PROOF OF THE CONTINUED FRACTION CONJECTURE FOR $(a, b) = (z^5 + z^4 + z^3 + z^2, z^2 + z + 1)$

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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 $(a, b) = (z^5 + z^4 + z^3 + z^2, z^2 + z + 1)$.

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

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

Date: 9/04/2020 19:19:25 .

2010 *Mathematics Subject Classification.* 11B85, 11J70, 11B50, 11Y65, 05A15.

Key words and phrases. automatic sequence, continued fraction, Thue-Morse sequence.

* This paper was automatically generated from a computer program developed by the authors, with 52.5 minutes CPU time used.

Theorem 1.1. *When* $(a,b)=(z^5+z^4+z^3+z^2, z^2+z+1)$*, 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 $\mathrm{CF}(a,b)$*,*

$$\begin{aligned}
p_0(z) &= z^{21}+z^{19}+z^{18}+z^{16}+z^{14}+z^{13}+z^5+z^2+1,\\
p_1(z) &= z^{26}+z^{25}+z^{22}+z^{21}+z^{19}+z^{15}+z^{11}+z^9+z^8+z^7+z^3+z^2,\\
p_2(z) &= z^{28}+z^{24}+z^{22}+z^{20}+z^{14}+z^{10}+z^6+z^4,\\
p_3(z) &= z^{26}+z^{25}+z^{22}+z^{21}+z^{19}+z^{15}+z^{11}+z^9+z^8+z^7+z^3+z^2,\\
p_4(z) &= z^{24}+z^{22}+z^{21}+z^{20}+z^{19}+z^{18}+z^{16}+z^{13}+z^{12}+z^{10}+z^8+z^6+z^5\\
&\quad +z^2,
\end{aligned}$$

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

$$\begin{aligned}
p_0(z) &= z^{21}+z^{20}+z^{19}+z^{18}+z^{14}+z^{13}+z^{12}+z^5+z^4+z^2,\\
p_1(z) &= z^{26}+z^{25}+z^{22}+z^{21}+z^{19}+z^{15}+z^{11}+z^9+z^8+z^7+z^3+z^2,\\
p_2(z) &= z^{28}+z^{24}+z^{22}+z^{20}+z^{14}+z^{10}+z^6+z^4,\\
p_3(z) &= z^{26}+z^{25}+z^{22}+z^{21}+z^{19}+z^{15}+z^{11}+z^9+z^8+z^7+z^3+z^2,\\
p_4(z) &= z^{24}+z^{22}+z^{21}+z^{19}+z^{18}+z^{13}+z^{10}+z^8+z^6+z^5+z^4+z^2+1.
\end{aligned}$$

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. □

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.*

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

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

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

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

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 $u = 2^{2k}$,

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

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

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

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

which can be rewritten as

$$\begin{aligned}0 &= T[[w]_2] + T[[10w]_2] + T[[11w]_2] + T[[100w]_2] + T[[101w]_2]\\ &\quad + T[[111w]_2], \qquad (2.7)\\ 0 &= T[[1w]_2] + T[[11w]_2] + T[[100w]_2] + T[[101w]_2] + T[[110w]_2]\\ &\quad + T[[1000w]_2], \qquad (2.8)\end{aligned}$$

$$0 = T[[w]_2] + T[[11w]_2] + T[[110w]_2] + T[[1001w]_2], \qquad (2.9)$$

$$0 = T[[1w]_2] + T[[10w]_2] + T[[11w]_2] + T[[101w]_2] + T[[1010w]_2], \qquad (2.10)$$

$$0 = T[[10w]_2] + T[[11w]_2] + T[[100w]_2] + T[[110w]_2] + T[[1011w]_2], \qquad (2.11)$$

$$0 = T[[10w]_2] + T[[1100w]_2], \qquad (2.12)$$

$$0 = T[[11w]_2] + T[[1101w]_2], \qquad (2.13)$$

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

$$\begin{aligned}0 &= T[[w]_2] + T[[10w]_2] + T[[11w]_2] + T[[100w]_2] + T[[101w]_2]\\ &\quad + T[[111w]_2], \qquad (2.14)\\ 0 &= T[[1w]_2] + T[[11w]_2] + T[[100w]_2] + T[[101w]_2] + T[[110w]_2]\\ &\quad + T[[1000w]_2], \qquad (2.15)\end{aligned}$$

$$0 = T[[w]_2] + T[[11w]_2] + T[[110w]_2] + T[[1001w]_2], \qquad (2.16)$$

$$0 = T[[1w]_2] + T[[10w]_2] + T[[11w]_2] + T[[101w]_2] + T[[1010w]_2], \qquad (2.17)$$

$$0 = T[[10w]_2] + T[[11w]_2] + T[[100w]_2] + T[[110w]_2] + T[[1011w]_2], \qquad (2.18)$$

$$0 = T[[10w]_2] + T[[1100w]_2], \qquad (2.19)$$

$$0 = T[[11w]_2] + T[[1101w]_2], \qquad (2.20)$$

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

First we calculate an 2-automaton that generates T from its minimal polynomial and its first terms. This automaton has 1923 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

$$\begin{aligned}0 &= \tau(A(s,\epsilon)) + \tau(A(s,10)) + \tau(A(s,11)) + \tau(A(s,100))\\ &\quad + \tau(A(s,101)) + \tau(A(s,111)), \qquad (2.21)\\ 0 &= \tau(A(s,1)) + \tau(A(s,11)) + \tau(A(s,100)) + \tau(A(s,101))\\ &\quad + \tau(A(s,110)) + \tau(A(s,1000)), \qquad (2.22)\end{aligned}$$

$$0 = \tau(A(s,\epsilon)) + \tau(A(s,11)) + \tau(A(s,110)) + \tau(A(s,1001)), \qquad (2.23)$$

$$0 = \tau(A(s,1)) + \tau(A(s,10)) + \tau(A(s,11)) + \tau(A(s,101))$$

$$+\tau(A(s,1010)), \tag{2.24}$$

$$\begin{aligned}0 &= \tau(A(s,10)) + \tau(A(s,11)) + \tau(A(s,100)) + \tau(A(s,110)) \\ &\quad + \tau(A(s,1011)),\end{aligned} \tag{2.25}$$

$$0 = \tau(A(s,10)) + \tau(A(s,1100)), \tag{2.26}$$

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

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

$$\begin{aligned}0 &= \tau(A(s,\epsilon)) + \tau(A(s,10)) + \tau(A(s,11)) + \tau(A(s,100)) \\ &\quad + \tau(A(s,101)) + \tau(A(s,111)),\end{aligned} \tag{2.28}$$

$$\begin{aligned}0 &= \tau(A(s,1)) + \tau(A(s,11)) + \tau(A(s,100)) + \tau(A(s,101)) \\ &\quad + \tau(A(s,110)) + \tau(A(s,1000)),\end{aligned} \tag{2.29}$$

$$0 = \tau(A(s,\epsilon)) + \tau(A(s,11)) + \tau(A(s,110)) + \tau(A(s,1001)), \tag{2.30}$$

$$\begin{aligned}0 &= \tau(A(s,1)) + \tau(A(s,10)) + \tau(A(s,11)) + \tau(A(s,101)) \\ &\quad + \tau(A(s,1010)),\end{aligned} \tag{2.31}$$

$$\begin{aligned}0 &= \tau(A(s,10)) + \tau(A(s,11)) + \tau(A(s,100)) + \tau(A(s,110)) \\ &\quad + \tau(A(s,1011)),\end{aligned} \tag{2.32}$$

$$0 = \tau(A(s,10)) + \tau(A(s,1100)), \tag{2.33}$$

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

for $s = A(i, 0^{2k})$. We find that $(A(i,0^{46}), E_{46}) = (A(i,0^{18}), E_{18})$, 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. □

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 $u = 2^{2k-1}$,*

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

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

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

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

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

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

$$\begin{aligned} W^e[:14v]M^e[:14v] + x^{4v}W^e[:10v]M^e[:10v] + x^{6v}W^e[:8v]M^e[:8v] \\ + x^{8v}W^e[:6v]M^e[:6v] + x^{10v}W^e[:4v]M^e[:4v]. \end{aligned}$$

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

$$\begin{aligned}
q_0(x) &= x^{28} + x^{26} + x^{23} + x^{15} + x^{14} + x^{12} + x^{10} + x^9 + x^7,\\
q_1(x) &= x^{26} + x^{25} + x^{21} + x^{20} + x^{19} + x^{17} + x^{13} + x^9 + x^7 + x^6 + x^3 + x^2,\\
q_2(x) &= x^{24} + x^{22} + x^{18} + x^{14} + x^8 + x^6 + x^4 + 1,\\
q_3(x) &= x^{26} + x^{25} + x^{21} + x^{20} + x^{19} + x^{17} + x^{13} + x^9 + x^7 + x^6 + x^3 + x^2,\\
q_4(x) &= x^{26} + x^{23} + x^{22} + x^{20} + x^{18} + x^{16} + x^{15} + x^{12} + x^{10} + x^9 + x^8 + x^7\\
&\quad + x^6 + x^4.
\end{aligned}$$

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

$$\begin{aligned}
p_0(x) &= x^{138} + x^{136} + x^{134} + x^{130} + x^{128} + x^{126} + x^{124} + x^{120} + x^{118} + x^{110}\\
&\quad + x^{104} + x^{98} + x^{96} + x^{86} + x^{84} + x^{80} + x^{78} + x^{74} + x^{72} + x^{70} + x^{68}\\
&\quad + x^{64} + x^{60} + x^{54} + x^{52} + x^{50} + x^{42} + x^{40} + x^{36} + x^{32} + x^{30} + x^{26}\\
&\quad + x^{24},\\
p_3(x) &= x^{132} + x^{130} + x^{124} + x^{118} + x^{116} + x^{114} + x^{110} + x^{108} + x^{98} + x^{94}\\
&\quad + x^{92} + x^{86} + x^{84} + x^{82} + x^{80} + x^{78} + x^{74} + x^{68} + x^{66} + x^{58} + x^{50}\\
&\quad + x^{48} + x^{46} + x^{38} + x^{36} + x^{30} + x^{24} + x^{16},\\
p_6(x) &= x^{132} + x^{128} + x^{126} + x^{124} + x^{122} + x^{114} + x^{112} + x^{110} + x^{96} + x^{92}\\
&\quad + x^{88} + x^{74} + x^{68} + x^{60} + x^{58} + x^{54} + x^{42} + x^{40} + x^{36} + x^{30} + x^{22}\\
&\quad + x^{20} + x^{12} + x^6 + x^2 + 1,\\
p_9(x) &= x^{134} + x^{132} + x^{128} + x^{118} + x^{114} + x^{110} + x^{106} + x^{100} + x^{94} + x^{90}\\
&\quad + x^{88} + x^{84} + x^{82} + x^{80} + x^{78} + x^{74} + x^{72} + x^{70} + x^{68} + x^{66} + x^{64}\\
&\quad + x^{62} + x^{60} + x^{58} + x^{50} + x^{36} + x^{34} + x^{28} + x^{26} + x^{16} + x^{12} + x^{10}\\
&\quad + x^8 + x^4,
\end{aligned}$$

$$\begin{aligned}p_{12}(x) &= x^{134}+x^{132}+x^{130}+x^{128}+x^{126}+x^{124}+x^{122}+x^{120}+x^{110}+x^{108}\\&\quad+x^{106}+x^{104}+x^{94}+x^{92}+x^{90}+x^{88}+x^{78}+x^{76}+x^{74}+x^{72}+x^{70}\\&\quad+x^{68}+x^{66}+x^{64}+x^{22}+x^{20}+x^{18}+x^{16}+x^{14}+x^{12}+x^{10}+x^{8}\\&\quad+x^{6}+x^{4}+x^{2}+1,\end{aligned}$$

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

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

$$\begin{aligned}p_{0}(x) &= x^{147}+x^{143}+x^{142}+x^{141}+x^{138}+x^{137}+x^{136}+x^{132}+x^{131}+x^{130}\\&\quad+x^{129}+x^{127}+x^{124}+x^{123}+x^{122}+x^{119}+x^{118}+x^{114}+x^{113}\\&\quad+x^{111}+x^{107}+x^{106}+x^{105}+x^{102}+x^{101}+x^{100}+x^{99}+x^{98}+x^{97}\\&\quad+x^{93}+x^{88}+x^{85}+x^{84}+x^{81}+x^{80}+x^{79}+x^{76}+x^{70}+x^{69}+x^{68}\\&\quad+x^{66}+x^{64}+x^{62}+x^{61}+x^{59}+x^{55}+x^{51}+x^{50}+x^{48}+x^{46}+x^{44}\\&\quad+x^{41}+x^{39}+x^{38}+x^{36}+x^{35}+x^{33},\\
p_{3}(x) &= x^{143}+x^{142}+x^{141}+x^{139}+x^{134}+x^{130}+x^{129}+x^{128}+x^{127}+x^{126}\\&\quad+x^{125}+x^{122}+x^{121}+x^{119}+x^{118}+x^{117}+x^{116}+x^{114}+x^{111}\\&\quad+x^{109}+x^{107}+x^{106}+x^{105}+x^{104}+x^{102}+x^{99}+x^{96}+x^{94}+x^{92}\\&\quad+x^{90}+x^{88}+x^{86}+x^{84}+x^{82}+x^{80}+x^{79}+x^{77}+x^{76}+x^{75}+x^{74}\\&\quad+x^{72}+x^{71}+x^{70}+x^{69}+x^{68}+x^{67}+x^{65}+x^{63}+x^{62}+x^{61}+x^{60}\\&\quad+x^{58}+x^{55}+x^{53}+x^{51}+x^{50}+x^{49}+x^{48}+x^{46}+x^{43}+x^{40}+x^{39}\\&\quad+x^{37}+x^{36}+x^{35}+x^{34}+x^{32}+x^{31}+x^{30}+x^{29}+x^{28}+x^{27}+x^{25}\\&\quad+x^{20}+x^{19}+x^{18},\\
p_{6}(x) &= x^{141}+x^{138}+x^{131}+x^{129}+x^{128}+x^{127}+x^{126}+x^{125}+x^{124}+x^{122}\\&\quad+x^{121}+x^{119}+x^{118}+x^{117}+x^{116}+x^{114}+x^{113}+x^{110}+x^{109}\\&\quad+x^{106}+x^{101}+x^{98}+x^{95}+x^{92}+x^{91}+x^{89}+x^{88}+x^{87}+x^{86}+x^{84}\\&\quad+x^{81}+x^{79}+x^{78}+x^{77}+x^{76}+x^{75}+x^{74}+x^{73}+x^{72}+x^{71}+x^{70}\\&\quad+x^{68}+x^{65}+x^{62}+x^{61}+x^{59}+x^{58}+x^{56}+x^{55}+x^{53}+x^{52}+x^{50}\\&\quad+x^{49}+x^{47}+x^{46}+x^{45}+x^{44}+x^{43}+x^{42}+x^{41}+x^{40}+x^{38}+x^{33}\\&\quad+x^{30}+x^{29}+x^{27}+x^{26}+x^{24}+x^{23}+x^{20}+x^{15}+x^{12},\\
p_{9}(x) &= x^{139}+x^{138}+x^{136}+x^{133}+x^{131}+x^{129}+x^{128}+x^{125}+x^{124}+x^{123}\\&\quad+x^{121}+x^{117}+x^{115}+x^{111}+x^{109}+x^{107}+x^{106}+x^{105}+x^{104}\\&\quad+x^{102}+x^{101}+x^{100}+x^{93}+x^{92}+x^{90}+x^{89}+x^{88}+x^{87}+x^{86}+x^{84}\\&\quad+x^{81}+x^{78}+x^{77}+x^{73}+x^{71}+x^{67}+x^{65}+x^{60}+x^{59}+x^{58}+x^{57}\\&\quad+x^{56}+x^{54}+x^{53}+x^{52}+x^{51}+x^{50}+x^{48}+x^{44}+x^{43}+x^{42}+x^{41}\\&\quad+x^{40}+x^{39}+x^{36}+x^{34}+x^{33}+x^{31}+x^{30}+x^{29}+x^{28}+x^{27}+x^{25}\\&\quad+x^{20}+x^{16}+x^{13}+x^{10}+x^{9}+x^{7}+x^{6},\\
p_{12}(x) &= x^{137}+x^{135}+x^{134}+x^{132}+x^{129}+x^{127}+x^{126}+x^{125}+x^{124}+x^{123}\end{aligned}$$

$$+ x^{122} + x^{121} + x^{120} + x^{119} + x^{118} + x^{117} + x^{116} + x^{115} + x^{114}$$
$$+ x^{113} + x^{112} + x^{111} + x^{110} + x^{109} + x^{108} + x^{107} + x^{106} + x^{105}$$
$$+ x^{104} + x^{103} + x^{102} + x^{101} + x^{100} + x^{99} + x^{98} + x^{97} + x^{96} + x^{95}$$
$$+ x^{94} + x^{93} + x^{92} + x^{91} + x^{90} + x^{89} + x^{88} + x^{87} + x^{86} + x^{85} + x^{84}$$
$$+ x^{83} + x^{82} + x^{81} + x^{80} + x^{79} + x^{78} + x^{77} + x^{76} + x^{75} + x^{74} + x^{72}$$
$$+ x^{69} + x^{67} + x^{66} + x^{64} + x^{25} + x^{23} + x^{22} + x^{20} + x^{17} + x^{15} + x^{14}$$
$$+ x^{13} + x^{12} + x^{11} + x^{10} + x^{8} + x^{5} + x^{3} + x^{2} + 1,$$

