

```

n = 54;
g1 = AP[1, Cycles[{{1, 18, 45, 28}, {2, 27, 44, 19},
  {3, 36, 43, 10}, {46, 52, 54, 48}, {47, 49, 53, 51}}]];
g2 = AP[1, Cycles[{{7, 16, 39, 30}, {8, 25, 38, 21}, {9, 34, 37, 12},
  {13, 15, 33, 31}, {14, 24, 32, 22}}]];
g3 = AP[1, Cycles[{{28, 31, 34, 48}, {29, 32, 35, 47}, {30, 33, 36, 46},
  {37, 39, 45, 43}, {38, 42, 44, 40}}]];
g4 = AP[1, Cycles[{{1, 3, 9, 7}, {2, 6, 8, 4}, {10, 54, 16, 13},
  {11, 53, 17, 14}, {12, 52, 18, 15}}]];
g5 = AP[1, Cycles[{{1, 13, 37, 46}, {4, 22, 40, 49}, {7, 31, 43, 52},
  {10, 12, 30, 28}, {11, 21, 29, 19}}]];
g6 = AP[1, Cycles[{{3, 48, 39, 15}, {6, 51, 42, 24}, {9, 54, 45, 33},
  {16, 18, 36, 34}, {17, 27, 35, 25}}]];

g1
AP[1, Cycles[
  {{1, 18, 45, 28}, {2, 27, 44, 19}, {3, 36, 43, 10}, {46, 52, 54, 48}, {47, 49, 53, 51}}]]

AP /: PermutationProduct[AP[k1_, p1_], AP[k2_, p2_]] :=
  AP[k1 + k2, PermutationProduct[p1, p2]];
AP /: PermutationSupport[AP[_ , p_]] := PermutationSupport[p];
AP /: PermutationReplace[i_, AP[_ , p_]] := PermutationReplace[i, p];
AP /: InversePermutation[AP[k_, p_]] := AP[k, InversePermutation[p]];

PermutationProduct[g1, g3]
AP[2, Cycles[{{1, 18, 43, 10, 3, 46, 52, 54, 28}, {2, 27, 40, 38, 42, 44, 19},
  {29, 32, 35, 47, 49, 53, 51}, {30, 33, 36, 37, 39, 45, 31, 34, 48}}]]

```

```

Clear[σ];
σ_°τ_ := PermutationProduct[τ, σ];
Feed[AP[_ , Cycles[{}]]] := Null;
Feed[τ_] := Module[{i, j, k, l, p},
  i = Min[PermutationSupport[τ]];
  j = PermutationReplace[i, τ];
  If[Head[σ[i, j]] === AP,
    p = InversePermutation[σ[i, j]] ° τ;
    If[σ[i, j][[1]] > τ[[1]], σ[i, j] = τ];
    Feed[p],
    (*Else*) σ[i, j] = τ;
  For[k = 1, k < n, ++k,
    For[l = k + 1, l ≤ n, ++l,
      If[Head[σ[k, l]] === AP,
        Feed[σ[i, j] ° σ[k, l]]; Feed[σ[k, l] ° σ[i, j]]]
    ]
  ]];
$RecursionLimit = ∞;

```

```
Feed[g1]
```

```
? σ
```

```
Global`σ
```

```
σ[1, 18] = AP[1, Cycles[
  {{1, 18, 45, 28}, {2, 27, 44, 19}, {3, 36, 43, 10}, {46, 52, 54, 48}, {47, 49, 53, 51}}]]
```

```
σ[1, 28] = AP[3, Cycles[
  {{1, 28, 45, 18}, {2, 19, 44, 27}, {3, 10, 43, 36}, {46, 48, 54, 52}, {47, 51, 53, 49}}]]
```

```
σ[1, 45] = AP[2, Cycles[{{1, 45}, {2, 44}, {3, 43},
  {10, 36}, {18, 28}, {19, 27}, {46, 54}, {47, 53}, {48, 52}, {49, 51}}]]
```

```
a = 1
```

```
1
```

```
? a
```

```
Global`a
```

```
a = 1
```

```
b1 // FullForm
```

```
Subscript[b, 1]
```

Table[Feed[g<sub>α</sub>];

$$\prod_{i=1}^n (1 + \text{Count}[\text{Range}[n], j_ /; \text{Head}[\sigma[i, j]] = \text{AP}]), \{\alpha, 6\} // \text{Timing}$$

```
{21.8125, {4, 16, 159 993 501 696 000, 21 119 142 223 872 000,
43 252 003 274 489 856 000, 43 252 003 274 489 856 000}}
```

? σ

Global`σ

σ[1, 3] = AP[1,

Cycles[{{1, 3, 9, 7}, {2, 6, 8, 4}, {10, 54, 16, 13}, {11, 53, 17, 14}, {12, 52, 18, 15}}]]

σ[1, 7] =

AP[17, Cycles[{{1, 7, 39, 54, 28}, {2, 42, 44, 19}, {3, 46, 52, 12, 34}, {8, 38}, {9, 37},  
{10, 13, 33, 18, 43}, {14, 32}, {15, 31}, {16, 30}, {21, 25}, {22, 24}, {35, 47, 49, 53}}]]]

σ[1, 9] =

AP[9, Cycles[{{1, 9, 39, 37, 3, 7}, {2, 8, 42, 38, 40}, {4, 6}, {10, 16, 33, 30, 54, 13},  
{11, 17}, {12, 52, 15, 34, 31, 18}, {14, 35, 32, 29, 53}}]]]

σ[1, 10] = AP[6, Cycles[{{1, 10, 52}, {2, 40, 38, 42, 19, 44, 27},

{3, 37, 39, 28, 45, 18, 31, 34, 46, 48, 54, 30, 33, 43, 36}, {29, 32, 35, 49, 47, 51, 53}}]]]

σ[1, 12] = AP[15, Cycles[{{1, 12, 31, 34, 16, 54, 46, 45},

{2, 44, 6, 8, 40, 4, 42, 27, 19}, {3, 43, 48, 52, 13, 30, 33, 9},

{7, 37, 39, 15, 18, 28, 36, 10}, {11, 35, 51, 49, 53, 47, 17, 14, 29}, {21, 25}, {22, 24}}]]]

σ[1, 13] = AP[1, Cycles[

{{1, 13, 37, 46}, {4, 22, 40, 49}, {7, 31, 43, 52}, {10, 12, 30, 28}, {11, 21, 29, 19}}]]]

