914, 701]	1275	[1646, 240]	1989	[2261, 711]	2703	[2799, 1642]
562	[915, 788]	1276	[1647, 789]	1990	[246, 2159]	2704	[869, 1426]
563	[916, 841]	1277	[1648, 1543]	1991	[2225, 2262]	2705	[915, 1571]
564	[99, 667]	1278	[1649, 1447]	1992	[1525, 1672]	2706	[733, 2611]
565	[917, 857]	1279	[1554, 1387]	1993	[2075, 677]	2707	[902, 259]
566	[251, 918]	1280	[1650, 843]	1994	[2248, 267]	2708	[2223, 2800]
567	[340, 638]	1281	[1651, 213]	1995	[2263, 733]	2709	[2801, 344]
568	[919, 81]	1282	[1652, 1457]	1996	[2264, 1583]	2710	[2647, 853]
569	[920, 880]	1283	[1653, 279]	1997	[2265, 761]	2711	[803, 2802]
570	[921, 922]	1284	[1654, 1655]	1998	[1631, 2266]	2712	[2236, 2800]
571	[923, 924]	1285	[1656, 1657]	1999	[2267, 1677]	2713	[2063, 265]
572	[925, 926]	1286	[1658, 1355]	2000	[2268, 2269]	2714	[2670, 2803]
573	[927, 928]	1287	[1659, 1660]	2001	[2270, 342]	2715	[2804, 1619]
574	[929, 930]	1288	[1661, 718]	2002	[2271, 1636]	2716	[2274, 2805]
575	[931, 790]	1289	[660, 929]	2003	[2272, 280]	2717	[974, 1508]
576	[932, 791]	1290	[763, 1496]	2004	[2273, 926]	2718	[1358, 1512]
577	[869, 933]	1291	[1513, 1662]	2005	[2274, 1660]	2719	[2245, 2656]
578	[934, 767]	1292	[1663, 238]	2006	[1618, 2231]	2720	[2257, 333]
579	[935, 936]	1293	[1664, 1665]	2007	[2275, 1478]	2721	[682, 1553]

580	[937, 718]	1294	[1666, 706]	2008	[79, 2256]	2722	[1710, 2806]
581	[938, 307]	1295	[1667, 1668]	2009	[265, 1488]	2723	[2604, 2807]
582	[939, 852]	1296	[1669, 1670]	2010	[234, 784]	2724	[2808, 2078]
583	[940, 941]	1297	[1671, 1672]	2011	[2276, 262]	2725	[807, 1370]
584	[648, 899]	1298	[1673, 209]	2012	[876, 863]	2726	[89, 2789]
585	[24, 942]	1299	[1674, 1675]	2013	[2119, 868]	2727	[2092, 2809]
586	[943, 360]	1300	[1676, 341]	2014	[2277, 252]	2728	[895, 1400]
587	[944, 204]	1301	[1677, 1419]	2015	[2278, 868]	2729	[1690, 2809]
588	[773, 945]	1302	[1678, 878]	2016	[2279, 2280]	2730	[639, 2134]
589	[946, 234]	1303	[643, 783]	2017	[2189, 2145]	2731	[2116, 2798]
590	[947, 948]	1304	[1679, 1680]	2018	[2281, 2282]	2732	[2810, 2668]
591	[629, 773]	1305	[1681, 1465]	2019	[1430, 2211]	2733	[2059, 1516]
592	[949, 950]	1306	[683, 654]	2020	[2283, 944]	2734	[2235, 628]
593	[951, 952]	1307	[1682, 285]	2021	[2284, 267]	2735	[2792, 259]
594	[953, 954]	1308	[1683, 847]	2022	[333, 633]	2736	[2286, 2811]
595	[955, 956]	1309	[1684, 1579]	2023	[754, 1662]	2737	[1686, 253]
596	[957, 958]	1310	[1386, 738]	2024	[2285, 2149]	2738	[84, 2812]
597	[959, 960]	1311	[1685, 966]	2025	[2221, 253]	2739	[57, 1493]
598	[961, 962]	1312	[754, 1514]	2026	[2187, 1403]	2740	[2665, 1384]
599	[286, 963]	1313	[1686, 315]	2027	[2286, 810]	2741	[1659, 2805]
600	[964, 732]	1314	[1687, 1528]	2028	[2287, 2288]	2742	[668, 708]
601	[815, 687]	1315	[621, 1688]	2029	[844, 899]	2743	[2813, 832]
602	[965, 647]	1316	[1689, 69]	2030	[2289, 2290]	2744	[2626, 2806]
603	[272, 348]	1317	[1690, 1691]	2031	[2291, 2132]	2745	[1594, 2794]
604	[966, 871]	1318	[1692, 1693]	2032	[214, 2083]	2746	[2814, 1535]
605	[967, 728]	1319	[210, 1694]	2033	[2292, 1439]	2747	[625, 65]
