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

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

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

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

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

$$\begin{aligned}
p_0(z)&=z^{21}+z^{18}+z^{16}+z^{15}+z^{13}+z^{10}+z^8+z^3+z^2+1,\\
p_1(z)&=z^{26}+z^{24}+z^{23}+z^{21}+z^{20}+z^{18}+z^{17}+z^{14}+z^{13}+z^{10}+z^5+z^4+z^3\\
&\quad+z^2,\\
p_2(z)&=z^{28}+z^{24}+z^{20}+z^{18}+z^{14}+z^{10}+z^6+z^4,\\
p_3(z)&=z^{26}+z^{24}+z^{23}+z^{21}+z^{20}+z^{18}+z^{17}+z^{14}+z^{13}+z^{10}+z^5+z^4+z^3\\
&\quad+z^2,\\
p_4(z)&=z^{24}+z^{21}+z^{15}+z^{14}+z^{13}+z^6+z^4+z^3+z^2,
\end{aligned}$$

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

$$\begin{aligned}
p_0(z)&=z^{21}+z^{20}+z^{18}+z^{16}+z^{15}+z^{13}+z^{12}+z^{10}+z^8+z^3+z^2,\\
p_1(z)&=z^{26}+z^{24}+z^{23}+z^{21}+z^{20}+z^{18}+z^{17}+z^{14}+z^{13}+z^{10}+z^5+z^4+z^3\\
&\quad+z^2,\\
p_2(z)&=z^{28}+z^{24}+z^{20}+z^{18}+z^{14}+z^{10}+z^6+z^4,\\
p_3(z)&=z^{26}+z^{24}+z^{23}+z^{21}+z^{20}+z^{18}+z^{17}+z^{14}+z^{13}+z^{10}+z^5+z^4+z^3\\
&\quad+z^2,\\
p_4(z)&=z^{24}+z^{21}+z^{20}+z^{15}+z^{14}+z^{13}+z^{12}+z^6+z^4+z^3+z^2+1.
\end{aligned}$$

2. Proof

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

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

By the basic properties of continued fractions, we have

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

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

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

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

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

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 $0 \leq i,j \leq 1$ 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 $0 \leq i,j \leq 1$, $T_{i,j}$ 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 $0 \leq i,j \leq 1$, 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 $n \geq 0$. If for some $n \geq 0$ 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 $j \geq 0$, $q_1(0) = 1$, 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.*

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

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

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

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

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

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

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

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

which can be rewritten as

$$0 = T[[w]_2] + T[[10w]_2] + T[[100w]_2] + T[[111w]_2], \tag{2.7}$$

$$0 = T[[w]_2] + T[[1w]_2] + T[[11w]_2] + T[[101w]_2] + T[[1000w]_2], \tag{2.8}$$

$$0 = T[[w]_2] + T[[1w]_2] + T[[10w]_2] + T[[100w]_2] + T[[110w]_2] + T[[1001w]_2], \tag{2.9}$$

$$0 = T[[1w]_2] + T[[11w]_2] + T[[100w]_2] + T[[101w]_2] + T[[1010w]_2], \tag{2.10}$$

$$0 = T[[w]_2] + T[[10w]_2] + T[[100w]_2] + T[[101w]_2] + T[[110w]_2] + T[[1011w]_2], \tag{2.11}$$

$$0 = T[[1w]_2] + T[[10w]_2] + T[[11w]_2] + T[[100w]_2] + T[[101w]_2] + T[[110w]_2] + T[[1100w]_2], \tag{2.12}$$

$$0 = T[[11w]_2] + T[[101w]_2] + T[[110w]_2] + T[[1101w]_2], \tag{2.13}$$

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

$$0 = T[[w]_2] + T[[10w]_2] + T[[100w]_2] + T[[111w]_2], \tag{2.14}$$

$$0 = T[[w]_2] + T[[1w]_2] + T[[11w]_2] + T[[101w]_2] + T[[1000w]_2], \tag{2.15}$$

$$0 = T[[w]_2] + T[[1w]_2] + T[[10w]_2] + T[[100w]_2] + T[[110w]_2] + T[[1001w]_2], \tag{2.16}$$

$$0 = T[[1w]_2] + T[[11w]_2] + T[[100w]_2] + T[[101w]_2] + T[[1010w]_2], \tag{2.17}$$

$$0 = T[[w]_2] + T[[10w]_2] + T[[100w]_2] + T[[101w]_2] + T[[110w]_2] + T[[1011w]_2], \tag{2.18}$$

$$0 = T[[1w]_2] + T[[10w]_2] + T[[11w]_2] + T[[100w]_2] + T[[101w]_2] + T[[110w]_2] + T[[1100w]_2], \tag{2.19}$$

$$0 = T[[11w]_2] + T[[101w]_2] + T[[110w]_2] + T[[1101w]_2], \tag{2.20}$$

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

First we calculate an 2-automaton that generates T from its minimal polynomial and its first terms. This automaton has 2796 states; its transition function and output function can be found in the annex. Let $A(s, w)$ denote the state reached after reading w from right to left starting from the state s, and τ the output function. Define

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

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

$$0 = \tau(A(s, \epsilon)) + \tau(A(s, 10)) + \tau(A(s, 100)) + \tau(A(s, 111)), \tag{2.21}$$

$$0 = \tau(A(s, \epsilon)) + \tau(A(s, 1)) + \tau(A(s, 11)) + \tau(A(s, 101)) + \tau(A(s, 1000)), \tag{2.22}$$

$$0 = \tau(A(s, \epsilon)) + \tau(A(s, 1)) + \tau(A(s, 10)) + \tau(A(s, 100)) + \tau(A(s, 110)) + \tau(A(s, 1001)), \tag{2.23}$$

$$0 = \tau(A(s, 1)) + \tau(A(s, 11)) + \tau(A(s, 100)) + \tau(A(s, 101)) + \tau(A(s, 1010)), \tag{2.24}$$

$$0 = \tau(A(s, \epsilon)) + \tau(A(s, 10)) + \tau(A(s, 100)) + \tau(A(s, 101)) + \tau(A(s, 110)) + \tau(A(s, 1011)), \tag{2.25}$$

$$0 = \tau(A(s, 1)) + \tau(A(s, 10)) + \tau(A(s, 11)) + \tau(A(s, 100)) + \tau(A(s, 101)) + \tau(A(s, 110)) + \tau(A(s, 1100)), \tag{2.26}$$

$$0 = \tau(A(s,11)) + \tau(A(s,101)) + \tau(A(s,110)) + \tau(A(s,1101)), \tag{2.27}$$

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

$$0 = \tau(A(s,\epsilon)) + \tau(A(s,10)) + \tau(A(s,100)) + \tau(A(s,111)), \tag{2.28}$$

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

$$\begin{aligned} 0 = {} & \tau(A(s,\epsilon)) + \tau(A(s,1)) + \tau(A(s,10)) + \tau(A(s,100)) \\ & + \tau(A(s,110)) + \tau(A(s,1001)), \end{aligned} \tag{2.30}$$

$$\begin{aligned} 0 = {} & \tau(A(s,1)) + \tau(A(s,11)) + \tau(A(s,100)) + \tau(A(s,101)) \\ & + \tau(A(s,1010)), \end{aligned} \tag{2.31}$$

$$\begin{aligned} 0 = {} & \tau(A(s,\epsilon)) + \tau(A(s,10)) + \tau(A(s,100)) + \tau(A(s,101)) \\ & + \tau(A(s,110)) + \tau(A(s,1011)), \end{aligned} \tag{2.32}$$

$$\begin{aligned} 0 = {} & \tau(A(s,1)) + \tau(A(s,10)) + \tau(A(s,11)) + \tau(A(s,100)) \\ & + \tau(A(s,101)) + \tau(A(s,110)) + \tau(A(s,1100)), \end{aligned} \tag{2.33}$$

$$0 = \tau(A(s,11)) + \tau(A(s,101)) + \tau(A(s,110)) + \tau(A(s,1101)), \tag{2.34}$$

for $s = A(i, 0^{2k})$. We find that $(A(i,0^{32}), E_{32}) = (A(i,0^{20}), E_{20})$, so that we only have to verify that identities (2.21) through (2.34) hold for $2 \le k \le 16$, which turns out to be true. $\square$

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

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

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

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

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

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

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

We give the proof of

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

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

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

Call this expression lhs. Note that both sides of identity M_{2k+1} have the same term of highest degree $x^{14v} R^o$. Therefore we only need to prove that their difference is

$O(x^{14v})$. Using Lemma 2.1 it can be seen that the right side of identity M_{2k+1} is congruent, modulo x^{14v}, to

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

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

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

Using the notation introduced above, we can represent the expressions lhs (2.35) and rhs as polynomials in $\mathbb{F}_2[a_1,\ldots,a_{14},b_1,\ldots,b_{14},c][X]$. 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

$$\begin{aligned}
q_0(x) &= x^{28}+x^{26}+x^{25}+x^{20}+x^{18}+x^{15}+x^{13}+x^{12}+x^{10}+x^7,\\
q_1(x) &= x^{26}+x^{25}+x^{24}+x^{23}+x^{18}+x^{15}+x^{14}+x^{11}+x^{10}+x^8+x^7+x^5\\
&\quad +x^4+x^2,\\
q_2(x) &= x^{24}+x^{22}+x^{18}+x^{14}+x^{10}+x^8+x^4+1,\\
q_3(x) &= x^{26}+x^{25}+x^{24}+x^{23}+x^{18}+x^{15}+x^{14}+x^{11}+x^{10}+x^8+x^7+x^5\\
&\quad +x^4+x^2,
\end{aligned}$$

$$q_4(x) = x^{26} + x^{25} + x^{24} + x^{22} + x^{15} + x^{14} + x^{13} + x^7 + x^4.$$

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

$$\begin{aligned}
p_0(x) &= x^{138} + x^{134} + x^{126} + x^{124} + x^{122} + x^{120} + x^{118} + x^{116} + x^{106} + x^{104} \\
&\quad + x^{96} + x^{94} + x^{90} + x^{88} + x^{84} + x^{82} + x^{76} + x^{74} + x^{70} + x^{64} + x^{62} \\
&\quad + x^{56} + x^{54} + x^{50} + x^{46} + x^{42} + x^{34} + x^{28} + x^{24}, \\
p_3(x) &= x^{130} + x^{128} + x^{124} + x^{120} + x^{118} + x^{112} + x^{110} + x^{108} + x^{102} + x^{98} \\
&\quad + x^{96} + x^{90} + x^{86} + x^{84} + x^{76} + x^{74} + x^{70} + x^{68} + x^{66} + x^{64} + x^{62} \\
&\quad + x^{60} + x^{58} + x^{52} + x^{48} + x^{46} + x^{36} + x^{34} + x^{24} + x^{22} + x^{18} + x^{16}, \\
p_6(x) &= x^{128} + x^{124} + x^{122} + x^{120} + x^{118} + x^{116} + x^{106} + x^{104} + x^{102} + x^{100} \\
&\quad + x^{98} + x^{94} + x^{92} + x^{80} + x^{78} + x^{68} + x^{64} + x^{60} + x^{58} + x^{54} + x^{52} \\
&\quad + x^{50} + x^{46} + x^{44} + x^{38} + x^{36} + x^{32} + x^{30} + x^{28} + x^{24} + x^{20} + x^{18} \\
&\quad + x^{16} + x^{14} + x^{12} + x^8 + x^6 + 1, \\
p_9(x) &= x^{134} + x^{132} + x^{130} + x^{128} + x^{126} + x^{122} + x^{120} + x^{112} + x^{108} + x^{106} \\
&\quad + x^{98} + x^{96} + x^{94} + x^{92} + x^{88} + x^{84} + x^{80} + x^{78} + x^{76} + x^{74} + x^{68} \\
&\quad + x^{66} + x^{64} + x^{62} + x^{58} + x^{54} + x^{50} + x^{42} + x^{34} + x^{32} + x^{28} + x^{26} \\
&\quad + x^{24} + x^{18} + x^8 + x^4, \\
p_{12}(x) &= x^{134} + x^{132} + x^{128} + x^{118} + x^{116} + x^{112} + x^{102} + x^{100} + x^{96} + x^{86} \\
&\quad + x^{84} + x^{80} + x^{70} + x^{68} + x^{64} + x^{38} + x^{36} + x^{32} + x^{22} + x^{20} + x^{16} \\
&\quad + x^6 + x^4 + 1,
\end{aligned}$$

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

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

$$\begin{aligned}
p_0(x) &= x^{147} + x^{145} + x^{144} + x^{140} + x^{139} + x^{138} + x^{136} + x^{133} + x^{132} + x^{129} \\
&\quad + x^{128} + x^{126} + x^{125} + x^{123} + x^{118} + x^{114} + x^{109} + x^{108} + x^{106} \\
&\quad + x^{104} + x^{102} + x^{101} + x^{99} + x^{98} + x^{96} + x^{94} + x^{93} + x^{92} + x^{87} + x^{86}
\end{aligned}$$

$$
\begin{aligned}
&+x^{84}+x^{83}+x^{82}+x^{81}+x^{80}+x^{78}+x^{76}+x^{74}+x^{71}+x^{69}+x^{67}\\
&+x^{66}+x^{63}+x^{62}+x^{54}+x^{53}+x^{51}+x^{49}+x^{44}+x^{43}+x^{42}+x^{41}\\
&+x^{37}+x^{36}+x^{33},\\
p_3(x) &= x^{143}+x^{141}+x^{140}+x^{137}+x^{136}+x^{134}+x^{133}+x^{132}+x^{130}+x^{129}\\
&+x^{128}+x^{126}+x^{125}+x^{124}+x^{123}+x^{122}+x^{121}+x^{116}+x^{107}\\
&+x^{104}+x^{103}+x^{102}+x^{100}+x^{99}+x^{98}+x^{96}+x^{94}+x^{93}+x^{91}\\
&+x^{90}+x^{89}+x^{87}+x^{85}+x^{83}+x^{81}+x^{76}+x^{67}+x^{64}+x^{62}+x^{61}\\
&+x^{59}+x^{58}+x^{57}+x^{52}+x^{51}+x^{48}+x^{46}+x^{45}+x^{42}+x^{41}+x^{40}\\
&+x^{38}+x^{37}+x^{36}+x^{34}+x^{33}+x^{32}+x^{31}+x^{30}+x^{27}+x^{26}+x^{24}\\
&+x^{23}+x^{22}+x^{20}+x^{18},\\
p_6(x) &= x^{141}+x^{140}+x^{138}+x^{133}+x^{132}+x^{130}+x^{129}+x^{128}+x^{126}+x^{123}\\
&+x^{122}+x^{120}+x^{119}+x^{118}+x^{117}+x^{115}+x^{113}+x^{110}+x^{107}\\
&+x^{106}+x^{104}+x^{103}+x^{102}+x^{101}+x^{98}+x^{97}+x^{96}+x^{95}+x^{92}\\
&+x^{91}+x^{90}+x^{88}+x^{87}+x^{86}+x^{84}+x^{77}+x^{76}+x^{74}+x^{73}+x^{72}\\
&+x^{71}+x^{69}+x^{67}+x^{64}+x^{61}+x^{60}+x^{59}+x^{56}+x^{53}+x^{52}+x^{51}\\
&+x^{49}+x^{46}+x^{43}+x^{42}+x^{41}+x^{38}+x^{35}+x^{34}+x^{32}+x^{31}+x^{30}\\
&+x^{29}+x^{27}+x^{24}+x^{19}+x^{18}+x^{17}+x^{15}+x^{12},\\
p_9(x) &= x^{139}+x^{136}+x^{134}+x^{133}+x^{130}+x^{128}+x^{123}+x^{121}+x^{120}+x^{119}\\
&+x^{117}+x^{112}+x^{107}+x^{105}+x^{104}+x^{103}+x^{99}+x^{98}+x^{96}+x^{95}\\
&+x^{94}+x^{92}+x^{91}+x^{90}+x^{89}+x^{88}+x^{87}+x^{85}+x^{81}+x^{80}+x^{78}\\
&+x^{77}+x^{76}+x^{75}+x^{74}+x^{73}+x^{69}+x^{68}+x^{66}+x^{65}+x^{64}+x^{62}\\
&+x^{61}+x^{60}+x^{59}+x^{58}+x^{57}+x^{55}+x^{53}+x^{51}+x^{46}+x^{43}+x^{41}\\
&+x^{40}+x^{39}+x^{34}+x^{33}+x^{30}+x^{28}+x^{21}+x^{18}+x^{17}+x^{16}+x^{14}\\
&+x^{12}+x^{11}+x^{8}+x^{6},\\
p_{12}(x) &= x^{137}+x^{136}+x^{135}+x^{133}+x^{131}+x^{129}+x^{127}+x^{124}+x^{117}+x^{116}\\
&+x^{115}+x^{112}+x^{105}+x^{104}+x^{103}+x^{101}+x^{99}+x^{97}+x^{95}+x^{92}\\
&+x^{85}+x^{84}+x^{83}+x^{80}+x^{73}+x^{72}+x^{71}+x^{69}+x^{67}+x^{65}+x^{63}\\
&+x^{60}+x^{57}+x^{56}+x^{55}+x^{52}+x^{49}+x^{48}+x^{47}+x^{44}+x^{37}+x^{36}\\
&+x^{35}+x^{32}+x^{25}+x^{24}+x^{23}+x^{21}+x^{19}+x^{17}+x^{15}+x^{12}+x^{5}\\
&+x^{4}+x^{3}+1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_0(x) &= x^{147}+x^{145}+x^{144}+x^{140}+x^{139}+x^{138}+x^{136}+x^{133}+x^{132}+x^{129}\\
&+x^{128}+x^{126}+x^{125}+x^{123}+x^{118}+x^{114}+x^{109}+x^{108}+x^{106}\\
&+x^{104}+x^{102}+x^{101}+x^{99}+x^{98}+x^{96}+x^{94}+x^{93}+x^{92}+x^{87}+x^{86}
\end{aligned}
$$

$$
\begin{aligned}
&+ x^{84} + x^{83} + x^{82} + x^{81} + x^{80} + x^{78} + x^{76} + x^{74} + x^{71} + x^{69} + x^{67}\\
&+ x^{66} + x^{63} + x^{62} + x^{54} + x^{53} + x^{51} + x^{49} + x^{44} + x^{43} + x^{42} + x^{41}\\
&+ x^{37} + x^{36} + x^{33},\\
p_3(x) = {}& x^{143} + x^{141} + x^{140} + x^{137} + x^{136} + x^{134} + x^{133} + x^{132} + x^{130} + x^{129}\\
&+ x^{128} + x^{126} + x^{125} + x^{124} + x^{123} + x^{122} + x^{121} + x^{116} + x^{107}\\
&+ x^{104} + x^{103} + x^{102} + x^{100} + x^{99} + x^{98} + x^{96} + x^{94} + x^{93} + x^{91}\\
&+ x^{90} + x^{89} + x^{87} + x^{85} + x^{83} + x^{81} + x^{76} + x^{67} + x^{64} + x^{62} + x^{61}\\
&+ x^{59} + x^{58} + x^{57} + x^{52} + x^{51} + x^{48} + x^{46} + x^{45} + x^{42} + x^{41} + x^{40}\\
&+ x^{38} + x^{37} + x^{36} + x^{34} + x^{33} + x^{32} + x^{31} + x^{30} + x^{27} + x^{26} + x^{24}\\
&+ x^{23} + x^{22} + x^{20} + x^{18},\\
p_6(x) = {}& x^{141} + x^{140} + x^{138} + x^{133} + x^{132} + x^{130} + x^{129} + x^{128} + x^{126} + x^{123}\\
&+ x^{122} + x^{120} + x^{119} + x^{118} + x^{117} + x^{115} + x^{113} + x^{110} + x^{107}\\
&+ x^{106} + x^{104} + x^{103} + x^{102} + x^{101} + x^{98} + x^{97} + x^{96} + x^{95} + x^{92}\\
&+ x^{91} + x^{90} + x^{88} + x^{87} + x^{86} + x^{84} + x^{77} + x^{76} + x^{74} + x^{73} + x^{72}\\
&+ x^{71} + x^{69} + x^{67} + x^{64} + x^{61} + x^{60} + x^{59} + x^{56} + x^{53} + x^{52} + x^{51}\\
&+ x^{49} + x^{46} + x^{43} + x^{42} + x^{41} + x^{38} + x^{35} + x^{34} + x^{32} + x^{31} + x^{30}\\
&+ x^{29} + x^{27} + x^{24} + x^{19} + x^{18} + x^{17} + x^{15} + x^{12},\\
p_9(x) = {}& x^{139} + x^{136} + x^{134} + x^{133} + x^{130} + x^{128} + x^{123} + x^{121} + x^{120} + x^{119}\\
&+ x^{117} + x^{112} + x^{107} + x^{105} + x^{104} + x^{103} + x^{99} + x^{98} + x^{96} + x^{95}\\
&+ x^{94} + x^{92} + x^{91} + x^{90} + x^{89} + x^{88} + x^{87} + x^{85} + x^{81} + x^{80} + x^{78}\\
&+ x^{77} + x^{76} + x^{75} + x^{74} + x^{73} + x^{69} + x^{68} + x^{66} + x^{65} + x^{64} + x^{62}\\
&+ x^{61} + x^{60} + x^{59} + x^{58} + x^{57} + x^{55} + x^{53} + x^{51} + x^{46} + x^{43} + x^{41}\\
&+ x^{40} + x^{39} + x^{34} + x^{33} + x^{30} + x^{28} + x^{21} + x^{18} + x^{17} + x^{16} + x^{14}\\
&+ x^{12} + x^{11} + x^{8} + x^{6},\\
p_{12}(x) = {}& x^{137} + x^{136} + x^{135} + x^{133} + x^{131} + x^{129} + x^{127} + x^{124} + x^{117} + x^{116}\\
&+ x^{115} + x^{112} + x^{105} + x^{104} + x^{103} + x^{101} + x^{99} + x^{97} + x^{95} + x^{92}\\
&+ x^{85} + x^{84} + x^{83} + x^{80} + x^{73} + x^{72} + x^{71} + x^{69} + x^{67} + x^{65} + x^{63}\\
&+ x^{60} + x^{57} + x^{56} + x^{55} + x^{52} + x^{49} + x^{48} + x^{47} + x^{44} + x^{37} + x^{36}\\
&+ x^{35} + x^{32} + x^{25} + x^{24} + x^{23} + x^{21} + x^{19} + x^{17} + x^{15} + x^{12} + x^{5}\\
&+ x^{4} + x^{3} + 1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_0(x) = {}& x^{156} + x^{150} + x^{146} + x^{144} + x^{142} + x^{140} + x^{136} + x^{126} + x^{114} + x^{112}\\
&+ x^{108} + x^{96} + x^{94} + x^{90} + x^{82} + x^{80} + x^{76} + x^{74} + x^{72} + x^{70} + x^{66}\\
&+ x^{62} + x^{60} + x^{56} + x^{48} + x^{46} + x^{42},
\end{aligned}
$$