σ[1, 15] =

AP[7, Cycles[{{1, 15, 31, 12, 34, 54, 46, 45}, {2, 44}, {3, 43, 48, 52, 16, 30, 13, 33},

{7, 39, 18, 28, 36, 10, 9, 37}, {8, 38, 42, 27, 19, 40},

{14, 32, 35, 51, 49, 29}, {21, 25}, {22, 24}, {47, 53}}]]]

σ[1, 16] = AP[17,

Cycles[{{1, 16, 13, 33, 48, 52, 9, 7, 39, 36, 10, 15, 12, 34, 45}, {2, 40, 27, 19, 38, 44, 6, 8,

4, 42}, {3, 37, 18, 31, 54, 30}, {11, 35, 53, 29, 51, 49, 32, 47, 17, 14}, {28, 46, 43}}]]]

σ[1, 18] = AP[1, Cycles[

{{1, 18, 45, 28}, {2, 27, 44, 19}, {3, 36, 43, 10}, {46, 52, 54, 48}, {47, 49, 53, 51}}]]]

σ[1, 28] = AP[3, Cycles[

{{1, 28, 45, 18}, {2, 19, 44, 27}, {3, 10, 43, 36}, {46, 48, 54, 52}, {47, 51, 53, 49}}]]]

$$\sigma[1, 30] = \text{AP}[6, \text{Cycles}[\{\{1, 30, 46, 52, 37, 43, 10, 31, 28\}, \{2, 42, 27, 38, 40, 44, 19\}, \{3, 45, 34, 54, 36, 39, 18, 48, 33\}, \{29, 47, 49, 53, 35, 51, 32\}\}]]$$

$$\sigma[1, 31] = \text{AP}[4, \text{Cycles}[\{\{1, 31, 34, 48, 54, 52, 30, 33, 36, 3, 10, 37, 39, 45, 18\}, \{2, 19, 40, 38, 42, 44, 27\}, \{28, 43, 46\}, \{29, 32, 35, 47, 51, 53, 49\}\}]]$$

$$\sigma[1, 33] = \text{AP}[8, \text{Cycles}[\{\{1, 33, 3, 43, 48, 52, 39, 18, 28, 36, 10, 34, 54, 46, 45\}, \{2, 44\}, \{7, 30, 15, 13, 31, 9, 12, 37, 16\}, \{8, 21, 38, 42, 27, 19, 40, 25\}, \{14, 22, 32, 35, 51, 49, 29, 24\}, \{47, 53\}\}]]$$

$$\sigma[1, 34] = \text{AP}[5, \text{Cycles}[\{\{1, 34, 28, 37, 45, 18\}, \{2, 19, 38, 44, 27\}, \{3, 10, 39, 43, 30, 36\}, \{29, 35\}, \{31, 48, 54, 52, 33, 46\}, \{32, 47, 51, 53, 49\}, \{40, 42\}\}]]$$

$$\sigma[1, 36] = \text{AP}[4, \text{Cycles}[\{\{1, 36, 43, 10, 48, 46, 52, 45, 28\}, \{2, 40, 38, 42, 27, 44, 19\}, \{3, 37, 39, 18, 31, 34, 54, 30, 33\}, \{29, 32, 35, 51, 47, 49, 53\}\}]]$$

$$\sigma[1, 37] = \text{AP}[6, \text{Cycles}[\{\{1, 37, 45\}, \{2, 38, 44\}, \{3, 39, 43\}, \{10, 30, 36\}, \{18, 34, 28\}, \{19, 27\}, \{29, 35\}, \{31, 48, 52\}, \{32, 47, 53\}, \{33, 46, 54\}, \{40, 42\}, \{49, 51\}\}]]$$

$$\sigma[1, 39] = \text{AP}[8, \text{Cycles}[\{\{1, 39, 46, 52, 34, 43, 10, 33, 28\}, \{2, 42, 38, 27, 40, 44, 19\}, \{3, 45, 31, 54, 36, 37, 18, 48, 30\}, \{29, 47, 49, 53, 35, 32, 51\}\}]]$$

$$\sigma[1, 43] = \text{AP}[3, \text{Cycles}[\{\{1, 43, 3, 37, 39, 45\}, \{2, 40, 38, 42, 44\}, \{10, 46, 54, 30, 33, 36\}, \{18, 31, 34, 48, 52, 28\}, \{19, 27\}, \{29, 32, 35, 47, 53\}, \{49, 51\}\}]]$$

$$\sigma[1, 45] = \text{AP}[2, \text{Cycles}[\{\{1, 45\}, \{2, 44\}, \{3, 43\}, \{10, 36\}, \{18, 28\}, \{19, 27\}, \{46, 54\}, \{47, 53\}, \{48, 52\}, \{49, 51\}\}]]$$

$$\sigma[1, 46] = \text{AP}[5, \text{Cycles}[\{\{1, 46, 52, 43, 10, 28\}, \{2, 38, 44, 19\}, \{3, 39, 18, 34, 54, 33\}, \{27, 40, 42\}, \{29, 35, 51\}, \{30, 36, 37, 45, 31, 48\}, \{32, 47, 49, 53\}\}]]$$

$$\sigma[1, 48] = \text{AP}[6, \text{Cycles}[\{\{1, 48, 54, 52, 36, 3, 10, 45, 18\}, \{2, 19, 42, 38, 40, 44, 27\}, \{28, 39, 37, 43, 33, 30, 46, 34, 31\}, \{29, 47, 51, 53, 49, 35, 32\}\}]]$$

$$\sigma[1, 52] = \text{AP}[22, \text{Cycles}[\{\{1, 52, 10\}, \{2, 38, 19, 40, 42, 27, 44\}, \{3, 39, 18, 34, 54, 33\}, \{28, 36, 43, 48, 46, 45\}, \{29, 35, 51, 47, 53, 32, 49\}, \{30, 31, 37\}\}]]$$

$$\sigma[1, 54] = \text{AP}[9, \text{Cycles}[\{\{1, 54, 33, 48, 52, 3, 39, 36, 10, 18, 34, 45\}, \{2, 38, 44\}, \{19, 42, 40, 27\}, \{28, 46, 43\}, \{29, 51, 49, 35\}, \{30, 37, 31\}, \{32, 47, 53\}\}]]$$