606	[968, 945]	1320	[1695, 970]	2034	[2093, 2293]	2748	[1448, 2563]
607	[969, 897]	1321	[351, 770]	2035	[1427, 1557]	2749	[66, 2625]
608	[970, 971]	1322	[1696, 883]	2036	[2273, 2294]	2750	[229, 2815]
609	[972, 359]	1323	[820, 200]	2037	[2295, 824]	2751	[2178, 2816]
610	[973, 322]	1324	[1697, 1534]	2038	[1652, 2062]	2752	[863, 2812]
611	[974, 975]	1325	[1698, 891]	2039	[2296, 865]	2753	[2569, 2817]
612	[976, 977]	1326	[927, 1699]	2040	[2297, 87]	2754	[2818, 839]
613	[978, 63]	1327	[1700, 1525]	2041	[2298, 992]	2755	[2578, 859]
614	[353, 979]	1328	[1701, 924]	2042	[2299, 609]	2756	[1538, 2610]
615	[980, 981]	1329	[1426, 953]	2043	[2300, 1964]	2757	[2819, 839]
616	[982, 983]	1330	[1702, 901]	2044	[2301, 43]	2758	[678, 1679]
617	[984, 261]	1331	[1703, 1704]	2045	[2302, 1744]	2759	[949, 2607]
618	[861, 852]	1332	[317, 960]	2046	[2303, 582]	2760	[2277, 201]
619	[985, 645]	1333	[652, 24]	2047	[2304, 1037]	2761	[2253, 2807]
620	[986, 578]	1334	[1705, 1407]	2048	[1805, 1744]	2762	[322, 2790]
621	[987, 597]	1335	[1706, 977]	2049	[2305, 526]	2763	[2220, 628]
622	[988, 989]	1336	[1707, 1602]	2050	[2027, 1037]	2764	[2046, 2661]
623	[990, 161]	1337	[691, 772]	2051	[2306, 1888]	2765	[2146, 2803]

624	[991, 37]	1338	[1708, 1570]	2052	[2307, 1109]	2766	[933, 953]
625	[176, 581]	1339	[695, 1709]	2053	[2308, 2309]	2767	[1410, 1626]
626	[51, 992]	1340	[1710, 1711]	2054	[2310, 548]	2768	[700, 2551]
627	[993, 615]	1341	[1712, 1456]	2055	[2311, 1185]	2769	[2637, 846]
628	[994, 516]	1342	[1713, 1600]	2056	[2312, 175]	2770	[862, 84]
629	[488, 995]	1343	[1714, 295]	2057	[2313, 574]	2771	[2621, 2820]
630	[996, 997]	1344	[1715, 288]	2058	[2314, 47]	2772	[337, 698]
631	[998, 549]	1345	[1573, 680]	2059	[2315, 2316]	2773	[975, 2629]
632	[999, 1000]	1346	[1716, 1303]	2060	[2317, 490]	2774	[964, 702]
633	[436, 1001]	1347	[1717, 1718]	2061	[2318, 595]	2775	[2821, 2650]
634	[124, 387]	1348	[1719, 570]	2062	[1186, 1880]	2776	[289, 850]
635	[1002, 1003]	1349	[1720, 1721]	2063	[2319, 475]	2777	[2821, 2640]
636	[1004, 1005]	1350	[552, 380]	2064	[2320, 1744]	2778	[2124, 2109]
637	[1006, 1007]	1351	[1722, 133]	2065	[2321, 989]	2779	[2584, 1677]
638	[1000, 1008]	1352	[1723, 1328]	2066	[2322, 570]	2780	[1407, 698]
639	[525, 197]	1353	[1724, 1204]	2067	[2323, 449]	2781	[1396, 2658]
640	[1009, 1010]	1354	[1725, 1220]	2068	[2324, 1319]	2782	[1369, 2802]
641	[1011, 574]	1355	[174, 1237]	2069	[2325, 1190]	2783	[1382, 1400]
642	[1012, 587]	1356	[1250, 1726]	2070	[2326, 1051]	2784	[2822, 2165]
643	[1013, 1014]	1357	[1727, 1728]	2071	[2327, 1072]	2785	[1535, 2816]
644	[1015, 40]	1358	[1301, 557]	2072	[2328, 40]	2786	[2547, 1385]
645	[1016, 183]	1359	[1729, 425]	2073	[2329, 487]	2787	[2546, 2078]
646	[603, 1017]	1360	[1730, 547]	2074	[1070, 483]	2788	[2823, 2600]
647	[193, 1018]	1361	[12, 585]	2075	[2330, 524]	2789	[509, 1235]
648	[1019, 1020]	1362	[1731, 1135]	2076	[2331, 544]	2790	[1344, 462]
649	[1021, 1022]	1363	[1732, 1041]	2077	[2332, 147]	2791	[2824, 144]