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

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

$$\begin{aligned}
p_0(x) = {} & x^{147} + x^{143} + x^{142} + x^{141} + x^{138} + x^{137} + x^{136} + x^{132} + x^{131} + x^{130} \\
& + x^{129} + x^{127} + x^{124} + x^{123} + x^{122} + x^{119} + x^{118} + x^{114} + x^{113} \\
& + x^{111} + x^{107} + x^{106} + x^{105} + x^{102} + x^{101} + x^{100} + x^{99} + x^{98} + x^{97} \\
& + x^{93} + x^{88} + x^{85} + x^{84} + x^{81} + x^{80} + x^{79} + x^{76} + x^{70} + x^{69} + x^{68} \\
& + x^{66} + x^{64} + x^{62} + x^{61} + x^{59} + x^{55} + x^{51} + x^{50} + x^{48} + x^{46} + x^{44} \\
& + x^{41} + x^{39} + x^{38} + x^{36} + x^{35} + x^{33}, \\
p_3(x) = {} & x^{143} + x^{142} + x^{141} + x^{139} + x^{134} + x^{130} + x^{129} + x^{128} + x^{127} + x^{126} \\
& + x^{125} + x^{122} + x^{121} + x^{119} + x^{118} + x^{117} + x^{116} + x^{114} + x^{111} \\
& + x^{109} + x^{107} + x^{106} + x^{105} + x^{104} + x^{102} + x^{99} + x^{96} + x^{94} + x^{92} \\
& + x^{90} + x^{88} + x^{86} + x^{84} + x^{82} + x^{80} + x^{79} + x^{77} + x^{76} + x^{75} + x^{74} \\
& + x^{72} + x^{71} + x^{70} + x^{69} + x^{68} + x^{67} + x^{65} + x^{63} + x^{62} + x^{61} + x^{60} \\
& + x^{58} + x^{55} + x^{53} + x^{51} + x^{50} + x^{49} + x^{48} + x^{46} + x^{43} + x^{40} + x^{39} \\
& + x^{37} + x^{36} + x^{35} + x^{34} + x^{32} + x^{31} + x^{30} + x^{29} + x^{28} + x^{27} + x^{25} \\
& + x^{20} + x^{19} + x^{18}, \\
p_6(x) = {} & x^{141} + x^{138} + x^{131} + x^{129} + x^{128} + x^{127} + x^{126} + x^{125} + x^{124} + x^{122} \\
& + x^{121} + x^{119} + x^{118} + x^{117} + x^{116} + x^{114} + x^{113} + x^{110} + x^{109} \\
& + x^{106} + x^{101} + x^{98} + x^{95} + x^{92} + x^{91} + x^{89} + x^{88} + x^{87} + x^{86} + x^{84} \\
& + x^{81} + x^{79} + x^{78} + x^{77} + x^{76} + x^{75} + x^{74} + x^{73} + x^{72} + x^{71} + x^{70} \\
& + x^{68} + x^{65} + x^{62} + x^{61} + x^{59} + x^{58} + x^{56} + x^{55} + x^{53} + x^{52} + x^{50} \\
& + x^{49} + x^{47} + x^{46} + x^{45} + x^{44} + x^{43} + x^{42} + x^{41} + x^{40} + x^{38} + x^{33} \\
& + x^{30} + x^{29} + x^{27} + x^{26} + x^{24} + x^{23} + x^{20} + x^{15} + x^{12}, \\
p_9(x) = {} & x^{139} + x^{138} + x^{136} + x^{133} + x^{131} + x^{129} + x^{128} + x^{125} + x^{124} + x^{123} \\
& + x^{121} + x^{117} + x^{115} + x^{111} + x^{109} + x^{107} + x^{106} + x^{105} + x^{104} \\
& + x^{102} + x^{101} + x^{100} + x^{93} + x^{92} + x^{90} + x^{89} + x^{88} + x^{87} + x^{86} + x^{84} \\
& + x^{81} + x^{78} + x^{77} + x^{73} + x^{71} + x^{67} + x^{65} + x^{60} + x^{59} + x^{58} + x^{57} \\
& + x^{56} + x^{54} + x^{53} + x^{52} + x^{51} + x^{50} + x^{48} + x^{44} + x^{43} + x^{42} + x^{41}
\end{aligned}$$

$$
\begin{aligned}
&+ x^{40} + x^{39} + x^{36} + x^{34} + x^{33} + x^{31} + x^{30} + x^{29} + x^{28} + x^{27} + x^{25} \\
&+ x^{20} + x^{16} + x^{13} + x^{10} + x^{9} + x^{7} + x^{6}, \\
p_{12}(x) = {}& x^{137} + x^{135} + x^{134} + x^{132} + x^{129} + x^{127} + x^{126} + x^{125} + x^{124} + x^{123} \\
&+ x^{122} + x^{121} + x^{120} + x^{119} + x^{118} + x^{117} + x^{116} + x^{115} + x^{114} \\
&+ x^{113} + x^{112} + x^{111} + x^{110} + x^{109} + x^{108} + x^{107} + x^{106} + x^{105} \\
&+ x^{104} + x^{103} + x^{102} + x^{101} + x^{100} + x^{99} + x^{98} + x^{97} + x^{96} + x^{95} \\
&+ x^{94} + x^{93} + x^{92} + x^{91} + x^{90} + x^{89} + x^{88} + x^{87} + x^{86} + x^{85} + x^{84} \\
&+ x^{83} + x^{82} + x^{81} + x^{80} + x^{79} + x^{78} + x^{77} + x^{76} + x^{75} + x^{74} + x^{72} \\
&+ x^{69} + x^{67} + x^{66} + x^{64} + x^{25} + x^{23} + x^{22} + x^{20} + x^{17} + x^{15} + x^{14} \\
&+ x^{13} + x^{12} + x^{11} + x^{10} + x^{8} + x^{5} + x^{3} + x^{2} + 1,
\end{aligned}
$$

and the initial terms are [0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0].
For $\phi(M^e, 1, 1)$:

$$
\begin{aligned}
p_0(x) = {}& x^{156} + x^{154} + x^{150} + x^{148} + x^{146} + x^{144} + x^{142} + x^{140} + x^{138} + x^{136} \\
&+ x^{128} + x^{114} + x^{106} + x^{102} + x^{100} + x^{96} + x^{94} + x^{92} + x^{90} + x^{82} \\
&+ x^{80} + x^{78} + x^{74} + x^{70} + x^{68} + x^{62} + x^{60} + x^{58} + x^{56} + x^{44} + x^{42}, \\
p_3(x) = {}& x^{144} + x^{140} + x^{128} + x^{126} + x^{124} + x^{122} + x^{120} + x^{118} + x^{114} + x^{112} \\
&+ x^{102} + x^{100} + x^{98} + x^{92} + x^{90} + x^{86} + x^{80} + x^{76} + x^{72} + x^{64} + x^{62} \\
&+ x^{60} + x^{56} + x^{54} + x^{46} + x^{44} + x^{42} + x^{40} + x^{36} + x^{34} + x^{32} + x^{30} \\
&+ x^{28} + x^{26} + x^{18} + x^{12}, \\
p_6(x) = {}& x^{144} + x^{138} + x^{134} + x^{132} + x^{130} + x^{128} + x^{120} + x^{116} + x^{112} + x^{110} \\
&+ x^{108} + x^{106} + x^{96} + x^{90} + x^{82} + x^{80} + x^{78} + x^{76} + x^{74} + x^{72} + x^{66} \\
&+ x^{64} + x^{60} + x^{58} + x^{56} + x^{54} + x^{52} + x^{46} + x^{44} + x^{38} + x^{36} + x^{34} \\
&+ x^{32} + x^{28} + x^{26} + x^{22} + x^{18} + x^{14} + x^{12} + x^{8} + x^{2} + 1, \\
p_9(x) = {}& x^{140} + x^{138} + x^{130} + x^{128} + x^{124} + x^{122} + x^{118} + x^{116} + x^{114} + x^{112} \\
&+ x^{108} + x^{100} + x^{96} + x^{94} + x^{88} + x^{84} + x^{82} + x^{80} + x^{78} + x^{74} + x^{68} \\
&+ x^{66} + x^{64} + x^{60} + x^{58} + x^{50} + x^{48} + x^{46} + x^{40} + x^{38} + x^{36} + x^{32} \\
&+ x^{24} + x^{18} + x^{16} + x^{14} + x^{8} + x^{4}, \\
p_{12}(x) = {}& x^{140} + x^{138} + x^{136} + x^{132} + x^{130} + x^{128} + x^{76} + x^{74} + x^{72} + x^{68} \\
&+ x^{66} + x^{64} + x^{28} + x^{26} + x^{24} + x^{20} + x^{18} + x^{16} + x^{12} + x^{10} + x^{8} \\
&+ x^{4} + x^{2} + 1,
\end{aligned}
$$

and the initial terms are [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 1, 0].
For $\phi(W^e, 0, 0)$:

$$
\begin{aligned}
p_0(x) = {}& x^{156} + x^{154} + x^{150} + x^{144} + x^{138} + x^{136} + x^{130} + x^{126} + x^{124} + x^{122} \\
&+ x^{118} + x^{116} + x^{106} + x^{104} + x^{100} + x^{98} + x^{92} + x^{86} + x^{74} + x^{72} \\
&+ x^{68} + x^{66} + x^{62} + x^{58} + x^{52} + x^{50} + x^{48} + x^{46} + x^{42} + x^{38} + x^{36}
\end{aligned}
$$

$$
\begin{aligned}
&+ x^{26} + x^{24},\\
p_3(x) &= x^{144} + x^{140} + x^{136} + x^{130} + x^{122} + x^{120} + x^{118} + x^{116} + x^{108} + x^{106}\\
&\quad + x^{104} + x^{98} + x^{92} + x^{88} + x^{84} + x^{76} + x^{72} + x^{64} + x^{62} + x^{56} + x^{50}\\
&\quad + x^{42} + x^{36} + x^{34} + x^{32} + x^{30} + x^{26} + x^{22} + x^{20} + x^{16},\\
p_6(x) &= x^{144} + x^{138} + x^{136} + x^{134} + x^{130} + x^{124} + x^{122} + x^{120} + x^{118} + x^{112}\\
&\quad + x^{110} + x^{100} + x^{98} + x^{96} + x^{94} + x^{90} + x^{88} + x^{84} + x^{74} + x^{72} + x^{66}\\
&\quad + x^{64} + x^{58} + x^{54} + x^{52} + x^{48} + x^{44} + x^{42} + x^{40} + x^{34} + x^{32} + x^{26}\\
&\quad + x^{24} + x^{22} + x^{20} + x^{18} + x^{16} + x^{10} + x^{2} + 1,\\
p_9(x) &= x^{140} + x^{138} + x^{130} + x^{128} + x^{124} + x^{122} + x^{118} + x^{116} + x^{114} + x^{112}\\
&\quad + x^{108} + x^{100} + x^{96} + x^{94} + x^{88} + x^{84} + x^{82} + x^{80} + x^{78} + x^{74} + x^{68}\\
&\quad + x^{66} + x^{64} + x^{60} + x^{58} + x^{50} + x^{48} + x^{46} + x^{40} + x^{38} + x^{36} + x^{32}\\
&\quad + x^{24} + x^{18} + x^{16} + x^{14} + x^{8} + x^{4},\\
p_{12}(x) &= x^{140} + x^{138} + x^{136} + x^{132} + x^{130} + x^{128} + x^{76} + x^{74} + x^{72} + x^{68}\\
&\quad + x^{66} + x^{64} + x^{28} + x^{26} + x^{24} + x^{20} + x^{18} + x^{16} + x^{12} + x^{10} + x^{8}\\
&\quad + x^{4} + x^{2} + 1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_0(x) &= x^{147} + x^{145} + x^{138} + x^{137} + x^{135} + x^{134} + x^{133} + x^{132} + x^{131} + x^{128}\\
&\quad + x^{126} + x^{125} + x^{119} + x^{118} + x^{117} + x^{114} + x^{113} + x^{112} + x^{111}\\
&\quad + x^{108} + x^{106} + x^{105} + x^{104} + x^{103} + x^{102} + x^{101} + x^{100} + x^{99} + x^{98}\\
&\quad + x^{96} + x^{94} + x^{93} + x^{92} + x^{91} + x^{89} + x^{88} + x^{84} + x^{83} + x^{82} + x^{79}\\
&\quad + x^{78} + x^{77} + x^{73} + x^{72} + x^{69} + x^{68} + x^{64} + x^{63} + x^{61} + x^{58} + x^{55}\\
&\quad + x^{53} + x^{52} + x^{48} + x^{44} + x^{43} + x^{42} + x^{41} + x^{39} + x^{34} + x^{33},\\
p_3(x) &= x^{143} + x^{142} + x^{141} + x^{139} + x^{134} + x^{130} + x^{129} + x^{128} + x^{127} + x^{126}\\
&\quad + x^{125} + x^{122} + x^{121} + x^{119} + x^{118} + x^{117} + x^{116} + x^{114} + x^{111}\\
&\quad + x^{109} + x^{107} + x^{106} + x^{105} + x^{104} + x^{102} + x^{99} + x^{96} + x^{94} + x^{92}\\
&\quad + x^{90} + x^{88} + x^{86} + x^{84} + x^{82} + x^{80} + x^{79} + x^{77} + x^{76} + x^{75} + x^{74}\\
&\quad + x^{72} + x^{71} + x^{70} + x^{69} + x^{68} + x^{67} + x^{65} + x^{63} + x^{62} + x^{61} + x^{60}\\
&\quad + x^{58} + x^{55} + x^{53} + x^{51} + x^{50} + x^{49} + x^{48} + x^{46} + x^{43} + x^{40} + x^{39}\\
&\quad + x^{37} + x^{36} + x^{35} + x^{34} + x^{32} + x^{31} + x^{30} + x^{29} + x^{28} + x^{27} + x^{25}\\
&\quad + x^{20} + x^{19} + x^{18},\\
p_6(x) &= x^{141} + x^{138} + x^{131} + x^{129} + x^{128} + x^{127} + x^{126} + x^{125} + x^{124} + x^{122}\\
&\quad + x^{121} + x^{119} + x^{118} + x^{117} + x^{116} + x^{114} + x^{113} + x^{110} + x^{109}\\
&\quad + x^{106} + x^{101} + x^{98} + x^{95} + x^{92} + x^{91} + x^{89} + x^{88} + x^{87} + x^{86} + x^{84}\\
&\quad + x^{81} + x^{79} + x^{78} + x^{77} + x^{76} + x^{75} + x^{74} + x^{73} + x^{72} + x^{71} + x^{70}
\end{aligned}
$$