$$
\begin{aligned}
p_3(x) &= x^{144} + x^{142} + x^{140} + x^{138} + x^{136} + x^{132} + x^{126} + x^{124} + x^{120} + x^{118} \\
&\quad + x^{116} + x^{114} + x^{112} + x^{110} + x^{104} + x^{102} + x^{90} + x^{84} + x^{80} + x^{78} \\
&\quad + x^{74} + x^{72} + x^{58} + x^{54} + x^{50} + x^{42} + x^{36} + x^{30} + x^{28} + x^{26} + x^{16} \\
&\quad + x^{12}, \\
p_6(x) &= x^{144} + x^{142} + x^{138} + x^{136} + x^{134} + x^{132} + x^{130} + x^{128} + x^{126} + x^{116} \\
&\quad + x^{112} + x^{108} + x^{106} + x^{102} + x^{100} + x^{96} + x^{94} + x^{86} + x^{84} + x^{82} \\
&\quad + x^{80} + x^{78} + x^{74} + x^{72} + x^{70} + x^{68} + x^{66} + x^{64} + x^{62} + x^{56} + x^{52} \\
&\quad + x^{48} + x^{44} + x^{42} + x^{40} + x^{38} + x^{36} + x^{34} + x^{22} + x^{18} + x^{14} + x^{12} \\
&\quad + x^{10} + 1, \\
p_9(x) &= x^{140} + x^{134} + x^{128} + x^{116} + x^{114} + x^{102} + x^{98} + x^{96} + x^{90} + x^{88} \\
&\quad + x^{86} + x^{84} + x^{82} + x^{74} + x^{72} + x^{68} + x^{66} + x^{60} + x^{58} + x^{56} + x^{52} \\
&\quad + x^{48} + x^{46} + x^{44} + x^{42} + x^{36} + x^{34} + x^{30} + x^{28} + x^{26} + x^{24} + x^{22} \\
&\quad + x^{20} + x^{18} + x^{16} + x^{10} + x^{8} + x^{4}, \\
p_{12}(x) &= x^{140} + x^{136} + x^{132} + x^{128} + x^{116} + x^{112} + x^{108} + x^{104} + x^{100} + x^{96} \\
&\quad + x^{84} + x^{80} + x^{76} + x^{72} + x^{68} + x^{64} + x^{60} + x^{56} + x^{36} + x^{32} + x^{28} \\
&\quad + x^{24} + x^{20} + x^{16} + x^{4} + 1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_0(x) &= x^{156} + x^{150} + x^{148} + x^{146} + x^{144} + x^{142} + x^{140} + x^{134} + x^{130} + x^{122} \\
&\quad + x^{120} + x^{108} + x^{104} + x^{102} + x^{100} + x^{98} + x^{94} + x^{92} + x^{90} + x^{86} \\
&\quad + x^{80} + x^{74} + x^{72} + x^{60} + x^{58} + x^{54} + x^{50} + x^{48} + x^{46} + x^{40} + x^{34} \\
&\quad + x^{32} + x^{30} + x^{28} + x^{24}, \\
p_3(x) &= x^{144} + x^{142} + x^{140} + x^{138} + x^{134} + x^{132} + x^{128} + x^{122} + x^{118} + x^{116} \\
&\quad + x^{114} + x^{106} + x^{104} + x^{102} + x^{98} + x^{94} + x^{92} + x^{88} + x^{84} + x^{82} \\
&\quad + x^{76} + x^{70} + x^{66} + x^{64} + x^{58} + x^{56} + x^{38} + x^{34} + x^{32} + x^{30} + x^{28} \\
&\quad + x^{20} + x^{18} + x^{16}, \\
p_6(x) &= x^{144} + x^{142} + x^{138} + x^{130} + x^{122} + x^{120} + x^{110} + x^{108} + x^{102} + x^{98} \\
&\quad + x^{92} + x^{90} + x^{88} + x^{86} + x^{84} + x^{72} + x^{68} + x^{64} + x^{62} + x^{60} + x^{54} \\
&\quad + x^{52} + x^{50} + x^{48} + x^{32} + x^{26} + x^{22} + x^{20} + x^{16} + x^{14} + x^{12} + x^{10} \\
&\quad + x^{8} + 1, \\
p_9(x) &= x^{140} + x^{134} + x^{128} + x^{116} + x^{114} + x^{102} + x^{98} + x^{96} + x^{90} + x^{88} \\
&\quad + x^{86} + x^{84} + x^{82} + x^{74} + x^{72} + x^{68} + x^{66} + x^{60} + x^{58} + x^{56} + x^{52} \\
&\quad + x^{48} + x^{46} + x^{44} + x^{42} + x^{36} + x^{34} + x^{30} + x^{28} + x^{26} + x^{24} + x^{22} \\
&\quad + x^{20} + x^{18} + x^{16} + x^{10} + x^{8} + x^{4}, \\
p_{12}(x) &= x^{140} + x^{136} + x^{132} + x^{128} + x^{116} + x^{112} + x^{108} + x^{104} + x^{100} + x^{96}
\end{aligned}
$$

$$+ x^{84} + x^{80} + x^{76} + x^{72} + x^{68} + x^{64} + x^{60} + x^{56} + x^{36} + x^{32} + x^{28} + x^{24} + x^{20} + x^{16} + x^{4} + 1,$$

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

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

$$\begin{aligned}
p_0(x) = {} & x^{147} + x^{140} + x^{139} + x^{138} + x^{137} + x^{131} + x^{130} + x^{128} + x^{127} + x^{125} \\
& + x^{123} + x^{120} + x^{119} + x^{118} + x^{117} + x^{116} + x^{113} + x^{112} + x^{111} \\
& + x^{110} + x^{109} + x^{107} + x^{106} + x^{105} + x^{104} + x^{103} + x^{101} + x^{100} \\
& + x^{99} + x^{98} + x^{97} + x^{95} + x^{93} + x^{92} + x^{87} + x^{86} + x^{84} + x^{79} + x^{76} \\
& + x^{71} + x^{68} + x^{67} + x^{66} + x^{61} + x^{59} + x^{54} + x^{53} + x^{52} + x^{50} + x^{49} \\
& + x^{46} + x^{45} + x^{44} + x^{42} + x^{41} + x^{40} + x^{39} + x^{38} + x^{35} + x^{34} + x^{33}, \\
p_3(x) = {} & x^{143} + x^{141} + x^{140} + x^{137} + x^{136} + x^{134} + x^{133} + x^{132} + x^{130} + x^{129} \\
& + x^{128} + x^{126} + x^{125} + x^{124} + x^{123} + x^{122} + x^{121} + x^{116} + x^{107} \\
& + x^{104} + x^{103} + x^{102} + x^{100} + x^{99} + x^{98} + x^{96} + x^{94} + x^{93} + x^{91} \\
& + x^{90} + x^{89} + x^{87} + x^{85} + x^{83} + x^{81} + x^{76} + x^{67} + x^{64} + x^{62} + x^{61} \\
& + x^{59} + x^{58} + x^{57} + x^{52} + x^{51} + x^{48} + x^{46} + x^{45} + x^{42} + x^{41} + x^{40} \\
& + x^{38} + x^{37} + x^{36} + x^{34} + x^{33} + x^{32} + x^{31} + x^{30} + x^{27} + x^{26} + x^{24} \\
& + x^{23} + x^{22} + x^{20} + x^{18}, \\
p_6(x) = {} & x^{141} + x^{140} + x^{138} + x^{133} + x^{132} + x^{130} + x^{129} + x^{128} + x^{126} + x^{123} \\
& + x^{122} + x^{120} + x^{119} + x^{118} + x^{117} + x^{115} + x^{113} + x^{110} + x^{107} \\
& + x^{106} + x^{104} + x^{103} + x^{102} + x^{101} + x^{98} + x^{97} + x^{96} + x^{95} + x^{92} \\
& + x^{91} + x^{90} + x^{88} + x^{87} + x^{86} + x^{84} + x^{77} + x^{76} + x^{74} + x^{73} + x^{72} \\
& + x^{71} + x^{69} + x^{67} + x^{64} + x^{61} + x^{60} + x^{59} + x^{56} + x^{53} + x^{52} + x^{51} \\
& + x^{49} + x^{46} + x^{43} + x^{42} + x^{41} + x^{38} + x^{35} + x^{34} + x^{32} + x^{31} + x^{30} \\
& + x^{29} + x^{27} + x^{24} + x^{19} + x^{18} + x^{17} + x^{15} + x^{12}, \\
p_9(x) = {} & x^{139} + x^{136} + x^{134} + x^{133} + x^{130} + x^{128} + x^{123} + x^{121} + x^{120} + x^{119} \\
& + x^{117} + x^{112} + x^{107} + x^{105} + x^{104} + x^{103} + x^{99} + x^{98} + x^{96} + x^{95} \\
& + x^{94} + x^{92} + x^{91} + x^{90} + x^{89} + x^{88} + x^{87} + x^{85} + x^{81} + x^{80} + x^{78} \\
& + x^{77} + x^{76} + x^{75} + x^{74} + x^{73} + x^{69} + x^{68} + x^{66} + x^{65} + x^{64} + x^{62} \\
& + x^{61} + x^{60} + x^{59} + x^{58} + x^{57} + x^{55} + x^{53} + x^{51} + x^{46} + x^{43} + x^{41} \\
& + x^{40} + x^{39} + x^{34} + x^{33} + x^{30} + x^{28} + x^{21} + x^{18} + x^{17} + x^{16} + x^{14} \\
& + x^{12} + x^{11} + x^{8} + x^{6}, \\
p_{12}(x) = {} & x^{137} + x^{136} + x^{135} + x^{133} + x^{131} + x^{129} + x^{127} + x^{124} + x^{117} + x^{116} \\
& + x^{115} + x^{112} + x^{105} + x^{104} + x^{103} + x^{101} + x^{99} + x^{97} + x^{95} + x^{92} \\
& + x^{85} + x^{84} + x^{83} + x^{80} + x^{73} + x^{72} + x^{71} + x^{69} + x^{67} + x^{65} + x^{63} \\
& + x^{60} + x^{57} + x^{56} + x^{55} + x^{52} + x^{49} + x^{48} + x^{47} + x^{44} + x^{37} + x^{36}
\end{aligned}$$

$$
\begin{aligned}
&+x^{35}+x^{32}+x^{25}+x^{24}+x^{23}+x^{21}+x^{19}+x^{17}+x^{15}+x^{12}+x^{5}\\
&+x^{4}+x^{3}+1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_0(x) &= x^{147}+x^{140}+x^{139}+x^{138}+x^{137}+x^{131}+x^{130}+x^{128}+x^{127}+x^{125}\\
&+x^{123}+x^{120}+x^{119}+x^{118}+x^{117}+x^{116}+x^{113}+x^{112}+x^{111}\\
&+x^{110}+x^{109}+x^{107}+x^{106}+x^{105}+x^{104}+x^{103}+x^{101}+x^{100}\\
&+x^{99}+x^{98}+x^{97}+x^{95}+x^{93}+x^{92}+x^{87}+x^{86}+x^{84}+x^{79}+x^{76}\\
&+x^{71}+x^{68}+x^{67}+x^{66}+x^{61}+x^{59}+x^{54}+x^{53}+x^{52}+x^{50}+x^{49}\\
&+x^{46}+x^{45}+x^{44}+x^{42}+x^{41}+x^{40}+x^{39}+x^{38}+x^{35}+x^{34}+x^{33},\\
p_3(x) &= x^{143}+x^{141}+x^{140}+x^{137}+x^{136}+x^{134}+x^{133}+x^{132}+x^{130}+x^{129}\\
&+x^{128}+x^{126}+x^{125}+x^{124}+x^{123}+x^{122}+x^{121}+x^{116}+x^{107}\\
&+x^{104}+x^{103}+x^{102}+x^{100}+x^{99}+x^{98}+x^{96}+x^{94}+x^{93}+x^{91}\\
&+x^{90}+x^{89}+x^{87}+x^{85}+x^{83}+x^{81}+x^{76}+x^{67}+x^{64}+x^{62}+x^{61}\\
&+x^{59}+x^{58}+x^{57}+x^{52}+x^{51}+x^{48}+x^{46}+x^{45}+x^{42}+x^{41}+x^{40}\\
&+x^{38}+x^{37}+x^{36}+x^{34}+x^{33}+x^{32}+x^{31}+x^{30}+x^{27}+x^{26}+x^{24}\\
&+x^{23}+x^{22}+x^{20}+x^{18},\\
p_6(x) &= x^{141}+x^{140}+x^{138}+x^{133}+x^{132}+x^{130}+x^{129}+x^{128}+x^{126}+x^{123}\\
&+x^{122}+x^{120}+x^{119}+x^{118}+x^{117}+x^{115}+x^{113}+x^{110}+x^{107}\\
&+x^{106}+x^{104}+x^{103}+x^{102}+x^{101}+x^{98}+x^{97}+x^{96}+x^{95}+x^{92}\\
&+x^{91}+x^{90}+x^{88}+x^{87}+x^{86}+x^{84}+x^{77}+x^{76}+x^{74}+x^{73}+x^{72}\\
&+x^{71}+x^{69}+x^{67}+x^{64}+x^{61}+x^{60}+x^{59}+x^{56}+x^{53}+x^{52}+x^{51}\\
&+x^{49}+x^{46}+x^{43}+x^{42}+x^{41}+x^{38}+x^{35}+x^{34}+x^{32}+x^{31}+x^{30}\\
&+x^{29}+x^{27}+x^{24}+x^{19}+x^{18}+x^{17}+x^{15}+x^{12},\\
p_9(x) &= x^{139}+x^{136}+x^{134}+x^{133}+x^{130}+x^{128}+x^{123}+x^{121}+x^{120}+x^{119}\\
&+x^{117}+x^{112}+x^{107}+x^{105}+x^{104}+x^{103}+x^{99}+x^{98}+x^{96}+x^{95}\\
&+x^{94}+x^{92}+x^{91}+x^{90}+x^{89}+x^{88}+x^{87}+x^{85}+x^{81}+x^{80}+x^{78}\\
&+x^{77}+x^{76}+x^{75}+x^{74}+x^{73}+x^{69}+x^{68}+x^{66}+x^{65}+x^{64}+x^{62}\\
&+x^{61}+x^{60}+x^{59}+x^{58}+x^{57}+x^{55}+x^{53}+x^{51}+x^{46}+x^{43}+x^{41}\\
&+x^{40}+x^{39}+x^{34}+x^{33}+x^{30}+x^{28}+x^{21}+x^{18}+x^{17}+x^{16}+x^{14}\\
&+x^{12}+x^{11}+x^{8}+x^{6},\\
p_{12}(x) &= x^{137}+x^{136}+x^{135}+x^{133}+x^{131}+x^{129}+x^{127}+x^{124}+x^{117}+x^{116}\\
&+x^{115}+x^{112}+x^{105}+x^{104}+x^{103}+x^{101}+x^{99}+x^{97}+x^{95}+x^{92}\\
&+x^{85}+x^{84}+x^{83}+x^{80}+x^{73}+x^{72}+x^{71}+x^{69}+x^{67}+x^{65}+x^{63}\\
&+x^{60}+x^{57}+x^{56}+x^{55}+x^{52}+x^{49}+x^{48}+x^{47}+x^{44}+x^{37}+x^{36}
\end{aligned}
$$

$$+ x^{35} + x^{32} + x^{25} + x^{24} + x^{23} + x^{21} + x^{19} + x^{17} + x^{15} + x^{12} + x^{5} + x^{4} + x^{3} + 1,$$

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

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

$$\begin{aligned}
p_0(x) &= x^{138} + x^{132} + x^{130} + x^{128} + x^{122} + x^{116} + x^{114} + x^{112} + x^{110} + x^{106} \\
&\quad + x^{104} + x^{100} + x^{98} + x^{96} + x^{90} + x^{88} + x^{84} + x^{82} + x^{70} + x^{66} + x^{60} \\
&\quad + x^{58} + x^{52} + x^{44} + x^{42}, \\
p_3(x) &= x^{128} + x^{122} + x^{118} + x^{116} + x^{114} + x^{110} + x^{106} + x^{104} + x^{102} + x^{100} \\
&\quad + x^{94} + x^{92} + x^{86} + x^{84} + x^{80} + x^{76} + x^{74} + x^{70} + x^{68} + x^{66} + x^{64} \\
&\quad + x^{62} + x^{60} + x^{54} + x^{48} + x^{44} + x^{42} + x^{40} + x^{36} + x^{32} + x^{28} + x^{26} \\
&\quad + x^{20} + x^{18} + x^{16} + x^{12}, \\
p_6(x) &= x^{130} + x^{128} + x^{126} + x^{124} + x^{122} + x^{112} + x^{110} + x^{108} + x^{106} + x^{98} \\
&\quad + x^{96} + x^{94} + x^{90} + x^{88} + x^{82} + x^{80} + x^{78} + x^{76} + x^{68} + x^{64} + x^{60} \\
&\quad + x^{54} + x^{52} + x^{50} + x^{48} + x^{46} + x^{44} + x^{40} + x^{38} + x^{32} + x^{18} + x^{12} \\
&\quad + x^{6} + 1, \\
p_9(x) &= x^{134} + x^{132} + x^{130} + x^{128} + x^{126} + x^{122} + x^{120} + x^{112} + x^{108} + x^{106} \\
&\quad + x^{98} + x^{96} + x^{94} + x^{92} + x^{88} + x^{84} + x^{80} + x^{78} + x^{76} + x^{74} + x^{68} \\
&\quad + x^{66} + x^{64} + x^{62} + x^{58} + x^{54} + x^{50} + x^{42} + x^{34} + x^{32} + x^{28} + x^{26} \\
&\quad + x^{24} + x^{18} + x^{8} + x^{4}, \\
p_{12}(x) &= x^{134} + x^{132} + x^{128} + x^{118} + x^{116} + x^{112} + x^{102} + x^{100} + x^{96} + x^{86} \\
&\quad + x^{84} + x^{80} + x^{70} + x^{68} + x^{64} + x^{38} + x^{36} + x^{32} + x^{22} + x^{20} + x^{16} \\
&\quad + x^{6} + x^{4} + 1,
\end{aligned}$$