650	[372, 449]	1364	[1733, 1198]	2078	[2333, 44]	2792	[2825, 1213]
651	[1023, 1024]	1365	[1734, 1127]	2079	[2334, 493]	2793	[2826, 1118]
652	[1025, 1026]	1366	[478, 1079]	2080	[2335, 1046]	2794	[2827, 1940]
653	[1027, 1028]	1367	[1735, 1736]	2081	[2336, 1085]	2795	[2828, 495]
654	[1029, 1030]	1368	[1737, 172]	2082	[2337, 1024]	2796	[2829, 1159]
655	[1031, 993]	1369	[1014, 42]	2083	[1282, 1046]	2797	[2830, 471]
656	[1032, 518]	1370	[1220, 1738]	2084	[2338, 2339]	2798	[2831, 12]
657	[1033, 1034]	1371	[38, 1739]	2085	[2340, 2341]	2799	[2832, 361]
658	[1035, 1036]	1372	[1740, 989]	2086	[2342, 1041]	2800	[2833, 500]
659	[1037, 1038]	1373	[1741, 1055]	2087	[2343, 1066]	2801	[2834, 1841]
660	[1039, 1040]	1374	[1742, 47]	2088	[2344, 1070]	2802	[1008, 1334]
661	[1041, 1000]	1375	[1743, 614]	2089	[2345, 438]	2803	[2835, 1019]
662	[1001, 1033]	1376	[1744, 575]	2090	[2346, 53]	2804	[2836, 1938]
663	[1042, 1043]	1377	[1745, 1258]	2091	[2347, 1861]	2805	[2837, 1046]
664	[1044, 467]	1378	[1746, 1091]	2092	[2348, 1065]	2806	[2838, 1736]
665	[1045, 479]	1379	[1747, 1271]	2093	[2349, 425]	2807	[2839, 1235]
666	[1046, 1021]	1380	[1748, 1020]	2094	[2350, 1013]	2808	[2840, 519]
667	[186, 1047]	1381	[184, 1159]	2095	[2351, 528]	2809	[2841, 1266]

668	[508, 1048]	1382	[1749, 1269]	2096	[2352, 1063]	2810	[2842, 1100]
669	[1049, 148]	1383	[461, 376]	2097	[2353, 1045]	2811	[1942, 393]
670	[1050, 558]	1384	[1750, 1321]	2098	[2354, 1852]	2812	[1771, 1940]
671	[36, 1051]	1385	[1751, 383]	2099	[2355, 505]	2813	[2843, 1222]
672	[1052, 1053]	1386	[1752, 565]	2100	[2356, 126]	2814	[2844, 133]
673	[1054, 1055]	1387	[1753, 174]	2101	[2357, 536]	2815	[2316, 107]
674	[1056, 364]	1388	[1754, 1204]	2102	[1010, 146]	2816	[1284, 1252]
675	[1057, 165]	1389	[1755, 48]	2103	[402, 1074]	2817	[2845, 479]
676	[1058, 1059]	1390	[1756, 1757]	2104	[2358, 1099]	2818	[2846, 1739]
677	[1060, 166]	1391	[1758, 1759]	2105	[2359, 1728]	2819	[2847, 43]
678	[1061, 1062]	1392	[374, 1228]	2106	[2360, 618]	2820	[2848, 1100]
679	[1063, 166]	1393	[1760, 391]	2107	[2361, 1231]	2821	[2849, 1938]
680	[1064, 1065]	1394	[1761, 616]	2108	[2362, 550]	2822	[2850, 107]
681	[531, 1066]	1395	[1762, 1325]	2109	[2363, 1213]	2823	[2851, 1114]
682	[1067, 1068]	1396	[1763, 419]	2110	[2364, 1150]	2824	[242, 2820]
683	[1069, 468]	1397	[597, 1207]	2111	[1726, 1231]	2825	[2808, 318]
684	[1018, 533]	1398	[1764, 531]	2112	[2365, 1054]	2826	[273, 1493]
685	[376, 546]	1399	[1134, 391]	2113	[2366, 1064]	2827	[2586, 2817]
686	[432, 1070]	1400	[1765, 1057]	2114	[2367, 506]	2828	[984, 764]
687	[1071, 432]	1401	[1766, 1220]	2115	[613, 1753]	2829	[2281, 2572]
688	[1072, 1073]	1402	[1767, 187]	2116	[2368, 1185]	2830	[2852, 809]
689	[1074, 1010]	1403	[529, 1718]	2117	[2369, 126]	2831	[1604, 2660]
690	[387, 459]	1404	[1768, 556]	2118	[1328, 466]	2832	[917, 621]
691	[1075, 588]	1405	[1769, 1304]	2119	[2370, 1252]	2833	[1667, 2208]
692	[1076, 1077]	1406	[1770, 484]	2120	[2371, 522]	2834	[1694, 621]