$$
\begin{aligned}
&+ x^{68} + x^{65} + x^{62} + x^{61} + x^{59} + x^{58} + x^{56} + x^{55} + x^{53} + x^{52} + x^{50}\\
&+ x^{49} + x^{47} + x^{46} + x^{45} + x^{44} + x^{43} + x^{42} + x^{41} + x^{40} + x^{38} + x^{33}\\
&+ x^{30} + x^{29} + x^{27} + x^{26} + x^{24} + x^{23} + x^{20} + x^{15} + x^{12},\\
p_9(x) = {}& x^{139} + x^{138} + x^{136} + x^{133} + x^{131} + x^{129} + x^{128} + x^{125} + x^{124} + x^{123}\\
&+ x^{121} + x^{117} + x^{115} + x^{111} + x^{109} + x^{107} + x^{106} + x^{105} + x^{104}\\
&+ x^{102} + x^{101} + x^{100} + x^{93} + x^{92} + x^{90} + x^{89} + x^{88} + x^{87} + x^{86} + x^{84}\\
&+ x^{81} + x^{78} + x^{77} + x^{73} + x^{71} + x^{67} + x^{65} + x^{60} + x^{59} + x^{58} + x^{57}\\
&+ x^{56} + x^{54} + x^{53} + x^{52} + x^{51} + x^{50} + x^{48} + x^{44} + x^{43} + x^{42} + x^{41}\\
&+ x^{40} + x^{39} + x^{36} + x^{34} + x^{33} + x^{31} + x^{30} + x^{29} + x^{28} + x^{27} + x^{25}\\
&+ x^{20} + x^{16} + x^{13} + x^{10} + x^{9} + x^{7} + x^{6},\\
p_{12}(x) = {}& x^{137} + x^{135} + x^{134} + x^{132} + x^{129} + x^{127} + x^{126} + x^{125} + x^{124} + x^{123}\\
&+ x^{122} + x^{121} + x^{120} + x^{119} + x^{118} + x^{117} + x^{116} + x^{115} + x^{114}\\
&+ x^{113} + x^{112} + x^{111} + x^{110} + x^{109} + x^{108} + x^{107} + x^{106} + x^{105}\\
&+ x^{104} + x^{103} + x^{102} + x^{101} + x^{100} + x^{99} + x^{98} + x^{97} + x^{96} + x^{95}\\
&+ x^{94} + x^{93} + x^{92} + x^{91} + x^{90} + x^{89} + x^{88} + x^{87} + x^{86} + x^{85} + x^{84}\\
&+ x^{83} + x^{82} + x^{81} + x^{80} + x^{79} + x^{78} + x^{77} + x^{76} + x^{75} + x^{74} + x^{72}\\
&+ x^{69} + x^{67} + x^{66} + x^{64} + x^{25} + x^{23} + x^{22} + x^{20} + x^{17} + x^{15} + x^{14}\\
&+ x^{13} + x^{12} + x^{11} + x^{10} + x^{8} + x^{5} + x^{3} + x^{2} + 1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_0(x) = {}& x^{147} + x^{145} + x^{138} + x^{137} + x^{135} + x^{134} + x^{133} + x^{132} + x^{131} + x^{128}\\
&+ x^{126} + x^{125} + x^{119} + x^{118} + x^{117} + x^{114} + x^{113} + x^{112} + x^{111}\\
&+ x^{108} + x^{106} + x^{105} + x^{104} + x^{103} + x^{102} + x^{101} + x^{100} + x^{99} + x^{98}\\
&+ x^{96} + x^{94} + x^{93} + x^{92} + x^{91} + x^{89} + x^{88} + x^{84} + x^{83} + x^{82} + x^{79}\\
&+ x^{78} + x^{77} + x^{73} + x^{72} + x^{69} + x^{68} + x^{64} + x^{63} + x^{61} + x^{58} + x^{55}\\
&+ x^{53} + x^{52} + x^{48} + x^{44} + x^{43} + x^{42} + x^{41} + x^{39} + x^{34} + x^{33},\\
p_3(x) = {}& x^{143} + x^{142} + x^{141} + x^{139} + x^{134} + x^{130} + x^{129} + x^{128} + x^{127} + x^{126}\\
&+ x^{125} + x^{122} + x^{121} + x^{119} + x^{118} + x^{117} + x^{116} + x^{114} + x^{111}\\
&+ x^{109} + x^{107} + x^{106} + x^{105} + x^{104} + x^{102} + x^{99} + x^{96} + x^{94} + x^{92}\\
&+ x^{90} + x^{88} + x^{86} + x^{84} + x^{82} + x^{80} + x^{79} + x^{77} + x^{76} + x^{75} + x^{74}\\
&+ x^{72} + x^{71} + x^{70} + x^{69} + x^{68} + x^{67} + x^{65} + x^{63} + x^{62} + x^{61} + x^{60}\\
&+ x^{58} + x^{55} + x^{53} + x^{51} + x^{50} + x^{49} + x^{48} + x^{46} + x^{43} + x^{40} + x^{39}\\
&+ x^{37} + x^{36} + x^{35} + x^{34} + x^{32} + x^{31} + x^{30} + x^{29} + x^{28} + x^{27} + x^{25}\\
&+ x^{20} + x^{19} + x^{18},\\
p_6(x) = {}& x^{141} + x^{138} + x^{131} + x^{129} + x^{128} + x^{127} + x^{126} + x^{125} + x^{124} + x^{122}
\end{aligned}
$$

$$
\begin{aligned}
&+ x^{121} + x^{119} + x^{118} + x^{117} + x^{116} + x^{114} + x^{113} + x^{110} + x^{109}\\
&+ x^{106} + x^{101} + x^{98} + x^{95} + x^{92} + x^{91} + x^{89} + x^{88} + x^{87} + x^{86} + x^{84}\\
&+ x^{81} + x^{79} + x^{78} + x^{77} + x^{76} + x^{75} + x^{74} + x^{73} + x^{72} + x^{71} + x^{70}\\
&+ x^{68} + x^{65} + x^{62} + x^{61} + x^{59} + x^{58} + x^{56} + x^{55} + x^{53} + x^{52} + x^{50}\\
&+ x^{49} + x^{47} + x^{46} + x^{45} + x^{44} + x^{43} + x^{42} + x^{41} + x^{40} + x^{38} + x^{33}\\
&+ x^{30} + x^{29} + x^{27} + x^{26} + x^{24} + x^{23} + x^{20} + x^{15} + x^{12},\\
p_9(x) &= x^{139} + x^{138} + x^{136} + x^{133} + x^{131} + x^{129} + x^{128} + x^{125} + x^{124} + x^{123}\\
&+ x^{121} + x^{117} + x^{115} + x^{111} + x^{109} + x^{107} + x^{106} + x^{105} + x^{104}\\
&+ x^{102} + x^{101} + x^{100} + x^{93} + x^{92} + x^{90} + x^{89} + x^{88} + x^{87} + x^{86} + x^{84}\\
&+ x^{81} + x^{78} + x^{77} + x^{73} + x^{71} + x^{67} + x^{65} + x^{60} + x^{59} + x^{58} + x^{57}\\
&+ x^{56} + x^{54} + x^{53} + x^{52} + x^{51} + x^{50} + x^{48} + x^{44} + x^{43} + x^{42} + x^{41}\\
&+ x^{40} + x^{39} + x^{36} + x^{34} + x^{33} + x^{31} + x^{30} + x^{29} + x^{28} + x^{27} + x^{25}\\
&+ x^{20} + x^{16} + x^{13} + x^{10} + x^{9} + x^{7} + x^{6},\\
p_{12}(x) &= x^{137} + x^{135} + x^{134} + x^{132} + x^{129} + x^{127} + x^{126} + x^{125} + x^{124} + x^{123}\\
&+ x^{122} + x^{121} + x^{120} + x^{119} + x^{118} + x^{117} + x^{116} + x^{115} + x^{114}\\
&+ x^{113} + x^{112} + x^{111} + x^{110} + x^{109} + x^{108} + x^{107} + x^{106} + x^{105}\\
&+ x^{104} + x^{103} + x^{102} + x^{101} + x^{100} + x^{99} + x^{98} + x^{97} + x^{96} + x^{95}\\
&+ x^{94} + x^{93} + x^{92} + x^{91} + x^{90} + x^{89} + x^{88} + x^{87} + x^{86} + x^{85} + x^{84}\\
&+ x^{83} + x^{82} + x^{81} + x^{80} + x^{79} + x^{78} + x^{77} + x^{76} + x^{75} + x^{74} + x^{72}\\
&+ x^{69} + x^{67} + x^{66} + x^{64} + x^{25} + x^{23} + x^{22} + x^{20} + x^{17} + x^{15} + x^{14}\\
&+ x^{13} + x^{12} + x^{11} + x^{10} + x^{8} + x^{5} + x^{3} + x^{2} + 1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_0(x) &= x^{138} + x^{136} + x^{132} + x^{124} + x^{122} + x^{110} + x^{108} + x^{104} + x^{102} + x^{96}\\
&+ x^{92} + x^{90} + x^{86} + x^{84} + x^{82} + x^{74} + x^{72} + x^{64} + x^{62} + x^{56} + x^{42},\\
p_3(x) &= x^{132} + x^{124} + x^{120} + x^{114} + x^{104} + x^{102} + x^{100} + x^{98} + x^{96} + x^{94}\\
&+ x^{90} + x^{88} + x^{84} + x^{82} + x^{72} + x^{70} + x^{66} + x^{62} + x^{56} + x^{52} + x^{50}\\
&+ x^{48} + x^{46} + x^{44} + x^{42} + x^{36} + x^{32} + x^{30} + x^{26} + x^{12},\\
p_6(x) &= x^{132} + x^{130} + x^{128} + x^{122} + x^{120} + x^{118} + x^{116} + x^{114} + x^{112} + x^{108}\\
&+ x^{106} + x^{98} + x^{96} + x^{94} + x^{92} + x^{90} + x^{86} + x^{82} + x^{78} + x^{72} + x^{70}\\
&+ x^{66} + x^{64} + x^{56} + x^{54} + x^{52} + x^{46} + x^{42} + x^{34} + x^{30} + x^{22} + x^{20}\\
&+ x^{16} + x^{10} + x^{8} + x^{6} + x^{2} + 1,\\
p_9(x) &= x^{134} + x^{132} + x^{128} + x^{118} + x^{114} + x^{110} + x^{106} + x^{100} + x^{94} + x^{90}\\
&+ x^{88} + x^{84} + x^{82} + x^{80} + x^{78} + x^{74} + x^{72} + x^{70} + x^{68} + x^{66} + x^{64}\\
&+ x^{62} + x^{60} + x^{58} + x^{50} + x^{36} + x^{34} + x^{28} + x^{26} + x^{16} + x^{12} + x^{10}
\end{aligned}
$$

$$
\begin{aligned}
&+ x^8 + x^4,\\
p_{12}(x) &= x^{134} + x^{132} + x^{130} + x^{128} + x^{126} + x^{124} + x^{122} + x^{120} + x^{110} + x^{108}\\
&+ x^{106} + x^{104} + x^{94} + x^{92} + x^{90} + x^{88} + x^{78} + x^{76} + x^{74} + x^{72} + x^{70}\\
&+ x^{68} + x^{66} + x^{64} + x^{22} + x^{20} + x^{18} + x^{16} + x^{14} + x^{12} + x^{10} + x^8\\
&+ x^6 + x^4 + x^2 + 1,
\end{aligned}
$$

and the initial terms are [0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0].
For $\phi(M^o, 0, 0)$:

$$
\begin{aligned}
p_0(x) &= x^{147} + x^{142} + x^{141} + x^{139} + x^{138} + x^{135} + x^{131} + x^{130} + x^{129} + x^{127}\\
&+ x^{126} + x^{124} + x^{122} + x^{121} + x^{120} + x^{118} + x^{114} + x^{113} + x^{112}\\
&+ x^{110} + x^{107} + x^{106} + x^{105} + x^{103} + x^{101} + x^{100} + x^{96} + x^{95} + x^{94}\\
&+ x^{90} + x^{87} + x^{84} + x^{82} + x^{81} + x^{80} + x^{78} + x^{74} + x^{72} + x^{71} + x^{70}\\
&+ x^{69} + x^{68} + x^{67} + x^{66} + x^{65} + x^{64} + x^{63} + x^{61} + x^{60} + x^{59} + x^{58}\\
&+ x^{57} + x^{56} + x^{55} + x^{52} + x^{51} + x^{49} + x^{48} + x^{47} + x^{45} + x^{43} + x^{42}\\
&+ x^{41} + x^{37} + x^{31} + x^{29} + x^{27} + x^{26} + x^{24},\\
p_3(x) &= x^{145} + x^{142} + x^{141} + x^{140} + x^{139} + x^{136} + x^{135} + x^{134} + x^{132} + x^{131}\\
&+ x^{130} + x^{128} + x^{127} + x^{125} + x^{123} + x^{121} + x^{119} + x^{118} + x^{117}\\
&+ x^{116} + x^{110} + x^{108} + x^{103} + x^{102} + x^{100} + x^{98} + x^{96} + x^{95} + x^{94}\\
&+ x^{90} + x^{88} + x^{86} + x^{85} + x^{84} + x^{81} + x^{80} + x^{75} + x^{73} + x^{71} + x^{70}\\
&+ x^{69} + x^{68} + x^{67} + x^{63} + x^{61} + x^{60} + x^{57} + x^{55} + x^{53} + x^{50} + x^{49}\\
&+ x^{45} + x^{40} + x^{38} + x^{37} + x^{34} + x^{32} + x^{31} + x^{28} + x^{26} + x^{25} + x^{24}\\
&+ x^{22} + x^{21} + x^{20} + x^{19} + x^{18} + x^{16},\\
p_6(x) &= x^{145} + x^{142} + x^{141} + x^{140} + x^{139} + x^{136} + x^{134} + x^{132} + x^{128} + x^{124}\\
&+ x^{122} + x^{120} + x^{118} + x^{116} + x^{115} + x^{110} + x^{109} + x^{107} + x^{106}\\
&+ x^{105} + x^{104} + x^{103} + x^{102} + x^{100} + x^{99} + x^{98} + x^{97} + x^{95} + x^{94}\\
&+ x^{93} + x^{91} + x^{89} + x^{88} + x^{85} + x^{84} + x^{83} + x^{80} + x^{79} + x^{78} + x^{74}\\
&+ x^{70} + x^{69} + x^{64} + x^{61} + x^{60} + x^{58} + x^{55} + x^{54} + x^{52} + x^{49} + x^{48}\\
&+ x^{47} + x^{46} + x^{45} + x^{42} + x^{38} + x^{36} + x^{35} + x^{34} + x^{33} + x^{31} + x^{30}\\
&+ x^{29} + x^{26} + x^{23} + x^{22} + x^{21} + x^{17} + x^{14} + x^{12} + x^5 + x^3 + x^2 + 1,\\
p_9(x) &= x^{145} + x^{143} + x^{142} + x^{141} + x^{140} + x^{139} + x^{138} + x^{136} + x^{133} + x^{131}\\
&+ x^{130} + x^{128} + x^{117} + x^{115} + x^{114} + x^{112} + x^{101} + x^{99} + x^{98} + x^{96}\\
&+ x^{85} + x^{83} + x^{82} + x^{81} + x^{80} + x^{79} + x^{78} + x^{77} + x^{76} + x^{75} + x^{74}\\
&+ x^{72} + x^{33} + x^{31} + x^{30} + x^{29} + x^{28} + x^{27} + x^{26} + x^{24} + x^{21} + x^{19}\\
&+ x^{18} + x^{17} + x^{16} + x^{15} + x^{14} + x^{13} + x^{12} + x^{11} + x^{10} + x^8,\\
p_{12}(x) &= x^{145} + x^{143} + x^{142} + x^{141} + x^{140} + x^{139} + x^{138} + x^{137} + x^{136} + x^{135}\\
&+ x^{134} + x^{133} + x^{132} + x^{131} + x^{130} + x^{129} + x^{128} + x^{127} + x^{126}
\end{aligned}
$$

$$+ x^{125} + x^{124} + x^{123} + x^{122} + x^{121} + x^{120} + x^{119} + x^{118} + x^{116}$$
$$+ x^{113} + x^{111} + x^{110} + x^{109} + x^{108} + x^{107} + x^{106} + x^{105} + x^{104}$$
$$+ x^{103} + x^{102} + x^{100} + x^{97} + x^{95} + x^{94} + x^{93} + x^{92} + x^{91} + x^{90} + x^{89}$$
$$+ x^{88} + x^{87} + x^{86} + x^{84} + x^{69} + x^{67} + x^{66} + x^{64} + x^{33} + x^{31} + x^{30}$$
$$+ x^{29} + x^{28} + x^{27} + x^{26} + x^{25} + x^{24} + x^{23} + x^{22} + x^{21} + x^{20} + x^{19}$$
$$+ x^{18} + x^{16} + x^{5} + x^{3} + x^{2} + 1,$$