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

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

$$\begin{aligned}
p_0(x) &= x^{147} + x^{145} + x^{144} + x^{143} + x^{141} + x^{140} + x^{139} + x^{138} + x^{136} + x^{134} \\
&\quad + x^{131} + x^{128} + x^{127} + x^{126} + x^{125} + x^{117} + x^{115} + x^{110} + x^{109} \\
&\quad + x^{108} + x^{107} + x^{105} + x^{102} + x^{101} + x^{99} + x^{95} + x^{94} + x^{92} + x^{88} \\
&\quad + x^{86} + x^{84} + x^{81} + x^{78} + x^{74} + x^{70} + x^{68} + x^{67} + x^{66} + x^{64} + x^{62} \\
&\quad + x^{60} + x^{59} + x^{58} + x^{57} + x^{52} + x^{51} + x^{50} + x^{49} + x^{48} + x^{46} + x^{43} \\
&\quad + x^{42} + x^{39} + x^{38} + x^{35} + x^{30} + x^{29} + x^{27} + x^{24}, \\
p_3(x) &= x^{145} + x^{144} + x^{138} + x^{136} + x^{135} + x^{130} + x^{128} + x^{127} + x^{123} + x^{122} \\
&\quad + x^{120} + x^{119} + x^{117} + x^{115} + x^{112} + x^{109} + x^{108} + x^{107} + x^{106} \\
&\quad + x^{103} + x^{98} + x^{97} + x^{94} + x^{93} + x^{91} + x^{88} + x^{85} + x^{84} + x^{83} + x^{80} \\
&\quad + x^{79} + x^{77} + x^{74} + x^{73} + x^{72} + x^{71} + x^{69} + x^{65} + x^{63} + x^{61} + x^{60} \\
&\quad + x^{59} + x^{57} + x^{55} + x^{54} + x^{52} + x^{50} + x^{48} + x^{47} + x^{46} + x^{45} + x^{44}
\end{aligned}$$

$$
\begin{aligned}
&+x^{40}+x^{39}+x^{37}+x^{36}+x^{35}+x^{34}+x^{33}+x^{32}+x^{31}+x^{29}+x^{28}\\
&+x^{24}+x^{22}+x^{21}+x^{19}+x^{16},\\
p_6(x)=&x^{145}+x^{144}+x^{138}+x^{136}+x^{132}+x^{131}+x^{128}+x^{127}+x^{126}+x^{125}\\
&+x^{124}+x^{122}+x^{121}+x^{119}+x^{117}+x^{115}+x^{114}+x^{112}+x^{110}\\
&+x^{106}+x^{100}+x^{98}+x^{97}+x^{93}+x^{92}+x^{90}+x^{88}+x^{82}+x^{80}+x^{79}\\
&+x^{78}+x^{73}+x^{72}+x^{71}+x^{70}+x^{69}+x^{68}+x^{67}+x^{66}+x^{63}+x^{62}\\
&+x^{61}+x^{59}+x^{58}+x^{55}+x^{54}+x^{52}+x^{51}+x^{50}+x^{47}+x^{46}+x^{43}\\
&+x^{42}+x^{37}+x^{34}+x^{32}+x^{29}+x^{28}+x^{27}+x^{25}+x^{23}+x^{19}+x^{17}\\
&+x^{16}+x^{15}+x^{14}+x^{13}+x^{12}+x^{11}+x^{8}+x^{5}+x^{4}+x^{3}+1,\\
p_9(x)=&x^{145}+x^{144}+x^{143}+x^{140}+x^{133}+x^{132}+x^{131}+x^{128}+x^{125}+x^{124}\\
&+x^{123}+x^{120}+x^{113}+x^{112}+x^{111}+x^{108}+x^{101}+x^{100}+x^{99}+x^{96}\\
&+x^{93}+x^{92}+x^{91}+x^{88}+x^{81}+x^{80}+x^{79}+x^{76}+x^{69}+x^{68}+x^{67}\\
&+x^{65}+x^{63}+x^{61}+x^{59}+x^{56}+x^{53}+x^{52}+x^{51}+x^{48}+x^{45}+x^{44}\\
&+x^{43}+x^{40}+x^{33}+x^{32}+x^{31}+x^{28}+x^{21}+x^{20}+x^{19}+x^{16}+x^{13}\\
&+x^{12}+x^{11}+x^{8},\\
p_{12}(x)=&x^{145}+x^{144}+x^{143}+x^{140}+x^{137}+x^{136}+x^{135}+x^{132}+x^{129}+x^{128}\\
&+x^{127}+x^{125}+x^{123}+x^{120}+x^{117}+x^{116}+x^{115}+x^{113}+x^{111}\\
&+x^{108}+x^{105}+x^{104}+x^{103}+x^{100}+x^{97}+x^{96}+x^{95}+x^{93}+x^{91}\\
&+x^{88}+x^{85}+x^{84}+x^{83}+x^{81}+x^{79}+x^{76}+x^{73}+x^{72}+x^{71}+x^{68}\\
&+x^{61}+x^{60}+x^{59}+x^{57}+x^{55}+x^{53}+x^{51}+x^{49}+x^{47}+x^{45}+x^{43}\\
&+x^{40}+x^{37}+x^{36}+x^{35}+x^{33}+x^{31}+x^{28}+x^{25}+x^{24}+x^{23}+x^{20}\\
&+x^{17}+x^{16}+x^{15}+x^{13}+x^{11}+x^{8}+x^{5}+x^{4}+x^{3}+1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_0(x)=&x^{160}+x^{154}+x^{153}+x^{152}+x^{151}+x^{149}+x^{147}+x^{143}+x^{141}+x^{140}\\
&+x^{137}+x^{135}+x^{132}+x^{125}+x^{123}+x^{120}+x^{119}+x^{114}+x^{113}\\
&+x^{111}+x^{108}+x^{107}+x^{105}+x^{104}+x^{103}+x^{101}+x^{100}+x^{98}+x^{96}\\
&+x^{94}+x^{93}+x^{92}+x^{89}+x^{88}+x^{85}+x^{81}+x^{80}+x^{79}+x^{77}+x^{76}\\
&+x^{75}+x^{74}+x^{72}+x^{71}+x^{69}+x^{68}+x^{67}+x^{65}+x^{63}+x^{61}+x^{59}\\
&+x^{58}+x^{57}+x^{54}+x^{53}+x^{51}+x^{50}+x^{49}+x^{48}+x^{47}+x^{45}+x^{44}\\
&+x^{43}+x^{42}+x^{40}+x^{38}+x^{37}+x^{33},\\
p_3(x)=&x^{146}+x^{145}+x^{140}+x^{139}+x^{137}+x^{136}+x^{135}+x^{134}+x^{131}+x^{126}\\
&+x^{125}+x^{123}+x^{122}+x^{121}+x^{120}+x^{117}+x^{114}+x^{113}+x^{112}\\
&+x^{111}+x^{109}+x^{104}+x^{102}+x^{100}+x^{97}+x^{96}+x^{94}+x^{91}+x^{90}\\
&+x^{89}+x^{87}+x^{84}+x^{83}+x^{81}+x^{80}+x^{77}+x^{74}+x^{73}+x^{72}+x^{71}
\end{aligned}
$$

$$
\begin{aligned}
&+ x^{69} + x^{66} + x^{65} + x^{64} + x^{62} + x^{59} + x^{55} + x^{47} + x^{46} + x^{45} + x^{43}\\
&+ x^{42} + x^{41} + x^{40} + x^{39} + x^{38} + x^{35} + x^{34} + x^{33} + x^{30} + x^{29} + x^{28}\\
&+ x^{25} + x^{23} + x^{22} + x^{21} + x^{20} + x^{18},\\
p_6(x) &= x^{148} + x^{146} + x^{140} + x^{138} + x^{132} + x^{128} + x^{126} + x^{124} + x^{122} + x^{120}\\
&+ x^{118} + x^{112} + x^{106} + x^{104} + x^{102} + x^{98} + x^{92} + x^{90} + x^{88} + x^{84}\\
&+ x^{78} + x^{76} + x^{74} + x^{72} + x^{60} + x^{56} + x^{54} + x^{50} + x^{48} + x^{46} + x^{44}\\
&+ x^{38} + x^{36} + x^{34} + x^{22} + x^{18} + x^{16} + x^{12},\\
p_9(x) &= x^{150} + x^{149} + x^{148} + x^{147} + x^{144} + x^{143} + x^{142} + x^{140} + x^{138} + x^{134}\\
&+ x^{132} + x^{131} + x^{130} + x^{126} + x^{123} + x^{121} + x^{120} + x^{117} + x^{116}\\
&+ x^{115} + x^{112} + x^{111} + x^{110} + x^{108} + x^{106} + x^{102} + x^{100} + x^{99} + x^{98}\\
&+ x^{94} + x^{91} + x^{89} + x^{88} + x^{85} + x^{84} + x^{83} + x^{80} + x^{79} + x^{78} + x^{76}\\
&+ x^{74} + x^{69} + x^{66} + x^{64} + x^{63} + x^{60} + x^{59} + x^{58} + x^{57} + x^{56} + x^{52}\\
&+ x^{51} + x^{50} + x^{46} + x^{43} + x^{41} + x^{40} + x^{37} + x^{36} + x^{35} + x^{32} + x^{31}\\
&+ x^{30} + x^{28} + x^{26} + x^{22} + x^{20} + x^{19} + x^{18} + x^{14} + x^{11} + x^{9} + x^{8} + x^{6},\\
p_{12}(x) &= x^{152} + x^{148} + x^{144} + x^{136} + x^{132} + x^{128} + x^{120} + x^{116} + x^{104} + x^{100}\\
&+ x^{96} + x^{88} + x^{84} + x^{56} + x^{52} + x^{40} + x^{36} + x^{24} + x^{20} + x^{16} + 1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_0(x) &= x^{144} + x^{141} + x^{139} + x^{136} + x^{135} + x^{134} + x^{133} + x^{129} + x^{128} + x^{127}\\
&+ x^{126} + x^{124} + x^{121} + x^{117} + x^{116} + x^{110} + x^{109} + x^{108} + x^{107}\\
&+ x^{106} + x^{105} + x^{102} + x^{101} + x^{99} + x^{97} + x^{96} + x^{92} + x^{86} + x^{80}\\
&+ x^{78} + x^{77} + x^{76} + x^{73} + x^{72} + x^{71} + x^{68} + x^{65} + x^{64} + x^{63} + x^{61}\\
&+ x^{59} + x^{58} + x^{54} + x^{51} + x^{50} + x^{49} + x^{48} + x^{47} + x^{46} + x^{44} + x^{42}\\
&+ x^{40} + x^{39} + x^{38} + x^{37} + x^{36} + x^{35} + x^{34} + x^{33},\\
p_3(x) &= x^{142} + x^{141} + x^{138} + x^{137} + x^{136} + x^{135} + x^{133} + x^{128} + x^{126} + x^{124}\\
&+ x^{122} + x^{120} + x^{117} + x^{116} + x^{113} + x^{111} + x^{110} + x^{109} + x^{108}\\
&+ x^{106} + x^{94} + x^{93} + x^{90} + x^{89} + x^{88} + x^{87} + x^{85} + x^{80} + x^{77} + x^{76}\\
&+ x^{73} + x^{71} + x^{70} + x^{69} + x^{68} + x^{66} + x^{62} + x^{61} + x^{58} + x^{57} + x^{56}\\
&+ x^{55} + x^{54} + x^{50} + x^{49} + x^{47} + x^{44} + x^{41} + x^{40} + x^{39} + x^{37} + x^{32}\\
&+ x^{29} + x^{28} + x^{25} + x^{23} + x^{22} + x^{21} + x^{20} + x^{18},\\
p_6(x) &= x^{144} + x^{142} + x^{140} + x^{138} + x^{136} + x^{134} + x^{128} + x^{124} + x^{120} + x^{118}\\
&+ x^{114} + x^{108} + x^{104} + x^{100} + x^{98} + x^{94} + x^{86} + x^{84} + x^{80} + x^{78}\\
&+ x^{74} + x^{72} + x^{68} + x^{52} + x^{50} + x^{36} + x^{32} + x^{30} + x^{28} + x^{24} + x^{22}\\
&+ x^{18} + x^{16} + x^{12},\\
p_9(x) &= x^{146} + x^{145} + x^{144} + x^{143} + x^{142} + x^{141} + x^{138} + x^{135} + x^{134} + x^{133}
\end{aligned}
$$

$$
\begin{aligned}
&+x^{131}+x^{126}+x^{123}+x^{121}+x^{120}+x^{118}+x^{114}+x^{113}+x^{112}\\
&+x^{111}+x^{110}+x^{109}+x^{106}+x^{103}+x^{102}+x^{101}+x^{99}+x^{94}+x^{91}\\
&+x^{89}+x^{88}+x^{86}+x^{82}+x^{81}+x^{80}+x^{79}+x^{78}+x^{77}+x^{74}+x^{71}\\
&+x^{70}+x^{69}+x^{67}+x^{66}+x^{65}+x^{64}+x^{63}+x^{61}+x^{59}+x^{58}+x^{57}\\
&+x^{56}+x^{55}+x^{53}+x^{51}+x^{46}+x^{43}+x^{41}+x^{40}+x^{38}+x^{34}+x^{33}\\
&+x^{32}+x^{31}+x^{30}+x^{29}+x^{26}+x^{23}+x^{22}+x^{21}+x^{19}+x^{14}+x^{11}\\
&+x^{9}+x^{8}+x^{6},\\
p_{12}(x)=&\,x^{148}+x^{128}+x^{124}+x^{116}+x^{112}+x^{96}+x^{92}+x^{84}+x^{80}+x^{68}+x^{64}\\
&+x^{60}+x^{44}+x^{36}+x^{32}+x^{16}+x^{12}+1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_0(x)=&\,x^{147}+x^{143}+x^{136}+x^{135}+x^{129}+x^{128}+x^{124}+x^{121}+x^{120}+x^{114}\\
&+x^{113}+x^{112}+x^{111}+x^{109}+x^{107}+x^{105}+x^{104}+x^{103}+x^{102}\\
&+x^{99}+x^{97}+x^{95}+x^{94}+x^{93}+x^{92}+x^{91}+x^{81}+x^{80}+x^{79}+x^{78}\\
&+x^{77}+x^{76}+x^{75}+x^{74}+x^{71}+x^{70}+x^{69}+x^{67}+x^{62}+x^{60}+x^{59}\\
&+x^{57}+x^{55}+x^{53}+x^{52}+x^{50}+x^{47}+x^{46}+x^{44}+x^{43}+x^{42},\\
p_3(x)=&\,x^{145}+x^{144}+x^{141}+x^{140}+x^{137}+x^{133}+x^{131}+x^{130}+x^{129}+x^{128}\\
&+x^{125}+x^{122}+x^{119}+x^{116}+x^{115}+x^{114}+x^{112}+x^{109}+x^{108}\\
&+x^{107}+x^{106}+x^{105}+x^{104}+x^{101}+x^{99}+x^{98}+x^{95}+x^{94}+x^{93}\\
&+x^{92}+x^{90}+x^{85}+x^{84}+x^{83}+x^{80}+x^{79}+x^{76}+x^{73}+x^{72}+x^{71}\\
&+x^{69}+x^{64}+x^{61}+x^{58}+x^{57}+x^{56}+x^{55}+x^{54}+x^{53}+x^{49}+x^{46}\\
&+x^{45}+x^{43}+x^{42}+x^{41}+x^{40}+x^{36}+x^{34}+x^{32}+x^{29}+x^{27}+x^{26}\\
&+x^{25}+x^{24}+x^{23}+x^{22},\\
p_6(x)=&\,x^{145}+x^{144}+x^{141}+x^{140}+x^{137}+x^{135}+x^{130}+x^{129}+x^{128}+x^{127}\\
&+x^{125}+x^{124}+x^{123}+x^{121}+x^{120}+x^{118}+x^{117}+x^{116}+x^{115}\\
&+x^{114}+x^{113}+x^{109}+x^{108}+x^{105}+x^{104}+x^{102}+x^{100}+x^{99}+x^{95}\\
&+x^{92}+x^{88}+x^{87}+x^{86}+x^{84}+x^{82}+x^{81}+x^{78}+x^{76}+x^{75}+x^{74}\\
&+x^{73}+x^{71}+x^{70}+x^{66}+x^{65}+x^{62}+x^{61}+x^{60}+x^{59}+x^{58}+x^{57}\\
&+x^{56}+x^{54}+x^{51}+x^{50}+x^{44}+x^{40}+x^{39}+x^{38}+x^{37}+x^{36}+x^{35}\\
&+x^{31}+x^{30}+x^{29}+x^{27}+x^{25}+x^{23}+x^{18}+x^{16}+x^{14}+x^{12}+x^{5}\\
&+x^{4}+x^{3}+1,\\
p_9(x)=&\,x^{145}+x^{144}+x^{143}+x^{140}+x^{133}+x^{132}+x^{131}+x^{128}+x^{125}+x^{124}\\
&+x^{123}+x^{120}+x^{113}+x^{112}+x^{111}+x^{108}+x^{101}+x^{100}+x^{99}+x^{96}\\
&+x^{93}+x^{92}+x^{91}+x^{88}+x^{81}+x^{80}+x^{79}+x^{76}+x^{69}+x^{68}+x^{67}\\
&+x^{65}+x^{63}+x^{61}+x^{59}+x^{56}+x^{53}+x^{52}+x^{51}+x^{48}+x^{45}+x^{44}
\end{aligned}
$$

$$
\begin{aligned}
&+ x^{43} + x^{40} + x^{33} + x^{32} + x^{31} + x^{28} + x^{21} + x^{20} + x^{19} + x^{16} + x^{13} \\
&+ x^{12} + x^{11} + x^{8}, \\
p_{12}(x) = {}& x^{145} + x^{144} + x^{143} + x^{140} + x^{137} + x^{136} + x^{135} + x^{132} + x^{129} + x^{128} \\
&+ x^{127} + x^{125} + x^{123} + x^{120} + x^{117} + x^{116} + x^{115} + x^{113} + x^{111} \\
&+ x^{108} + x^{105} + x^{104} + x^{103} + x^{100} + x^{97} + x^{96} + x^{95} + x^{93} + x^{91} \\
&+ x^{88} + x^{85} + x^{84} + x^{83} + x^{81} + x^{79} + x^{76} + x^{73} + x^{72} + x^{71} + x^{68} \\
&+ x^{61} + x^{60} + x^{59} + x^{57} + x^{55} + x^{53} + x^{51} + x^{49} + x^{47} + x^{45} + x^{43} \\
&+ x^{40} + x^{37} + x^{36} + x^{35} + x^{33} + x^{31} + x^{28} + x^{25} + x^{24} + x^{23} + x^{20} \\
&+ x^{17} + x^{16} + x^{15} + x^{13} + x^{11} + x^{8} + x^{5} + x^{4} + x^{3} + 1,
\end{aligned}
$$

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

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

$$
\begin{aligned}
p_0(x) = {}& x^{147} + x^{145} + x^{144} + x^{143} + x^{141} + x^{140} + x^{139} + x^{138} + x^{136} + x^{134} \\
&+ x^{131} + x^{128} + x^{127} + x^{126} + x^{125} + x^{117} + x^{115} + x^{110} + x^{109} \\
&+ x^{108} + x^{107} + x^{105} + x^{102} + x^{101} + x^{99} + x^{95} + x^{94} + x^{92} + x^{88} \\
&+ x^{86} + x^{84} + x^{81} + x^{78} + x^{74} + x^{70} + x^{68} + x^{67} + x^{66} + x^{64} + x^{62} \\
&+ x^{60} + x^{59} + x^{58} + x^{57} + x^{52} + x^{51} + x^{50} + x^{49} + x^{48} + x^{46} + x^{43} \\
&+ x^{42} + x^{39} + x^{38} + x^{35} + x^{30} + x^{29} + x^{27} + x^{24}, \\
p_3(x) = {}& x^{145} + x^{144} + x^{138} + x^{136} + x^{135} + x^{130} + x^{128} + x^{127} + x^{123} + x^{122} \\
&+ x^{120} + x^{119} + x^{117} + x^{115} + x^{112} + x^{109} + x^{108} + x^{107} + x^{106} \\
&+ x^{103} + x^{98} + x^{97} + x^{94} + x^{93} + x^{91} + x^{88} + x^{85} + x^{84} + x^{83} + x^{80} \\
&+ x^{79} + x^{77} + x^{74} + x^{73} + x^{72} + x^{71} + x^{69} + x^{65} + x^{63} + x^{61} + x^{60} \\
&+ x^{59} + x^{57} + x^{55} + x^{54} + x^{52} + x^{50} + x^{48} + x^{47} + x^{46} + x^{45} + x^{44} \\
&+ x^{40} + x^{39} + x^{37} + x^{36} + x^{35} + x^{34} + x^{33} + x^{32} + x^{31} + x^{29} + x^{28} \\
&+ x^{24} + x^{22} + x^{21} + x^{19} + x^{16}, \\
p_6(x) = {}& x^{145} + x^{144} + x^{138} + x^{136} + x^{132} + x^{131} + x^{128} + x^{127} + x^{126} + x^{125} \\
&+ x^{124} + x^{122} + x^{121} + x^{119} + x^{117} + x^{115} + x^{114} + x^{112} + x^{110} \\
&+ x^{106} + x^{100} + x^{98} + x^{97} + x^{93} + x^{92} + x^{90} + x^{88} + x^{82} + x^{80} + x^{79} \\
&+ x^{78} + x^{73} + x^{72} + x^{71} + x^{70} + x^{69} + x^{68} + x^{67} + x^{66} + x^{63} + x^{62} \\
&+ x^{61} + x^{59} + x^{58} + x^{55} + x^{54} + x^{52} + x^{51} + x^{50} + x^{47} + x^{46} + x^{43} \\
&+ x^{42} + x^{37} + x^{34} + x^{32} + x^{29} + x^{28} + x^{27} + x^{25} + x^{23} + x^{19} + x^{17} \\
&+ x^{16} + x^{15} + x^{14} + x^{13} + x^{12} + x^{11} + x^{8} + x^{5} + x^{4} + x^{3} + 1, \\
p_9(x) = {}& x^{145} + x^{144} + x^{143} + x^{140} + x^{133} + x^{132} + x^{131} + x^{128} + x^{125} + x^{124} \\
&+ x^{123} + x^{120} + x^{113} + x^{112} + x^{111} + x^{108} + x^{101} + x^{100} + x^{99} + x^{96} \\
&+ x^{93} + x^{92} + x^{91} + x^{88} + x^{81} + x^{80} + x^{79} + x^{76} + x^{69} + x^{68} + x^{67} \\
&+ x^{65} + x^{63} + x^{61} + x^{59} + x^{56} + x^{53} + x^{52} + x^{51} + x^{48} + x^{45} + x^{44}
\end{aligned}
$$

$$+ x^{43} + x^{40} + x^{33} + x^{32} + x^{31} + x^{28} + x^{21} + x^{20} + x^{19} + x^{16} + x^{13} + x^{12} + x^{11} + x^{8},$$

$$\begin{aligned} p_{12}(x) = {} & x^{145} + x^{144} + x^{143} + x^{140} + x^{137} + x^{136} + x^{135} + x^{132} + x^{129} + x^{128} \\ & + x^{127} + x^{125} + x^{123} + x^{120} + x^{117} + x^{116} + x^{115} + x^{113} + x^{111} \\ & + x^{108} + x^{105} + x^{104} + x^{103} + x^{100} + x^{97} + x^{96} + x^{95} + x^{93} + x^{91} \\ & + x^{88} + x^{85} + x^{84} + x^{83} + x^{81} + x^{79} + x^{76} + x^{73} + x^{72} + x^{71} + x^{68} \\ & + x^{61} + x^{60} + x^{59} + x^{57} + x^{55} + x^{53} + x^{51} + x^{49} + x^{47} + x^{45} + x^{43} \\ & + x^{40} + x^{37} + x^{36} + x^{35} + x^{33} + x^{31} + x^{28} + x^{25} + x^{24} + x^{23} + x^{20} \\ & + x^{17} + x^{16} + x^{15} + x^{13} + x^{11} + x^{8} + x^{5} + x^{4} + x^{3} + 1, \end{aligned}$$