693	[1078, 1079]	1407	[392, 1771]	2121	[2372, 1942]	2835	[2573, 1384]
694	[1080, 452]	1408	[1772, 1271]	2122	[2373, 1022]	2836	[1355, 850]
695	[1081, 1082]	1409	[1773, 618]	2123	[2374, 434]	2837	[2296, 1385]
696	[1083, 567]	1410	[1774, 566]	2124	[2375, 1222]	2838	[2796, 1498]
697	[1084, 148]	1411	[1775, 602]	2125	[2376, 466]	2839	[2174, 2791]
698	[1038, 516]	1412	[1776, 1777]	2126	[2377, 141]	2840	[1546, 333]
699	[415, 1085]	1413	[1778, 1736]	2127	[2378, 49]	2841	[2144, 2190]
700	[463, 423]	1414	[1779, 1111]	2128	[2379, 1826]	2842	[809, 2811]
701	[1086, 507]	1415	[554, 406]	2129	[2380, 501]	2843	[973, 1423]
702	[1087, 557]	1416	[1780, 111]	2130	[2381, 122]	2844	[921, 1626]
703	[618, 182]	1417	[1781, 1738]	2131	[2382, 1065]	2845	[2594, 2596]
704	[1088, 515]	1418	[1782, 1783]	2132	[2383, 501]	2846	[88, 708]
705	[1089, 135]	1419	[153, 143]	2133	[2384, 562]	2847	[876, 84]
706	[197, 1090]	1420	[474, 1241]	2134	[1228, 377]	2848	[2053, 96]
707	[1091, 55]	1421	[1784, 1785]	2135	[2385, 1164]	2849	[17, 752]
708	[1092, 1057]	1422	[1786, 1005]	2136	[2386, 571]	2850	[2214, 2815]
709	[1048, 1093]	1423	[535, 568]	2137	[2387, 1079]	2851	[237, 1494]
710	[1094, 388]	1424	[1787, 373]	2138	[2388, 445]	2852	[2853, 1726]
711	[1095, 190]	1425	[1788, 434]	2139	[2389, 585]	2853	[839, 1466]

712	[1096, 1097]	1426	[538, 1789]	2140	[2390, 1086]
713	[1098, 125]	1427	[1253, 1332]	2141	[2391, 1046]

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	476	0	952	0	1428	1	1904	1	2380	1
1	0	477	1	953	1	1429	0	1905	1	2381	0
2	0	478	0	954	0	1430	0	1906	0	2382	1
3	0	479	1	955	1	1431	0	1907	1	2383	0
4	1	480	0	956	1	1432	0	1908	1	2384	1
5	0	481	0	957	1	1433	1	1909	0	2385	0
6	1	482	0	958	0	1434	1	1910	1	2386	1
7	0	483	0	959	1	1435	1	1911	0	2387	1
8	1	484	0	960	0	1436	0	1912	1	2388	0
9	1	485	0	961	0	1437	1	1913	0	2389	1
10	0	486	0	962	0	1438	0	1914	1	2390	0
11	0	487	1	963	0	1439	0	1915	0	2391	0
12	1	488	1	964	1	1440	1	1916	0	2392	0
13	1	489	0	965	0	1441	1	1917	1	2393	1
14	0	490	1	966	1	1442	1	1918	0	2394	0
15	0	491	0	967	1	1443	1	1919	0	2395	0
16	1	492	1	968	0	1444	0	1920	0	2396	0
17	1	493	0	969	1	1445	1	1921	0	2397	1
18	0	494	1	970	1	1446	0	1922	0	2398	1
19	1	495	0	971	1	1447	0	1923	1	2399	1
20	0	496	0	972	0	1448	1	1924	1	2400	1
21	0	497	1	973	0	1449	0	1925	1	2401	1
22	0	498	1	974	0	1450	1	1926	0	2402	1
23	0	499	0	975	0	1451	0	1927	1	2403	1
24	1	500	0	976	0	1452	0	1928	0	2404	0
25	1	501	0	977	0	1453	0	1929	1	2405	1
26	0	502	0	978	0	1454	0	1930	1	2406	1
27	1	503	0	979	1	1455	1	1931	1	2407	1
28	0	504	1	980	1	1456	1	1932	0	2408	0
29	0	505	1	981	1	1457	1	1933	0	2409	0
30	1	506	0	982	0	1458	1	1934	1	2410	1
31	1	507	0	983	1	1459	1	1935	0	2411	1
32	1	508	0	984	1	1460	0	1936	0	2412	0
33	1	509	0	985	0	1461	0	1937	0	2413	1
34	1	510	0	986	0	1462	0	1938	1	2414	0
35	0	511	1	987	0	1463	0	1939	0	2415	1
36	0	512	0	988	1	1464	1	1940	1	2416	1
37	1	513	1	989	0	1465	0	1941	0	2417	0
38	0	514	0	990	1	1466	1	1942	1	2418	0

39	0	515	0	991	1	1467	1	1943	0	2419	0
40	0	516	1	992	1	1468	0	1944	0	2420	1