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

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

$$\begin{aligned}
p_0(x) = {} & x^{160} + x^{156} + x^{151} + x^{150} + x^{149} + x^{141} + x^{140} + x^{138} + x^{137} + x^{136} \\
& + x^{133} + x^{132} + x^{127} + x^{126} + x^{125} + x^{122} + x^{120} + x^{118} + x^{117} \\
& + x^{114} + x^{113} + x^{112} + x^{110} + x^{109} + x^{108} + x^{107} + x^{105} + x^{104} \\
& + x^{103} + x^{102} + x^{101} + x^{99} + x^{98} + x^{97} + x^{91} + x^{90} + x^{89} + x^{88} + x^{87} \\
& + x^{86} + x^{82} + x^{75} + x^{73} + x^{72} + x^{70} + x^{67} + x^{64} + x^{61} + x^{57} + x^{56} \\
& + x^{55} + x^{52} + x^{47} + x^{46} + x^{43} + x^{40} + x^{33}, \\
p_3(x) = {} & x^{146} + x^{145} + x^{144} + x^{143} + x^{141} + x^{139} + x^{138} + x^{136} + x^{135} + x^{134} \\
& + x^{131} + x^{129} + x^{128} + x^{127} + x^{125} + x^{123} + x^{121} + x^{118} + x^{117} \\
& + x^{114} + x^{113} + x^{110} + x^{109} + x^{104} + x^{103} + x^{102} + x^{99} + x^{98} + x^{82} \\
& + x^{81} + x^{80} + x^{79} + x^{77} + x^{75} + x^{73} + x^{70} + x^{69} + x^{66} + x^{65} + x^{62} \\
& + x^{61} + x^{58} + x^{57} + x^{54} + x^{53} + x^{48} + x^{47} + x^{46} + x^{43} + x^{41} + x^{40} \\
& + x^{39} + x^{37} + x^{35} + x^{33} + x^{30} + x^{29} + x^{24} + x^{23} + x^{22} + x^{19} + x^{18}, \\
p_6(x) = {} & x^{148} + x^{146} + x^{140} + x^{128} + x^{118} + x^{116} + x^{112} + x^{110} + x^{102} + x^{94} \\
& + x^{90} + x^{88} + x^{84} + x^{80} + x^{76} + x^{72} + x^{70} + x^{60} + x^{58} + x^{54} + x^{50} \\
& + x^{48} + x^{46} + x^{40} + x^{36} + x^{24} + x^{14} + x^{12}, \\
p_9(x) = {} & x^{150} + x^{149} + x^{145} + x^{142} + x^{140} + x^{133} + x^{132} + x^{131} + x^{130} + x^{129} \\
& + x^{128} + x^{127} + x^{126} + x^{125} + x^{124} + x^{123} + x^{122} + x^{121} + x^{120} \\
& + x^{119} + x^{118} + x^{117} + x^{116} + x^{115} + x^{114} + x^{113} + x^{112} + x^{111} \\
& + x^{110} + x^{109} + x^{108} + x^{107} + x^{106} + x^{105} + x^{104} + x^{103} + x^{102} \\
& + x^{101} + x^{100} + x^{99} + x^{98} + x^{97} + x^{96} + x^{95} + x^{94} + x^{93} + x^{92} + x^{91} \\
& + x^{90} + x^{89} + x^{88} + x^{87} + x^{84} + x^{83} + x^{82} + x^{80} + x^{79} + x^{77} + x^{75} \\
& + x^{74} + x^{73} + x^{72} + x^{71} + x^{70} + x^{38} + x^{37} + x^{33} + x^{30} + x^{28} + x^{22} \\
& + x^{20} + x^{19} + x^{18} + x^{16} + x^{15} + x^{13} + x^{11} + x^{10} + x^{9} + x^{8} + x^{7} + x^{6}, \\
p_{12}(x) = {} & x^{152} + x^{144} + x^{124} + x^{120} + x^{116} + x^{112} + x^{108} + x^{104} + x^{100} + x^{96} \\
& + x^{92} + x^{84} + x^{76} + x^{72} + x^{68} + x^{64} + x^{40} + x^{32} + x^{24} + x^{16} + x^{12} \\
& + x^{8} + x^{4} + 1,
\end{aligned}$$

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

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

$$\begin{aligned}
p_0(x) &= x^{144} + x^{142} + x^{140} + x^{139} + x^{138} + x^{137} + x^{135} + x^{133} + x^{132} + x^{131} \\
&\quad + x^{130} + x^{129} + x^{127} + x^{126} + x^{125} + x^{124} + x^{123} + x^{122} + x^{121} \\
&\quad + x^{119} + x^{115} + x^{112} + x^{111} + x^{110} + x^{109} + x^{108} + x^{106} + x^{104} \\
&\quad + x^{103} + x^{101} + x^{100} + x^{99} + x^{98} + x^{97} + x^{95} + x^{93} + x^{92} + x^{91} + x^{90} \\
&\quad + x^{87} + x^{84} + x^{83} + x^{82} + x^{78} + x^{72} + x^{71} + x^{70} + x^{69} + x^{68} + x^{67} \\
&\quad + x^{61} + x^{60} + x^{57} + x^{56} + x^{55} + x^{53} + x^{52} + x^{51} + x^{48} + x^{44} + x^{42} \\
&\quad + x^{40} + x^{39} + x^{35} + x^{34} + x^{33}, \\
p_3(x) &= x^{142} + x^{141} + x^{140} + x^{139} + x^{137} + x^{135} + x^{134} + x^{132} + x^{131} + x^{129} \\
&\quad + x^{128} + x^{126} + x^{125} + x^{123} + x^{122} + x^{120} + x^{119} + x^{117} + x^{116} \\
&\quad + x^{114} + x^{113} + x^{111} + x^{109} + x^{104} + x^{103} + x^{102} + x^{99} + x^{98} + x^{78} \\
&\quad + x^{77} + x^{76} + x^{75} + x^{73} + x^{71} + x^{69} + x^{64} + x^{63} + x^{61} + x^{60} + x^{58} \\
&\quad + x^{57} + x^{55} + x^{53} + x^{48} + x^{47} + x^{46} + x^{43} + x^{42} + x^{38} + x^{37} + x^{36} \\
&\quad + x^{35} + x^{33} + x^{31} + x^{29} + x^{24} + x^{23} + x^{22} + x^{19} + x^{18}, \\
p_6(x) &= x^{144} + x^{142} + x^{136} + x^{132} + x^{130} + x^{128} + x^{126} + x^{120} + x^{116} + x^{112} \\
&\quad + x^{110} + x^{108} + x^{106} + x^{104} + x^{102} + x^{98} + x^{92} + x^{88} + x^{86} + x^{84} \\
&\quad + x^{82} + x^{80} + x^{78} + x^{74} + x^{72} + x^{70} + x^{68} + x^{62} + x^{60} + x^{58} + x^{56} \\
&\quad + x^{54} + x^{52} + x^{50} + x^{44} + x^{42} + x^{40} + x^{30} + x^{28} + x^{26} + x^{14} + x^{12}, \\
p_9(x) &= x^{146} + x^{145} + x^{141} + x^{138} + x^{136} + x^{134} + x^{133} + x^{130} + x^{129} + x^{128} \\
&\quad + x^{127} + x^{123} + x^{121} + x^{119} + x^{117} + x^{114} + x^{113} + x^{112} + x^{111} \\
&\quad + x^{107} + x^{105} + x^{103} + x^{101} + x^{98} + x^{97} + x^{96} + x^{95} + x^{91} + x^{89} \\
&\quad + x^{87} + x^{85} + x^{80} + x^{79} + x^{77} + x^{75} + x^{74} + x^{73} + x^{72} + x^{71} + x^{70} \\
&\quad + x^{34} + x^{33} + x^{29} + x^{26} + x^{24} + x^{22} + x^{21} + x^{16} + x^{15} + x^{13} + x^{11} \\
&\quad + x^{10} + x^{9} + x^{8} + x^{7} + x^{6}, \\
p_{12}(x) &= x^{148} + x^{140} + x^{136} + x^{132} + x^{128} + x^{124} + x^{108} + x^{92} + x^{84} + x^{72} \\
&\quad + x^{68} + x^{64} + x^{36} + x^{28} + x^{24} + x^{16} + x^{8} + x^{4} + 1,
\end{aligned}$$

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

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

$$\begin{aligned}
p_0(x) &= x^{147} + x^{145} + x^{143} + x^{141} + x^{139} + x^{135} + x^{134} + x^{132} + x^{131} + x^{130} \\
&\quad + x^{129} + x^{128} + x^{127} + x^{126} + x^{125} + x^{124} + x^{119} + x^{117} + x^{114} \\
&\quad + x^{112} + x^{109} + x^{108} + x^{107} + x^{102} + x^{101} + x^{100} + x^{96} + x^{95} + x^{94} \\
&\quad + x^{92} + x^{91} + x^{90} + x^{88} + x^{86} + x^{82} + x^{80} + x^{79} + x^{77} + x^{76} + x^{74} \\
&\quad + x^{70} + x^{69} + x^{68} + x^{67} + x^{65} + x^{64} + x^{62} + x^{61} + x^{60} + x^{59} + x^{55} \\
&\quad + x^{54} + x^{51} + x^{43} + x^{42}, \\
p_3(x) &= x^{145} + x^{142} + x^{140} + x^{139} + x^{138} + x^{137} + x^{136} + x^{133} + x^{129} + x^{127}
\end{aligned}$$

$$
\begin{aligned}
&+ x^{126} + x^{123} + x^{122} + x^{121} + x^{118} + x^{117} + x^{115} + x^{113} + x^{112}\\
&+ x^{111} + x^{107} + x^{104} + x^{102} + x^{101} + x^{99} + x^{95} + x^{94} + x^{90} + x^{88}\\
&+ x^{86} + x^{85} + x^{84} + x^{81} + x^{80} + x^{77} + x^{75} + x^{74} + x^{69} + x^{64} + x^{61}\\
&+ x^{59} + x^{56} + x^{54} + x^{53} + x^{52} + x^{51} + x^{50} + x^{49} + x^{48} + x^{47} + x^{44}\\
&+ x^{43} + x^{42} + x^{38} + x^{33} + x^{32} + x^{30} + x^{27} + x^{26} + x^{25} + x^{23} + x^{22},\\
p_6(x) = {}& x^{145} + x^{142} + x^{140} + x^{139} + x^{138} + x^{137} + x^{136} + x^{135} + x^{131} + x^{129}\\
&+ x^{127} + x^{126} + x^{125} + x^{120} + x^{118} + x^{116} + x^{113} + x^{112} + x^{107}\\
&+ x^{105} + x^{104} + x^{103} + x^{102} + x^{100} + x^{98} + x^{97} + x^{96} + x^{94} + x^{92}\\
&+ x^{91} + x^{90} + x^{88} + x^{87} + x^{86} + x^{85} + x^{83} + x^{81} + x^{80} + x^{76} + x^{74}\\
&+ x^{73} + x^{71} + x^{68} + x^{67} + x^{66} + x^{63} + x^{59} + x^{56} + x^{54} + x^{53} + x^{50}\\
&+ x^{48} + x^{44} + x^{43} + x^{40} + x^{39} + x^{38} + x^{35} + x^{34} + x^{33} + x^{30} + x^{28}\\
&+ x^{27} + x^{24} + x^{22} + x^{21} + x^{20} + x^{13} + x^{12} + x^{11} + x^{10} + x^{8} + x^{5} + x^{3}\\
&+ x^{2} + 1,\\
p_9(x) = {}& x^{145} + x^{143} + x^{142} + x^{141} + x^{140} + x^{139} + x^{138} + x^{136} + x^{133} + x^{131}\\
&+ x^{130} + x^{128} + x^{117} + x^{115} + x^{114} + x^{112} + x^{101} + x^{99} + x^{98} + x^{96}\\
&+ x^{85} + x^{83} + x^{82} + x^{81} + x^{80} + x^{79} + x^{78} + x^{77} + x^{76} + x^{75} + x^{74}\\
&+ x^{72} + x^{33} + x^{31} + x^{30} + x^{29} + x^{28} + x^{27} + x^{26} + x^{24} + x^{21} + x^{19}\\
&+ x^{18} + x^{17} + x^{16} + x^{15} + x^{14} + x^{13} + x^{12} + x^{11} + x^{10} + x^{8},\\
p_{12}(x) = {}& x^{145} + x^{143} + x^{142} + x^{141} + x^{140} + x^{139} + x^{138} + x^{137} + x^{136} + x^{135}\\
&+ x^{134} + x^{133} + x^{132} + x^{131} + x^{130} + x^{129} + x^{128} + x^{127} + x^{126}\\
&+ x^{125} + x^{124} + x^{123} + x^{122} + x^{121} + x^{120} + x^{119} + x^{118} + x^{116}\\
&+ x^{113} + x^{111} + x^{110} + x^{109} + x^{108} + x^{107} + x^{106} + x^{105} + x^{104}\\
&+ x^{103} + x^{102} + x^{100} + x^{97} + x^{95} + x^{94} + x^{93} + x^{92} + x^{91} + x^{90} + x^{89}\\
&+ x^{88} + x^{87} + x^{86} + x^{84} + x^{69} + x^{67} + x^{66} + x^{64} + x^{33} + x^{31} + x^{30}\\
&+ x^{29} + x^{28} + x^{27} + x^{26} + x^{25} + x^{24} + x^{23} + x^{22} + x^{21} + x^{20} + x^{19}\\
&+ x^{18} + x^{16} + x^{5} + x^{3} + x^{2} + 1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_0(x) = {}& x^{147} + x^{142} + x^{141} + x^{139} + x^{138} + x^{135} + x^{131} + x^{130} + x^{129} + x^{127}\\
&+ x^{126} + x^{124} + x^{122} + x^{121} + x^{120} + x^{118} + x^{114} + x^{113} + x^{112}\\
&+ x^{110} + x^{107} + x^{106} + x^{105} + x^{103} + x^{101} + x^{100} + x^{96} + x^{95} + x^{94}\\
&+ x^{90} + x^{87} + x^{84} + x^{82} + x^{81} + x^{80} + x^{78} + x^{74} + x^{72} + x^{71} + x^{70}\\
&+ x^{69} + x^{68} + x^{67} + x^{66} + x^{65} + x^{64} + x^{63} + x^{61} + x^{60} + x^{59} + x^{58}\\
&+ x^{57} + x^{56} + x^{55} + x^{52} + x^{51} + x^{49} + x^{48} + x^{47} + x^{45} + x^{43} + x^{42}\\
&+ x^{41} + x^{37} + x^{31} + x^{29} + x^{27} + x^{26} + x^{24},
\end{aligned}
$$

$$\begin{aligned}
p_3(x) = {}& x^{145} + x^{142} + x^{141} + x^{140} + x^{139} + x^{136} + x^{135} + x^{134} + x^{132} + x^{131} \\
&+ x^{130} + x^{128} + x^{127} + x^{125} + x^{123} + x^{121} + x^{119} + x^{118} + x^{117} \\
&+ x^{116} + x^{110} + x^{108} + x^{103} + x^{102} + x^{100} + x^{98} + x^{96} + x^{95} + x^{94} \\
&+ x^{90} + x^{88} + x^{86} + x^{85} + x^{84} + x^{81} + x^{80} + x^{75} + x^{73} + x^{71} + x^{70} \\
&+ x^{69} + x^{68} + x^{67} + x^{63} + x^{61} + x^{60} + x^{57} + x^{55} + x^{53} + x^{50} + x^{49} \\
&+ x^{45} + x^{40} + x^{38} + x^{37} + x^{34} + x^{32} + x^{31} + x^{28} + x^{26} + x^{25} + x^{24} \\
&+ x^{22} + x^{21} + x^{20} + x^{19} + x^{18} + x^{16}, \\
p_6(x) = {}& x^{145} + x^{142} + x^{141} + x^{140} + x^{139} + x^{136} + x^{134} + x^{132} + x^{128} + x^{124} \\
&+ x^{122} + x^{120} + x^{118} + x^{116} + x^{115} + x^{110} + x^{109} + x^{107} + x^{106} \\
&+ x^{105} + x^{104} + x^{103} + x^{102} + x^{100} + x^{99} + x^{98} + x^{97} + x^{95} + x^{94} \\
&+ x^{93} + x^{91} + x^{89} + x^{88} + x^{85} + x^{84} + x^{83} + x^{80} + x^{79} + x^{78} + x^{74} \\
&+ x^{70} + x^{69} + x^{64} + x^{61} + x^{60} + x^{58} + x^{55} + x^{54} + x^{52} + x^{49} + x^{48} \\
&+ x^{47} + x^{46} + x^{45} + x^{42} + x^{38} + x^{36} + x^{35} + x^{34} + x^{33} + x^{31} + x^{30} \\
&+ x^{29} + x^{26} + x^{23} + x^{22} + x^{21} + x^{17} + x^{14} + x^{12} + x^{5} + x^{3} + x^{2} + 1, \\
p_9(x) = {}& x^{145} + x^{143} + x^{142} + x^{141} + x^{140} + x^{139} + x^{138} + x^{136} + x^{133} + x^{131} \\
&+ x^{130} + x^{128} + x^{117} + x^{115} + x^{114} + x^{112} + x^{101} + x^{99} + x^{98} + x^{96} \\
&+ x^{85} + x^{83} + x^{82} + x^{81} + x^{80} + x^{79} + x^{78} + x^{77} + x^{76} + x^{75} + x^{74} \\
&+ x^{72} + x^{33} + x^{31} + x^{30} + x^{29} + x^{28} + x^{27} + x^{26} + x^{24} + x^{21} + x^{19} \\
&+ x^{18} + x^{17} + x^{16} + x^{15} + x^{14} + x^{13} + x^{12} + x^{11} + x^{10} + x^{8}, \\
p_{12}(x) = {}& x^{145} + x^{143} + x^{142} + x^{141} + x^{140} + x^{139} + x^{138} + x^{137} + x^{136} + x^{135} \\
&+ x^{134} + x^{133} + x^{132} + x^{131} + x^{130} + x^{129} + x^{128} + x^{127} + x^{126} \\
&+ x^{125} + x^{124} + x^{123} + x^{122} + x^{121} + x^{120} + x^{119} + x^{118} + x^{116} \\
&+ x^{113} + x^{111} + x^{110} + x^{109} + x^{108} + x^{107} + x^{106} + x^{105} + x^{104} \\
&+ x^{103} + x^{102} + x^{100} + x^{97} + x^{95} + x^{94} + x^{93} + x^{92} + x^{91} + x^{90} + x^{89} \\
&+ x^{88} + x^{87} + x^{86} + x^{84} + x^{69} + x^{67} + x^{66} + x^{64} + x^{33} + x^{31} + x^{30} \\
&+ x^{29} + x^{28} + x^{27} + x^{26} + x^{25} + x^{24} + x^{23} + x^{22} + x^{21} + x^{20} + x^{19} \\
&+ x^{18} + x^{16} + x^{5} + x^{3} + x^{2} + 1,
\end{aligned}$$