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

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

$$\begin{aligned} p_{0}(x) = {} & x^{144} + x^{141} + x^{139} + x^{136} + x^{135} + x^{134} + x^{133} + x^{129} + x^{128} + x^{127} \\ & + x^{126} + x^{124} + x^{121} + x^{117} + x^{116} + x^{110} + x^{109} + x^{108} + x^{107} \\ & + x^{106} + x^{105} + x^{102} + x^{101} + x^{99} + x^{97} + x^{96} + x^{92} + x^{86} + x^{80} \\ & + x^{78} + x^{77} + x^{76} + x^{73} + x^{72} + x^{71} + x^{68} + x^{65} + x^{64} + x^{63} + x^{61} \\ & + x^{59} + x^{58} + x^{54} + x^{51} + x^{50} + x^{49} + x^{48} + x^{47} + x^{46} + x^{44} + x^{42} \\ & + x^{40} + x^{39} + x^{38} + x^{37} + x^{36} + x^{35} + x^{34} + x^{33}, \\ p_{3}(x) = {} & x^{142} + x^{141} + x^{138} + x^{137} + x^{136} + x^{135} + x^{133} + x^{128} + x^{126} + x^{124} \\ & + x^{122} + x^{120} + x^{117} + x^{116} + x^{113} + x^{111} + x^{110} + x^{109} + x^{108} \\ & + x^{106} + x^{94} + x^{93} + x^{90} + x^{89} + x^{88} + x^{87} + x^{85} + x^{80} + x^{77} + x^{76} \\ & + x^{73} + x^{71} + x^{70} + x^{69} + x^{68} + x^{66} + x^{62} + x^{61} + x^{58} + x^{57} + x^{56} \\ & + x^{55} + x^{54} + x^{50} + x^{49} + x^{47} + x^{44} + x^{41} + x^{40} + x^{39} + x^{37} + x^{32} \\ & + x^{29} + x^{28} + x^{25} + x^{23} + x^{22} + x^{21} + x^{20} + x^{18}, \\ p_{6}(x) = {} & x^{144} + x^{142} + x^{140} + x^{138} + x^{136} + x^{134} + x^{128} + x^{124} + x^{120} + x^{118} \\ & + x^{114} + x^{108} + x^{104} + x^{100} + x^{98} + x^{94} + x^{86} + x^{84} + x^{80} + x^{78} \\ & + x^{74} + x^{72} + x^{68} + x^{52} + x^{50} + x^{36} + x^{32} + x^{30} + x^{28} + x^{24} + x^{22} \\ & + x^{18} + x^{16} + x^{12}, \\ p_{9}(x) = {} & x^{146} + x^{145} + x^{144} + x^{143} + x^{142} + x^{141} + x^{138} + x^{135} + x^{134} + x^{133} \\ & + x^{131} + x^{126} + x^{123} + x^{121} + x^{120} + x^{118} + x^{114} + x^{113} + x^{112} \\ & + x^{111} + x^{110} + x^{109} + x^{106} + x^{103} + x^{102} + x^{101} + x^{99} + x^{94} + x^{91} \\ & + x^{89} + x^{88} + x^{86} + x^{82} + x^{81} + x^{80} + x^{79} + x^{78} + x^{77} + x^{74} + x^{71} \\ & + x^{70} + x^{69} + x^{67} + x^{66} + x^{65} + x^{64} + x^{63} + x^{61} + x^{59} + x^{58} + x^{57} \\ & + x^{56} + x^{55} + x^{53} + x^{51} + x^{46} + x^{43} + x^{41} + x^{40} + x^{38} + x^{34} + x^{33} \\ & + x^{32} + x^{31} + x^{30} + x^{29} + x^{26} + x^{23} + x^{22} + x^{21} + x^{19} + x^{14} + x^{11} \\ & + x^{9} + x^{8} + x^{6}, \end{aligned}$$

$$\begin{aligned}p_{12}(x) &= x^{148}+x^{128}+x^{124}+x^{116}+x^{112}+x^{96}+x^{92}+x^{84}+x^{80}+x^{68}+x^{64}\\&\quad+x^{60}+x^{44}+x^{36}+x^{32}+x^{16}+x^{12}+1,\end{aligned}$$

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

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

$$\begin{aligned}p_0(x) &= x^{160}+x^{154}+x^{153}+x^{152}+x^{151}+x^{149}+x^{147}+x^{143}+x^{141}+x^{140}\\&\quad+x^{137}+x^{135}+x^{132}+x^{125}+x^{123}+x^{120}+x^{119}+x^{114}+x^{113}\\&\quad+x^{111}+x^{108}+x^{107}+x^{105}+x^{104}+x^{103}+x^{101}+x^{100}+x^{98}+x^{96}\\&\quad+x^{94}+x^{93}+x^{92}+x^{89}+x^{88}+x^{85}+x^{81}+x^{80}+x^{79}+x^{77}+x^{76}\\&\quad+x^{75}+x^{74}+x^{72}+x^{71}+x^{69}+x^{68}+x^{67}+x^{65}+x^{63}+x^{61}+x^{59}\\&\quad+x^{58}+x^{57}+x^{54}+x^{53}+x^{51}+x^{50}+x^{49}+x^{48}+x^{47}+x^{45}+x^{44}\\&\quad+x^{43}+x^{42}+x^{40}+x^{38}+x^{37}+x^{33},\\
p_3(x) &= x^{146}+x^{145}+x^{140}+x^{139}+x^{137}+x^{136}+x^{135}+x^{134}+x^{131}+x^{126}\\&\quad+x^{125}+x^{123}+x^{122}+x^{121}+x^{120}+x^{117}+x^{114}+x^{113}+x^{112}\\&\quad+x^{111}+x^{109}+x^{104}+x^{102}+x^{100}+x^{97}+x^{96}+x^{94}+x^{91}+x^{90}\\&\quad+x^{89}+x^{87}+x^{84}+x^{83}+x^{81}+x^{80}+x^{77}+x^{74}+x^{73}+x^{72}+x^{71}\\&\quad+x^{69}+x^{66}+x^{65}+x^{64}+x^{62}+x^{59}+x^{55}+x^{47}+x^{46}+x^{45}+x^{43}\\&\quad+x^{42}+x^{41}+x^{40}+x^{39}+x^{38}+x^{35}+x^{34}+x^{33}+x^{30}+x^{29}+x^{28}\\&\quad+x^{25}+x^{23}+x^{22}+x^{21}+x^{20}+x^{18},\\
p_6(x) &= x^{148}+x^{146}+x^{140}+x^{138}+x^{132}+x^{128}+x^{126}+x^{124}+x^{122}+x^{120}\\&\quad+x^{118}+x^{112}+x^{106}+x^{104}+x^{102}+x^{98}+x^{92}+x^{90}+x^{88}+x^{84}\\&\quad+x^{78}+x^{76}+x^{74}+x^{72}+x^{60}+x^{56}+x^{54}+x^{50}+x^{48}+x^{46}+x^{44}\\&\quad+x^{38}+x^{36}+x^{34}+x^{22}+x^{18}+x^{16}+x^{12},\\
p_9(x) &= x^{150}+x^{149}+x^{148}+x^{147}+x^{144}+x^{143}+x^{142}+x^{140}+x^{138}+x^{134}\\&\quad+x^{132}+x^{131}+x^{130}+x^{126}+x^{123}+x^{121}+x^{120}+x^{117}+x^{116}\\&\quad+x^{115}+x^{112}+x^{111}+x^{110}+x^{108}+x^{106}+x^{102}+x^{100}+x^{99}+x^{98}\\&\quad+x^{94}+x^{91}+x^{89}+x^{88}+x^{85}+x^{84}+x^{83}+x^{80}+x^{79}+x^{78}+x^{76}\\&\quad+x^{74}+x^{69}+x^{66}+x^{64}+x^{63}+x^{60}+x^{59}+x^{58}+x^{57}+x^{56}+x^{52}\\&\quad+x^{51}+x^{50}+x^{46}+x^{43}+x^{41}+x^{40}+x^{37}+x^{36}+x^{35}+x^{32}+x^{31}\\&\quad+x^{30}+x^{28}+x^{26}+x^{22}+x^{20}+x^{19}+x^{18}+x^{14}+x^{11}+x^{9}+x^{8}+x^{6},\\
p_{12}(x) &= x^{152}+x^{148}+x^{144}+x^{136}+x^{132}+x^{128}+x^{120}+x^{116}+x^{104}+x^{100}\\&\quad+x^{96}+x^{88}+x^{84}+x^{56}+x^{52}+x^{40}+x^{36}+x^{24}+x^{20}+x^{16}+1,\end{aligned}$$

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

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

$$\begin{aligned}p_0(x) &= x^{147}+x^{143}+x^{136}+x^{135}+x^{129}+x^{128}+x^{124}+x^{121}+x^{120}+x^{114}\\&\quad+x^{113}+x^{112}+x^{111}+x^{109}+x^{107}+x^{105}+x^{104}+x^{103}+x^{102}\end{aligned}$$

$$
\begin{aligned}
&+ x^{99} + x^{97} + x^{95} + x^{94} + x^{93} + x^{92} + x^{91} + x^{81} + x^{80} + x^{79} + x^{78}\\
&+ x^{77} + x^{76} + x^{75} + x^{74} + x^{71} + x^{70} + x^{69} + x^{67} + x^{62} + x^{60} + x^{59}\\
&+ x^{57} + x^{55} + x^{53} + x^{52} + x^{50} + x^{47} + x^{46} + x^{44} + x^{43} + x^{42},\\
p_3(x) = {}& x^{145} + x^{144} + x^{141} + x^{140} + x^{137} + x^{133} + x^{131} + x^{130} + x^{129} + x^{128}\\
&+ x^{125} + x^{122} + x^{119} + x^{116} + x^{115} + x^{114} + x^{112} + x^{109} + x^{108}\\
&+ x^{107} + x^{106} + x^{105} + x^{104} + x^{101} + x^{99} + x^{98} + x^{95} + x^{94} + x^{93}\\
&+ x^{92} + x^{90} + x^{85} + x^{84} + x^{83} + x^{80} + x^{79} + x^{76} + x^{73} + x^{72} + x^{71}\\
&+ x^{69} + x^{64} + x^{61} + x^{58} + x^{57} + x^{56} + x^{55} + x^{54} + x^{53} + x^{49} + x^{46}\\
&+ x^{45} + x^{43} + x^{42} + x^{41} + x^{40} + x^{36} + x^{34} + x^{32} + x^{29} + x^{27} + x^{26}\\
&+ x^{25} + x^{24} + x^{23} + x^{22},\\
p_6(x) = {}& x^{145} + x^{144} + x^{141} + x^{140} + x^{137} + x^{135} + x^{130} + x^{129} + x^{128} + x^{127}\\
&+ x^{125} + x^{124} + x^{123} + x^{121} + x^{120} + x^{118} + x^{117} + x^{116} + x^{115}\\
&+ x^{114} + x^{113} + x^{109} + x^{108} + x^{105} + x^{104} + x^{102} + x^{100} + x^{99} + x^{95}\\
&+ x^{92} + x^{88} + x^{87} + x^{86} + x^{84} + x^{82} + x^{81} + x^{78} + x^{76} + x^{75} + x^{74}\\
&+ x^{73} + x^{71} + x^{70} + x^{66} + x^{65} + x^{62} + x^{61} + x^{60} + x^{59} + x^{58} + x^{57}\\
&+ x^{56} + x^{54} + x^{51} + x^{50} + x^{44} + x^{40} + x^{39} + x^{38} + x^{37} + x^{36} + x^{35}\\
&+ x^{31} + x^{30} + x^{29} + x^{27} + x^{25} + x^{23} + x^{18} + x^{16} + x^{14} + x^{12} + x^{5}\\
&+ x^{4} + x^{3} + 1,\\
p_9(x) = {}& x^{145} + x^{144} + x^{143} + x^{140} + x^{133} + x^{132} + x^{131} + x^{128} + x^{125} + x^{124}\\
&+ x^{123} + x^{120} + x^{113} + x^{112} + x^{111} + x^{108} + x^{101} + x^{100} + x^{99} + x^{96}\\
&+ x^{93} + x^{92} + x^{91} + x^{88} + x^{81} + x^{80} + x^{79} + x^{76} + x^{69} + x^{68} + x^{67}\\
&+ x^{65} + x^{63} + x^{61} + x^{59} + x^{56} + x^{53} + x^{52} + x^{51} + x^{48} + x^{45} + x^{44}\\
&+ x^{43} + x^{40} + x^{33} + x^{32} + x^{31} + x^{28} + x^{21} + x^{20} + x^{19} + x^{16} + x^{13}\\
&+ x^{12} + x^{11} + x^{8},\\
p_{12}(x) = {}& x^{145} + x^{144} + x^{143} + x^{140} + x^{137} + x^{136} + x^{135} + x^{132} + x^{129} + x^{128}\\
&+ x^{127} + x^{125} + x^{123} + x^{120} + x^{117} + x^{116} + x^{115} + x^{113} + x^{111}\\
&+ x^{108} + x^{105} + x^{104} + x^{103} + x^{100} + x^{97} + x^{96} + x^{95} + x^{93} + x^{91}\\
&+ x^{88} + x^{85} + x^{84} + x^{83} + x^{81} + x^{79} + x^{76} + x^{73} + x^{72} + x^{71} + x^{68}\\
&+ x^{61} + x^{60} + x^{59} + x^{57} + x^{55} + x^{53} + x^{51} + x^{49} + x^{47} + x^{45} + x^{43}\\
&+ x^{40} + x^{37} + x^{36} + x^{35} + x^{33} + x^{31} + x^{28} + x^{25} + x^{24} + x^{23} + x^{20}\\
&+ x^{17} + x^{16} + x^{15} + x^{13} + x^{11} + x^{8} + x^{5} + x^{4} + x^{3} + 1,
\end{aligned}
$$

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

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

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

n	$\Lambda(n)$	n	$\Lambda(n)$	n	$\Lambda(n)$	n	$\Lambda(n)$
0	[1, 2]	700	[1186, 963]	1400	[1798, 1766]	2100	[2329, 180]
1	[3, 4]	701	[1187, 1136]	1401	[1799, 1800]	2101	[2330, 195]
2	[5, 6]	702	[1188, 1189]	1402	[115, 1801]	2102	[2312, 504]
3	[7, 8]	703	[922, 1190]	1403	[1802, 1803]	2103	[2331, 699]
4	[9, 10]	704	[1191, 1192]	1404	[1804, 1805]	2104	[630, 2332]
5	[11, 12]	705	[1193, 1194]	1405	[1806, 1807]	2105	[619, 2197]
6	[13, 14]	706	[1195, 1196]	1406	[1808, 1809]	2106	[132, 2327]
7	[15, 16]	707	[1197, 1198]	1407	[1810, 1811]	2107	[1635, 1497]
8	[17, 18]	708	[1199, 1200]	1408	[1812, 1813]	2108	[2333, 1427]
9	[19, 20]	709	[1201, 1202]	1409	[1814, 1815]	2109	[2334, 2335]
10	[21, 22]	710	[1203, 1201]	1410	[1816, 1091]	2110	[2222, 2336]
11	[23, 24]	711	[1204, 462]	1411	[1773, 1817]	2111	[1635, 2313]
12	[25, 26]	712	[1205, 1007]	1412	[1818, 1819]	2112	[514, 635]
13	[27, 28]	713	[1206, 1207]	1413	[990, 1820]	2113	[2285, 196]
14	[29, 30]	714	[1208, 1209]	1414	[1821, 1822]	2114	[1464, 1479]
15	[31, 32]	715	[1210, 1211]	1415	[1823, 1824]	2115	[2186, 2337]
16	[33, 34]	716	[954, 1212]	1416	[1825, 1826]	2116	[2338, 2241]
17	[35, 36]	717	[1213, 1027]	1417	[1827, 1828]	2117	[2339, 655]
18	[37, 38]	718	[1214, 1215]	1418	[1829, 90]	2118	[2268, 2340]
19	[39, 40]	719	[1216, 1013]	1419	[1830, 1831]	2119	[1323, 2184]
20	[41, 42]	720	[1217, 1218]	1420	[1832, 1833]	2120	[1382, 470]
21	[43, 44]	721	[1219, 1220]	1421	[1834, 1806]	2121	[684, 136]
22	[45, 46]	722	[1221, 1222]	1422	[1835, 1836]	2122	[615, 673]
23	[47, 48]	723	[1223, 1224]	1423	[123, 1837]	2123	[710, 1638]
24	[49, 50]	724	[1225, 1226]	1424	[1838, 1839]	2124	[2227, 2192]
25	[51, 52]	725	[1227, 1228]	1425	[1840, 879]	2125	[763, 1604]
26	[53, 54]	726	[1229, 294]	1426	[1841, 1842]	2126	[1334, 485]
27	[55, 56]	727	[1230, 1172]	1427	[1843, 360]	2127	[643, 2341]
28	[57, 58]	728	[1231, 1232]	1428	[1278, 1844]	2128	[697, 519]
29	[59, 60]	729	[64, 1233]	1429	[1845, 810]	2129	[2183, 238]
30	[61, 62]	730	[1234, 779]	1430	[1846, 1847]	2130	[2342, 2178]
31	[63, 64]	731	[1235, 1236]	1431	[1848, 1849]	2131	[51, 2195]
32	[65, 66]	732	[1237, 1140]	1432	[1850, 295]	2132	[731, 2332]
33	[67, 68]	733	[1238, 1180]	1433	[1851, 1852]	2133	[1644, 2291]
34	[69, 70]	734	[1239, 1240]	1434	[1853, 1854]	2134	[479, 513]
35	[71, 72]	735	[1241, 834]	1435	[1855, 1856]	2135	[1471, 10]
36	[73, 74]	736	[1242, 1241]	1436	[1857, 1858]	2136	[704, 768]
37	[75, 76]	737	[1243, 428]	1437	[450, 435]	2137	[2298, 60]
38	[77, 78]	738	[1244, 1121]	1438	[1859, 1860]	2138	[1586, 1403]
39	[79, 80]	739	[263, 1245]	1439	[1861, 1756]	2139	[505, 1342]
40	[81, 82]	740	[1246, 361]	1440	[1862, 1863]	2140	[163, 606]
41	[83, 84]	741	[1247, 1248]	1441	[1864, 1766]	2141	[58, 2343]
42	[85, 86]	742	[1249, 1250]	1442	[1865, 793]	2142	[2318, 2344]