41	0	517	1	993	0	1469	0	1945	0	2421	1
42	0	518	1	994	1	1470	1	1946	0	2422	1
43	0	519	1	995	1	1471	1	1947	1	2423	1
44	0	520	1	996	1	1472	0	1948	0	2424	1
45	0	521	1	997	0	1473	1	1949	1	2425	0
46	1	522	1	998	0	1474	1	1950	1	2426	0
47	1	523	0	999	0	1475	1	1951	1	2427	1
48	0	524	0	1000	1	1476	0	1952	1	2428	1
49	1	525	1	1001	0	1477	0	1953	0	2429	0
50	1	526	0	1002	0	1478	1	1954	1	2430	0
51	0	527	0	1003	1	1479	0	1955	0	2431	0
52	1	528	0	1004	0	1480	1	1956	0	2432	1
53	1	529	1	1005	1	1481	0	1957	0	2433	0
54	0	530	0	1006	0	1482	0	1958	0	2434	0
55	1	531	0	1007	0	1483	0	1959	1	2435	1
56	0	532	0	1008	0	1484	1	1960	0	2436	1
57	1	533	0	1009	0	1485	1	1961	0	2437	0
58	1	534	0	1010	1	1486	0	1962	1	2438	1
59	1	535	1	1011	1	1487	1	1963	1	2439	1
60	1	536	1	1012	1	1488	0	1964	0	2440	0
61	1	537	1	1013	0	1489	1	1965	1	2441	1
62	1	538	1	1014	1	1490	0	1966	0	2442	1
63	0	539	0	1015	1	1491	0	1967	1	2443	1
64	1	540	1	1016	1	1492	1	1968	1	2444	1
65	1	541	1	1017	0	1493	0	1969	1	2445	0
66	1	542	1	1018	1	1494	1	1970	1	2446	1
67	1	543	1	1019	0	1495	0	1971	1	2447	0
68	0	544	0	1020	0	1496	0	1972	0	2448	0
69	0	545	0	1021	1	1497	0	1973	1	2449	1
70	0	546	1	1022	1	1498	0	1974	1	2450	0
71	1	547	0	1023	0	1499	0	1975	0	2451	0
72	1	548	1	1024	0	1500	1	1976	1	2452	0
73	0	549	0	1025	1	1501	1	1977	0	2453	1
74	0	550	1	1026	1	1502	0	1978	1	2454	1
75	1	551	0	1027	1	1503	1	1979	0	2455	0
76	0	552	1	1028	0	1504	0	1980	1	2456	1
77	0	553	0	1029	0	1505	1	1981	0	2457	0
78	0	554	1	1030	1	1506	1	1982	1	2458	1
79	1	555	0	1031	1	1507	1	1983	0	2459	0
80	0	556	0	1032	1	1508	1	1984	1	2460	1
81	0	557	0	1033	1	1509	1	1985	0	2461	0
82	0	558	0	1034	0	1510	0	1986	0	2462	0

83	0	559	0	1035	1	1511	1	1987	1	2463	0
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85	1	561	1	1037	1	1513	1	1989	0	2465	0
86	0	562	0	1038	0	1514	0	1990	0	2466	0
87	0	563	1	1039	1	1515	1	1991	0	2467	0
88	1	564	0	1040	0	1516	1	1992	1	2468	0
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90	1	566	1	1042	1	1518	0	1994	0	2470	0
91	0	567	1	1043	0	1519	0	1995	0	2471	0
92	0	568	1	1044	0	1520	0	1996	1	2472	0
93	1	569	1	1045	1	1521	1	1997	1	2473	0
94	1	570	0	1046	1	1522	1	1998	1	2474	1
95	1	571	1	1047	1	1523	0	1999	1	2475	1
96	1	572	1	1048	1	1524	1	2000	0	2476	1
97	1	573	0	1049	1	1525	1	2001	0	2477	1
98	0	574	0	1050	1	1526	0	2002	0	2478	1
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103	0	579	1	1055	0	1531	1	2007	1	2483	0
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105	1	581	0	1057	1	1533	1	2009	1	2485	0
106	1	582	1	1058	0	1534	1	2010	1	2486	0
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108	1	584	0	1060	0	1536	1	2012	0	2488	1
109	1	585	1	1061	1	1537	0	2013	0	2489	1
110	0	586	1	1062	1	1538	0	2014	1	2490	0
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112	0	588	1	1064	0	1540	1	2016	1	2492	1
113	1	589	1	1065	0	1541	0	2017	1	2493	0
114	1	590	1	1066	0	1542	0	2018	1	2494	0
115	1	591	1	1067	1	1543	1	2019	0	2495	0
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118	1	594	1	1070	1	1546	1	2022	1	2498	0