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

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

$$\begin{aligned}
p_0(x) = {}& x^{144} + x^{142} + x^{140} + x^{139} + x^{138} + x^{137} + x^{135} + x^{133} + x^{132} + x^{131} \\
&+ x^{130} + x^{129} + x^{127} + x^{126} + x^{125} + x^{124} + x^{123} + x^{122} + x^{121} \\
&+ x^{119} + x^{115} + x^{112} + x^{111} + x^{110} + x^{109} + x^{108} + x^{106} + x^{104} \\
&+ x^{103} + x^{101} + x^{100} + x^{99} + x^{98} + x^{97} + x^{95} + x^{93} + x^{92} + x^{91} + x^{90} \\
&+ x^{87} + x^{84} + x^{83} + x^{82} + x^{78} + x^{72} + x^{71} + x^{70} + x^{69} + x^{68} + x^{67} \\
&+ x^{61} + x^{60} + x^{57} + x^{56} + x^{55} + x^{53} + x^{52} + x^{51} + x^{48} + x^{44} + x^{42}
\end{aligned}$$

$$
\begin{aligned}
&+ x^{40} + x^{39} + x^{35} + x^{34} + x^{33},\\
p_3(x) &= x^{142} + x^{141} + x^{140} + x^{139} + x^{137} + x^{135} + x^{134} + x^{132} + x^{131} + x^{129}\\
&+ x^{128} + x^{126} + x^{125} + x^{123} + x^{122} + x^{120} + x^{119} + x^{117} + x^{116}\\
&+ x^{114} + x^{113} + x^{111} + x^{109} + x^{104} + x^{103} + x^{102} + x^{99} + x^{98} + x^{78}\\
&+ x^{77} + x^{76} + x^{75} + x^{73} + x^{71} + x^{69} + x^{64} + x^{63} + x^{61} + x^{60} + x^{58}\\
&+ x^{57} + x^{55} + x^{53} + x^{48} + x^{47} + x^{46} + x^{43} + x^{42} + x^{38} + x^{37} + x^{36}\\
&+ x^{35} + x^{33} + x^{31} + x^{29} + x^{24} + x^{23} + x^{22} + x^{19} + x^{18},\\
p_6(x) &= x^{144} + x^{142} + x^{136} + x^{132} + x^{130} + x^{128} + x^{126} + x^{120} + x^{116} + x^{112}\\
&+ x^{110} + x^{108} + x^{106} + x^{104} + x^{102} + x^{98} + x^{92} + x^{88} + x^{86} + x^{84}\\
&+ x^{82} + x^{80} + x^{78} + x^{74} + x^{72} + x^{70} + x^{68} + x^{62} + x^{60} + x^{58} + x^{56}\\
&+ x^{54} + x^{52} + x^{50} + x^{44} + x^{42} + x^{40} + x^{30} + x^{28} + x^{26} + x^{14} + x^{12},\\
p_9(x) &= x^{146} + x^{145} + x^{141} + x^{138} + x^{136} + x^{134} + x^{133} + x^{130} + x^{129} + x^{128}\\
&+ x^{127} + x^{123} + x^{121} + x^{119} + x^{117} + x^{114} + x^{113} + x^{112} + x^{111}\\
&+ x^{107} + x^{105} + x^{103} + x^{101} + x^{98} + x^{97} + x^{96} + x^{95} + x^{91} + x^{89}\\
&+ x^{87} + x^{85} + x^{80} + x^{79} + x^{77} + x^{75} + x^{74} + x^{73} + x^{72} + x^{71} + x^{70}\\
&+ x^{34} + x^{33} + x^{29} + x^{26} + x^{24} + x^{22} + x^{21} + x^{16} + x^{15} + x^{13} + x^{11}\\
&+ x^{10} + x^{9} + x^{8} + x^{7} + x^{6},\\
p_{12}(x) &= x^{148} + x^{140} + x^{136} + x^{132} + x^{128} + x^{124} + x^{108} + x^{92} + x^{84} + x^{72}\\
&+ x^{68} + x^{64} + x^{36} + x^{28} + x^{24} + x^{16} + x^{8} + x^{4} + 1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_0(x) &= x^{160} + x^{156} + x^{151} + x^{150} + x^{149} + x^{141} + x^{140} + x^{138} + x^{137} + x^{136}\\
&+ x^{133} + x^{132} + x^{127} + x^{126} + x^{125} + x^{122} + x^{120} + x^{118} + x^{117}\\
&+ x^{114} + x^{113} + x^{112} + x^{110} + x^{109} + x^{108} + x^{107} + x^{105} + x^{104}\\
&+ x^{103} + x^{102} + x^{101} + x^{99} + x^{98} + x^{97} + x^{91} + x^{90} + x^{89} + x^{88} + x^{87}\\
&+ x^{86} + x^{82} + x^{75} + x^{73} + x^{72} + x^{70} + x^{67} + x^{64} + x^{61} + x^{57} + x^{56}\\
&+ x^{55} + x^{52} + x^{47} + x^{46} + x^{43} + x^{40} + x^{33},\\
p_3(x) &= x^{146} + x^{145} + x^{144} + x^{143} + x^{141} + x^{139} + x^{138} + x^{136} + x^{135} + x^{134}\\
&+ x^{131} + x^{129} + x^{128} + x^{127} + x^{125} + x^{123} + x^{121} + x^{118} + x^{117}\\
&+ x^{114} + x^{113} + x^{110} + x^{109} + x^{104} + x^{103} + x^{102} + x^{99} + x^{98} + x^{82}\\
&+ x^{81} + x^{80} + x^{79} + x^{77} + x^{75} + x^{73} + x^{70} + x^{69} + x^{66} + x^{65} + x^{62}\\
&+ x^{61} + x^{58} + x^{57} + x^{54} + x^{53} + x^{48} + x^{47} + x^{46} + x^{43} + x^{41} + x^{40}\\
&+ x^{39} + x^{37} + x^{35} + x^{33} + x^{30} + x^{29} + x^{24} + x^{23} + x^{22} + x^{19} + x^{18},\\
p_6(x) &= x^{148} + x^{146} + x^{140} + x^{128} + x^{118} + x^{116} + x^{112} + x^{110} + x^{102} + x^{94}\\
&+ x^{90} + x^{88} + x^{84} + x^{80} + x^{76} + x^{72} + x^{70} + x^{60} + x^{58} + x^{54} + x^{50}
\end{aligned}
$$

$$
\begin{aligned}
&+ x^{48} + x^{46} + x^{40} + x^{36} + x^{24} + x^{14} + x^{12},\\
p_9(x) = {}& x^{150} + x^{149} + x^{145} + x^{142} + x^{140} + x^{133} + x^{132} + x^{131} + x^{130} + x^{129}\\
&+ x^{128} + x^{127} + x^{126} + x^{125} + x^{124} + x^{123} + x^{122} + x^{121} + x^{120}\\
&+ x^{119} + x^{118} + x^{117} + x^{116} + x^{115} + x^{114} + x^{113} + x^{112} + x^{111}\\
&+ x^{110} + x^{109} + x^{108} + x^{107} + x^{106} + x^{105} + x^{104} + x^{103} + x^{102}\\
&+ x^{101} + x^{100} + x^{99} + x^{98} + x^{97} + x^{96} + x^{95} + x^{94} + x^{93} + x^{92} + x^{91}\\
&+ x^{90} + x^{89} + x^{88} + x^{87} + x^{84} + x^{83} + x^{82} + x^{80} + x^{79} + x^{77} + x^{75}\\
&+ x^{74} + x^{73} + x^{72} + x^{71} + x^{70} + x^{38} + x^{37} + x^{33} + x^{30} + x^{28} + x^{22}\\
&+ x^{20} + x^{19} + x^{18} + x^{16} + x^{15} + x^{13} + x^{11} + x^{10} + x^{9} + x^{8} + x^{7} + x^{6},\\
p_{12}(x) = {}& x^{152} + x^{144} + x^{124} + x^{120} + x^{116} + x^{112} + x^{108} + x^{104} + x^{100} + x^{96}\\
&+ x^{92} + x^{84} + x^{76} + x^{72} + x^{68} + x^{64} + x^{40} + x^{32} + x^{24} + x^{16} + x^{12}\\
&+ x^{8} + x^{4} + 1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_0(x) = {}& x^{147} + x^{145} + x^{143} + x^{141} + x^{139} + x^{135} + x^{134} + x^{132} + x^{131} + x^{130}\\
&+ x^{129} + x^{128} + x^{127} + x^{126} + x^{125} + x^{124} + x^{119} + x^{117} + x^{114}\\
&+ x^{112} + x^{109} + x^{108} + x^{107} + x^{102} + x^{101} + x^{100} + x^{96} + x^{95} + x^{94}\\
&+ x^{92} + x^{91} + x^{90} + x^{88} + x^{86} + x^{82} + x^{80} + x^{79} + x^{77} + x^{76} + x^{74}\\
&+ x^{70} + x^{69} + x^{68} + x^{67} + x^{65} + x^{64} + x^{62} + x^{61} + x^{60} + x^{59} + x^{55}\\
&+ x^{54} + x^{51} + x^{43} + x^{42},\\
p_3(x) = {}& x^{145} + x^{142} + x^{140} + x^{139} + x^{138} + x^{137} + x^{136} + x^{133} + x^{129} + x^{127}\\
&+ x^{126} + x^{123} + x^{122} + x^{121} + x^{118} + x^{117} + x^{115} + x^{113} + x^{112}\\
&+ x^{111} + x^{107} + x^{104} + x^{102} + x^{101} + x^{99} + x^{95} + x^{94} + x^{90} + x^{88}\\
&+ x^{86} + x^{85} + x^{84} + x^{81} + x^{80} + x^{77} + x^{75} + x^{74} + x^{69} + x^{64} + x^{61}\\
&+ x^{59} + x^{56} + x^{54} + x^{53} + x^{52} + x^{51} + x^{50} + x^{49} + x^{48} + x^{47} + x^{44}\\
&+ x^{43} + x^{42} + x^{38} + x^{33} + x^{32} + x^{30} + x^{27} + x^{26} + x^{25} + x^{23} + x^{22},\\
p_6(x) = {}& x^{145} + x^{142} + x^{140} + x^{139} + x^{138} + x^{137} + x^{136} + x^{135} + x^{131} + x^{129}\\
&+ x^{127} + x^{126} + x^{125} + x^{120} + x^{118} + x^{116} + x^{113} + x^{112} + x^{107}\\
&+ x^{105} + x^{104} + x^{103} + x^{102} + x^{100} + x^{98} + x^{97} + x^{96} + x^{94} + x^{92}\\
&+ x^{91} + x^{90} + x^{88} + x^{87} + x^{86} + x^{85} + x^{83} + x^{81} + x^{80} + x^{76} + x^{74}\\
&+ x^{73} + x^{71} + x^{68} + x^{67} + x^{66} + x^{63} + x^{59} + x^{56} + x^{54} + x^{53} + x^{50}\\
&+ x^{48} + x^{44} + x^{43} + x^{40} + x^{39} + x^{38} + x^{35} + x^{34} + x^{33} + x^{30} + x^{28}\\
&+ x^{27} + x^{24} + x^{22} + x^{21} + x^{20} + x^{13} + x^{12} + x^{11} + x^{10} + x^{8} + x^{5} + x^{3}\\
&+ x^{2} + 1,\\
p_9(x) = {}& x^{145} + x^{143} + x^{142} + x^{141} + x^{140} + x^{139} + x^{138} + x^{136} + x^{133} + x^{131}
\end{aligned}
$$

$$
\begin{aligned}
&+ x^{130} + x^{128} + x^{117} + x^{115} + x^{114} + x^{112} + x^{101} + x^{99} + x^{98} + x^{96}\\
&+ x^{85} + x^{83} + x^{82} + x^{81} + x^{80} + x^{79} + x^{78} + x^{77} + x^{76} + x^{75} + x^{74}\\
&+ x^{72} + x^{33} + x^{31} + x^{30} + x^{29} + x^{28} + x^{27} + x^{26} + x^{24} + x^{21} + x^{19}\\
&+ x^{18} + x^{17} + x^{16} + x^{15} + x^{14} + x^{13} + x^{12} + x^{11} + x^{10} + x^{8},\\
p_{12}(x) = {}& x^{145} + x^{143} + x^{142} + x^{141} + x^{140} + x^{139} + x^{138} + x^{137} + x^{136} + x^{135}\\
&+ x^{134} + x^{133} + x^{132} + x^{131} + x^{130} + x^{129} + x^{128} + x^{127} + x^{126}\\
&+ x^{125} + x^{124} + x^{123} + x^{122} + x^{121} + x^{120} + x^{119} + x^{118} + x^{116}\\
&+ x^{113} + x^{111} + x^{110} + x^{109} + x^{108} + x^{107} + x^{106} + x^{105} + x^{104}\\
&+ x^{103} + x^{102} + x^{100} + x^{97} + x^{95} + x^{94} + x^{93} + x^{92} + x^{91} + x^{90} + x^{89}\\
&+ x^{88} + x^{87} + x^{86} + x^{84} + x^{69} + x^{67} + x^{66} + x^{64} + x^{33} + x^{31} + x^{30}\\
&+ x^{29} + x^{28} + x^{27} + x^{26} + x^{25} + x^{24} + x^{23} + x^{22} + x^{21} + x^{20} + x^{19}\\
&+ x^{18} + x^{16} + x^{5} + x^{3} + x^{2} + 1,
\end{aligned}
$$

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

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]	481	[763, 764]	962	[1131, 1255]	1443	[1215, 1668]
1	[3, 4]	482	[765, 766]	963	[628, 1256]	1444	[154, 554]
2	[5, 6]	483	[750, 714]	964	[1082, 639]	1445	[150, 1115]
3	[7, 8]	484	[767, 768]	965	[480, 163]	1446	[466, 150]
4	[9, 10]	485	[769, 770]	966	[612, 139]	1447	[1642, 1239]
5	[11, 12]	486	[771, 772]	967	[1257, 579]	1448	[646, 614]
6	[13, 14]	487	[360, 773]	968	[615, 605]	1449	[1669, 1670]
7	[15, 16]	488	[774, 267]	969	[1258, 1242]	1450	[1671, 122]
8	[17, 18]	489	[775, 776]	970	[643, 201]	1451	[1657, 1272]
9	[19, 20]	490	[777, 705]	971	[1259, 1101]	1452	[1166, 1216]
10	[21, 22]	491	[778, 779]	972	[652, 1260]	1453	[493, 1636]
11	[23, 24]	492	[780, 781]	973	[1133, 657]	1454	[1621, 1142]
12	[25, 26]	493	[782, 783]	974	[569, 440]	1455	[1672, 1673]
13	[27, 28]	494	[784, 785]	975	[1261, 623]	1456	[1086, 1182]
14	[29, 30]	495	[786, 787]	976	[1261, 211]	1457	[138, 613]
15	[31, 32]	496	[788, 789]	977	[1255, 661]	1458	[469, 1073]
16	[33, 34]	497	[790, 791]	978	[8, 522]	1459	[538, 221]
17	[35, 36]	498	[792, 793]	979	[128, 126]	1460	[572, 1277]
18	[37, 38]	499	[308, 734]	980	[1262, 1099]	1461	[1089, 530]
19	[39, 40]	500	[794, 795]	981	[61, 661]	1462	[1191, 657]
20	[41, 42]	501	[796, 797]	982	[458, 1163]	1463	[538, 187]
21	[43, 44]	502	[672, 798]	983	[579, 1263]	1464	[459, 1674]
22	[45, 46]	503	[799, 800]	984	[163, 429]	1465	[1672, 1284]