43	[87, 88]	743	[1251, 1252]	1443	[1866, 1867]	2143	[2345, 680]
44	[89, 90]	744	[1253, 1027]	1444	[1868, 1753]	2144	[2346, 2209]
45	[91, 92]	745	[1254, 1057]	1445	[1869, 397]	2145	[2297, 159]
46	[93, 66]	746	[1255, 83]	1446	[1870, 849]	2146	[2220, 225]
47	[94, 95]	747	[1256, 1257]	1447	[433, 1735]	2147	[1303, 1588]
48	[96, 97]	748	[1258, 852]	1448	[1871, 1872]	2148	[32, 729]
49	[98, 99]	749	[1259, 342]	1449	[1873, 1130]	2149	[1551, 2221]
50	[100, 101]	750	[1260, 116]	1450	[1874, 802]	2150	[562, 1437]
51	[102, 103]	751	[1261, 1262]	1451	[1250, 1875]	2151	[1431, 544]
52	[104, 105]	752	[1263, 1264]	1452	[1876, 1877]	2152	[1352, 714]
53	[106, 107]	753	[1265, 82]	1453	[1878, 1879]	2153	[208, 518]
54	[108, 109]	754	[1266, 1267]	1454	[1880, 1881]	2154	[47, 1474]
55	[110, 111]	755	[1268, 1013]	1455	[1882, 1113]	2155	[527, 2347]
56	[112, 113]	756	[1269, 1270]	1456	[1883, 1884]	2156	[206, 621]
57	[114, 115]	757	[332, 1271]	1457	[1885, 1194]	2157	[2348, 1014]
58	[116, 117]	758	[1272, 1273]	1458	[1886, 1887]	2158	[2349, 2350]
59	[118, 119]	759	[1274, 1275]	1459	[1888, 1889]	2159	[2351, 2352]
60	[120, 121]	760	[1276, 439]	1460	[1890, 1891]	2160	[2353, 1881]
61	[122, 123]	761	[1277, 1278]	1461	[1892, 1675]	2161	[2354, 2355]
62	[124, 125]	762	[1279, 1085]	1462	[1893, 1894]	2162	[2356, 2037]
63	[42, 126]	763	[1280, 1281]	1463	[1895, 1896]	2163	[2357, 2358]
64	[127, 128]	764	[1282, 3]	1464	[1897, 1102]	2164	[2098, 2126]
65	[129, 130]	765	[289, 787]	1465	[1898, 1170]	2165	[2359, 977]
66	[131, 132]	766	[1283, 4]	1466	[1899, 1900]	2166	[2360, 1135]
67	[133, 134]	767	[1284, 1285]	1467	[1901, 1902]	2167	[2361, 389]
68	[135, 136]	768	[1286, 1287]	1468	[1903, 1904]	2168	[2362, 1691]
69	[137, 138]	769	[1288, 1289]	1469	[1905, 1906]	2169	[2363, 415]
70	[139, 140]	770	[1290, 1291]	1470	[1907, 1908]	2170	[2364, 2365]
71	[141, 142]	771	[1292, 1293]	1471	[1909, 1910]	2171	[2366, 853]
72	[143, 144]	772	[1294, 1295]	1472	[1911, 1912]	2172	[437, 1210]
73	[145, 146]	773	[1296, 336]	1473	[1913, 1914]	2173	[2367, 2368]
74	[147, 54]	774	[1297, 1298]	1474	[1915, 1916]	2174	[2369, 876]
75	[59, 128]	775	[348, 318]	1475	[1783, 1917]	2175	[2370, 1801]
76	[148, 149]	776	[1299, 955]	1476	[1918, 378]	2176	[2371, 1292]
77	[150, 132]	777	[1300, 1301]	1477	[1919, 947]	2177	[2372, 2373]
78	[151, 152]	778	[705, 207]	1478	[1920, 1921]	2178	[2374, 957]
79	[153, 154]	779	[693, 1302]	1479	[1922, 303]	2179	[2375, 2376]
80	[155, 156]	780	[1303, 683]	1480	[1923, 1924]	2180	[2377, 2378]
81	[157, 158]	781	[209, 1304]	1481	[1925, 1926]	2181	[2379, 2380]
82	[159, 60]	782	[1305, 751]	1482	[1927, 1175]	2182	[2381, 1769]
83	[160, 161]	783	[145, 700]	1483	[1928, 429]	2183	[2382, 2383]
84	[162, 163]	784	[534, 1306]	1484	[1929, 1930]	2184	[999, 2384]
85	[164, 165]	785	[1307, 674]	1485	[1931, 101]	2185	[2385, 1987]
86	[166, 167]	786	[161, 707]	1486	[982, 1932]	2186	[2386, 2387]

87	[168, 169]	787	[185, 1308]	1487	[1933, 1934]	2187	[2388, 921]
88	[170, 171]	788	[540, 38]	1488	[1935, 1900]	2188	[2389, 2364]
89	[145, 172]	789	[12, 1309]	1489	[1936, 1937]	2189	[2390, 1903]
90	[173, 174]	790	[1310, 196]	1490	[1938, 834]	2190	[2391, 2392]
91	[175, 176]	791	[700, 1311]	1491	[1939, 1940]	2191	[2393, 2394]
92	[177, 178]	792	[195, 1312]	1492	[1941, 907]	2192	[2395, 1285]
93	[179, 180]	793	[1313, 764]	1493	[1942, 1943]	2193	[2396, 951]
94	[181, 182]	794	[1314, 1315]	1494	[1944, 1903]	2194	[2397, 2398]
95	[183, 184]	795	[1316, 670]	1495	[1945, 1192]	2195	[2399, 1252]
96	[185, 186]	796	[1317, 1318]	1496	[1946, 1947]	2196	[2400, 2401]
97	[187, 188]	797	[1319, 1320]	1497	[1948, 1949]	2197	[946, 1970]
98	[189, 190]	798	[610, 721]	1498	[1950, 1951]	2198	[2402, 2403]
99	[191, 192]	799	[14, 516]	1499	[864, 1952]	2199	[2404, 1161]
100	[193, 194]	800	[1321, 1322]	1500	[1953, 799]	2200	[2405, 1198]
101	[195, 196]	801	[1323, 1324]	1501	[1954, 958]	2201	[800, 884]
102	[197, 198]	802	[1325, 721]	1502	[885, 77]	2202	[2406, 807]
103	[199, 200]	803	[537, 1326]	1503	[1955, 1956]	2203	[2407, 1884]
104	[201, 202]	804	[126, 720]	1504	[1957, 1958]	2204	[2408, 422]
105	[149, 203]	805	[1327, 607]	1505	[1959, 1960]	2205	[2409, 1936]
106	[204, 205]	806	[1319, 1328]	1506	[1961, 1293]	2206	[2410, 1844]
107	[206, 207]	807	[502, 637]	1507	[1962, 1963]	2207	[2411, 816]
108	[208, 209]	808	[1329, 1330]	1508	[1964, 826]	2208	[2412, 2413]
109	[210, 211]	809	[664, 498]	1509	[1965, 1966]	2209	[2414, 251]
110	[212, 213]	810	[499, 495]	1510	[1967, 1968]	2210	[2415, 122]
111	[214, 215]	811	[737, 735]	1511	[1969, 1970]	2211	[2416, 2417]
112	[216, 217]	812	[1331, 1332]	1512	[1971, 1972]	2212	[2418, 2419]
113	[218, 219]	813	[582, 219]	1513	[1943, 969]	2213	[2420, 2421]
114	[220, 221]	814	[227, 747]	1514	[1973, 1974]	2214	[2422, 2423]
115	[222, 223]	815	[213, 211]	1515	[1975, 75]	2215	[2424, 1001]
116	[224, 225]	816	[656, 184]	1516	[1976, 1977]	2216	[2425, 2426]
117	[226, 140]	817	[1333, 1334]	1517	[1978, 315]	2217	[2427, 1073]
118	[227, 228]	818	[726, 1302]	1518	[1979, 1856]	2218	[2428, 2429]
119	[229, 230]	819	[1335, 1336]	1519	[1980, 1883]	2219	[2430, 1960]
120	[183, 231]	820	[1337, 494]	1520	[1981, 1672]	2220	[2431, 2432]
121	[232, 233]	821	[153, 1338]	1521	[1681, 1706]	2221	[2433, 303]
122	[234, 235]	822	[1339, 607]	1522	[1982, 1783]	2222	[2434, 2435]
123	[236, 237]	823	[619, 1340]	1523	[1983, 1984]	2223	[2436, 934]
124	[238, 239]	824	[1341, 493]	1524	[1985, 1917]	2224	[2437, 2438]
125	[240, 241]	825	[766, 1342]	1525	[1986, 1987]	2225	[2439, 3]
126	[242, 243]	826	[130, 1343]	1526	[1988, 1989]	2226	[2440, 2094]
127	[244, 245]	827	[731, 1344]	1527	[1990, 864]	2227	[813, 2441]
128	[246, 247]	828	[753, 206]	1528	[1991, 1813]	2228	[2442, 1764]
129	[248, 249]	829	[667, 34]	1529	[1992, 1993]	2229	[2443, 2444]
130	[250, 251]	830	[746, 620]	1530	[1994, 1208]	2230	[2445, 420]

131	[252, 253]	831	[540, 709]	1531	[1995, 1996]	2231	[2446, 2447]
132	[254, 255]	832	[1345, 660]	1532	[1997, 1998]	2232	[2448, 79]
133	[256, 257]	833	[1346, 739]	1533	[1999, 109]	2233	[2449, 293]
134	[258, 259]	834	[739, 735]	1534	[1689, 2000]	2234	[2450, 304]
135	[260, 261]	835	[737, 660]	1535	[2001, 1120]	2235	[2451, 1729]
136	[262, 263]	836	[735, 496]	1536	[2002, 2003]	2236	[2452, 1287]
137	[264, 265]	837	[1347, 1346]	1537	[2004, 1217]	2237	[2453, 1058]
138	[266, 267]	838	[494, 500]	1538	[2005, 418]	2238	[1801, 1716]
139	[268, 269]	839	[1346, 737]	1539	[2006, 1751]	2239	[2454, 803]
140	[270, 271]	840	[135, 1347]	1540	[2007, 2008]	2240	[2455, 1254]
141	[272, 273]	841	[1348, 660]	1541	[2009, 869]	2241	[2456, 803]
142	[274, 275]	842	[715, 720]	1542	[2010, 2011]	2242	[2457, 1972]
143	[276, 277]	843	[1349, 620]	1543	[2012, 1144]	2243	[2458, 22]
144	[278, 279]	844	[1350, 1351]	1544	[2013, 428]	2244	[2459, 1711]
145	[280, 281]	845	[1352, 755]	1545	[2014, 2015]	2245	[2460, 283]
146	[282, 283]	846	[712, 1353]	1546	[2016, 398]	2246	[2461, 2462]
147	[284, 285]	847	[716, 699]	1547	[2017, 2018]	2247	[2463, 2464]
148	[286, 287]	848	[172, 701]	1548	[2019, 2020]	2248	[2465, 862]
149	[288, 289]	849	[219, 1354]	1549	[2021, 2022]	2249	[2466, 2467]
150	[290, 291]	850	[1355, 1356]	1550	[2023, 2024]	2250	[2468, 967]
151	[292, 293]	851	[201, 1357]	1551	[2025, 2026]	2251	[2469, 2470]
152	[294, 295]	852	[610, 692]	1552	[2027, 2028]	2252	[103, 2471]
153	[296, 297]	853	[597, 727]	1553	[2029, 2030]	2253	[2472, 2473]
154	[298, 95]	854	[165, 540]	1554	[1651, 2031]	2254	[2474, 2475]
155	[299, 300]	855	[743, 1358]	1555	[2032, 2033]	2255	[2476, 2477]
156	[301, 302]	856	[1359, 1360]	1556	[2034, 1656]	2256	[2478, 2479]
157	[303, 304]	857	[1361, 1362]	1557	[2035, 1989]	2257	[2480, 414]
158	[305, 260]	858	[1363, 1364]	1558	[2036, 262]	2258	[2481, 2482]
159	[306, 307]	859	[669, 1308]	1559	[2037, 1996]	2259	[2483, 2484]
160	[308, 309]	860	[621, 1365]	1560	[2038, 2039]	2260	[2485, 1057]
161	[310, 311]	861	[643, 1366]	1561	[2040, 2041]	2261	[2486, 286]
162	[312, 313]	862	[1367, 1368]	1562	[2042, 2043]	2262	[2487, 1852]
163	[314, 315]	863	[763, 1369]	1563	[2044, 2045]	2263	[2488, 2140]
164	[316, 75]	864	[150, 465]	1564	[2046, 1724]	2264	[2489, 2490]
165	[317, 318]	865	[12, 633]	1565	[2047, 2048]	2265	[2491, 442]
166	[319, 320]	866	[734, 8]	1566	[2049, 2050]	2266	[2492, 1245]
167	[321, 322]	867	[1370, 1371]	1567	[2051, 2052]	2267	[2493, 452]
168	[88, 323]	868	[644, 1372]	1568	[2053, 2054]	2268	[2494, 1765]
169	[324, 325]	869	[1373, 1374]	1569	[2055, 1708]	2269	[2495, 1035]
170	[326, 327]	870	[615, 771]	1570	[2056, 2057]	2270	[2419, 2496]
171	[328, 270]	871	[56, 1375]	1571	[2058, 2059]	2271	[782, 1231]
172	[329, 330]	872	[1376, 1377]	1572	[2060, 2061]	2272	[2497, 2065]
173	[331, 332]	873	[1317, 1378]	1573	[2062, 2063]	2273	[2498, 2473]
174	[333, 334]	874	[514, 1379]	1574	[2064, 1936]	2274	[2499, 18]

175	[335, 336]	875	[583, 1380]	1575	[2065, 2066]	2275	[2500, 784]
176	[337, 338]	876	[487, 587]	1576	[2067, 2068]	2276	[2501, 1096]
177	[339, 340]	877	[1381, 1375]	1577	[2069, 1286]	2277	[2502, 2503]
178	[341, 342]	878	[1382, 1383]	1578	[2070, 2071]	2278	[2504, 2505]
179	[343, 344]	879	[574, 590]	1579	[2072, 872]	2279	[2506, 1248]
180	[345, 346]	880	[1384, 1385]	1580	[2073, 2074]	2280	[2507, 871]
181	[347, 348]	881	[742, 504]	1581	[423, 243]	2281	[2508, 2509]
182	[349, 350]	882	[1386, 1332]	1582	[2075, 2076]	2282	[2510, 2137]
183	[351, 352]	883	[532, 14]	1583	[1177, 1017]	2283	[2511, 912]
184	[353, 354]	884	[1387, 150]	1584	[2077, 2003]	2284	[1726, 1015]
185	[355, 356]	885	[638, 489]	1585	[2078, 875]	2285	[2512, 2513]
186	[357, 358]	886	[718, 1388]	1586	[2079, 2080]	2286	[2514, 2515]
187	[359, 360]	887	[1389, 1368]	1587	[2081, 2082]	2287	[2516, 805]
188	[361, 362]	888	[153, 1390]	1588	[2083, 1734]	2288	[2517, 1921]
189	[363, 364]	889	[1391, 1392]	1589	[2084, 2040]	2289	[2518, 2519]
190	[365, 366]	890	[1393, 1394]	1590	[2085, 1209]	2290	[68, 2090]
191	[367, 368]	891	[621, 1395]	1591	[2086, 2087]	2291	[2520, 2521]
192	[369, 370]	892	[1396, 723]	1592	[2088, 790]	2292	[2522, 1211]
193	[371, 372]	893	[1397, 1398]	1593	[2089, 2090]	2293	[2523, 1015]
194	[373, 374]	894	[611, 1399]	1594	[2091, 2092]	2294	[2524, 992]
195	[375, 376]	895	[1400, 219]	1595	[2093, 2094]	2295	[2525, 1122]
196	[377, 378]	896	[1353, 203]	1596	[2095, 2096]	2296	[2526, 2447]
197	[379, 380]	897	[1401, 688]	1597	[2097, 2098]	2297	[2527, 1828]
198	[381, 382]	898	[58, 1402]	1598	[2099, 1151]	2298	[2528, 1745]
199	[383, 384]	899	[1315, 703]	1599	[344, 2100]	2299	[1776, 2529]
200	[385, 120]	900	[129, 1403]	1600	[2101, 2102]	2300	[2530, 2069]
201	[386, 387]	901	[1404, 536]	1601	[883, 2103]	2301	[2531, 2532]
202	[388, 389]	902	[1405, 7]	1602	[2104, 1052]	2302	[2533, 2534]
203	[390, 391]	903	[1406, 209]	1603	[2105, 798]	2303	[1951, 942]
204	[392, 393]	904	[527, 1399]	1604	[2106, 1698]	2304	[2535, 2536]
205	[394, 395]	905	[1407, 1408]	1605	[2107, 2108]	2305	[2537, 1949]
206	[396, 397]	906	[1337, 223]	1606	[2109, 64]	2306	[2538, 2539]
207	[398, 399]	907	[55, 225]	1607	[2110, 2111]	2307	[2540, 1298]
208	[400, 401]	908	[1409, 561]	1608	[2112, 2113]	2308	[2541, 2542]
209	[402, 403]	909	[185, 1410]	1609	[2114, 1273]	2309	[2543, 2544]
210	[404, 405]	910	[578, 1411]	1610	[1289, 901]	2310	[2545, 1203]
211	[406, 407]	911	[1383, 46]	1611	[1023, 1219]	2311	[2546, 263]
212	[408, 406]	912	[513, 565]	1612	[30, 926]	2312	[1769, 2547]
213	[409, 410]	913	[726, 151]	1613	[2115, 2116]	2313	[2548, 1034]
214	[411, 412]	914	[609, 720]	1614	[2117, 1292]	2314	[2549, 2550]
215	[413, 414]	915	[1412, 1392]	1615	[2118, 2039]	2315	[2551, 1781]
216	[415, 416]	916	[1413, 639]	1616	[2119, 259]	2316	[870, 2552]
217	[417, 418]	917	[700, 1414]	1617	[2120, 2121]	2317	[2553, 663]
218	[419, 354]	918	[7, 178]	1618	[2122, 408]	2318	[2554, 2555]

219	[420, 421]	919	[207, 1415]	1619	[2123, 2124]	2319	[2556, 993]
220	[422, 423]	920	[1416, 1417]	1620	[2125, 2126]	2320	[2557, 2558]
221	[424, 425]	921	[234, 1418]	1621	[1739, 2076]	2321	[2559, 1667]
222	[426, 427]	922	[1419, 465]	1622	[2127, 395]	2322	[1761, 2560]
223	[428, 429]	923	[1420, 748]	1623	[401, 2128]	2323	[315, 2561]
224	[430, 431]	924	[175, 719]	1624	[2129, 2130]	2324	[2562, 2520]
225	[432, 433]	925	[1421, 1354]	1625	[2131, 1887]	2325	[2563, 1257]
226	[434, 435]	926	[35, 1422]	1626	[2132, 70]	2326	[2564, 425]
227	[436, 437]	927	[62, 1423]	1627	[2133, 1649]	2327	[1912, 2565]
228	[438, 439]	928	[1424, 1425]	1628	[2134, 270]	2328	[251, 2095]
229	[440, 441]	929	[1426, 1427]	1629	[2135, 1288]	2329	[393, 2566]
230	[442, 443]	930	[1428, 1429]	1630	[2136, 2137]	2330	[1233, 2567]
231	[444, 445]	931	[191, 754]	1631	[2138, 959]	2331	[2568, 2569]
232	[446, 447]	932	[1430, 1418]	1632	[2139, 2140]	2332	[2570, 1867]
233	[448, 332]	933	[1431, 532]	1633	[431, 1694]	2333	[860, 2571]
234	[449, 450]	934	[1432, 239]	1634	[2141, 925]	2334	[2572, 1202]
235	[451, 452]	935	[548, 1433]	1635	[2142, 2143]	2335	[1226, 1243]
236	[453, 454]	936	[1434, 1435]	1636	[2144, 321]	2336	[2573, 2574]
237	[455, 456]	937	[558, 193]	1637	[2145, 2146]	2337	[2575, 1157]
238	[457, 458]	938	[1436, 1437]	1638	[2147, 2148]	2338	[2576, 2577]
239	[459, 460]	939	[1438, 33]	1639	[2149, 2150]	2339	[2578, 2579]
240	[461, 390]	940	[1439, 147]	1640	[1098, 1146]	2340	[2580, 322]
241	[462, 463]	941	[42, 609]	1641	[2151, 2152]	2341	[1264, 2581]
242	[137, 464]	942	[1440, 485]	1642	[2153, 1081]	2342	[2582, 2583]
243	[131, 465]	943	[656, 1441]	1643	[2154, 1197]	2343	[1163, 2011]
244	[466, 467]	944	[739, 660]	1644	[2155, 1270]	2344	[2584, 1132]
245	[468, 469]	945	[1442, 1443]	1645	[2156, 859]	2345	[2585, 2586]
246	[470, 46]	946	[1329, 684]	1646	[540, 2157]	2346	[2587, 2588]
247	[471, 472]	947	[726, 572]	1647	[2158, 1356]	2347	[2589, 896]
248	[473, 177]	948	[226, 771]	1648	[755, 724]	2348	[33, 626]
249	[474, 475]	949	[669, 186]	1649	[507, 703]	2349	[598, 2282]
250	[476, 477]	950	[213, 510]	1650	[530, 744]	2350	[1516, 2231]
251	[206, 478]	951	[1444, 1445]	1651	[173, 1377]	2351	[2185, 2590]
252	[479, 480]	952	[232, 565]	1652	[2159, 2160]	2352	[2591, 685]
253	[481, 482]	953	[476, 1446]	1653	[2161, 1486]	2353	[1563, 1454]
254	[137, 483]	954	[617, 219]	1654	[1377, 672]	2354	[31, 674]
255	[484, 485]	955	[1447, 743]	1655	[2162, 1510]	2355	[713, 755]
256	[486, 487]	956	[175, 1388]	1656	[578, 1486]	2356	[769, 471]
257	[488, 489]	957	[628, 1312]	1657	[711, 240]	2357	[769, 1443]
258	[490, 491]	958	[1448, 1449]	1658	[1498, 1632]	2358	[135, 482]
259	[492, 493]	959	[759, 695]	1659	[130, 1364]	2359	[668, 1506]
260	[494, 495]	960	[1450, 1451]	1660	[179, 1616]	2360	[2162, 1409]
261	[496, 495]	961	[1452, 144]	1661	[680, 544]	2361	[1485, 2276]
262	[497, 498]	962	[1453, 1454]	1662	[2163, 2164]	2362	[1362, 1602]