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142	0	618	0	1094	1	1570	0	2046	1	2522	0
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150	1	626	0	1102	1	1578	0	2054	0	2530	0
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155	1	631	0	1107	0	1583	0	2059	0	2535	0
156	0	632	0	1108	0	1584	0	2060	0	2536	1
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160	1	636	0	1112	1	1588	1	2064	1	2540	0
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168	1	644	1	1120	0	1596	0	2072	0	2548	0
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171	0	647	0	1123	0	1599	0	2075	1	2551	1
172	1	648	0	1124	0	1600	0	2076	0	2552	0
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174	0	650	1	1126	0	1602	1	2078	1	2554	1
175	1	651	0	1127	0	1603	0	2079	0	2555	1
176	0	652	1	1128	0	1604	0	2080	1	2556	1
177	1	653	1	1129	1	1605	0	2081	0	2557	0
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179	1	655	1	1131	0	1607	0	2083	1	2559	0
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181	1	657	1	1133	0	1609	0	2085	1	2561	0
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185	0	661	1	1137	1	1613	1	2089	1	2565	1
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187	1	663	1	1139	1	1615	1	2091	0	2567	0
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189	1	665	1	1141	1	1617	1	2093	0	2569	0
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191	0	667	0	1143	1	1619	0	2095	0	2571	0
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193	0	669	1	1145	1	1621	0	2097	0	2573	0
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195	1	671	0	1147	1	1623	1	2099	1	2575	0
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207	1	683	1	1159	0	1635	1	2111	0	2587	0
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223	1	699	0	1175	1	1651	0	2127	0	2603	1
224	0	700	0	1176	1	1652	1	2128	1	2604	1
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226	0	702	0	1178	1	1654	0	2130	0	2606	1
227	0	703	0	1179	1	1655	0	2131	1	2607	0
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229	1	705	1	1181	0	1657	0	2133	1	2609	0
230	0	706	0	1182	0	1658	0	2134	1	2610	1
231	1	707	1	1183	0	1659	1	2135	0	2611	0
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234	1	710	1	1186	0	1662	1	2138	0	2614	1
235	1	711	0	1187	0	1663	0	2139	1	2615	0
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237	1	713	0	1189	1	1665	1	2141	0	2617	1
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242	0	718	1	1194	1	1670	0	2146	0	2622	1
243	0	719	1	1195	0	1671	0	2147	1	2623	0
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247	0	723	0	1199	0	1675	0	2151	1	2627	1
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251	1	727	0	1203	1	1679	0	2155	0	2631	0
252	0	728	0	1204	0	1680	1	2156	1	2632	1
253	1	729	0	1205	1	1681	1	2157	1	2633	0
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259	0	735	0	1211	0	1687	1	2163	1	2639	0
260	1	736	0	1212	1	1688	0	2164	1	2640	1
261	0	737	1	1213	1	1689	1	2165	0	2641	0