$$\sigma[2, 4] = \text{AP}[24, \text{Cycles}[\{\{2, 4, 40, 8, 38, 6, 42\}, \{3, 39, 9, 37, 7\}, \{11, 29, 14, 32, 17, 35, 53\}, \{12, 18, 34, 15, 31\}, \{13, 54, 33, 16, 30\}\}]]$$

```

σ[2, 6] = AP[8, Cycles[{{2, 6, 8, 4, 42, 38, 40}, {3, 9, 7, 39, 37},
  {11, 35, 32, 29, 53, 17, 14}, {12, 34, 31, 18, 15}, {13, 33, 30, 54, 16}}]]

σ[2, 8] = AP[16, Cycles[{{2, 8, 42, 40, 6, 4, 38}, {3, 7, 37, 9, 39},
  {11, 32, 53, 14, 35, 29, 17}, {12, 31, 15, 34, 18}, {13, 30, 16, 33, 54}}]]

σ[2, 11] = AP[25, Cycles[{{2, 11, 40, 35, 32, 24, 14, 22},
  {4, 29, 42, 38, 25, 8, 21, 53}, {7, 30, 39, 16}, {9, 12, 37, 34}, {13, 31, 33, 15}}]]

σ[2, 14] =
  AP[78, Cycles[{{2, 14, 42, 21, 51, 47, 53, 8, 35, 22, 27, 44}, {3, 36, 43, 9, 34, 54, 48,
    46, 16, 39, 18, 45, 28, 15, 33}, {19, 49}, {29, 32}, {30, 37, 31}, {38, 40}}]]

σ[2, 17] = AP[33, Cycles[{{2, 17, 11, 38, 44, 27, 40, 42, 14, 22, 19, 25},
  {3, 13, 34, 28, 15, 54, 12, 39, 43, 9, 18, 7, 33, 46, 16},
  {4, 32, 47, 51, 29, 35, 8, 21, 49, 24, 53, 6}, {30, 36, 37, 45, 31, 48}}]]

σ[2, 19] = AP[16, Cycles[{{2, 19, 6, 8, 4, 38, 40}, {3, 33, 9, 7, 37},
  {11, 32, 29, 53, 49, 17, 14}, {12, 31, 18, 39, 15}, {13, 30, 54, 34, 16}}]]

σ[2, 21] =
  AP[33, Cycles[{{2, 21, 8, 25}, {3, 31, 39, 13, 15, 54, 37, 33, 12, 9, 18, 30, 34, 7, 16},
    {14, 24, 53, 22}, {19, 44, 40}, {28, 45, 46, 48, 43, 36}, {29, 49, 47}}]]

σ[2, 22] =
  AP[97, Cycles[{{2, 22, 27, 44}, {3, 36, 43, 12, 37, 33}, {4, 29, 24, 14, 38, 35, 19}, {7, 30,
    34, 54, 48, 46}, {8, 32, 42, 49, 11, 40, 25}, {13, 31, 39, 18, 45, 28}, {21, 51, 47, 53}}]]

σ[2, 24] = AP[44, Cycles[{{2, 24, 22, 27, 40, 8, 49, 4, 53, 25, 21, 51, 29, 14, 19, 11},
  {3, 33, 15, 31, 12}, {7, 54, 34, 9, 37}, {13, 18, 39, 16, 30}, {32, 42, 38, 35}}]]

σ[2, 25] = AP[21,
  Cycles[{{2, 25, 8, 21}, {3, 16, 7, 46}, {9, 12, 43, 18}, {13, 28, 54, 15}, {14, 22, 53, 24}}]]

σ[2, 27] = AP[9, Cycles[
  {{2, 27, 44, 42}, {3, 36, 33, 28}, {18, 45, 39, 46}, {34, 43, 54, 48}, {35, 53, 51, 47}}]]

σ[2, 29] = AP[43, Cycles[{{2, 29, 22, 19, 11, 42}, {3, 16, 39, 12, 18, 9, 34, 13, 54, 15, 33, 7},
  {4, 35, 53, 40, 21, 49}, {6, 38}, {8, 25}, {14, 24}, {17, 32}, {30, 31, 37}}]]

σ[2, 32] = AP[25, Cycles[{{2, 32, 29, 24, 14, 22, 27, 11}, {3, 31, 9, 12},
  {4, 53, 38, 40, 25, 8, 21, 51}, {7, 54, 37, 16}, {13, 18, 30, 15}}]]

σ[2, 35] = AP[32, Cycles[{{2, 35, 32, 4, 29, 24, 14, 22, 19}, {3, 34, 54, 39, 18, 33},
  {7, 30, 43, 9, 12, 37, 28, 15, 13, 31, 46, 16}, {8, 21, 49, 53, 42, 38, 11, 40, 25}}]]