263	[499, 500]	963	[1455, 1456]	1663	[1373, 2165]	2363	[132, 2340]
264	[501, 502]	964	[1350, 1376]	1664	[708, 1529]	2364	[2249, 2592]
265	[503, 504]	965	[1392, 34]	1665	[199, 1417]	2365	[2593, 2594]
266	[505, 506]	966	[1407, 45]	1666	[2166, 647]	2366	[2235, 2595]
267	[13, 507]	967	[1336, 1457]	1667	[144, 1323]	2367	[1605, 2596]
268	[508, 509]	968	[648, 1458]	1668	[1303, 2167]	2368	[2597, 2598]
269	[210, 510]	969	[1459, 230]	1669	[1527, 241]	2369	[1313, 1369]
270	[511, 512]	970	[1405, 177]	1670	[1450, 1358]	2370	[232, 1564]
271	[513, 233]	971	[1460, 215]	1671	[1597, 161]	2371	[1442, 1609]
272	[514, 515]	972	[611, 1461]	1672	[1314, 14]	2372	[170, 2599]
273	[507, 516]	973	[768, 478]	1673	[1601, 2168]	2373	[1438, 1392]
274	[517, 518]	974	[1462, 558]	1674	[700, 1626]	2374	[58, 1394]
275	[62, 519]	975	[1463, 758]	1675	[1469, 1354]	2375	[2297, 127]
276	[520, 127]	976	[1464, 1465]	1676	[1386, 2169]	2376	[2600, 138]
277	[521, 522]	977	[1466, 493]	1677	[638, 1592]	2377	[1321, 723]
278	[523, 524]	978	[495, 1330]	1678	[2170, 2171]	2378	[625, 1352]
279	[495, 135]	979	[576, 737]	1679	[2172, 42]	2379	[2254, 2601]
280	[520, 59]	980	[498, 663]	1680	[2173, 1517]	2380	[1613, 171]
281	[525, 526]	981	[1376, 1467]	1681	[1383, 2174]	2381	[1624, 2602]
282	[527, 528]	982	[508, 1422]	1682	[497, 497]	2382	[1599, 2225]
283	[529, 54]	983	[1431, 1314]	1683	[560, 2175]	2383	[659, 231]
284	[530, 531]	984	[1392, 668]	1684	[2176, 139]	2384	[221, 592]
285	[532, 507]	985	[617, 583]	1685	[2177, 2178]	2385	[1644, 2603]
286	[533, 534]	986	[1468, 1318]	1686	[481, 575]	2386	[623, 2604]
287	[535, 536]	987	[1362, 1320]	1687	[576, 739]	2387	[2605, 1488]
288	[537, 538]	988	[1469, 1380]	1688	[1347, 738]	2388	[730, 1419]
289	[539, 540]	989	[1377, 1470]	1689	[1424, 200]	2389	[598, 2606]
290	[541, 542]	990	[1471, 624]	1690	[193, 1621]	2390	[2286, 172]
291	[500, 135]	991	[661, 529]	1691	[702, 516]	2391	[732, 1366]
292	[543, 217]	992	[1472, 465]	1692	[523, 774]	2392	[1310, 1312]
293	[544, 14]	993	[127, 60]	1693	[35, 509]	2393	[126, 1325]
294	[545, 546]	994	[539, 37]	1694	[741, 188]	2394	[2607, 1318]
295	[229, 547]	995	[645, 539]	1695	[2179, 2163]	2395	[1478, 2200]
296	[548, 549]	996	[1473, 628]	1696	[2180, 1369]	2396	[1501, 232]
297	[550, 551]	997	[1460, 580]	1697	[632, 1309]	2397	[1401, 1356]
298	[552, 2]	998	[133, 221]	1698	[1367, 637]	2398	[2289, 150]
299	[219, 553]	999	[136, 576]	1699	[135, 575]	2399	[626, 2290]
300	[554, 555]	1000	[585, 483]	1700	[664, 663]	2400	[2318, 2230]
301	[556, 557]	1001	[1474, 1475]	1701	[2181, 2182]	2401	[1577, 2241]
302	[558, 559]	1002	[1378, 1476]	1702	[574, 512]	2402	[2305, 1571]
303	[560, 561]	1003	[1477, 1360]	1703	[2183, 597]	2403	[657, 1302]
304	[562, 563]	1004	[666, 218]	1704	[1519, 483]	2404	[497, 664]
305	[564, 565]	1005	[754, 714]	1705	[494, 1329]	2405	[1448, 2326]
306	[566, 567]	1006	[1448, 180]	1706	[774, 1502]	2406	[619, 194]

307	[568, 510]	1007	[586, 1323]	1707	[1537, 715]	2407	[708, 2288]
308	[569, 570]	1008	[1478, 1479]	1708	[192, 714]	2408	[189, 2250]
309	[571, 572]	1009	[487, 1323]	1709	[1323, 1398]	2409	[2247, 2165]
310	[573, 574]	1010	[1469, 553]	1710	[725, 1499]	2410	[1360, 1574]
311	[575, 576]	1011	[1480, 1481]	1711	[214, 580]	2411	[133, 665]
312	[577, 578]	1012	[1482, 1483]	1712	[1397, 2184]	2412	[2211, 2608]
313	[579, 580]	1013	[1303, 1475]	1713	[495, 481]	2413	[2609, 1435]
314	[581, 531]	1014	[1484, 1375]	1714	[223, 495]	2414	[1361, 1319]
315	[582, 583]	1015	[1485, 775]	1715	[481, 1347]	2415	[1327, 236]
316	[584, 148]	1016	[708, 1458]	1716	[223, 500]	2416	[199, 2610]
317	[585, 464]	1017	[1385, 1486]	1717	[136, 738]	2417	[2611, 2315]
318	[586, 587]	1018	[189, 1435]	1718	[136, 1346]	2418	[209, 1623]
319	[588, 567]	1019	[1487, 1488]	1719	[2185, 1596]	2419	[1562, 1360]
320	[589, 188]	1020	[1489, 1490]	1720	[1359, 618]	2420	[148, 725]
321	[542, 590]	1021	[1491, 1326]	1721	[1350, 173]	2421	[2607, 1378]
322	[591, 592]	1022	[1492, 236]	1722	[1432, 727]	2422	[1504, 1636]
323	[593, 594]	1023	[1493, 1494]	1723	[533, 163]	2423	[1339, 1404]
324	[595, 596]	1024	[39, 1495]	1724	[1472, 132]	2424	[630, 1344]
325	[597, 239]	1025	[1496, 1497]	1725	[181, 1485]	2425	[2612, 2613]
326	[598, 599]	1026	[1498, 12]	1726	[1347, 576]	2426	[1462, 618]
327	[600, 42]	1027	[149, 1499]	1727	[1409, 2175]	2427	[2286, 700]
328	[601, 602]	1028	[237, 202]	1728	[712, 241]	2428	[2305, 1556]
329	[603, 604]	1029	[216, 1500]	1729	[694, 152]	2429	[2614, 2165]
330	[605, 606]	1030	[705, 478]	1730	[2186, 2171]	2430	[1335, 1444]
331	[224, 56]	1031	[1447, 504]	1731	[2187, 680]	2431	[2330, 628]
332	[607, 237]	1032	[1459, 547]	1732	[2188, 2189]	2432	[474, 546]
333	[166, 608]	1033	[1501, 480]	1733	[2190, 184]	2433	[776, 562]
334	[609, 610]	1034	[1444, 1457]	1734	[770, 1610]	2434	[1523, 2615]
335	[611, 528]	1035	[182, 1502]	1735	[2191, 2192]	2435	[2616, 594]
336	[464, 612]	1036	[693, 151]	1736	[207, 622]	2436	[2617, 2618]
337	[613, 614]	1037	[165, 37]	1737	[2193, 1510]	2437	[2186, 2619]
338	[615, 140]	1038	[1503, 1417]	1738	[479, 564]	2438	[2301, 154]
339	[616, 617]	1039	[545, 475]	1739	[1347, 736]	2439	[1362, 2205]
340	[618, 619]	1040	[1504, 1505]	1740	[569, 1491]	2440	[1393, 1402]
341	[227, 620]	1041	[1391, 647]	1741	[2194, 526]	2441	[2331, 717]
342	[621, 622]	1042	[626, 1506]	1742	[476, 2195]	2442	[2193, 2203]
343	[623, 624]	1043	[177, 8]	1743	[766, 506]	2443	[2301, 2598]
344	[625, 192]	1044	[1507, 1508]	1744	[1400, 583]	2444	[2620, 1569]
345	[626, 627]	1045	[1509, 230]	1745	[1385, 1411]	2445	[2621, 1429]
346	[628, 196]	1046	[1431, 13]	1746	[694, 1583]	2446	[1350, 1631]
347	[629, 586]	1047	[570, 1326]	1747	[763, 1526]	2447	[570, 538]
348	[630, 631]	1048	[585, 1455]	1748	[704, 206]	2448	[2281, 2622]
349	[632, 633]	1049	[541, 574]	1749	[618, 559]	2449	[642, 732]
350	[634, 493]	1050	[660, 223]	1750	[185, 670]	2450	[192, 2623]

351	[490, 635]	1051	[585, 138]	1751	[729, 1423]	2451	[696, 2624]
352	[636, 637]	1052	[1510, 561]	1752	[1393, 1531]	2452	[2201, 2625]
353	[638, 639]	1053	[1453, 175]	1753	[1466, 762]	2453	[127, 2626]
354	[607, 536]	1054	[1403, 1343]	1754	[2196, 10]	2454	[595, 2335]
355	[580, 640]	1055	[1440, 1511]	1755	[193, 2197]	2455	[1387, 1419]
356	[629, 641]	1056	[646, 37]	1756	[1566, 475]	2456	[1537, 126]
357	[642, 643]	1057	[1419, 132]	1757	[687, 1356]	2457	[1541, 2627]
358	[644, 54]	1058	[1512, 1513]	1758	[2198, 607]	2458	[658, 183]
359	[645, 646]	1059	[1514, 1515]	1759	[237, 2199]	2459	[2265, 229]
360	[647, 34]	1060	[1516, 31]	1760	[776, 1418]	2460	[11, 632]
361	[648, 649]	1061	[552, 1517]	1761	[148, 241]	2461	[1537, 1611]
362	[650, 622]	1062	[1518, 537]	1762	[1464, 2200]	2462	[647, 668]
363	[168, 651]	1063	[1519, 138]	1763	[720, 721]	2463	[2301, 1390]
364	[652, 653]	1064	[1493, 1520]	1764	[2201, 2202]	2464	[2628, 1352]
365	[654, 655]	1065	[1440, 1521]	1765	[2203, 561]	2465	[689, 2629]
366	[656, 231]	1066	[1345, 1337]	1766	[641, 1323]	2466	[2222, 2630]
367	[520, 159]	1067	[1307, 32]	1767	[1512, 677]	2467	[2631, 31]
368	[657, 572]	1068	[1360, 559]	1768	[603, 1585]	2468	[2308, 2632]
369	[658, 659]	1069	[1522, 1474]	1769	[1314, 507]	2469	[1553, 502]
370	[660, 494]	1070	[1523, 723]	1770	[1562, 1617]	2470	[2323, 1584]
371	[661, 53]	1071	[237, 1524]	1771	[2204, 639]	2471	[2198, 1404]
372	[662, 485]	1072	[1331, 1525]	1772	[1319, 2205]	2472	[707, 2633]
373	[663, 664]	1073	[1403, 1364]	1773	[746, 756]	2473	[14, 703]
374	[665, 592]	1074	[1313, 1526]	1774	[164, 646]	2474	[1613, 1548]
375	[666, 617]	1075	[584, 1527]	1775	[729, 2206]	2475	[2634, 2279]
376	[667, 668]	1076	[1360, 619]	1776	[1523, 1322]	2476	[546, 1539]
377	[669, 670]	1077	[488, 1528]	1777	[2207, 484]	2477	[143, 641]
378	[671, 672]	1078	[711, 1527]	1778	[49, 526]	2478	[717, 2635]
379	[226, 673]	1079	[33, 668]	1779	[2203, 1559]	2479	[486, 641]
380	[674, 62]	1080	[648, 1529]	1780	[42, 715]	2480	[1393, 2343]
381	[192, 675]	1081	[1467, 757]	1781	[1551, 2164]	2481	[1473, 195]
382	[676, 677]	1082	[1530, 1352]	1782	[2208, 2209]	2482	[1406, 1584]
383	[678, 40]	1083	[58, 1531]	1783	[470, 2174]	2483	[182, 2636]
384	[679, 680]	1084	[1447, 1450]	1784	[1628, 139]	2484	[134, 1581]
385	[601, 681]	1085	[650, 1365]	1785	[1532, 659]	2485	[1373, 2248]
386	[682, 605]	1086	[1532, 656]	1786	[575, 736]	2486	[1492, 535]
387	[48, 683]	1087	[1330, 482]	1787	[776, 1436]	2487	[680, 13]
388	[495, 684]	1088	[1522, 1533]	1788	[1533, 1475]	2488	[1541, 2275]
389	[480, 565]	1089	[1534, 1535]	1789	[736, 1345]	2489	[42, 1611]
390	[685, 58]	1090	[204, 1536]	1790	[647, 626]	2490	[558, 619]
391	[235, 563]	1091	[483, 1456]	1791	[1436, 563]	2491	[173, 671]
392	[671, 686]	1092	[543, 1500]	1792	[548, 1576]	2492	[470, 2637]
393	[687, 688]	1093	[1351, 174]	1793	[2210, 31]	2493	[2228, 2627]
394	[689, 690]	1094	[1537, 609]	1794	[1598, 676]	2494	[1600, 644]

395	[691, 692]	1095	[661, 147]	1795	[560, 1559]	2495	[736, 1348]
396	[693, 694]	1096	[535, 237]	1796	[499, 1558]	2496	[162, 534]
397	[57, 695]	1097	[523, 1485]	1797	[668, 1640]	2497	[1514, 2638]
398	[696, 608]	1098	[735, 223]	1798	[1598, 1512]	2498	[732, 2639]
399	[240, 149]	1099	[1538, 1539]	1799	[2211, 1606]	2499	[742, 1450]
400	[674, 697]	1100	[1540, 685]	1800	[41, 551]	2500	[1386, 1525]
401	[698, 699]	1101	[1541, 490]	1801	[221, 1581]	2501	[2177, 2640]
402	[700, 701]	1102	[529, 1372]	1802	[1370, 1301]	2502	[2272, 2641]
403	[702, 703]	1103	[1409, 1542]	1803	[1351, 1377]	2503	[1336, 1445]
404	[704, 705]	1104	[674, 729]	1804	[573, 542]	2504	[14, 2309]
405	[706, 707]	1105	[1543, 1544]	1805	[1330, 136]	2505	[2642, 555]
406	[708, 649]	1106	[1545, 538]	1806	[712, 149]	2506	[2237, 2643]
407	[37, 709]	1107	[486, 144]	1807	[2212, 1529]	2507	[238, 2644]
408	[710, 37]	1108	[682, 163]	1808	[126, 691]	2508	[1471, 2645]
409	[711, 712]	1109	[645, 165]	1809	[2213, 1595]	2509	[2646, 2594]
410	[713, 714]	1110	[678, 1546]	1810	[1438, 647]	2510	[2647, 1544]
411	[715, 691]	1111	[1547, 1548]	1811	[2214, 758]	2511	[494, 1558]
412	[716, 717]	1112	[1549, 1319]	1812	[760, 2215]	2512	[645, 710]
413	[718, 719]	1113	[1376, 174]	1813	[636, 1368]	2513	[192, 755]
414	[720, 692]	1114	[1478, 1465]	1814	[2216, 2217]	2514	[1518, 1545]
415	[691, 721]	1115	[1550, 1341]	1815	[1555, 1411]	2515	[2648, 614]
416	[722, 723]	1116	[503, 743]	1816	[2218, 1625]	2516	[170, 1614]
417	[675, 724]	1117	[160, 1551]	1817	[729, 519]	2517	[2649, 2325]
418	[725, 203]	1118	[1552, 180]	1818	[2219, 1571]	2518	[569, 537]
419	[726, 694]	1119	[172, 1414]	1819	[2220, 1484]	2519	[2244, 522]
420	[238, 727]	1120	[1341, 762]	1820	[1412, 647]	2520	[2177, 2202]
421	[728, 729]	1121	[1345, 735]	1821	[2201, 2178]	2521	[1580, 140]
422	[730, 131]	1122	[496, 500]	1822	[48, 1475]	2522	[2201, 2640]
423	[731, 631]	1123	[1553, 1389]	1823	[161, 2221]	2523	[770, 2650]
424	[732, 733]	1124	[1554, 580]	1824	[225, 1633]	2524	[2177, 2625]
425	[734, 178]	1125	[466, 1508]	1825	[2222, 2223]	2525	[511, 2651]
426	[735, 499]	1126	[1555, 1486]	1826	[2172, 551]	2526	[1482, 158]
427	[736, 737]	1127	[1329, 481]	1827	[2224, 2189]	2527	[541, 1608]
428	[738, 739]	1128	[1348, 735]	1828	[2225, 1457]	2528	[35, 1587]
429	[663, 498]	1129	[172, 1311]	1829	[1386, 2226]	2529	[1492, 607]
430	[740, 741]	1130	[502, 1368]	1830	[1382, 1408]	2530	[2273, 749]
431	[742, 743]	1131	[616, 582]	1831	[482, 576]	2531	[1605, 2296]
432	[581, 744]	1132	[1556, 608]	1832	[674, 197]	2532	[2240, 753]
433	[745, 207]	1133	[1335, 1557]	1833	[2227, 748]	2533	[717, 1561]
434	[746, 747]	1134	[1558, 684]	1834	[226, 1593]	2534	[160, 706]
435	[187, 469]	1135	[693, 572]	1835	[2228, 490]	2535	[712, 725]
436	[748, 749]	1136	[1409, 1559]	1836	[464, 1456]	2536	[2652, 748]
437	[750, 751]	1137	[1560, 1561]	1837	[235, 1437]	2537	[1532, 2190]
438	[752, 643]	1138	[1562, 618]	1838	[2229, 2230]	2538	[623, 10]

439	[138, 612]	1139	[1563, 175]	1839	[2210, 2231]	2539	[1387, 131]
440	[753, 705]	1140	[534, 606]	1840	[2232, 2233]	2540	[755, 2653]
441	[754, 755]	1141	[560, 1542]	1841	[610, 2234]	2541	[2170, 2654]
442	[227, 756]	1142	[710, 540]	1842	[1480, 645]	2542	[189, 2592]
443	[671, 757]	1143	[641, 587]	1843	[2235, 557]	2543	[161, 689]
444	[630, 758]	1144	[1418, 563]	1844	[1302, 152]	2544	[572, 152]
445	[759, 58]	1145	[564, 1564]	1845	[1444, 2236]	2545	[1305, 685]
446	[760, 761]	1146	[1485, 1502]	1846	[501, 1389]	2546	[183, 1441]
447	[492, 762]	1147	[55, 1381]	1847	[1573, 546]	2547	[1468, 1378]
448	[763, 764]	1148	[234, 562]	1848	[666, 1400]	2548	[2173, 2]
449	[765, 187]	1149	[1300, 1565]	1849	[1545, 1326]	2549	[1353, 2655]
450	[579, 215]	1150	[218, 583]	1850	[669, 1410]	2550	[2642, 1350]
451	[766, 767]	1151	[1566, 546]	1851	[2237, 2238]	2551	[2334, 2311]
452	[768, 207]	1152	[1401, 1567]	1852	[159, 128]	2552	[676, 1513]
453	[769, 770]	1153	[1568, 1569]	1853	[678, 2239]	2553	[656, 2294]
454	[136, 736]	1154	[1412, 667]	1854	[2240, 2241]	2554	[687, 2656]
455	[129, 522]	1155	[1570, 1494]	1855	[2188, 2242]	2555	[2657, 156]
456	[139, 771]	1156	[680, 532]	1856	[1608, 590]	2556	[556, 2658]
457	[772, 773]	1157	[1571, 608]	1857	[1370, 1565]	2557	[1575, 549]
458	[568, 211]	1158	[1563, 1572]	1858	[544, 507]	2558	[2345, 653]
459	[511, 590]	1159	[1550, 1466]	1859	[2243, 597]	2559	[49, 2307]
460	[774, 775]	1160	[1573, 475]	1860	[2244, 1363]	2560	[2659, 670]
461	[776, 235]	1161	[182, 775]	1861	[740, 187]	2561	[1420, 2192]
462	[696, 167]	1162	[181, 524]	1862	[566, 2245]	2562	[1628, 1580]
463	[728, 62]	1163	[481, 136]	1863	[2246, 547]	2563	[603, 1536]
464	[777, 778]	1164	[558, 1574]	1864	[2247, 2248]	2564	[707, 2660]
465	[779, 780]	1165	[1520, 1513]	1865	[750, 57]	2565	[770, 472]
466	[781, 782]	1166	[1575, 1576]	1866	[643, 733]	2566	[2166, 1392]
467	[783, 784]	1167	[1577, 753]	1867	[634, 762]	2567	[2661, 36]
468	[785, 786]	1168	[1578, 681]	1868	[718, 176]	2568	[715, 1325]
469	[787, 788]	1169	[533, 1579]	1869	[488, 639]	2569	[2652, 2192]
470	[789, 790]	1170	[1580, 771]	1870	[707, 690]	2570	[689, 2660]
471	[791, 792]	1171	[738, 1348]	1871	[2249, 2250]	2571	[2662, 2663]
472	[793, 28]	1172	[665, 1581]	1872	[1327, 1404]	2572	[597, 2664]
473	[794, 795]	1173	[1334, 1582]	1873	[201, 1524]	2573	[2665, 2666]
474	[107, 796]	1174	[1527, 149]	1874	[490, 1379]	2574	[2298, 128]
475	[797, 798]	1175	[151, 1583]	1875	[1618, 38]	2575	[2237, 2618]
476	[799, 800]	1176	[577, 1385]	1876	[1518, 570]	2576	[1438, 667]
477	[801, 802]	1177	[517, 1584]	1877	[2251, 225]	2577	[1430, 235]
478	[803, 804]	1178	[204, 1585]	1878	[2219, 696]	2578	[2229, 2667]
479	[805, 448]	1179	[1586, 522]	1879	[2252, 2178]	2579	[2668, 1497]
480	[806, 807]	1180	[1510, 1559]	1880	[530, 1591]	2580	[739, 222]
481	[808, 809]	1181	[508, 1587]	1881	[147, 1372]	2581	[662, 1521]
482	[810, 811]	1182	[1533, 1588]	1882	[51, 477]	2582	[1635, 1505]