23	[47, 48]	504	[801, 802]	985	[139, 200]	1466	[172, 171]
24	[49, 12]	505	[803, 804]	986	[1264, 496]	1467	[611, 1616]
25	[50, 51]	506	[805, 806]	987	[613, 200]	1468	[512, 484]
26	[52, 53]	507	[807, 808]	988	[1265, 1266]	1469	[1675, 1676]
27	[54, 55]	508	[809, 810]	989	[1267, 533]	1470	[1130, 1212]
28	[56, 57]	509	[811, 812]	990	[623, 1069]	1471	[170, 548]
29	[58, 59]	510	[813, 814]	991	[1104, 147]	1472	[1242, 1087]
30	[60, 61]	511	[815, 816]	992	[1211, 35]	1473	[1138, 487]
31	[62, 63]	512	[817, 818]	993	[1268, 13]	1474	[664, 1179]
32	[64, 65]	513	[819, 820]	994	[1126, 638]	1475	[628, 528]
33	[66, 67]	514	[821, 822]	995	[210, 1070]	1476	[1677, 1101]
34	[68, 69]	515	[415, 90]	996	[637, 622]	1477	[1255, 1177]
35	[70, 71]	516	[823, 824]	997	[189, 474]	1478	[1168, 638]
36	[72, 73]	517	[825, 826]	998	[574, 173]	1479	[1238, 1643]
37	[74, 75]	518	[113, 827]	999	[521, 592]	1480	[1058, 129]
38	[76, 77]	519	[673, 828]	1000	[1162, 667]	1481	[472, 1678]
39	[78, 79]	520	[829, 830]	1001	[506, 1214]	1482	[1204, 661]
40	[80, 81]	521	[831, 832]	1002	[191, 664]	1483	[1629, 1679]
41	[82, 83]	522	[833, 834]	1003	[1269, 1231]	1484	[1680, 1676]
42	[84, 85]	523	[71, 835]	1004	[646, 486]	1485	[44, 551]
43	[86, 87]	524	[836, 837]	1005	[1270, 625]	1486	[1681, 175]
44	[88, 89]	525	[838, 839]	1006	[1106, 1085]	1487	[187, 1168]
45	[90, 91]	526	[840, 285]	1007	[41, 1074]	1488	[430, 1682]
46	[92, 93]	527	[756, 841]	1008	[1262, 1271]	1489	[547, 549]
47	[94, 95]	528	[758, 842]	1009	[1230, 474]	1490	[545, 180]
48	[96, 97]	529	[843, 759]	1010	[206, 651]	1491	[1110, 1083]
49	[98, 99]	530	[844, 845]	1011	[441, 1272]	1492	[1051, 127]
50	[100, 101]	531	[846, 847]	1012	[1149, 622]	1493	[429, 528]
51	[102, 103]	532	[848, 849]	1013	[1273, 1274]	1494	[1269, 47]
52	[104, 105]	533	[850, 311]	1014	[1224, 1275]	1495	[1683, 1684]
53	[106, 107]	534	[851, 852]	1015	[1276, 659]	1496	[1103, 146]
54	[108, 109]	535	[853, 854]	1016	[201, 1277]	1497	[1133, 214]
55	[110, 111]	536	[855, 856]	1017	[203, 140]	1498	[123, 593]
56	[101, 112]	537	[857, 799]	1018	[497, 1278]	1499	[1221, 1231]
57	[24, 113]	538	[858, 295]	1019	[632, 1209]	1500	[1685, 1686]
58	[114, 115]	539	[859, 860]	1020	[637, 653]	1501	[452, 1260]
59	[116, 117]	540	[861, 862]	1021	[1069, 653]	1502	[440, 569]
60	[118, 119]	541	[863, 396]	1022	[613, 643]	1503	[7, 1136]
61	[120, 121]	542	[760, 724]	1023	[479, 617]	1504	[197, 508]
62	[122, 123]	543	[864, 865]	1024	[141, 1167]	1505	[477, 542]
63	[124, 125]	544	[866, 867]	1025	[1235, 196]	1506	[646, 1687]
64	[126, 127]	545	[868, 869]	1026	[478, 628]	1507	[132, 1048]
65	[128, 129]	546	[725, 870]	1027	[508, 1063]	1508	[533, 1077]
66	[130, 131]	547	[87, 319]	1028	[529, 1090]	1509	[1688, 1280]

67	[132, 133]	548	[871, 872]	1029	[556, 593]	1510	[655, 542]
68	[134, 135]	549	[873, 874]	1030	[216, 179]	1511	[603, 1682]
69	[136, 137]	550	[875, 733]	1031	[1279, 1280]	1512	[32, 46]
70	[138, 139]	551	[318, 876]	1032	[1051, 507]	1513	[1689, 1690]
71	[35, 140]	552	[400, 332]	1033	[1281, 1159]	1514	[1680, 1691]
72	[141, 142]	553	[877, 878]	1034	[1181, 1087]	1515	[136, 540]
73	[143, 137]	554	[879, 880]	1035	[129, 1214]	1516	[61, 1177]
74	[144, 145]	555	[881, 882]	1036	[1079, 53]	1517	[1071, 210]
75	[146, 147]	556	[883, 884]	1037	[538, 448]	1518	[1276, 1102]
76	[148, 149]	557	[18, 885]	1038	[1101, 659]	1519	[581, 222]
77	[150, 151]	558	[731, 886]	1039	[158, 142]	1520	[1198, 485]
78	[152, 153]	559	[709, 887]	1040	[513, 609]	1521	[1654, 183]
79	[154, 155]	560	[888, 889]	1041	[1282, 1176]	1522	[1201, 503]
80	[156, 157]	561	[890, 891]	1042	[623, 637]	1523	[43, 169]
81	[57, 158]	562	[892, 893]	1043	[1283, 1284]	1524	[449, 157]
82	[159, 160]	563	[779, 894]	1044	[1285, 369]	1525	[1205, 1255]
83	[161, 162]	564	[895, 896]	1045	[1286, 80]	1526	[1688, 1624]
84	[163, 164]	565	[884, 897]	1046	[1287, 1288]	1527	[531, 1179]
85	[37, 165]	566	[898, 899]	1047	[1289, 1290]	1528	[1077, 1692]
86	[166, 167]	567	[900, 901]	1048	[1291, 1292]	1529	[1058, 126]
87	[168, 169]	568	[902, 903]	1049	[245, 777]	1530	[590, 1138]
88	[170, 43]	569	[693, 382]	1050	[1293, 817]	1531	[1186, 1161]
89	[171, 172]	570	[904, 905]	1051	[1294, 726]	1532	[210, 1148]
90	[173, 174]	571	[906, 907]	1052	[1295, 1296]	1533	[1683, 444]
91	[175, 176]	572	[908, 909]	1053	[694, 1297]	1534	[1268, 579]
92	[177, 178]	573	[910, 324]	1054	[1298, 1299]	1535	[1136, 522]
93	[179, 180]	574	[413, 326]	1055	[1300, 730]	1536	[49, 1111]
94	[181, 182]	575	[911, 254]	1056	[930, 1301]	1537	[513, 615]
95	[183, 184]	576	[912, 913]	1057	[1302, 237]	1538	[465, 474]
96	[134, 56]	577	[914, 915]	1058	[1303, 1029]	1539	[1217, 228]
97	[185, 141]	578	[916, 917]	1059	[1304, 1305]	1540	[543, 578]
98	[186, 187]	579	[918, 919]	1060	[1306, 1307]	1541	[1191, 214]
99	[188, 189]	580	[920, 66]	1061	[1305, 27]	1542	[1693, 1694]
100	[190, 191]	581	[921, 416]	1062	[1308, 1309]	1543	[1653, 437]
101	[192, 193]	582	[922, 745]	1063	[1310, 1311]	1544	[1695, 1068]
102	[194, 195]	583	[923, 924]	1064	[1312, 106]	1545	[183, 213]
103	[196, 197]	584	[925, 94]	1065	[1313, 1022]	1546	[223, 509]
104	[150, 198]	585	[670, 926]	1066	[1314, 1315]	1547	[1696, 624]
105	[130, 199]	586	[257, 751]	1067	[1316, 1317]	1548	[1045, 630]
106	[200, 201]	587	[927, 928]	1068	[1318, 992]	1549	[1068, 1697]
107	[202, 203]	588	[919, 5]	1069	[1319, 975]	1550	[1665, 1674]
108	[204, 205]	589	[929, 930]	1070	[1320, 1321]	1551	[1655, 122]
109	[206, 207]	590	[783, 815]	1071	[393, 394]	1552	[547, 43]
110	[208, 209]	591	[931, 932]	1072	[109, 1322]	1553	[1217, 1208]

111	[210, 211]	592	[16, 933]	1073	[1323, 1324]	1554	[449, 1169]
112	[212, 213]	593	[230, 934]	1074	[1325, 281]	1555	[187, 449]
113	[48, 214]	594	[935, 936]	1075	[1326, 1327]	1556	[1698, 1202]
114	[215, 216]	595	[937, 76]	1076	[1328, 1329]	1557	[517, 1078]
115	[217, 218]	596	[894, 838]	1077	[936, 1330]	1558	[1151, 1645]
116	[219, 220]	597	[938, 939]	1078	[1331, 1332]	1559	[1161, 1179]
117	[186, 221]	598	[940, 941]	1079	[1333, 1334]	1560	[1628, 1100]
118	[222, 223]	599	[939, 942]	1080	[1335, 1336]	1561	[124, 1678]
119	[224, 225]	600	[89, 943]	1081	[770, 774]	1562	[1231, 490]
120	[161, 226]	601	[944, 945]	1082	[1337, 1338]	1563	[1248, 1245]
121	[227, 228]	602	[946, 947]	1083	[1339, 1340]	1564	[60, 1255]
122	[229, 230]	603	[948, 949]	1084	[377, 1341]	1565	[1699, 458]
123	[231, 232]	604	[950, 863]	1085	[1342, 1343]	1566	[1064, 52]
124	[233, 234]	605	[820, 951]	1086	[1344, 1345]	1567	[1116, 203]
125	[235, 236]	606	[814, 952]	1087	[1346, 1347]	1568	[1700, 1701]
126	[237, 238]	607	[953, 920]	1088	[1348, 1349]	1569	[1613, 1702]
127	[239, 240]	608	[954, 346]	1089	[1350, 1351]	1570	[568, 440]
128	[241, 242]	609	[955, 956]	1090	[1352, 1353]	1571	[1081, 56]
129	[243, 78]	610	[957, 923]	1091	[409, 911]	1572	[1245, 131]
130	[244, 245]	611	[958, 959]	1092	[1354, 1355]	1573	[1703, 1212]
131	[246, 247]	612	[103, 690]	1093	[837, 900]	1574	[432, 505]
132	[248, 249]	613	[960, 961]	1094	[1356, 1357]	1575	[630, 470]
133	[250, 251]	614	[764, 962]	1095	[966, 1358]	1576	[202, 35]
134	[252, 253]	615	[963, 964]	1096	[1359, 1339]	1577	[1199, 539]
135	[254, 255]	616	[965, 966]	1097	[1360, 120]	1578	[462, 545]
136	[256, 257]	617	[967, 968]	1098	[1361, 1362]	1579	[1275, 1051]
137	[258, 259]	618	[834, 969]	1099	[1363, 1364]	1580	[1249, 196]
138	[260, 261]	619	[776, 970]	1100	[1365, 1366]	1581	[51, 1083]
139	[262, 263]	620	[971, 972]	1101	[1367, 1368]	1582	[653, 1148]
140	[264, 265]	621	[973, 697]	1102	[1369, 1370]	1583	[1119, 1702]
141	[112, 266]	622	[395, 974]	1103	[1371, 277]	1584	[122, 522]
142	[267, 268]	623	[975, 976]	1104	[1372, 1373]	1585	[627, 160]
143	[269, 270]	624	[977, 978]	1105	[880, 1374]	1586	[1654, 212]
144	[271, 272]	625	[119, 979]	1106	[1375, 1376]	1587	[1704, 1683]
145	[273, 274]	626	[980, 981]	1107	[1377, 1378]	1588	[1705, 515]
146	[275, 276]	627	[982, 803]	1108	[1379, 873]	1589	[189, 526]
147	[277, 278]	628	[968, 983]	1109	[97, 977]	1590	[60, 660]
148	[279, 280]	629	[984, 985]	1110	[1380, 1381]	1591	[144, 553]
149	[281, 282]	630	[986, 811]	1111	[1382, 299]	1592	[623, 1071]
150	[283, 284]	631	[292, 987]	1112	[1383, 1011]	1593	[1264, 541]
151	[285, 286]	632	[988, 989]	1113	[304, 1384]	1594	[1110, 639]
152	[287, 288]	633	[990, 991]	1114	[1006, 1385]	1595	[464, 1706]
153	[289, 290]	634	[992, 70]	1115	[1386, 1387]	1596	[197, 223]
154	[291, 292]	635	[993, 994]	1116	[1388, 72]	1597	[587, 543]

155	[293, 294]	636	[995, 692]	1117	[1389, 1359]	1598	[515, 611]
156	[295, 296]	637	[974, 996]	1118	[1390, 1391]	1599	[1654, 572]
157	[297, 298]	638	[352, 997]	1119	[1392, 1393]	1600	[496, 643]
158	[299, 300]	639	[341, 998]	1120	[1394, 1395]	1601	[1234, 529]
159	[288, 256]	640	[999, 1000]	1121	[1396, 1352]	1602	[1275, 129]
160	[301, 302]	641	[1001, 1002]	1122	[1397, 674]	1603	[1675, 1691]
161	[303, 304]	642	[1003, 1004]	1123	[1398, 1399]	1604	[502, 2]
162	[305, 306]	643	[261, 398]	1124	[1400, 1401]	1605	[170, 168]
163	[307, 308]	644	[1005, 1006]	1125	[942, 373]	1606	[218, 1707]
164	[309, 310]	645	[1007, 921]	1126	[1402, 1403]	1607	[535, 1679]
165	[311, 312]	646	[1008, 1009]	1127	[1404, 669]	1608	[1245, 199]
166	[313, 314]	647	[899, 1010]	1128	[1405, 390]	1609	[1708, 367]
167	[315, 316]	648	[1011, 1012]	1129	[1406, 788]	1610	[1452, 1709]
168	[317, 318]	649	[1013, 1014]	1130	[385, 1407]	1611	[994, 1710]
169	[319, 320]	650	[976, 1015]	1131	[1408, 1035]	1612	[704, 1711]
170	[321, 322]	651	[1016, 1017]	1132	[1409, 1410]	1613	[1512, 1712]
171	[171, 171]	652	[1018, 1019]	1133	[1411, 937]	1614	[1713, 1714]
172	[314, 323]	653	[1020, 1021]	1134	[1019, 1412]	1615	[1715, 699]
173	[324, 325]	654	[1022, 1023]	1135	[1413, 1414]	1616	[1716, 1717]
174	[326, 327]	655	[405, 1024]	1136	[376, 1001]	1617	[1718, 1719]
175	[328, 329]	656	[1025, 1026]	1137	[1415, 1416]	1618	[1720, 1721]
176	[330, 331]	657	[1027, 1028]	1138	[1417, 1418]	1619	[1722, 1723]
177	[332, 333]	658	[1029, 1030]	1139	[234, 1419]	1620	[1724, 844]
178	[334, 335]	659	[1031, 1032]	1140	[1021, 1420]	1621	[869, 1725]
179	[336, 337]	660	[1033, 1034]	1141	[1421, 1422]	1622	[1726, 1727]
180	[338, 339]	661	[1035, 1036]	1142	[1423, 1424]	1623	[1728, 1413]
181	[340, 341]	662	[1037, 819]	1143	[1425, 1323]	1624	[1729, 1730]
182	[342, 343]	663	[1000, 98]	1144	[1426, 1427]	1625	[1496, 74]
183	[344, 345]	664	[972, 1038]	1145	[255, 1428]	1626	[1731, 1732]
184	[346, 347]	665	[358, 1039]	1146	[1429, 330]	1627	[1733, 1734]
185	[348, 241]	666	[1040, 420]	1147	[1430, 1431]	1628	[1735, 890]
186	[349, 350]	667	[1041, 1042]	1148	[1432, 1020]	1629	[1514, 1007]
187	[351, 352]	668	[1043, 684]	1149	[1433, 1434]	1630	[1736, 1737]
188	[353, 354]	669	[1044, 1045]	1150	[1435, 388]	1631	[952, 1738]
189	[355, 283]	670	[656, 36]	1151	[1376, 1436]	1632	[1739, 248]
190	[79, 356]	671	[446, 1046]	1152	[1437, 1438]	1633	[1740, 1741]
191	[357, 358]	672	[610, 137]	1153	[1439, 1440]	1634	[1742, 1743]
192	[359, 360]	673	[1047, 1048]	1154	[1441, 763]	1635	[1744, 1745]
193	[361, 362]	674	[1049, 1050]	1155	[316, 1442]	1636	[1746, 1747]
194	[363, 364]	675	[539, 137]	1156	[1443, 1444]	1637	[1748, 426]
195	[365, 366]	676	[1051, 1052]	1157	[1445, 1446]	1638	[1399, 925]
196	[367, 368]	677	[175, 173]	1158	[1334, 1447]	1639	[1321, 1749]
197	[369, 370]	678	[1053, 1054]	1159	[354, 1448]	1640	[1750, 1751]
198	[371, 372]	679	[522, 557]	1160	[1449, 1450]	1641	[1752, 1753]