```

```

σ[2, 38] =
  AP[14, Cycles[{{2, 38, 42}, {3, 46, 18, 43, 54, 28}, {30, 33, 31, 34, 37, 39}, {32, 35, 53}}]]

σ[2, 40] = AP[13, Cycles[
  {{2, 40, 38, 19}, {3, 37, 28, 33}, {18, 31, 46, 39}, {29, 32, 49, 53}, {30, 43, 34, 54}}]]

σ[2, 42] = AP[13, Cycles[
  {{2, 42, 44, 27}, {3, 28, 33, 36}, {18, 46, 39, 45}, {34, 48, 54, 43}, {35, 47, 51, 53}}]]

σ[2, 44] = AP[7, Cycles[{{2, 44}, {3, 33, 15, 13, 31},
  {4, 29, 27, 42, 38, 25, 8, 21, 49}, {7, 30, 18, 39, 16}, {9, 12, 37, 54, 34},
  {11, 40, 51, 35, 32, 24, 14, 22, 19}, {28, 36}, {43, 48}, {45, 46}, {47, 53}}]]

σ[2, 47] = AP[82, Cycles[{{2, 47, 22, 19, 53, 44, 21, 49},
  {28, 34, 30}, {29, 42, 40, 35}, {31, 43, 39}, {33, 37, 46}}]]

σ[2, 49] =
  AP[52, Cycles[{{2, 49, 47, 42, 38, 25}, {3, 33, 37, 15, 54, 34, 30, 9, 18, 39, 31, 16}, {4, 29},
  {11, 40}, {19, 44, 35, 32, 24, 53}, {28, 45, 46, 48, 43, 36}}]]

σ[2, 51] = AP[85, Cycles[{{2, 51, 47, 22, 19}, {3, 36, 43, 30, 15, 33}, {8, 35, 29, 32},
  {9, 34, 54, 48, 46, 31}, {14, 42, 40, 38}, {16, 39, 18, 45, 28, 37}, {21, 49, 53, 27, 44}}]]

σ[2, 53] =
  AP[53, Cycles[{{2, 53}, {3, 12, 37, 33, 48, 46, 18, 13, 31, 39, 36, 43, 54, 7, 30, 34, 45, 28},
  {4, 8, 29, 51}, {6, 25, 38, 42, 19, 21, 47, 17, 24, 32, 35, 49, 22, 44},
  {9, 16, 15}, {11, 14, 40, 27}}]]

σ[3, 7] = AP[19, Cycles[{{3, 7, 9, 45, 43, 39}, {4, 44, 38, 42, 6}, {11, 47, 32, 35, 17},
  {12, 15, 48, 28, 34, 18}, {13, 16, 36, 46, 33, 54}, {21, 25}, {22, 24}}]]

σ[3, 9] = AP[10, Cycles[{{3, 9}, {7, 37}, {8, 40},
  {12, 31}, {13, 30}, {14, 29}, {15, 18}, {16, 54}, {21, 25}, {22, 24}}]]

σ[3, 12] = AP[9,
  Cycles[{{3, 12, 9, 31}, {7, 16, 37, 54}, {8, 25, 40, 21}, {13, 15, 30, 18}, {14, 24, 29, 22}}]]

σ[3, 13] =
  AP[16, Cycles[{{3, 13, 33, 18, 7, 39, 54, 12, 34}, {8, 38}, {9, 37}, {14, 32}, {15, 31},
  {16, 30}, {21, 25}, {22, 24}, {27, 42, 44}, {28, 45, 43, 36, 46, 48}, {35, 47, 51}}]]

σ[3, 15] =
  AP[17, Cycles[{{3, 15, 13, 31, 33, 18, 16, 7, 30, 39, 54, 9, 12, 37, 34}, {8, 21, 38, 25},
  {14, 22, 32, 24}, {27, 42, 44}, {28, 45, 43, 36, 46, 48}, {35, 47, 51}}]]

σ[3, 16] = AP[19, Cycles[{{3, 16, 36, 34, 54, 15, 48, 39, 18, 9, 45, 33},
  {24, 51, 29}, {25, 27, 40}, {30, 37, 31}, {32, 35}, {38, 42}}]]

```

```

σ[3, 18] = AP[21, Cycles[{{3, 18, 54}, {19, 27, 44, 40, 38, 42},
  {28, 31, 34, 36, 43, 37, 39, 48, 46, 30, 33, 45}, {29, 32, 35, 49, 51, 47}}]]

σ[3, 28] = AP[4, Cycles[{{3, 28, 31, 48, 33}, {18, 46, 30, 36, 39},
  {27, 38, 44, 40, 42}, {29, 35, 51, 32, 47}, {34, 54, 43, 37, 45}}]]

σ[3, 30] = AP[6, Cycles[{{3, 30}, {18, 37}, {27, 38},
  {29, 35}, {31, 54}, {32, 51}, {33, 48}, {34, 45}, {36, 39}, {40, 42}}]]

σ[3, 31] = AP[5, Cycles[{{3, 31, 28, 34, 54, 37, 43, 39, 18, 30, 46, 33},
  {27, 42}, {29, 47, 32}, {35, 51}, {36, 45, 48}, {38, 40, 44}}]]

σ[3, 33] = AP[7, Cycles[{{3, 33, 28, 31, 54, 34, 43, 37, 18, 39, 46, 30},
  {27, 42, 38}, {29, 47}, {32, 51, 35}, {36, 45, 48}, {40, 44}}]]

σ[3, 34] =
  AP[6, Cycles[{{3, 34, 54, 39, 18, 33}, {27, 44, 42}, {28, 48, 46, 36, 43, 45}, {35, 51, 47}}]]

σ[3, 36] = AP[8, Cycles[{{3, 36, 43, 39, 30},
  {18, 45, 28, 34, 37}, {27, 44, 38}, {31, 54, 48, 46, 33}, {32, 51, 47}}]]

σ[3, 37] = AP[12, Cycles[{{3, 37, 39, 18, 31, 34, 54, 30, 33}, {7, 48, 15, 13, 45, 9, 12, 36, 16},
  {8, 21, 40, 38, 42, 27, 25}, {14, 22, 29, 32, 35, 51, 24}}]]

σ[3, 39] = AP[13,
  Cycles[{{3, 39, 18, 34, 54, 33}, {7, 28, 31, 48, 15, 13, 43, 37, 45, 9, 12, 46, 30, 36, 16},
  {8, 21, 38, 44, 40, 42, 27, 25}, {14, 22, 32, 47, 29, 35, 51, 24}}]]

σ[3, 43] =
  AP[15, Cycles[{{3, 43, 45, 9, 12, 33}, {7, 34, 54, 46, 36, 16}, {8, 21, 44, 42, 27, 25},
  {13, 39, 18, 28, 48, 15}, {14, 22, 47, 35, 51, 24}}]]

σ[3, 45] =
  AP[14, Cycles[{{3, 45, 9, 12, 30, 46, 33}, {7, 31, 28, 34, 54, 36, 16}, {8, 21, 42, 27, 25},
  {13, 37, 43, 39, 18, 48, 15}, {14, 22, 35, 51, 24}, {29, 47, 32}, {38, 40, 44}}]]

σ[3, 46] = AP[9, Cycles[{{3, 46, 36, 37, 18, 43, 45, 31, 54, 28, 48, 30},
  {27, 40, 38}, {29, 32, 51}, {33, 34, 39}, {35, 47}, {42, 44}}]]

σ[3, 48] = AP[1, Cycles[
  {{3, 48, 39, 15}, {6, 51, 42, 24}, {9, 54, 45, 33}, {16, 18, 36, 34}, {17, 27, 35, 25}}]]

σ[3, 54] = AP[17, Cycles[{{3, 54, 18}, {7, 31, 9, 12, 30, 15, 13, 37, 16}, {8, 21, 42, 40, 25},
  {14, 22, 35, 29, 24}, {27, 38}, {32, 51}, {33, 48}, {34, 45}, {36, 39}}]]