483	[812, 813]	1183	[646, 540]	1883	[517, 209]	2583	[2628, 192]
484	[814, 815]	1184	[1589, 699]	1884	[741, 469]	2584	[2665, 2317]
485	[816, 374]	1185	[175, 1590]	1885	[731, 758]	2585	[1462, 1360]
486	[817, 818]	1186	[581, 1591]	1886	[1549, 1362]	2586	[2669, 147]
487	[819, 820]	1187	[488, 1592]	1887	[605, 1306]	2587	[1575, 2670]
488	[821, 822]	1188	[615, 1593]	1888	[584, 712]	2588	[2671, 2598]
489	[823, 824]	1189	[715, 610]	1889	[161, 2164]	2589	[689, 2633]
490	[825, 826]	1190	[1418, 1437]	1890	[61, 697]	2590	[2124, 2672]
491	[827, 255]	1191	[753, 745]	1891	[1619, 2168]	2591	[2673, 2674]
492	[828, 829]	1192	[1594, 727]	1892	[237, 1357]	2592	[2675, 911]
493	[830, 831]	1193	[137, 1455]	1893	[2183, 1432]	2593	[2676, 2677]
494	[832, 833]	1194	[1404, 237]	1894	[2251, 1484]	2594	[2678, 984]
495	[834, 835]	1195	[1501, 564]	1895	[1424, 1417]	2595	[1734, 1242]
496	[836, 260]	1196	[735, 494]	1896	[1530, 192]	2596	[2679, 124]
497	[837, 838]	1197	[1586, 1363]	1897	[505, 2253]	2597	[2680, 2681]
498	[838, 839]	1198	[1474, 683]	1898	[1629, 526]	2598	[2682, 2683]
499	[840, 841]	1199	[1595, 1596]	1899	[1630, 1351]	2599	[2684, 2685]
500	[427, 810]	1200	[1597, 706]	1900	[2163, 707]	2600	[2686, 1039]
501	[842, 843]	1201	[685, 695]	1901	[1334, 1511]	2601	[2687, 1217]
502	[844, 845]	1202	[1494, 677]	1902	[32, 62]	2602	[2688, 1993]
503	[846, 847]	1203	[1598, 1494]	1903	[745, 478]	2603	[2689, 1795]
504	[848, 105]	1204	[1307, 728]	1904	[1589, 717]	2604	[2690, 2383]
505	[849, 850]	1205	[1586, 130]	1905	[1533, 2167]	2605	[2691, 2692]
506	[851, 852]	1206	[1599, 1557]	1906	[1611, 720]	2606	[2693, 1722]
507	[853, 854]	1207	[684, 482]	1907	[713, 675]	2607	[2694, 2695]
508	[855, 856]	1208	[129, 1363]	1908	[572, 1583]	2608	[2696, 2697]
509	[857, 858]	1209	[484, 1521]	1909	[2254, 2223]	2609	[2698, 2699]
510	[859, 860]	1210	[1600, 147]	1910	[2187, 653]	2610	[2700, 246]
511	[861, 862]	1211	[751, 58]	1911	[1442, 770]	2611	[1654, 2701]
512	[863, 864]	1212	[1601, 1595]	1912	[222, 494]	2612	[2702, 2048]
513	[865, 866]	1213	[1319, 1602]	1913	[582, 1421]	2613	[2703, 831]
514	[867, 868]	1214	[543, 1603]	1914	[2255, 620]	2614	[2704, 1810]
515	[869, 870]	1215	[1579, 1306]	1915	[2256, 2217]	2615	[2705, 816]
516	[28, 871]	1216	[1313, 1604]	1916	[1509, 547]	2616	[788, 2706]
517	[872, 873]	1217	[1491, 538]	1917	[591, 1581]	2617	[117, 1824]
518	[874, 875]	1218	[61, 729]	1918	[545, 1538]	2618	[952, 1121]
519	[876, 877]	1219	[236, 536]	1919	[2176, 226]	2619	[2707, 29]
520	[878, 879]	1220	[1494, 1513]	1920	[1300, 2257]	2620	[1751, 2708]
521	[880, 881]	1221	[1605, 1606]	1921	[522, 1343]	2621	[2709, 1837]
522	[882, 883]	1222	[679, 653]	1922	[1534, 614]	2622	[2710, 333]
523	[884, 885]	1223	[1607, 44]	1923	[2179, 706]	2623	[2711, 1779]
524	[886, 887]	1224	[1608, 512]	1924	[2258, 1418]	2624	[2712, 2713]
525	[888, 889]	1225	[663, 497]	1925	[1630, 173]	2625	[2714, 866]
526	[890, 887]	1226	[1609, 1610]	1926	[1571, 167]	2626	[2715, 2384]

527	[891, 892]	1227	[1440, 1582]	1927	[1491, 2259]	2627	[2716, 2717]
528	[893, 273]	1228	[1611, 610]	1928	[1557, 2260]	2628	[2718, 1268]
529	[894, 895]	1229	[1612, 229]	1929	[527, 1461]	2629	[2358, 2719]
530	[896, 897]	1230	[1557, 1457]	1930	[1631, 174]	2630	[2720, 86]
531	[898, 899]	1231	[682, 534]	1931	[1362, 1328]	2631	[1963, 2721]
532	[900, 901]	1232	[751, 695]	1932	[1467, 672]	2632	[2722, 985]
533	[902, 903]	1233	[126, 610]	1933	[207, 1365]	2633	[2723, 460]
534	[904, 6]	1234	[47, 1303]	1934	[2261, 2262]	2634	[2041, 2724]
535	[905, 906]	1235	[1613, 1614]	1935	[157, 1483]	2635	[1184, 2725]
536	[907, 908]	1236	[730, 150]	1936	[1533, 683]	2636	[2726, 1201]
537	[909, 910]	1237	[530, 1615]	1937	[1520, 677]	2637	[2727, 1232]
538	[911, 912]	1238	[1448, 1616]	1938	[1557, 2236]	2638	[2728, 1926]
539	[913, 77]	1239	[164, 710]	1939	[2256, 2263]	2639	[1089, 1788]
540	[325, 914]	1240	[1551, 707]	1940	[2264, 510]	2640	[2729, 447]
541	[915, 916]	1241	[738, 737]	1941	[2193, 1409]	2641	[2730, 113]
542	[917, 918]	1242	[736, 739]	1942	[2265, 1459]	2642	[2731, 1723]
543	[919, 920]	1243	[497, 663]	1943	[208, 1584]	2643	[2732, 1241]
544	[921, 922]	1244	[222, 496]	1944	[1331, 2226]	2644	[2733, 2719]
545	[285, 923]	1245	[498, 498]	1945	[1543, 2266]	2645	[2734, 1230]
546	[924, 925]	1246	[745, 650]	1946	[1514, 651]	2646	[378, 2735]
547	[926, 927]	1247	[680, 1314]	1947	[600, 551]	2647	[1136, 1908]
548	[928, 929]	1248	[1617, 619]	1948	[1607, 2267]	2648	[2736, 1997]
549	[930, 462]	1249	[539, 1618]	1949	[2190, 231]	2649	[2737, 2689]
550	[931, 932]	1250	[1619, 1595]	1950	[2207, 1440]	2650	[2738, 922]
551	[933, 934]	1251	[1478, 1620]	1951	[613, 1535]	2651	[2739, 287]
552	[935, 936]	1252	[1315, 516]	1952	[1381, 1633]	2652	[1113, 2740]
553	[937, 938]	1253	[619, 1621]	1953	[2268, 2269]	2653	[1267, 2484]
554	[939, 940]	1254	[1493, 1512]	1954	[1305, 759]	2654	[2741, 1849]
555	[941, 333]	1255	[1622, 1623]	1955	[168, 1515]	2655	[2742, 2743]
556	[942, 938]	1256	[1624, 1625]	1956	[2270, 753]	2656	[2744, 2037]
557	[943, 944]	1257	[53, 1372]	1957	[39, 2239]	2657	[2745, 2746]
558	[945, 946]	1258	[172, 1626]	1958	[2271, 2231]	2658	[1161, 809]
559	[947, 948]	1259	[214, 1627]	1959	[2272, 2182]	2659	[2747, 2748]
560	[949, 950]	1260	[1628, 226]	1960	[1408, 46]	2660	[1196, 305]
561	[951, 952]	1261	[658, 656]	1961	[738, 1345]	2661	[2749, 2750]
562	[953, 954]	1262	[500, 684]	1962	[2273, 2274]	2662	[2479, 1798]
563	[955, 269]	1263	[1333, 662]	1963	[2179, 161]	2663	[2751, 993]
564	[956, 957]	1264	[1629, 50]	1964	[2228, 2275]	2664	[2752, 305]
565	[958, 959]	1265	[1630, 1631]	1965	[1630, 1376]	2665	[2753, 1952]
566	[960, 961]	1266	[220, 134]	1966	[1617, 559]	2666	[2754, 839]
567	[962, 963]	1267	[1329, 135]	1967	[772, 2160]	2667	[2755, 1047]
568	[964, 965]	1268	[55, 1484]	1968	[2246, 230]	2668	[2756, 2757]
569	[966, 967]	1269	[11, 1632]	1969	[182, 2276]	2669	[2758, 108]
570	[968, 969]	1270	[163, 1306]	1970	[1443, 472]	2670	[2759, 288]

571	[970, 971]	1271	[56, 1633]	1971	[505, 767]	2671	[2760, 2761]
572	[972, 973]	1272	[668, 627]	1972	[1631, 1377]	2672	[1638, 709]
573	[974, 975]	1273	[1389, 637]	1973	[1321, 2277]	2673	[2219, 166]
574	[976, 977]	1274	[1599, 1336]	1974	[2278, 2279]	2674	[2600, 483]
575	[978, 979]	1275	[482, 736]	1975	[2280, 1490]	2675	[1578, 602]
576	[944, 980]	1276	[216, 1634]	1976	[625, 754]	2676	[149, 2655]
577	[981, 982]	1277	[638, 1528]	1977	[1570, 1512]	2677	[2310, 645]
578	[983, 984]	1278	[1334, 1521]	1978	[1453, 1572]	2678	[2617, 2643]
579	[985, 986]	1279	[508, 36]	1979	[573, 511]	2679	[1489, 2295]
580	[987, 988]	1280	[1635, 1636]	1980	[765, 741]	2680	[2170, 2337]
581	[989, 990]	1281	[1637, 131]	1981	[51, 1446]	2681	[2631, 2231]
582	[991, 992]	1282	[193, 1340]	1982	[220, 591]	2682	[43, 2267]
583	[993, 994]	1283	[1638, 1639]	1983	[2281, 2282]	2683	[2225, 1445]
584	[995, 288]	1284	[626, 1640]	1984	[2270, 2241]	2684	[2232, 2632]
585	[996, 997]	1285	[1421, 1380]	1985	[499, 1329]	2685	[659, 184]
586	[998, 999]	1286	[1600, 529]	1986	[755, 2283]	2686	[1645, 213]
587	[1000, 1001]	1287	[144, 587]	1987	[583, 1354]	2687	[2621, 2762]
588	[1002, 1003]	1288	[1492, 1404]	1988	[755, 2284]	2688	[1331, 2169]
589	[1004, 1005]	1289	[179, 1449]	1989	[2285, 1312]	2689	[2247, 1374]
590	[1006, 1007]	1290	[514, 491]	1990	[224, 1381]	2690	[2181, 2641]
591	[1008, 346]	1291	[1641, 8]	1991	[675, 2284]	2691	[691, 2234]
592	[257, 1009]	1292	[1557, 1445]	1992	[2286, 146]	2692	[554, 1350]
593	[1010, 1011]	1293	[1609, 472]	1993	[1455, 612]	2693	[1482, 2763]
594	[1012, 845]	1294	[546, 1642]	1994	[1333, 484]	2694	[539, 1638]
595	[1013, 1014]	1295	[1643, 706]	1995	[739, 1337]	2695	[2304, 1318]
596	[1015, 979]	1296	[1498, 632]	1996	[471, 1610]	2696	[2647, 2266]
597	[1016, 1017]	1297	[1644, 761]	1997	[191, 1352]	2697	[1556, 167]
598	[1018, 1019]	1298	[1641, 178]	1998	[2287, 1369]	2698	[2229, 2344]
599	[1020, 1021]	1299	[1645, 210]	1999	[648, 2288]	2699	[550, 42]
600	[1022, 1023]	1300	[1646, 1647]	2000	[2289, 131]	2700	[2339, 2764]
601	[1024, 1025]	1301	[1648, 1649]	2001	[201, 2199]	2701	[2765, 2262]
602	[1026, 895]	1302	[1650, 1651]	2002	[668, 2290]	2702	[632, 2766]
603	[1027, 343]	1303	[1652, 1653]	2003	[241, 1499]	2703	[579, 1627]
604	[1028, 403]	1304	[873, 1654]	2004	[31, 61]	2704	[2249, 190]
605	[1029, 1030]	1305	[1655, 1179]	2005	[760, 2291]	2705	[2346, 2767]
606	[1031, 1032]	1306	[313, 1656]	2006	[1566, 1538]	2706	[2662, 616]
607	[1033, 388]	1307	[1657, 124]	2007	[2243, 1432]	2707	[1428, 2762]
608	[1034, 1035]	1308	[1658, 1659]	2008	[571, 1302]	2708	[2768, 616]
609	[1036, 1009]	1309	[1660, 456]	2009	[2176, 615]	2709	[166, 2769]
610	[86, 1037]	1310	[1661, 1662]	2010	[221, 2292]	2710	[2334, 596]
611	[852, 1038]	1311	[1663, 1065]	2011	[524, 775]	2711	[682, 1579]
612	[1039, 950]	1312	[1664, 275]	2012	[537, 2293]	2712	[221, 2770]
613	[1040, 1041]	1313	[1665, 1666]	2013	[183, 2294]	2713	[480, 233]
614	[1042, 1043]	1314	[1108, 1667]	2014	[2159, 773]	2714	[2268, 2771]

615	[1044, 1045]	1315	[1668, 1669]	2015	[589, 469]	2715	[1609, 2650]
616	[1046, 1047]	1316	[1670, 1671]	2016	[2280, 2295]	2716	[476, 52]
617	[1048, 445]	1317	[1672, 1673]	2017	[2211, 2296]	2717	[483, 612]
618	[1049, 1050]	1318	[1674, 1675]	2018	[2271, 31]	2718	[1522, 1303]
619	[1051, 1052]	1319	[1676, 74]	2019	[2224, 2242]	2719	[1443, 1610]
620	[1053, 1054]	1320	[1677, 948]	2020	[45, 2174]	2720	[556, 2595]
621	[1055, 1056]	1321	[1678, 1679]	2021	[2297, 2298]	2721	[2669, 529]
622	[1057, 1058]	1322	[1680, 1681]	2022	[2299, 614]	2722	[2218, 2602]
623	[1059, 1060]	1323	[818, 1278]	2023	[532, 702]	2723	[1345, 222]
624	[1061, 459]	1324	[1682, 121]	2024	[2300, 1529]	2724	[2765, 584]
625	[1062, 1063]	1325	[1683, 842]	2025	[1407, 470]	2725	[174, 757]
626	[1064, 1065]	1326	[366, 1226]	2026	[1558, 135]	2726	[2247, 2772]
627	[1066, 271]	1327	[1684, 455]	2027	[2301, 1338]	2727	[49, 2773]
628	[1067, 1068]	1328	[1685, 372]	2028	[1637, 150]	2728	[157, 2763]
629	[1069, 1000]	1329	[1686, 1687]	2029	[617, 1469]	2729	[675, 2653]
630	[1070, 915]	1330	[1688, 1242]	2030	[2302, 36]	2730	[752, 732]
631	[1071, 792]	1331	[403, 1689]	2031	[2191, 748]	2731	[1387, 1472]
632	[1072, 1073]	1332	[1690, 1691]	2032	[616, 218]	2732	[1444, 2260]
633	[1074, 908]	1333	[1692, 1681]	2033	[706, 2164]	2733	[665, 2770]
634	[1075, 1076]	1334	[1693, 1694]	2034	[746, 228]	2734	[2208, 2767]
635	[1077, 780]	1335	[1695, 1696]	2035	[1644, 2215]	2735	[2768, 2663]
636	[1078, 1079]	1336	[1697, 1698]	2036	[222, 499]	2736	[1613, 2599]
637	[1080, 1081]	1337	[1699, 1700]	2037	[542, 512]	2737	[2162, 560]
638	[897, 1082]	1338	[1701, 1702]	2038	[12, 2303]	2738	[613, 2774]
639	[1083, 92]	1339	[1703, 1704]	2039	[219, 1380]	2739	[1629, 2773]
640	[1084, 1085]	1340	[1705, 1706]	2040	[2304, 1378]	2740	[2328, 2168]
641	[1086, 1087]	1341	[1707, 1708]	2041	[197, 1423]	2741	[2316, 2666]
642	[1088, 1089]	1342	[1709, 1710]	2042	[2305, 166]	2742	[33, 2775]
643	[1090, 1091]	1343	[1711, 119]	2043	[521, 1363]	2743	[1302, 1583]
644	[1092, 1093]	1344	[1712, 1291]	2044	[2243, 1594]	2744	[654, 2764]
645	[1094, 325]	1345	[1713, 1714]	2045	[2306, 2165]	2745	[1638, 38]
646	[1095, 1096]	1346	[1715, 1716]	2046	[1629, 2307]	2746	[2261, 584]
647	[1097, 1098]	1347	[1717, 1243]	2047	[132, 2269]	2747	[1378, 142]
648	[1099, 1100]	1348	[1718, 832]	2048	[1353, 1499]	2748	[1540, 751]
649	[1101, 1102]	1349	[1719, 1720]	2049	[148, 1353]	2749	[2612, 640]
650	[1103, 1104]	1350	[1721, 1722]	2050	[2213, 2168]	2750	[750, 685]
651	[1105, 1106]	1351	[1723, 1724]	2051	[2308, 2233]	2751	[164, 539]
652	[1107, 1108]	1352	[1725, 1726]	2052	[1408, 2174]	2752	[564, 2776]
653	[1109, 853]	1353	[1727, 1728]	2053	[702, 2309]	2753	[59, 2777]
654	[1110, 1111]	1354	[354, 1729]	2054	[2310, 1481]	2754	[1383, 2637]
655	[1112, 1113]	1355	[1730, 1731]	2055	[595, 2311]	2755	[2617, 2238]
656	[1114, 1043]	1356	[1732, 1733]	2056	[473, 7]	2756	[2254, 2630]
657	[1115, 1116]	1357	[454, 1734]	2057	[2312, 743]	2757	[2338, 753]
658	[1117, 1118]	1358	[1735, 1736]	2058	[1507, 467]	2758	[212, 210]