199	[373, 374]	680	[1055, 1056]	1161	[1451, 1452]	1642	[1754, 1573]
200	[375, 376]	681	[1057, 1058]	1162	[1453, 1454]	1643	[1755, 1756]
201	[263, 377]	682	[440, 568]	1163	[1455, 1456]	1644	[1757, 1469]
202	[115, 378]	683	[1059, 659]	1164	[1403, 1453]	1645	[402, 1758]
203	[379, 118]	684	[1060, 228]	1165	[1457, 1458]	1646	[677, 1509]
204	[380, 381]	685	[1061, 1062]	1166	[1431, 999]	1647	[1759, 258]
205	[382, 383]	686	[580, 1063]	1167	[928, 1459]	1648	[337, 1760]
206	[384, 385]	687	[1064, 36]	1168	[1460, 1461]	1649	[737, 1761]
207	[386, 387]	688	[1065, 1066]	1169	[1462, 1463]	1650	[1762, 1763]
208	[388, 389]	689	[1067, 633]	1170	[798, 1464]	1651	[1764, 244]
209	[390, 391]	690	[1044, 607]	1171	[1465, 1466]	1652	[1765, 1766]
210	[392, 393]	691	[1068, 525]	1172	[1467, 1468]	1653	[1767, 1768]
211	[394, 395]	692	[1069, 622]	1173	[1469, 1470]	1654	[1769, 17]
212	[396, 397]	693	[1070, 1071]	1174	[1471, 1472]	1655	[1393, 1722]
213	[398, 399]	694	[1072, 494]	1175	[419, 1383]	1656	[1770, 1771]
214	[95, 400]	695	[654, 477]	1176	[1023, 1473]	1657	[1772, 1773]
215	[401, 402]	696	[1068, 1073]	1177	[1474, 1475]	1658	[1774, 1591]
216	[403, 338]	697	[148, 451]	1178	[1349, 1476]	1659	[1775, 1776]
217	[404, 405]	698	[1074, 450]	1179	[1477, 1478]	1660	[1709, 243]
218	[406, 407]	699	[194, 1075]	1180	[841, 1479]	1661	[1777, 1778]
219	[408, 409]	700	[1076, 174]	1181	[832, 1480]	1662	[1373, 1346]
220	[410, 411]	701	[1077, 1078]	1182	[1481, 1482]	1663	[979, 892]
221	[412, 413]	702	[201, 213]	1183	[1483, 1484]	1664	[1779, 1780]
222	[414, 415]	703	[1079, 1080]	1184	[83, 1485]	1665	[1781, 971]
223	[416, 417]	704	[193, 511]	1185	[1486, 749]	1666	[1782, 1783]
224	[418, 419]	705	[221, 449]	1186	[1487, 1477]	1667	[368, 1784]
225	[420, 421]	706	[589, 187]	1187	[1488, 1489]	1668	[1785, 1786]
226	[422, 423]	707	[1081, 135]	1188	[752, 1490]	1669	[331, 1787]
227	[424, 425]	708	[470, 509]	1189	[787, 1491]	1670	[1024, 1788]
228	[426, 427]	709	[1082, 1083]	1190	[1492, 1493]	1671	[1789, 833]
229	[428, 429]	710	[1084, 1085]	1191	[1494, 767]	1672	[1790, 938]
230	[173, 225]	711	[1086, 1087]	1192	[1495, 1496]	1673	[253, 1791]
231	[430, 431]	712	[1088, 665]	1193	[762, 1497]	1674	[1792, 1793]
232	[432, 433]	713	[201, 184]	1194	[63, 1498]	1675	[826, 910]
233	[434, 435]	714	[1089, 1090]	1195	[1499, 328]	1676	[1794, 1795]
234	[436, 437]	715	[1091, 1092]	1196	[1500, 1316]	1677	[1309, 102]
235	[438, 439]	716	[1093, 202]	1197	[1501, 1502]	1678	[1796, 1797]
236	[440, 440]	717	[469, 525]	1198	[1503, 771]	1679	[1798, 1799]
237	[441, 442]	718	[1094, 1095]	1199	[249, 861]	1680	[1800, 1801]
238	[443, 444]	719	[1071, 622]	1200	[1504, 1505]	1681	[1802, 410]
239	[61, 445]	720	[1096, 1082]	1201	[1506, 1507]	1682	[1536, 1803]
240	[446, 447]	721	[1097, 60]	1202	[85, 1508]	1683	[1490, 1804]
241	[448, 449]	722	[1098, 1099]	1203	[1509, 1510]	1684	[1805, 1806]
242	[450, 451]	723	[1050, 490]	1204	[1511, 1512]	1685	[1583, 1807]

243	[452, 453]	724	[582, 580]	1205	[1026, 1474]	1686	[996, 1808]
244	[177, 454]	725	[1100, 165]	1206	[1513, 1514]	1687	[1809, 1810]
245	[455, 221]	726	[1101, 1102]	1207	[924, 1515]	1688	[1811, 1550]
246	[456, 457]	727	[1103, 1104]	1208	[1374, 1516]	1689	[1812, 1813]
247	[458, 179]	728	[512, 1046]	1209	[1517, 1518]	1690	[320, 1814]
248	[459, 460]	729	[513, 483]	1210	[1519, 379]	1691	[1815, 1816]
249	[461, 462]	730	[1105, 1060]	1211	[1520, 264]	1692	[1817, 1818]
250	[463, 170]	731	[1106, 1107]	1212	[1521, 801]	1693	[1297, 1396]
251	[464, 228]	732	[203, 52]	1213	[1522, 1523]	1694	[903, 1819]
252	[465, 466]	733	[1108, 551]	1214	[242, 1524]	1695	[1820, 858]
253	[467, 455]	734	[129, 507]	1215	[329, 1525]	1696	[1821, 843]
254	[468, 469]	735	[1109, 37]	1216	[1526, 1527]	1697	[1822, 1823]
255	[470, 471]	736	[575, 1110]	1217	[1528, 1529]	1698	[1030, 92]
256	[472, 125]	737	[164, 528]	1218	[1530, 1531]	1699	[1824, 336]
257	[473, 474]	738	[537, 186]	1219	[1532, 1533]	1700	[1825, 1820]
258	[217, 475]	739	[1111, 185]	1220	[1534, 1535]	1701	[1434, 1826]
259	[476, 450]	740	[1112, 1109]	1221	[407, 1536]	1702	[1827, 1828]
260	[477, 478]	741	[1113, 1114]	1222	[1537, 1538]	1703	[1829, 940]
261	[479, 480]	742	[607, 197]	1223	[1307, 881]	1704	[735, 1318]
262	[481, 482]	743	[609, 1115]	1224	[945, 1363]	1705	[1830, 1740]
263	[483, 151]	744	[143, 540]	1225	[828, 114]	1706	[1831, 1832]
264	[214, 484]	745	[542, 628]	1226	[872, 1539]	1707	[1833, 1834]
265	[485, 486]	746	[1116, 35]	1227	[1540, 1541]	1708	[1835, 499]
266	[193, 487]	747	[1117, 1118]	1228	[265, 823]	1709	[1836, 152]
267	[488, 141]	748	[1119, 1120]	1229	[1542, 1543]	1710	[513, 150]
268	[489, 490]	749	[1121, 1089]	1230	[1544, 1545]	1711	[1652, 1219]
269	[491, 178]	750	[140, 53]	1231	[1416, 1546]	1712	[159, 432]
270	[12, 488]	751	[1122, 1050]	1232	[1547, 1400]	1713	[647, 1197]
271	[469, 492]	752	[474, 483]	1233	[723, 412]	1714	[611, 451]
272	[493, 494]	753	[1123, 1124]	1234	[989, 736]	1715	[574, 1076]
273	[495, 496]	754	[473, 513]	1235	[1548, 1457]	1716	[517, 1692]
274	[497, 487]	755	[1125, 475]	1236	[1508, 1369]	1717	[628, 585]
275	[61, 498]	756	[1126, 157]	1237	[1549, 1398]	1718	[668, 1837]
276	[499, 179]	757	[1127, 477]	1238	[1550, 1551]	1719	[158, 1167]
277	[500, 501]	758	[608, 212]	1239	[1552, 1553]	1720	[1838, 1839]
278	[176, 225]	759	[607, 582]	1240	[1554, 1555]	1721	[1175, 1240]
279	[502, 503]	760	[1128, 635]	1241	[1556, 958]	1722	[570, 1253]
280	[504, 505]	761	[1129, 136]	1242	[1557, 1371]	1723	[170, 549]
281	[506, 507]	762	[214, 447]	1243	[1558, 1559]	1724	[1840, 1188]
282	[508, 509]	763	[1130, 1131]	1244	[1560, 813]	1725	[1662, 1086]
283	[223, 471]	764	[645, 485]	1245	[1561, 1562]	1726	[508, 1664]
284	[510, 511]	765	[1053, 1132]	1246	[1563, 1564]	1727	[1654, 201]
285	[48, 512]	766	[1050, 1133]	1247	[969, 914]	1728	[1677, 1059]
286	[465, 513]	767	[490, 214]	1248	[1565, 246]	1729	[1283, 1673]

287	[179, 514]	768	[47, 1133]	1249	[791, 922]	1730	[463, 551]
288	[515, 450]	769	[1134, 1135]	1250	[1566, 1567]	1731	[1161, 532]
289	[516, 195]	770	[56, 488]	1251	[1568, 1569]	1732	[580, 509]
290	[517, 38]	771	[1125, 218]	1252	[356, 1570]	1733	[1195, 1168]
291	[518, 506]	772	[1136, 592]	1253	[1571, 1572]	1734	[489, 1133]
292	[519, 501]	773	[595, 1077]	1254	[1573, 755]	1735	[1195, 1126]
293	[123, 520]	774	[1049, 489]	1255	[1407, 1574]	1736	[1203, 1841]
294	[521, 522]	775	[1137, 1138]	1256	[1575, 1576]	1737	[563, 435]
295	[52, 523]	776	[140, 523]	1257	[1450, 1577]	1738	[51, 639]
296	[524, 525]	777	[467, 589]	1258	[1578, 765]	1739	[1842, 1843]
297	[526, 483]	778	[1139, 1140]	1259	[1579, 1031]	1740	[1656, 34]
298	[135, 488]	779	[1141, 1142]	1260	[1580, 1581]	1741	[547, 168]
299	[527, 528]	780	[1143, 1068]	1261	[1582, 1390]	1742	[611, 1837]
300	[529, 530]	781	[574, 176]	1262	[689, 1583]	1743	[216, 558]
301	[531, 532]	782	[1144, 1145]	1263	[1577, 1584]	1744	[1695, 631]
302	[533, 37]	783	[1146, 1147]	1264	[343, 375]	1745	[518, 126]
303	[457, 534]	784	[1148, 1149]	1265	[711, 1585]	1746	[1149, 1261]
304	[535, 536]	785	[155, 555]	1266	[350, 1586]	1747	[624, 562]
305	[537, 538]	786	[202, 1064]	1267	[1587, 1501]	1748	[476, 668]
306	[539, 540]	787	[1128, 1116]	1268	[1588, 1520]	1749	[1104, 1216]
307	[495, 541]	788	[58, 457]	1269	[1589, 1411]	1750	[36, 1080]
308	[542, 527]	789	[1150, 142]	1270	[1590, 269]	1751	[197, 580]
309	[543, 544]	790	[1151, 1152]	1271	[1591, 1592]	1752	[1647, 136]
310	[482, 486]	791	[617, 542]	1272	[1593, 1594]	1753	[1131, 61]
311	[545, 546]	792	[176, 1153]	1273	[1595, 82]	1754	[1844, 1845]
312	[446, 484]	793	[508, 471]	1274	[1545, 1596]	1755	[549, 1108]
313	[547, 548]	794	[1154, 1155]	1275	[1597, 807]	1756	[625, 433]
314	[169, 547]	795	[1156, 1157]	1276	[827, 1598]	1757	[9, 1846]
315	[549, 44]	796	[1158, 1159]	1277	[1599, 1600]	1758	[549, 169]
316	[550, 549]	797	[44, 547]	1278	[1601, 1602]	1759	[1847, 476]
317	[550, 168]	798	[1160, 10]	1279	[67, 1603]	1760	[1651, 1060]
318	[551, 549]	799	[1122, 489]	1280	[1604, 1605]	1761	[1064, 140]
319	[167, 172]	800	[218, 131]	1281	[1606, 1483]	1762	[1196, 648]
320	[169, 551]	801	[1100, 38]	1282	[956, 233]	1763	[179, 546]
321	[172, 166]	802	[621, 1161]	1283	[744, 1607]	1764	[1136, 556]
322	[551, 168]	803	[1162, 55]	1284	[99, 1608]	1765	[1848, 1849]
323	[548, 169]	804	[1163, 546]	1285	[139, 608]	1766	[1232, 1186]
324	[552, 553]	805	[1164, 1165]	1286	[1609, 663]	1767	[160, 1850]
325	[554, 555]	806	[1166, 147]	1287	[57, 543]	1768	[1258, 1086]
326	[556, 557]	807	[558, 180]	1288	[1111, 488]	1769	[1093, 1211]
327	[512, 447]	808	[543, 1167]	1289	[1610, 1611]	1770	[13, 1851]
328	[221, 156]	809	[1168, 1169]	1290	[1241, 1074]	1771	[1160, 1174]
329	[558, 546]	810	[485, 614]	1291	[172, 167]	1772	[1138, 1852]
330	[559, 560]	811	[582, 223]	1292	[160, 505]	1773	[434, 564]

331	[561, 562]	812	[496, 200]	1293	[1143, 631]	1774	[1853, 1276]
332	[563, 564]	813	[1170, 1171]	1294	[1612, 439]	1775	[1251, 1124]
333	[565, 207]	814	[635, 203]	1295	[522, 520]	1776	[123, 557]
334	[566, 567]	815	[584, 193]	1296	[150, 605]	1777	[219, 1135]
335	[568, 569]	816	[1147, 176]	1297	[1613, 1120]	1778	[1163, 180]
336	[570, 571]	817	[164, 585]	1298	[1612, 1189]	1779	[203, 1079]
337	[504, 433]	818	[631, 1073]	1299	[653, 623]	1780	[480, 428]
338	[224, 174]	819	[11, 1111]	1300	[1062, 1614]	1781	[1104, 1854]
339	[572, 213]	820	[448, 156]	1301	[428, 527]	1782	[155, 1855]
340	[573, 574]	821	[531, 1172]	1302	[1615, 443]	1783	[1646, 152]
341	[575, 182]	822	[36, 53]	1303	[466, 615]	1784	[1191, 512]
342	[576, 577]	823	[1173, 1174]	1304	[668, 1616]	1785	[1632, 1184]
343	[541, 200]	824	[1175, 1157]	1305	[1212, 1255]	1786	[1051, 1214]
344	[158, 578]	825	[1094, 1176]	1306	[176, 1617]	1787	[1259, 1059]
345	[579, 14]	826	[554, 444]	1307	[191, 1161]	1788	[587, 141]
346	[222, 580]	827	[660, 1177]	1308	[1161, 1172]	1789	[1856, 1181]
347	[581, 582]	828	[1178, 602]	1309	[621, 664]	1790	[663, 1857]
348	[583, 473]	829	[126, 1052]	1310	[643, 183]	1791	[457, 1263]
349	[584, 497]	830	[572, 184]	1311	[581, 197]	1792	[158, 544]
350	[527, 585]	831	[197, 470]	1312	[1210, 202]	1793	[1195, 156]
351	[586, 189]	832	[1088, 1179]	1313	[1618, 1619]	1794	[609, 198]
352	[185, 158]	833	[1180, 162]	1314	[1620, 1203]	1795	[587, 158]
353	[135, 587]	834	[1181, 1182]	1315	[1147, 173]	1796	[1630, 1165]
354	[588, 589]	835	[139, 643]	1316	[1621, 1622]	1797	[1149, 653]
355	[590, 510]	836	[1183, 1184]	1317	[1623, 1147]	1798	[44, 550]
356	[559, 591]	837	[655, 428]	1318	[1279, 1624]	1799	[641, 1182]
357	[488, 158]	838	[1185, 1089]	1319	[1071, 1261]	1800	[1634, 1858]
358	[592, 593]	839	[1186, 664]	1320	[1149, 210]	1801	[1836, 1634]
359	[594, 595]	840	[662, 465]	1321	[636, 440]	1802	[1859, 1215]
360	[596, 469]	841	[475, 199]	1322	[1625, 533]	1803	[663, 486]
361	[597, 598]	842	[477, 428]	1323	[181, 1110]	1804	[499, 558]
362	[196, 582]	843	[500, 1187]	1324	[518, 129]	1805	[1644, 1152]
363	[599, 600]	844	[468, 524]	1325	[630, 508]	1806	[126, 507]
364	[601, 602]	845	[1188, 1161]	1326	[1281, 1207]	1807	[1267, 1628]
365	[603, 431]	846	[438, 1189]	1327	[166, 172]	1808	[1683, 555]
366	[549, 463]	847	[152, 562]	1328	[1282, 1095]	1809	[1257, 13]
367	[604, 539]	848	[179, 1190]	1329	[146, 1216]	1810	[476, 611]
368	[483, 605]	849	[609, 151]	1330	[658, 1102]	1811	[1860, 1861]
369	[606, 607]	850	[1191, 446]	1331	[123, 1626]	1812	[1862, 1863]
370	[608, 201]	851	[481, 663]	1332	[449, 638]	1813	[461, 216]
371	[466, 609]	852	[42, 450]	1333	[449, 1627]	1814	[45, 1194]
372	[47, 490]	853	[1192, 1193]	1334	[59, 1263]	1815	[1168, 1627]
373	[604, 610]	854	[215, 462]	1335	[428, 164]	1816	[1133, 512]
374	[42, 611]	855	[166, 166]	1336	[1045, 582]	1817	[1204, 498]