```

```

σ[4, 6] =
  AP[96, Cycles[{{4, 6, 47, 32, 51, 35, 24, 29, 8, 21, 49}, {7, 33, 46, 9, 12, 39, 43, 15, 13, 34,
    28, 16}, {11, 17, 44, 38, 27, 42, 25, 40, 14, 22, 19}, {30, 48, 31, 45, 37, 36}}]]

σ[4, 8] = AP[35,
  Cycles[{{4, 8, 27, 42}, {7, 9, 34, 36}, {11, 14, 51, 35}, {12, 15, 33, 45}, {13, 16, 39, 48}}]]

σ[4, 11] =
  AP[39, Cycles[{{4, 11}, {6, 21, 49, 32, 51, 17, 22, 19, 38, 27}, {7, 28, 16, 31, 33, 48},
    {8, 29, 42, 25}, {9, 30, 39, 36, 12, 46}, {13, 43, 15, 37, 34, 45}, {14, 40, 35, 24}}]]

σ[4, 14] =
  AP[27, Cycles[{{4, 14, 24, 29, 42, 38, 21, 49}, {7, 13, 12}, {8, 25, 40, 35, 32, 22, 19, 11},
    {9, 31, 33, 45, 15, 30, 39, 48, 16, 37, 34, 36}}]]

σ[4, 17] = AP[96, Cycles[{{4, 17, 14, 11, 6, 8}, {7, 39, 28, 31, 9}, {12, 34, 46, 30, 15},
    {13, 33, 43, 37, 16}, {19, 35, 47, 22}, {21, 49, 42, 44}, {29, 38, 40, 32}}]]

σ[4, 19] = AP[20, Cycles[{{4, 19, 42, 38, 27, 6, 8}, {7, 28, 39, 36, 9},
    {11, 49, 35, 32, 51, 17, 14}, {12, 46, 34, 45, 15}, {13, 43, 33, 48, 16}}]]

σ[4, 21] =
  AP[34, Cycles[{{4, 21, 8}, {6, 25, 27, 44, 42, 38, 19}, {7, 33, 31, 36, 43, 12, 39, 30, 45,
    28, 13, 34, 37, 48, 46}, {9, 16, 15}, {11, 22, 14}, {17, 24, 51, 47, 35, 32, 49}}]]

σ[4, 22] = AP[40, Cycles[{{4, 22, 14, 24, 38, 27, 42, 40, 49}, {7, 16, 31, 33, 48},
    {8, 25, 32, 51, 35, 29, 19, 11, 21}, {9, 30, 39, 36, 12}, {13, 15, 37, 34, 45}}]]

σ[4, 24] =
  AP[22, Cycles[{{4, 24, 14, 22, 19, 11, 25, 8, 21, 49}, {7, 30, 15, 13, 31, 9, 12, 37, 16},
    {28, 33, 36, 46, 39, 45, 43, 34, 48}, {29, 44, 40, 47}, {32, 35}, {38, 42}}]]

σ[4, 25] = AP[36,
  Cycles[{{4, 25, 8, 29, 42, 27, 6, 21, 49}, {7, 34, 46, 45, 13, 39, 28, 36, 12, 33, 43, 48},
    {9, 30, 15, 37, 16, 31}, {11, 24, 14, 40, 35, 51, 17, 22, 19}}]]

σ[4, 27] = AP[19, Cycles[
  {{4, 27, 38, 42}, {7, 31, 36, 39}, {11, 51, 32, 35}, {12, 30, 45, 34}, {13, 37, 48, 33}}]]

σ[4, 29] = AP[19, Cycles[{{4, 29, 42, 38, 25, 8, 21, 49}, {7, 30, 39, 16},
    {9, 12, 37, 34}, {11, 40, 35, 32, 24, 14, 22, 19}, {13, 31, 33, 15}}]]

σ[4, 32] = AP[20, Cycles[{{4, 32, 24, 14, 22, 19, 11, 38, 25, 8, 21, 49},
    {7, 33, 15, 13, 34, 9, 12, 39, 16}, {28, 31, 36, 46, 30, 45, 43, 37, 48}, {29, 44, 40, 47}}]]

σ[4, 35] = AP[21, Cycles[{{4, 35, 47, 32, 24, 14, 22, 19, 11, 42, 44, 38, 25, 8, 21, 49},
    {7, 36, 30, 43, 39, 16}, {9, 12, 45, 37, 28, 34}, {13, 48, 31, 46, 33, 15}, {29, 40}}]]

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σ[4, 38] = AP[17, Cycles[{{4, 38, 42, 27, 6, 8}, {7, 37, 39, 28, 36, 9},
  {11, 32, 35, 51, 17, 14}, {12, 31, 34, 46, 45, 15}, {13, 30, 33, 43, 48, 16}}]]

σ[4, 40] = AP[25, Cycles[
  {{4, 40, 27, 44}, {7, 46, 31, 45}, {11, 29, 51, 47}, {12, 43, 30, 48}, {13, 28, 37, 36}}]]

σ[4, 42] = AP[12, Cycles[{{4, 42, 38, 40, 44, 6, 8}, {7, 39, 37, 43, 9},
  {11, 35, 32, 29, 47, 17, 14}, {12, 34, 31, 28, 15}, {13, 33, 30, 46, 16}}]]

σ[4, 44] = AP[17, Cycles[
  {{4, 44, 38, 42}, {7, 45, 43, 39}, {11, 47, 32, 35}, {12, 48, 28, 34}, {13, 36, 46, 33}}]]

σ[4, 47] =
  AP[22, Cycles[{{4, 47, 35, 29, 38, 25, 8, 21, 49}, {7, 46, 36, 33, 15, 13, 28, 48, 34, 9,
    12, 43, 45, 39, 16}, {11, 44, 42, 40, 32, 24, 14, 22, 19}, {30, 37, 31}}]]

σ[4, 49] = AP[34, Cycles[{{4, 49, 38, 8, 51}, {11, 19, 32, 14, 27}}]]

σ[4, 51] = AP[25, Cycles[{{4, 51, 38, 40, 25, 8, 21, 49}, {7, 48, 37, 16},
  {9, 12, 36, 31}, {11, 27, 32, 29, 24, 14, 22, 19}, {13, 45, 30, 15}}]]

σ[6, 8] = AP[26, Cycles[{{6, 8, 21}, {7, 33, 12, 39, 13, 34},
  {9, 37, 16, 30, 15, 31}, {14, 22, 17}, {24, 35, 29}, {25, 42, 40}}]]

σ[6, 14] =
  AP[111, Cycles[{{6, 14, 17, 8}, {9, 43, 37, 36, 16, 46, 30, 48, 15, 28, 31, 45}, {19, 47, 22},