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265	1	741	0	1217	1	1693	1	2169	1	2645	1
266	1	742	0	1218	0	1694	1	2170	0	2646	0
267	1	743	1	1219	1	1695	1	2171	0	2647	0
268	1	744	0	1220	1	1696	1	2172	0	2648	1
269	0	745	0	1221	0	1697	0	2173	1	2649	0
270	0	746	1	1222	1	1698	0	2174	1	2650	0
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272	1	748	1	1224	1	1700	0	2176	0	2652	1
273	0	749	1	1225	1	1701	0	2177	1	2653	0
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275	1	751	0	1227	0	1703	1	2179	0	2655	1
276	0	752	1	1228	1	1704	0	2180	0	2656	1
277	0	753	1	1229	0	1705	1	2181	1	2657	1
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280	0	756	0	1232	0	1708	0	2184	0	2660	1
281	1	757	0	1233	0	1709	0	2185	0	2661	0
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283	1	759	1	1235	1	1711	0	2187	0	2663	1
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289	1	765	1	1241	1	1717	0	2193	1	2669	0
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291	0	767	0	1243	0	1719	0	2195	0	2671	0
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293	1	769	0	1245	1	1721	1	2197	1	2673	1
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296	1	772	0	1248	1	1724	1	2200	0	2676	1
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306	1	782	1	1258	0	1734	1	2210	1	2686	0
307	1	783	0	1259	0	1735	0	2211	1	2687	1
308	1	784	0	1260	0	1736	0	2212	0	2688	1
309	0	785	0	1261	1	1737	1	2213	1	2689	1
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323	0	799	1	1275	1	1751	1	2227	1	2703	0
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335	0	811	1	1287	1	1763	1	2239	0	2715	0
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342	1	818	1	1294	0	1770	1	2246	1	2722	0
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344	1	820	0	1296	0	1772	0	2248	0	2724	1
345	0	821	1	1297	0	1773	0	2249	1	2725	0
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347	1	823	0	1299	0	1775	1	2251	0	2727	0
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350	0	826	1	1302	1	1778	1	2254	0	2730	1
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352	1	828	0	1304	0	1780	1	2256	1	2732	1
353	0	829	1	1305	1	1781	0	2257	0	2733	0
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355	0	831	1	1307	1	1783	1	2259	0	2735	1
356	0	832	0	1308	0	1784	0	2260	1	2736	0
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360	0	836	0	1312	0	1788	1	2264	1	2740	1
361	0	837	1	1313	1	1789	0	2265	1	2741	1
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364	0	840	0	1316	1	1792	0	2268	0	2744	1
365	0	841	0	1317	1	1793	0	2269	1	2745	1
366	1	842	1	1318	0	1794	1	2270	0	2746	0
367	1	843	0	1319	0	1795	1	2271	0	2747	0
368	0	844	1	1320	1	1796	0	2272	1	2748	1
369	0	845	0	1321	1	1797	0	2273	0	2749	1
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375	1	851	0	1327	0	1803	0	2279	1	2755	0
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473	1	949	0	1425	1	1901	1	2377	0	2853	1
474	1	950	1	1426	1	1902	1	2378	0		
475	1	951	1	1427	0	1903	0	2379	1		

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