375	[612, 613]	856	[1062, 1194]	1337	[1206, 1213]	1818	[543, 142]
376	[200, 212]	857	[589, 1195]	1338	[617, 428]	1819	[155, 444]
377	[482, 614]	858	[596, 524]	1339	[1121, 1065]	1820	[1623, 666]
378	[615, 151]	859	[1196, 1197]	1340	[1628, 37]	1821	[1188, 1088]
379	[616, 617]	860	[455, 187]	1341	[1629, 536]	1822	[1137, 510]
380	[618, 619]	861	[1198, 646]	1342	[1233, 186]	1823	[1628, 1077]
381	[620, 621]	862	[462, 558]	1343	[218, 199]	1824	[1864, 504]
382	[622, 623]	863	[1199, 610]	1344	[1076, 1153]	1825	[1865, 1866]
383	[624, 153]	864	[36, 1200]	1345	[1109, 1077]	1826	[1634, 562]
384	[625, 626]	865	[182, 1083]	1346	[491, 454]	1827	[429, 1256]
385	[627, 432]	866	[1133, 446]	1347	[611, 149]	1828	[163, 527]
386	[628, 629]	867	[135, 57]	1348	[1630, 1631]	1829	[1867, 45]
387	[630, 223]	868	[1201, 2]	1349	[443, 555]	1830	[1868, 464]
388	[631, 525]	869	[1202, 1194]	1350	[1632, 1633]	1831	[1098, 1271]
389	[632, 633]	870	[580, 471]	1351	[1211, 203]	1832	[522, 593]
390	[634, 635]	871	[44, 170]	1352	[192, 497]	1833	[1609, 482]
391	[497, 511]	872	[167, 171]	1353	[1275, 126]	1834	[122, 592]
392	[440, 636]	873	[548, 463]	1354	[568, 636]	1835	[685, 1437]
393	[622, 211]	874	[1108, 547]	1355	[1634, 153]	1836	[1869, 289]
394	[636, 569]	875	[463, 550]	1356	[1110, 1635]	1837	[1870, 1871]
395	[211, 637]	876	[168, 463]	1357	[1072, 1636]	1838	[1872, 1406]
396	[156, 638]	877	[1127, 655]	1358	[1065, 530]	1839	[322, 1873]
397	[610, 540]	878	[1203, 530]	1359	[1625, 1628]	1840	[1874, 1451]
398	[478, 527]	879	[1204, 445]	1360	[1637, 227]	1841	[1875, 1876]
399	[480, 542]	880	[1205, 61]	1361	[1638, 1639]	1842	[824, 1877]
400	[182, 639]	881	[1206, 1171]	1362	[436, 1640]	1843	[876, 1878]
401	[640, 641]	882	[1161, 665]	1363	[1237, 560]	1844	[1879, 1880]
402	[33, 642]	883	[1158, 1207]	1364	[210, 623]	1845	[378, 1881]
403	[643, 572]	884	[227, 1208]	1365	[566, 209]	1846	[874, 1882]
404	[644, 8]	885	[36, 523]	1366	[561, 153]	1847	[1725, 710]
405	[645, 646]	886	[1060, 1208]	1367	[1163, 1190]	1848	[1574, 15]
406	[647, 648]	887	[1067, 1209]	1368	[8, 592]	1849	[26, 1883]
407	[12, 57]	888	[1210, 1211]	1369	[519, 1187]	1850	[1884, 1885]
408	[649, 650]	889	[1065, 1090]	1370	[1077, 165]	1851	[1886, 1887]
409	[565, 651]	890	[592, 557]	1371	[666, 176]	1852	[1888, 1889]
410	[652, 453]	891	[1212, 61]	1372	[522, 1626]	1853	[1890, 1337]
411	[653, 211]	892	[1170, 1213]	1373	[1074, 611]	1854	[1891, 1892]
412	[588, 455]	893	[126, 1214]	1374	[1229, 1132]	1855	[1893, 1894]
413	[490, 512]	894	[620, 1186]	1375	[136, 1641]	1856	[1895, 1481]
414	[654, 655]	895	[653, 1070]	1376	[1642, 1643]	1857	[1896, 1897]
415	[656, 140]	896	[1215, 1216]	1377	[583, 465]	1858	[1898, 1899]
416	[657, 447]	897	[1105, 1217]	1378	[13, 1263]	1859	[1480, 1417]
417	[59, 14]	898	[51, 1218]	1379	[43, 1108]	1860	[1384, 1900]
418	[208, 567]	899	[1091, 1219]	1380	[1644, 1645]	1861	[323, 1901]

419	[658, 659]	900	[606, 1045]	1381	[635, 35]	1862	[1902, 1728]
420	[660, 661]	901	[1203, 1090]	1382	[1620, 529]	1863	[961, 1903]
421	[609, 605]	902	[568, 568]	1383	[1646, 1634]	1864	[978, 678]
422	[662, 473]	903	[569, 569]	1384	[601, 1227]	1865	[1904, 1905]
423	[663, 614]	904	[539, 1220]	1385	[463, 547]	1866	[1546, 1906]
424	[664, 665]	905	[1047, 133]	1386	[587, 1150]	1867	[1907, 918]
425	[666, 173]	906	[1221, 47]	1387	[589, 221]	1868	[1804, 1561]
426	[54, 667]	907	[457, 14]	1388	[1647, 143]	1869	[595, 517]
427	[668, 451]	908	[512, 1222]	1389	[1648, 1649]	1870	[1076, 1617]
428	[669, 670]	909	[475, 131]	1390	[1070, 637]	1871	[1079, 523]
429	[671, 672]	910	[1223, 554]	1391	[1059, 1102]	1872	[1908, 1909]
430	[345, 673]	911	[1224, 1058]	1392	[1242, 1650]	1873	[1062, 46]
431	[674, 675]	912	[1225, 1226]	1393	[1651, 1217]	1874	[1910, 1166]
432	[676, 677]	913	[1178, 1227]	1394	[572, 1250]	1875	[50, 1082]
433	[678, 679]	914	[1228, 571]	1395	[643, 212]	1876	[595, 37]
434	[680, 681]	915	[43, 463]	1396	[1057, 1275]	1877	[1703, 1131]
435	[682, 683]	916	[187, 1126]	1397	[489, 1191]	1878	[641, 1087]
436	[684, 685]	917	[189, 513]	1398	[1652, 1092]	1879	[1276, 1911]
437	[686, 687]	918	[1229, 1054]	1399	[1653, 1640]	1880	[1223, 155]
438	[688, 689]	919	[1230, 513]	1400	[552, 145]	1881	[1195, 449]
439	[690, 691]	920	[1150, 1167]	1401	[1071, 653]	1882	[625, 505]
440	[692, 693]	921	[456, 59]	1402	[429, 629]	1883	[203, 36]
441	[300, 694]	922	[634, 1116]	1403	[510, 487]	1884	[1134, 220]
442	[695, 696]	923	[1231, 1133]	1404	[1116, 656]	1885	[668, 149]
443	[697, 698]	924	[586, 1230]	1405	[496, 1654]	1886	[1254, 130]
444	[699, 700]	925	[1232, 621]	1406	[1655, 521]	1887	[458, 558]
445	[701, 702]	926	[1045, 197]	1407	[1656, 642]	1888	[1096, 51]
446	[703, 704]	927	[1233, 538]	1408	[1064, 1079]	1889	[1188, 664]
447	[705, 706]	928	[474, 150]	1409	[1164, 1631]	1890	[1147, 224]
448	[707, 297]	929	[1234, 1203]	1410	[1148, 1071]	1891	[1618, 1114]
449	[708, 709]	930	[212, 184]	1411	[188, 1230]	1892	[1077, 38]
450	[710, 711]	931	[1235, 581]	1412	[1141, 1622]	1893	[576, 598]
451	[712, 713]	932	[1138, 511]	1413	[1657, 442]	1894	[517, 165]
452	[714, 715]	933	[32, 1194]	1414	[1148, 637]	1895	[1131, 1204]
453	[716, 717]	934	[429, 585]	1415	[1658, 128]	1896	[1129, 143]
454	[718, 719]	935	[1236, 658]	1416	[1185, 1065]	1897	[462, 179]
455	[720, 708]	936	[1237, 591]	1417	[516, 1075]	1898	[597, 577]
456	[721, 29]	937	[526, 150]	1418	[541, 643]	1899	[1076, 225]
457	[722, 723]	938	[1238, 1239]	1419	[1146, 666]	1900	[1671, 521]
458	[724, 725]	939	[1156, 1240]	1420	[1215, 147]	1901	[464, 1208]
459	[726, 727]	940	[1084, 1107]	1421	[641, 1659]	1902	[1059, 1912]
460	[728, 729]	941	[172, 172]	1422	[31, 1062]	1903	[187, 156]
461	[730, 731]	942	[1241, 42]	1423	[1079, 1200]	1904	[45, 1913]
462	[732, 424]	943	[1242, 1182]	1424	[428, 628]	1905	[1061, 32]

463	[733, 317]	944	[624, 1243]	1425	[1660, 518]	1906	[163, 628]
464	[734, 735]	945	[1244, 1104]	1426	[1217, 1661]	1907	[42, 148]
465	[736, 737]	946	[446, 1222]	1427	[1662, 1242]	1908	[75, 1914]
466	[738, 357]	947	[57, 141]	1428	[630, 580]	1909	[789, 1915]
467	[739, 351]	948	[1245, 1246]	1429	[1663, 561]	1910	[1916, 1526]
468	[740, 349]	949	[1173, 10]	1430	[57, 1150]	1911	[1917, 1918]
469	[741, 742]	950	[1247, 1205]	1431	[450, 149]	1912	[1919, 1920]
470	[743, 744]	951	[1111, 57]	1432	[1148, 1069]	1913	[1921, 1922]
471	[745, 746]	952	[616, 480]	1433	[623, 1149]	1914	[1244, 146]
472	[747, 748]	953	[1248, 130]	1434	[211, 1071]	1915	[466, 483]
473	[749, 750]	954	[1249, 581]	1435	[580, 1664]	1916	[1186, 531]
474	[751, 752]	955	[201, 1250]	1436	[1665, 460]	1917	[1183, 1633]
475	[753, 754]	956	[524, 1073]	1437	[1180, 226]	1918	[531, 665]
476	[370, 712]	957	[1251, 1252]	1438	[166, 171]	1919	[1113, 1619]
477	[755, 756]	958	[1228, 1253]	1439	[1163, 514]	1920	[176, 174]
478	[757, 758]	959	[1202, 46]	1440	[1168, 157]	1921	[1123, 1252]
479	[759, 760]	960	[1254, 1245]	1441	[1666, 1667]	1922	[1204, 1177]
480	[761, 762]	961	[657, 484]	1442	[160, 433]		

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	321	1	642	0	963	1	1284	1	1605	1
1	0	322	1	643	0	964	1	1285	0	1606	0
2	0	323	1	644	1	965	1	1286	1	1607	1
3	0	324	0	645	1	966	1	1287	1	1608	1
4	1	325	1	646	1	967	0	1288	0	1609	1
5	0	326	1	647	0	968	1	1289	1	1610	1
6	1	327	1	648	0	969	1	1290	0	1611	0
7	0	328	1	649	1	970	0	1291	1	1612	1
8	0	329	0	650	1	971	0	1292	0	1613	0
9	1	330	1	651	0	972	0	1293	0	1614	0
10	0	331	0	652	0	973	1	1294	1	1615	0
11	0	332	0	653	1	974	1	1295	1	1616	1
12	1	333	0	654	1	975	1	1296	1	1617	1
13	1	334	0	655	1	976	1	1297	0	1618	0
14	1	335	1	656	1	977	1	1298	1	1619	1
15	0	336	1	657	1	978	0	1299	1	1620	0
16	0	337	0	658	1	979	0	1300	1	1621	1
17	0	338	1	659	0	980	1	1301	0	1622	1
18	1	339	1	660	0	981	0	1302	0	1623	1
19	1	340	0	661	1	982	0	1303	1	1624	1
20	1	341	1	662	0	983	0	1304	1	1625	0
21	0	342	0	663	0	984	1	1305	1	1626	1
22	0	343	0	664	0	985	0	1306	1	1627	1

23	0	344	0	665	0	986	0	1307	0	1628	1
24	1	345	0	666	0	987	1	1308	1	1629	0
25	1	346	1	667	0	988	0	1309	1	1630	1
26	1	347	0	668	1	989	1	1310	0	1631	1
27	1	348	1	669	0	990	1	1311	0	1632	1
28	0	349	1	670	1	991	1	1312	0	1633	1
29	1	350	0	671	0	992	0	1313	0	1634	0
30	1	351	0	672	0	993	1	1314	0	1635	1
31	0	352	1	673	1	994	0	1315	1	1636	1
32	0	353	1	674	0	995	0	1316	1	1637	0
33	0	354	1	675	1	996	1	1317	1	1638	0
34	1	355	0	676	1	997	0	1318	0	1639	0
35	0	356	1	677	1	998	0	1319	0	1640	1
36	1	357	0	678	1	999	1	1320	1	1641	0
37	1	358	0	679	1	1000	0	1321	0	1642	0
38	0	359	0	680	1	1001	0	1322	0	1643	1
39	1	360	0	681	0	1002	0	1323	0	1644	1
40	1	361	1	682	0	1003	0	1324	1	1645	0
41	1	362	1	683	1	1004	1	1325	0	1646	1
42	1	363	0	684	1	1005	1	1326	0	1647	0
43	0	364	1	685	1	1006	0	1327	0	1648	0
44	1	365	1	686	0	1007	1	1328	0	1649	1
45	0	366	1	687	0	1008	1	1329	0	1650	1
46	0	367	1	688	0	1009	1	1330	1	1651	1
47	0	368	0	689	1	1010	1	1331	0	1652	1
48	1	369	1	690	0	1011	0	1332	0	1653	0
49	1	370	0	691	0	1012	1	1333	0	1654	1
50	1	371	1	692	0	1013	1	1334	1	1655	1
51	0	372	0	693	1	1014	1	1335	0	1656	1
52	1	373	1	694	1	1015	0	1336	1	1657	1
53	1	374	1	695	1	1016	0	1337	1	1658	1
54	1	375	1	696	0	1017	1	1338	0	1659	0
55	1	376	1	697	0	1018	0	1339	0	1660	0
56	0	377	1	698	0	1019	0	1340	1	1661	1
57	1	378	1	699	0	1020	1	1341	0	1662	0
58	1	379	1	700	0	1021	0	1342	0	1663	0
59	1	380	1	701	0	1022	1	1343	0	1664	1
60	1	381	0	702	0	1023	0	1344	0	1665	1
61	0	382	0	703	0	1024	1	1345	1	1666	0
62	0	383	1	704	1	1025	1	1346	1	1667	0
63	1	384	1	705	1	1026	0	1347	0	1668	1
64	0	385	0	706	1	1027	1	1348	1	1669	0
65	0	386	1	707	0	1028	0	1349	0	1670	1
66	0	387	0	708	0	1029	1	1350	1	1671	0

67	0	388	1	709	1	1030	0	1351	0	1672	0
68	1	389	0	710	1	1031	0	1352	0	1673	0
69	0	390	0	711	0	1032	1	1353	0	1674	0
70	0	391	0	712	1	1033	0	1354	1	1675	1
71	0	392	0	713	0	1034	1	1355	0	1676	0
72	1	393	0	714	1	1035	1	1356	1	1677	1
73	1	394	0	715	0	1036	0	1357	1	1678	1
74	1	395	0	716	1	1037	0	1358	0	1679	1
75	0	396	1	717	1	1038	0	1359	0	1680	0
76	0	397	0	718	1	1039	0	1360	0	1681	1
77	1	398	0	719	0	1040	0	1361	0	1682	1
78	1	399	1	720	0	1041	0	1362	1	1683	1
79	1	400	0	721	0	1042	1	1363	0	1684	1
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81	1	402	0	723	0	1044	0	1365	0	1686	1
82	1	403	0	724	0	1045	1	1366	0	1687	0
83	0	404	1	725	0	1046	1	1367	0	1688	1
84	1	405	1	726	0	1047	1	1368	0	1689	1
85	1	406	0	727	0	1048	1	1369	1	1690	1
86	0	407	1	728	1	1049	0	1370	0	1691	1
87	0	408	1	729	0	1050	0	1371	0	1692	1
88	1	409	0	730	0	1051	1	1372	1	1693	0
89	0	410	0	731	0	1052	1	1373	0	1694	1
90	0	411	1	732	1	1053	1	1374	0	1695	1
91	1	412	1	733	0	1054	1	1375	0	1696	1
92	0	413	0	734	1	1055	1	1376	0	1697	1
93	1	414	1	735	1	1056	1	1377	1	1698	0
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96	1	417	1	738	1	1059	1	1380	1	1701	0
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98	1	419	1	740	1	1061	1	1382	0	1703	1
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115	1	436	1	757	0	1078	0	1399	0	1720	0
116	1	437	0	758	0	1079	0	1400	0	1721	1
117	1	438	0	759	0	1080	0	1401	0	1722	1
118	1	439	0	760	1	1081	0	1402	0	1723	1
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122	0	443	0	764	1	1085	0	1406	1	1727	1
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125	0	446	0	767	0	1088	1	1409	0	1730	0
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319	1	640	1	961	1	1282	0	1603	1		
320	1	641	0	962	0	1283	1	1604	0		

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