    {21, 49, 44}, {29, 42, 38, 40, 35, 32}, {33, 39, 34}}]]

σ[6, 17] =
  AP[132, Cycles[{{6, 17}, {7, 12, 13}, {8, 47, 14, 44}, {9, 37, 36, 16, 30, 48, 15, 31, 45},
    {19, 27, 40, 21, 49, 51, 29, 22}, {28, 46, 43}, {33, 34, 39}, {35, 42}}]]

σ[6, 19] = AP[52, Cycles[{{6, 19, 27, 42, 40, 44, 8}, {7, 12, 13},
  {9, 33, 28, 37, 36, 16, 34, 43, 30, 48, 15, 39, 46, 31, 45}, {14, 17, 49, 51, 35, 29, 47}}]]

σ[6, 21] =
  AP[48, Cycles[{{6, 21, 49, 8, 29, 47, 51, 35, 24, 17, 22, 19, 14, 40, 44, 27, 42, 25}, {7, 48,
    43, 15}, {9, 13, 45, 46}, {12, 36, 28, 16}, {30, 34}, {31, 39}, {32, 38}, {33, 37}}]]

σ[6, 22] = AP[98, Cycles[{{6, 22, 40, 44, 25}, {7, 28, 37, 12, 46, 31, 13, 43, 30},
  {9, 15, 16}, {17, 21, 29, 47, 24}, {27, 42, 38}, {32, 51, 35}, {33, 39, 34}}]]

σ[6, 24] =
  AP[99, Cycles[{{6, 24, 32, 35, 29, 44, 21, 49}, {9, 34, 30}, {15, 33, 37}, {16, 39, 31},
    {17, 25, 38, 42, 40, 47, 22, 19}, {28, 48}, {36, 46}, {43, 45}}]]

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$\sigma[6, 25] = \text{AP}[31, \text{Cycles}[\{\{6, 25, 38, 21\}, \{9, 34, 37, 15, 33, 31, 16, 39, 30\},$   
 $\{17, 24, 32, 22\}, \{27, 42, 44\}, \{28, 45, 43, 36, 46, 48\}, \{35, 47, 51\}\}]]$

$\sigma[6, 27] =$   
 $\text{AP}[35, \text{Cycles}[\{\{6, 27, 42, 44, 38, 8\}, \{7, 33, 28, 15, 45, 37\}, \{9, 36, 30, 13, 34, 43\},$   
 $\{12, 39, 46, 16, 48, 31\}, \{14, 17, 51, 35, 47, 32\}\}]]$

$\sigma[6, 29] = \text{AP}[76, \text{Cycles}[\{\{6, 29, 24, 51, 42, 8, 38, 44, 49\}, \{9, 34, 31, 43, 45\},$   
 $\{14, 32, 47, 19, 17, 40, 25, 27, 35\}, \{15, 33, 30, 28, 48\}, \{16, 39, 37, 46, 36\}\}]]$

$\sigma[6, 32] =$   
 $\text{AP}[61, \text{Cycles}[\{\{6, 32, 51, 47, 24, 19, 35, 17, 38, 27, 44, 25, 49, 42\}, \{7, 34, 37\}, \{8, 21\},$   
 $\{9, 28\}, \{12, 33, 31\}, \{13, 39, 30\}, \{14, 22\}, \{15, 46\}, \{16, 43\}, \{29, 40\}\}]]$

$\sigma[6, 35] = \text{AP}[4, \text{Cycles}[\{\{6, 35, 25, 17, 42, 24\},$   
 $\{9, 34, 16, 39, 15, 33\}, \{27, 32, 29, 51, 38, 40\}, \{30, 48, 37, 36, 31, 45\}\}]]$

$\sigma[6, 38] = \text{AP}[69, \text{Cycles}[\{\{6, 38, 42, 8\}, \{7, 34, 37, 12, 33, 31, 13, 39, 30\},$   
 $\{14, 17, 32, 35\}, \{27, 29, 44\}, \{28, 45, 43, 36, 46, 48\}, \{40, 47, 51\}\}]]$

$\sigma[6, 40] =$   
 $\text{AP}[31, \text{Cycles}[\{\{6, 40, 44, 38, 21, 27, 42\}, \{7, 45, 37, 43, 13, 36, 30, 46, 12, 48, 31, 28\},$   
 $\{8, 25\}, \{9, 16, 15\}, \{14, 24\}, \{17, 29, 47, 32, 22, 51, 35\}, \{33, 34, 39\}\}]]$

$\sigma[6, 42] =$   
 $\text{AP}[51, \text{Cycles}[\{\{6, 42, 27, 44, 8\}, \{7, 16, 43\}, \{9, 28, 12\}, \{13, 15, 46\}, \{14, 17, 35, 51, 47\},$   
 $\{29, 32\}, \{30, 37, 31\}, \{33, 45, 34, 36, 39, 48\}, \{38, 40\}\}]]$

$\sigma[6, 44] = \text{AP}[31, \text{Cycles}[\{\{6, 44, 8\}, \{9, 43, 45\}, \{14, 17, 47\},$   
 $\{15, 28, 48\}, \{16, 46, 36\}, \{29, 32\}, \{30, 33\}, \{31, 34\}, \{37, 39\}, \{38, 40\}\}]]$

$\sigma[6, 47] = \text{AP}[77, \text{Cycles}[\{\{6, 47, 32, 24, 51, 35, 14, 29\}, \{8, 40, 17, 44, 38, 25, 27, 42\},$   
 $\{9, 28, 16, 43, 15, 46\}, \{30, 33, 45, 37, 39, 48, 31, 34, 36\}\}]]$

$\sigma[6, 49] = \text{AP}[93, \text{Cycles}[\{\{6, 49\}, \{17, 19\}, \{21, 32, 51, 47, 22, 38, 27, 44\},$   
 $\{28, 45\}, \{29, 42, 40, 35\}, \{30, 37, 31\}, \{33, 34, 39\}, \{36, 43\}, \{46, 48\}\}]]$

$\sigma[6, 51] = \text{AP}[82, \text{Cycles}[\{\{6, 51, 22, 44, 17, 27, 21, 47\},$   
 $\{29, 42, 40, 35\}, \{30, 45, 34\}, \{31, 36, 39\}, \{33, 37, 48\}\}]]$

$\sigma[7, 9] = \text{AP}[62, \text{Cycles}[\{\{7, 9, 34, 28, 31\}, \{8, 25, 44, 40, 38, 21, 27\},$   
 $\{12, 15, 33, 46, 30\}, \{13, 16, 39, 43, 37\}, \{14, 24, 47, 29, 32, 22, 51\}\}]]$