659	[1119, 1120]	1359	[1737, 1051]	2059	[2264, 211]	2759	[2235, 2658]
660	[1121, 1122]	1360	[1738, 1739]	2060	[204, 604]	2760	[2281, 599]
661	[1123, 1124]	1361	[1740, 1741]	2061	[1363, 1343]	2761	[652, 680]
662	[1125, 1126]	1362	[1742, 858]	2062	[710, 1618]	2762	[2778, 835]
663	[663, 663]	1363	[1743, 1744]	2063	[698, 717]	2763	[1172, 841]
664	[1127, 1128]	1364	[881, 1745]	2064	[1598, 1520]	2764	[2779, 778]
665	[1129, 1130]	1365	[397, 1746]	2065	[1504, 2313]	2765	[2780, 2781]
666	[1131, 1132]	1366	[1747, 117]	2066	[2314, 2315]	2766	[24, 387]
667	[1133, 1134]	1367	[1748, 1749]	2067	[2316, 2317]	2767	[2782, 1803]
668	[1135, 1136]	1368	[1750, 1751]	2068	[1594, 239]	2768	[2426, 2783]
669	[1137, 1138]	1369	[1752, 1753]	2069	[629, 144]	2769	[2784, 2565]
670	[1139, 1140]	1370	[988, 1754]	2070	[2318, 2319]	2770	[2785, 1219]
671	[1141, 1142]	1371	[1755, 988]	2071	[2320, 1548]	2771	[253, 2713]
672	[1143, 1144]	1372	[1756, 97]	2072	[603, 205]	2772	[2786, 2113]
673	[1145, 1146]	1373	[1757, 1758]	2073	[588, 2245]	2773	[2787, 350]
674	[1147, 876]	1374	[1759, 918]	2074	[2161, 1411]	2774	[2788, 352]
675	[1148, 338]	1375	[111, 815]	2075	[770, 2321]	2775	[2789, 1822]
676	[1149, 1150]	1376	[1760, 1143]	2076	[564, 233]	2776	[2790, 1143]
677	[1151, 910]	1377	[1021, 1761]	2077	[1464, 1620]	2777	[2791, 2792]
678	[1152, 1153]	1378	[1762, 1763]	2078	[1397, 1324]	2778	[542, 2651]
679	[1154, 1155]	1379	[1764, 1765]	2079	[2322, 1341]	2779	[2649, 2793]
680	[1156, 1157]	1380	[1766, 1767]	2080	[2323, 209]	2780	[191, 713]
681	[1158, 285]	1381	[1768, 1769]	2081	[2324, 2325]	2781	[1439, 529]
682	[1159, 1160]	1382	[1770, 1771]	2082	[1579, 606]	2782	[2324, 2793]
683	[95, 1161]	1383	[1772, 824]	2083	[1609, 2321]	2783	[2258, 235]
684	[429, 944]	1384	[1104, 1773]	2084	[61, 197]	2784	[232, 2776]
685	[1162, 1163]	1385	[1774, 302]	2085	[179, 2326]	2785	[1373, 2772]
686	[1164, 1165]	1386	[1775, 1776]	2086	[675, 2283]	2786	[1397, 2794]
687	[1166, 1167]	1387	[1777, 254]	2087	[1325, 692]	2787	[132, 2771]
688	[1168, 951]	1388	[1778, 1779]	2088	[2268, 2327]	2788	[1323, 2794]
689	[1169, 1170]	1389	[1780, 1781]	2089	[665, 2292]	2789	[1600, 53]
690	[1171, 1172]	1390	[1782, 1783]	2090	[134, 592]	2790	[1534, 2774]
691	[1173, 1174]	1391	[1784, 69]	2091	[2216, 2263]	2791	[1485, 2636]
692	[1009, 1175]	1392	[1785, 1786]	2092	[468, 188]	2792	[524, 1502]
693	[1176, 1177]	1393	[1787, 1788]	2093	[718, 1590]	2793	[2795, 1054]
694	[1178, 985]	1394	[1789, 952]	2094	[241, 203]	2794	[279, 2792]
695	[1179, 1180]	1395	[1790, 1791]	2095	[2328, 1595]	2795	[581, 1615]
696	[1181, 1032]	1396	[1792, 1793]	2096	[478, 1365]		
697	[1182, 1183]	1397	[1794, 1795]	2097	[2207, 1334]		
698	[90, 1184]	1398	[1796, 247]	2098	[224, 1484]		
699	[1185, 899]	1399	[1797, 1763]	2099	[1384, 578]		

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	467	1	934	0	1401	1	1868	1	2335	1
1	0	468	0	935	1	1402	0	1869	1	2336	0
2	0	469	0	936	1	1403	1	1870	1	2337	0
3	0	470	0	937	0	1404	1	1871	0	2338	1
4	1	471	0	938	1	1405	1	1872	0	2339	1
5	0	472	1	939	1	1406	1	1873	1	2340	1
6	0	473	1	940	0	1407	1	1874	1	2341	0
7	0	474	0	941	0	1408	1	1875	0	2342	1
8	1	475	0	942	1	1409	0	1876	1	2343	1
9	1	476	0	943	1	1410	1	1877	1	2344	0
10	0	477	0	944	1	1411	0	1878	1	2345	1
11	0	478	0	945	0	1412	1	1879	1	2346	1
12	0	479	0	946	1	1413	0	1880	0	2347	1
13	0	480	0	947	0	1414	0	1881	0	2348	0
14	0	481	1	948	0	1415	1	1882	0	2349	0
15	0	482	1	949	0	1416	0	1883	0	2350	1
16	0	483	0	950	0	1417	0	1884	1	2351	1
17	1	484	0	951	1	1418	0	1885	0	2352	1
18	0	485	1	952	1	1419	1	1886	1	2353	1
19	1	486	0	953	0	1420	0	1887	1	2354	0
20	1	487	1	954	1	1421	0	1888	0	2355	1
21	0	488	1	955	0	1422	0	1889	1	2356	0
22	1	489	1	956	1	1423	0	1890	0	2357	0
23	0	490	1	957	0	1424	1	1891	0	2358	1
24	0	491	0	958	0	1425	0	1892	1	2359	0
25	0	492	1	959	1	1426	1	1893	1	2360	0
26	0	493	0	960	1	1427	1	1894	1	2361	0
27	0	494	1	961	1	1428	1	1895	1	2362	0
28	0	495	1	962	1	1429	1	1896	0	2363	1
29	0	496	0	963	0	1430	1	1897	1	2364	0
30	0	497	0	964	1	1431	1	1898	0	2365	0
31	0	498	1	965	1	1432	0	1899	1	2366	1
32	1	499	1	966	1	1433	0	1900	0	2367	1
33	0	500	0	967	0	1434	1	1901	1	2368	0
34	1	501	1	968	1	1435	0	1902	1	2369	1
35	1	502	1	969	0	1436	1	1903	0	2370	1
36	1	503	1	970	1	1437	1	1904	0	2371	0
37	0	504	0	971	0	1438	1	1905	1	2372	0
38	1	505	1	972	1	1439	0	1906	0	2373	1
39	1	506	1	973	1	1440	1	1907	1	2374	0
40	0	507	1	974	1	1441	1	1908	1	2375	1
41	1	508	1	975	1	1442	0	1909	0	2376	0
42	0	509	1	976	1	1443	0	1910	0	2377	0

43	0	510	0	977	1	1444	1	1911	0	2378	1
44	1	511	0	978	1	1445	1	1912	0	2379	0
45	1	512	1	979	1	1446	1	1913	1	2380	0
46	0	513	0	980	1	1447	0	1914	1	2381	1
47	0	514	1	981	0	1448	0	1915	0	2382	1
48	0	515	1	982	1	1449	1	1916	1	2383	0
49	0	516	0	983	1	1450	1	1917	1	2384	0
50	1	517	0	984	1	1451	0	1918	1	2385	1
51	0	518	1	985	1	1452	1	1919	0	2386	0
52	1	519	1	986	0	1453	1	1920	1	2387	1
53	0	520	1	987	0	1454	0	1921	0	2388	0
54	0	521	0	988	1	1455	0	1922	1	2389	0
55	0	522	0	989	0	1456	0	1923	1	2390	1
56	1	523	0	990	0	1457	0	1924	1	2391	0
57	0	524	1	991	1	1458	1	1925	1	2392	1
58	0	525	1	992	0	1459	0	1926	0	2393	1
59	0	526	0	993	0	1460	0	1927	0	2394	0
60	1	527	1	994	0	1461	1	1928	1	2395	1
61	0	528	0	995	0	1462	1	1929	1	2396	0
62	1	529	1	996	1	1463	1	1930	1	2397	1
63	0	530	0	997	0	1464	1	1931	0	2398	1
64	0	531	0	998	0	1465	0	1932	1	2399	0
65	1	532	1	999	0	1466	1	1933	1	2400	1
66	0	533	1	1000	1	1467	1	1934	0	2401	0
67	0	534	1	1001	0	1468	0	1935	0	2402	1
68	1	535	1	1002	1	1469	1	1936	1	2403	1
69	1	536	0	1003	0	1470	1	1937	0	2404	0
70	1	537	0	1004	1	1471	0	1938	1	2405	0
71	1	538	0	1005	0	1472	0	1939	0	2406	1
72	1	539	0	1006	0	1473	1	1940	0	2407	1
73	1	540	1	1007	0	1474	0	1941	0	2408	0
74	0	541	1	1008	1	1475	0	1942	0	2409	1
75	0	542	0	1009	1	1476	1	1943	0	2410	0
76	1	543	1	1010	1	1477	0	1944	0	2411	0
77	1	544	0	1011	1	1478	1	1945	0	2412	1
78	1	545	1	1012	0	1479	1	1946	0	2413	1
79	1	546	1	1013	1	1480	1	1947	0	2414	1
80	1	547	1	1014	1	1481	1	1948	0	2415	0
81	0	548	1	1015	0	1482	0	1949	0	2416	1
82	1	549	1	1016	1	1483	1	1950	0	2417	0
83	1	550	1	1017	0	1484	1	1951	1	2418	0
84	0	551	1	1018	0	1485	0	1952	0	2419	1
85	0	552	1	1019	1	1486	1	1953	1	2420	1
86	1	553	0	1020	1	1487	1	1954	0	2421	0

87	0	554	1	1021	0	1488	0	1955	0	2422	1
88	0	555	0	1022	0	1489	1	1956	1	2423	1
89	1	556	1	1023	0	1490	1	1957	1	2424	0
90	0	557	1	1024	1	1491	0	1958	0	2425	0
91	1	558	0	1025	0	1492	0	1959	0	2426	1
92	1	559	0	1026	0	1493	0	1960	1	2427	1
93	0	560	0	1027	0	1494	0	1961	0	2428	1
94	0	561	1	1028	1	1495	0	1962	0	2429	0
95	1	562	0	1029	1	1496	0	1963	1	2430	1
96	0	563	0	1030	1	1497	0	1964	0	2431	1
97	0	564	1	1031	0	1498	0	1965	1	2432	0
98	0	565	0	1032	0	1499	1	1966	1	2433	0
99	1	566	1	1033	0	1500	1	1967	1	2434	0
100	1	567	1	1034	1	1501	0	1968	0	2435	1
101	1	568	1	1035	0	1502	1	1969	0	2436	0
102	0	569	1	1036	0	1503	0	1970	0	2437	0
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104	1	571	1	1038	0	1505	0	1972	1	2439	0
105	0	572	1	1039	1	1506	0	1973	0	2440	0
106	0	573	1	1040	1	1507	0	1974	0	2441	1
107	0	574	1	1041	0	1508	0	1975	1	2442	0
108	0	575	1	1042	0	1509	1	1976	1	2443	1
109	1	576	1	1043	1	1510	1	1977	1	2444	0
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111	1	578	1	1045	1	1512	1	1979	1	2446	1
112	1	579	1	1046	1	1513	0	1980	0	2447	1
113	0	580	0	1047	1	1514	0	1981	0	2448	0
114	0	581	0	1048	1	1515	1	1982	0	2449	0
115	0	582	1	1049	1	1516	1	1983	0	2450	1
116	0	583	0	1050	1	1517	1	1984	1	2451	1
117	0	584	0	1051	1	1518	1	1985	1	2452	0
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124	1	591	1	1058	1	1525	0	1992	1	2459	0
125	0	592	1	1059	0	1526	0	1993	0	2460	0
126	1	593	1	1060	1	1527	0	1994	0	2461	0
127	0	594	0	1061	1	1528	0	1995	1	2462	0
128	0	595	1	1062	1	1529	1	1996	0	2463	1
129	1	596	0	1063	0	1530	0	1997	1	2464	0
130	0	597	1	1064	0	1531	1	1998	0	2465	1

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132	1	599	1	1066	1	1533	1	2000	1	2467	1
133	0	600	0	1067	0	1534	1	2001	1	2468	0
134	1	601	1	1068	0	1535	1	2002	0	2469	1
135	1	602	0	1069	0	1536	0	2003	1	2470	1
136	0	603	0	1070	0	1537	0	2004	0	2471	1
137	1	604	1	1071	1	1538	1	2005	1	2472	1
138	1	605	1	1072	0	1539	1	2006	1	2473	0
139	1	606	0	1073	1	1540	1	2007	1	2474	0
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141	1	608	1	1075	0	1542	0	2009	0	2476	1
142	0	609	0	1076	0	1543	0	2010	0	2477	1
143	1	610	1	1077	1	1544	1	2011	1	2478	0
144	0	611	1	1078	0	1545	1	2012	0	2479	0
145	1	612	1	1079	0	1546	1	2013	1	2480	0
146	1	613	1	1080	1	1547	1	2014	1	2481	1
147	0	614	0	1081	1	1548	0	2015	1	2482	1
148	1	615	0	1082	0	1549	1	2016	1	2483	0
149	0	616	1	1083	0	1550	1	2017	1	2484	1
150	1	617	1	1084	0	1551	1	2018	0	2485	1
151	1	618	1	1085	0	1552	1	2019	0	2486	0
152	1	619	1	1086	1	1553	1	2020	1	2487	1
153	1	620	1	1087	0	1554	0	2021	1	2488	0
154	1	621	1	1088	0	1555	1	2022	0	2489	0
155	1	622	1	1089	1	1556	0	2023	1	2490	0
156	1	623	0	1090	0	1557	1	2024	0	2491	0
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160	1	627	1	1094	0	1561	1	2028	1	2495	0
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163	0	630	0	1097	0	1564	0	2031	1	2498	0
164	0	631	1	1098	0	1565	1	2032	1	2499	0
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166	1	633	1	1100	1	1567	0	2034	0	2501	0
167	0	634	0	1101	0	1568	0	2035	1	2502	0
168	0	635	1	1102	1	1569	1	2036	0	2503	0
169	1	636	0	1103	0	1570	1	2037	0	2504	0
170	0	637	1	1104	0	1571	0	2038	0	2505	0
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172	0	639	0	1106	1	1573	0	2040	1	2507	1
173	0	640	0	1107	0	1574	0	2041	0	2508	0
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175	1	642	0	1109	0	1576	0	2043	0	2510	0
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177	1	644	1	1111	1	1578	1	2045	0	2512	0
178	0	645	0	1112	1	1579	0	2046	0	2513	1
179	0	646	1	1113	0	1580	1	2047	1	2514	1
180	0	647	0	1114	1	1581	0	2048	0	2515	0
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187	0	654	1	1121	1	1588	1	2055	1	2522	0
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193	1	660	1	1127	1	1594	0	2061	1	2528	1
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200	1	667	1	1134	0	1601	1	2068	0	2535	1
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203	0	670	1	1137	0	1604	1	2071	1	2538	0
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207	1	674	0	1141	0	1608	1	2075	1	2542	0
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209	0	676	1	1143	1	1610	0	2077	1	2544	1
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212	0	679	1	1146	0	1613	0	2080	1	2547	0
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214	1	681	1	1148	0	1615	1	2082	0	2549	0
215	1	682	1	1149	1	1616	0	2083	1	2550	0
216	1	683	1	1150	0	1617	1	2084	0	2551	1
217	0	684	0	1151	1	1618	0	2085	0	2552	1
218	0	685	0	1152	1	1619	0	2086	0	2553	1

219	1	686	0	1153	0	1620	1	2087	0	2554	1
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228	0	695	1	1162	0	1629	0	2096	0	2563	0
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233	1	700	0	1167	0	1634	0	2101	1	2568	1
234	0	701	1	1168	1	1635	1	2102	1	2569	0
235	1	702	0	1169	1	1636	1	2103	1	2570	1
236	0	703	1	1170	1	1637	1	2104	0	2571	0
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240	0	707	1	1174	0	1641	1	2108	1	2575	0
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244	0	711	0	1178	0	1645	0	2112	1	2579	0
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248	1	715	1	1182	1	1649	1	2116	1	2583	0
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251	0	718	1	1185	1	1652	1	2119	0	2586	0
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253	1	720	0	1187	1	1654	0	2121	0	2588	0
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255	0	722	1	1189	1	1656	1	2123	0	2590	1
256	0	723	0	1190	0	1657	0	2124	1	2591	1
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258	1	725	1	1192	0	1659	0	2126	1	2593	0
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261	0	728	1	1195	0	1662	0	2129	1	2596	1
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263	1	730	0	1197	1	1664	1	2131	0	2598	0
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265	1	732	0	1199	1	1666	0	2133	1	2600	0
266	1	733	0	1200	0	1667	0	2134	0	2601	1
267	0	734	0	1201	0	1668	1	2135	0	2602	0
268	1	735	0	1202	0	1669	0	2136	1	2603	1
269	1	736	0	1203	0	1670	1	2137	1	2604	0
270	0	737	0	1204	0	1671	0	2138	1	2605	1
271	0	738	0	1205	1	1672	1	2139	1	2606	0
272	1	739	1	1206	1	1673	1	2140	0	2607	0
273	1	740	0	1207	0	1674	0	2141	0	2608	0
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275	1	742	0	1209	0	1676	0	2143	1	2610	1
276	1	743	1	1210	1	1677	1	2144	1	2611	0
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279	1	746	0	1213	0	1680	1	2147	1	2614	0
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281	1	748	0	1215	0	1682	0	2149	1	2616	1
282	1	749	1	1216	1	1683	0	2150	0	2617	0
283	1	750	0	1217	0	1684	0	2151	1	2618	1
284	0	751	1	1218	0	1685	0	2152	0	2619	1
285	1	752	0	1219	0	1686	1	2153	0	2620	0
286	1	753	1	1220	0	1687	1	2154	0	2621	1
287	1	754	0	1221	1	1688	0	2155	1	2622	1
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293	0	760	1	1227	1	1694	1	2161	0	2628	0
294	1	761	1	1228	0	1695	1	2162	0	2629	1
295	1	762	1	1229	0	1696	0	2163	0	2630	1
296	1	763	1	1230	1	1697	0	2164	0	2631	1
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299	1	766	1	1233	1	1700	1	2167	0	2634	0
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307	1	774	1	1241	0	1708	1	2175	1	2642	0
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309	1	776	0	1243	0	1710	1	2177	0	2644	0
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311	1	778	1	1245	1	1712	0	2179	1	2646	0
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315	1	782	0	1249	0	1716	0	2183	1	2650	1
316	0	783	1	1250	0	1717	0	2184	0	2651	0
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319	1	786	1	1253	1	1720	0	2187	0	2654	0
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325	1	792	1	1259	1	1726	0	2193	0	2660	0
326	0	793	1	1260	0	1727	0	2194	1	2661	0
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333	1	800	0	1267	1	1734	1	2201	0	2668	0
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367	1	834	1	1301	0	1768	0	2235	1	2702	0
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371	1	838	1	1305	0	1772	0	2239	1	2706	0
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373	0	840	1	1307	0	1774	0	2241	0	2708	1
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380	0	847	1	1314	1	1781	1	2248	1	2715	1
381	1	848	0	1315	1	1782	1	2249	0	2716	0
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383	1	850	0	1317	1	1784	0	2251	1	2718	0
384	1	851	1	1318	0	1785	1	2252	1	2719	0
385	1	852	1	1319	0	1786	1	2253	1	2720	1
386	1	853	1	1320	1	1787	0	2254	0	2721	0
387	0	854	1	1321	0	1788	1	2255	1	2722	1
388	1	855	1	1322	1	1789	0	2256	0	2723	1
389	0	856	0	1323	0	1790	0	2257	0	2724	1
390	0	857	1	1324	0	1791	1	2258	1	2725	1
391	1	858	1	1325	0	1792	1	2259	0	2726	1
392	0	859	0	1326	1	1793	0	2260	1	2727	0
393	1	860	1	1327	0	1794	0	2261	0	2728	0
394	1	861	0	1328	0	1795	0	2262	1	2729	0

395	1	862	1	1329	1	1796	1	2263	0	2730	0
396	0	863	1	1330	0	1797	0	2264	0	2731	0
397	0	864	1	1331	0	1798	0	2265	0	2732	1
398	1	865	0	1332	1	1799	1	2266	0	2733	0
399	0	866	0	1333	0	1800	1	2267	0	2734	1
400	0	867	1	1334	1	1801	0	2268	1	2735	1
401	0	868	1	1335	1	1802	1	2269	0	2736	0
402	0	869	1	1336	0	1803	1	2270	1	2737	0
403	0	870	0	1337	1	1804	1	2271	0	2738	1
404	1	871	1	1338	0	1805	0	2272	0	2739	0
405	0	872	0	1339	1	1806	1	2273	0	2740	0
406	1	873	1	1340	1	1807	0	2274	0	2741	0
407	0	874	1	1341	0	1808	1	2275	0	2742	0
408	0	875	0	1342	0	1809	1	2276	0	2743	0
409	0	876	1	1343	1	1810	1	2277	0	2744	1
410	1	877	0	1344	0	1811	1	2278	0	2745	1
411	1	878	1	1345	1	1812	1	2279	0	2746	0
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413	1	880	0	1347	0	1814	0	2281	0	2748	1
414	0	881	0	1348	0	1815	1	2282	0	2749	0
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416	1	883	1	1350	1	1817	0	2284	0	2751	0
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453	0	920	0	1387	0	1854	0	2321	0	2788	0
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459	0	926	1	1393	0	1860	0	2327	0	2794	1
460	1	927	1	1394	0	1861	0	2328	0	2795	0
461	0	928	1	1395	0	1862	1	2329	1		
462	1	929	1	1396	1	1863	0	2330	1		
463	1	930	1	1397	0	1864	1	2331	1		
464	1	931	1	1398	1	1865	0	2332	1		
465	0	932	1	1399	0	1866	0	2333	1		
466	0	933	1	1400	0	1867	0	2334	1		

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