$\sigma[7, 12] =$   
 $\text{AP}[62, \text{Cycles}[\{\{7, 12, 13\}, \{8, 40, 42, 38\}, \{9, 15, 16\}, \{14, 29, 35, 32\}, \{21, 27, 44, 25\},$   
 $\{22, 51, 47, 24\}, \{28, 48, 46, 36, 43, 45\}, \{30, 34\}, \{31, 39\}, \{33, 37\}\}]]$

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σ[7, 13] = AP[54, Cycles[{{7, 13, 12}, {21, 44, 27, 42, 38},
  {22, 47, 51, 35, 32}, {28, 46, 43}, {33, 34, 39}, {36, 45, 48}}]]

σ[7, 15] = AP[57, Cycles[{{7, 15, 28, 12, 16, 46, 13, 9, 43}, {8, 27, 42, 38, 44},
  {14, 51, 35, 32, 47}, {24, 29}, {25, 40}, {30, 48, 31, 45, 37, 36}}]]

σ[7, 16] = AP[1, Cycles[
  {{7, 16, 39, 30}, {8, 25, 38, 21}, {9, 34, 37, 12}, {13, 15, 33, 31}, {14, 24, 32, 22}}]]

σ[7, 28] =
  AP[10, Cycles[{{7, 28, 31, 9, 12, 46, 30, 15, 13, 43, 37, 16}, {8, 21, 38, 42, 44, 40, 25},
  {14, 22, 32, 35, 47, 29, 24}, {33, 36, 34, 48, 39, 45}}]]

σ[7, 30] = AP[3, Cycles[
  {{7, 30, 39, 16}, {8, 21, 38, 25}, {9, 12, 37, 34}, {13, 31, 33, 15}, {14, 22, 32, 24}}]]

σ[7, 31] = AP[29, Cycles[
  {{7, 31, 34, 46}, {12, 30, 33, 43}, {13, 37, 39, 28}, {19, 40, 38, 42}, {29, 32, 35, 49}}]]

σ[7, 33] = AP[4, Cycles[{{7, 33, 15, 13, 34, 9, 12, 39, 16}, {8, 21, 42, 44, 40, 38, 25},
  {14, 22, 35, 47, 29, 32, 24}, {28, 31, 36, 46, 30, 45, 43, 37, 48}}]]

σ[7, 34] = AP[17, Cycles[
  {{7, 34, 36, 16}, {8, 21, 27, 25}, {9, 12, 33, 45}, {13, 39, 48, 15}, {14, 22, 51, 24}}]]

σ[7, 36] = AP[5, Cycles[{{7, 36, 30, 43, 39, 16}, {8, 21, 44, 38, 25}, {9, 12, 45, 37, 28, 34},
  {13, 48, 31, 46, 33, 15}, {14, 22, 47, 32, 24}, {29, 35}, {40, 42}}]]

σ[7, 37] = AP[8, Cycles[{{7, 37}, {8, 40}, {9, 36},
  {12, 31}, {13, 30}, {14, 29}, {15, 45}, {16, 48}, {21, 25}, {22, 24}}]]

σ[7, 39] = AP[2, Cycles[{{7, 39}, {8, 38}, {9, 37},
  {12, 34}, {13, 33}, {14, 32}, {15, 31}, {16, 30}, {21, 25}, {22, 24}}]]

σ[7, 43] =
  AP[4, Cycles[{{7, 43, 39}, {8, 44, 38}, {9, 45, 37}, {12, 28, 34}, {13, 46, 33}, {14, 47, 32},
  {15, 48, 31}, {16, 36, 30}, {21, 25}, {22, 24}, {29, 35}, {40, 42}}]]

σ[7, 45] = AP[3, Cycles[{{7, 45, 43, 37, 9, 39}, {8, 42, 44, 40, 38}, {12, 48, 28, 31, 15, 34},
  {13, 36, 46, 30, 16, 33}, {14, 35, 47, 29, 32}, {21, 25}, {22, 24}}]]

σ[7, 46] = AP[6, Cycles[{{7, 46, 36, 33, 15, 13, 28, 48, 34, 9, 12, 43, 45, 39, 16},
  {8, 21, 40, 44, 42, 38, 25}, {14, 22, 29, 47, 35, 32, 24}, {30, 37, 31}}]]

σ[7, 48] = AP[9, Cycles[
  {{7, 48, 37, 16}, {8, 21, 40, 25}, {9, 12, 36, 31}, {13, 45, 30, 15}, {14, 22, 29, 24}}]]

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$\sigma[8, 14] =$

AP[100, Cycles[{{8, 14}, {9, 37, 28, 16, 30, 43, 15, 31, 46}, {19, 44, 21, 27, 24, 38, 42},  
{22, 51, 25, 32, 35, 49, 47}, {29, 40}, {33, 34, 39}, {36, 48, 45}}]]

$\sigma[8, 19] =$

AP[49, Cycles[{{8, 19, 25, 38, 40, 44, 21}, {9, 37, 43, 39, 16, 30, 46, 33, 15, 31, 28, 34},  
{14, 49, 24, 32, 29, 47, 22}, {27, 42}, {35, 51}, {36, 45, 48}}]]

$\sigma[8, 21] =$

AP[39, Cycles[{{8, 21, 42, 27}, {9, 15, 16}, {14, 22, 35, 51}, {24, 29, 32}, {25, 40, 38},  
{28, 31, 36, 34, 43, 37, 48, 39, 46, 30, 45, 33}}]]

$\sigma[8, 22] =$  AP[110, Cycles[{{8, 22, 29, 32, 35, 14, 21, 40, 38, 42},

{19, 27, 47, 49, 51, 44}, {30, 33, 36}, {31, 34, 48}, {37, 39, 45}}]]

$\sigma[8, 24] =$  AP[92, Cycles[{{8, 24, 51, 32, 47, 42, 40, 21, 49}, {9, 33, 36, 28, 31},

{14, 25, 27, 38, 44, 35, 29, 22, 19}, {15, 39, 45, 46, 30}, {16, 34, 48, 43, 37}}]]

$\sigma[8, 25] =$

AP[21, Cycles[{{8, 25, 27}, {9, 45, 37, 28, 16, 36, 30, 43, 15, 48, 31, 46}, {14, 24, 51},  
{21, 44, 38}, {22, 47, 32}, {29, 35}, {33, 39, 34}, {40, 42}}]]

$\sigma[8, 27] =$

AP[45, Cycles[{{8, 27, 38, 42, 44, 21, 25, 40}, {9, 46, 37, 48, 16, 28, 30, 45, 15, 43, 31, 36},  
{14, 51, 32, 35, 47, 22, 24, 29}, {33, 39, 34}}]]

$\sigma[8, 29] =$  AP[74, Cycles[{{8, 29, 27, 38, 44, 21, 49}, {9, 28, 16, 43, 15, 46},

{14, 40, 51, 32, 47, 22, 19}, {30, 31, 37}, {33, 45, 34, 36, 39, 48}}]]

$\sigma[8, 32] =$

AP[75, Cycles[{{8, 32, 29, 27, 42, 44, 21, 49}, {9, 31, 39, 28, 16, 37, 33, 43, 15, 30, 34, 46},  
{14, 38, 40, 51, 35, 47, 22, 19}, {36, 45, 48}}]]

$\sigma[8, 35] =$  AP[72, Cycles[{{8, 35, 29, 27, 44, 21, 49}, {9, 34, 30, 48, 46},

{14, 42, 40, 51, 47, 22, 19}, {15, 33, 37, 36, 43}, {16, 39, 31, 45, 28}}]]

$\sigma[8, 38] =$  AP[39, Cycles[{{8, 38}, {9, 46, 30, 16, 28, 31, 15, 43, 37},

{14, 32}, {29, 35, 47}, {33, 36, 39, 45, 34, 48}, {40, 42, 44}}]]

$\sigma[8, 40] =$  AP[29, Cycles[{{8, 40}, {9, 43}, {14, 29}, {15, 28}, {16, 46},

{30, 36, 33}, {31, 48, 34}, {32, 47, 35}, {37, 45, 39}, {38, 44, 42}}]]

$\sigma[8, 42] =$  AP[27, Cycles[

{{8, 42, 44, 40}, {9, 39, 45, 43}, {14, 35, 47, 29}, {15, 34, 48, 28}, {16, 33, 36, 46}}]]

$\sigma[8, 44] =$  AP[28, Cycles[{{8, 44, 38, 42, 40}, {9, 45, 37, 39, 43},

{14, 47, 32, 35, 29}, {15, 48, 31, 34, 28}, {16, 36, 30, 33, 46}}]]

$\sigma[8, 47] = \text{AP}[60, \text{Cycles}[\{\{8, 47, 35, 51, 14, 44, 42, 27\},$   
 $\{9, 31, 16, 37, 15, 30\}, \{21, 25, 40, 32, 22, 24, 29, 38\}, \{33, 45, 39, 48, 34, 36\}\}]]$

$\sigma[8, 49] =$   
 $\text{AP}[81, \text{Cycles}[\{\{8, 49, 38, 21, 25, 29, 35, 27\}, \{9, 34, 28, 36, 15, 33, 46, 45, 16, 39, 43, 48\},$   
 $\{14, 19, 32, 22, 24, 40, 42, 51\}, \{30, 31, 37\}\}]]$

$\sigma[8, 51] = \text{AP}[56, \text{Cycles}[\{\{8, 51, 29, 42, 21, 49, 38\}, \{14, 27, 40, 35, 22, 19, 32\}\}]]$

$\sigma[9, 15] = \text{AP}[105, \text{Cycles}[\{\{9, 15, 16\}, \{19, 40, 42, 27\}, \{21, 25\}, \{22, 24\},$   
 $\{28, 45, 33, 37, 43, 36, 34, 30, 46, 48, 39, 31\}, \{29, 35, 51, 49\}, \{32, 47\}, \{38, 44\}\}]]$

$\sigma[9, 16] = \text{AP}[45, \text{Cycles}[\{\{9, 16, 15\}, \{19, 42, 40\}, \{27, 38\},$   
 $\{28, 36, 30, 34, 46, 45, 37, 33, 43, 48, 31, 39\}, \{29, 49, 35\}, \{32, 51\}\}]]$

$\sigma[9, 28] = \text{AP}[4, \text{Cycles}[\{\{9, 28, 36, 30, 33\}, \{15, 46, 45, 37, 39\},$   
 $\{16, 43, 48, 31, 34\}, \{24, 47, 32, 35, 29\}, \{25, 44, 38, 42, 40\}\}]]$

$\sigma[9, 30] = \text{AP}[11, \text{Cycles}[\{\{9, 30, 39, 16, 31, 33, 15, 37, 34\},$   
 $\{24, 47, 35, 32\}, \{25, 44, 42, 38\}, \{28, 48, 46, 36, 43, 45\}\}]]$

$\sigma[9, 31] = \text{AP}[66, \text{Cycles}[\{\{9, 31, 46, 39, 48\}, \{15, 30, 43, 34, 36\},$   
 $\{16, 37, 28, 33, 45\}, \{19, 27, 42, 40, 38\}, \{29, 32, 49, 51, 35\}\}]]$

$\sigma[9, 33] =$   
 $\text{AP}[8, \text{Cycles}[\{\{9, 33, 15, 39, 16, 34\}, \{24, 29, 32\}, \{25, 40, 38\}, \{30, 45, 31, 36, 37, 48\}\}]]$

$\sigma[9, 34] = \text{AP}[19, \text{Cycles}[\{\{9, 34, 48, 28\}, \{15, 33, 36, 46\}, \{16, 39, 45, 43\}, \{24, 32, 35, 47\}, \{25, 38, 42, 44\}\}]]$

$\sigma[9, 36] = \text{AP}[9, \text{Cycles}[\{\{9, 36, 39, 16, 48, 33, 15, 45, 34\},$   
 $\{24, 32\}, \{25, 38\}, \{28, 31, 46, 30, 43, 37\}, \{29, 35, 47\}, \{40, 42, 44\}\}]]$

$\sigma[9, 37] = \text{AP}[23, \text{Cycles}[\{\{9, 37\}, \{15, 31\}, \{16, 30\}, \{21, 25\}, \{22, 24\},$   
 $\{28, 34, 48\}, \{32, 35, 47\}, \{33, 36, 46\}, \{38, 42, 44\}, \{39, 45, 43\}\}]]$

$\sigma[9, 39] = \text{AP}[24, \text{Cycles}[\{\{9, 39, 43, 45, 37\}, \{15, 34, 28, 48, 31\},$   
 $\{16, 33, 46, 36, 30\}, \{21, 25\}, \{22, 24\}, \{29, 32, 47, 35\}, \{38, 44, 42, 40\}\}]]$

$\sigma[9, 43] = \text{AP}[17, \text{Cycles}[\{\{9, 43, 37, 48, 16, 46, 30, 45, 15, 28, 31, 36\},$   
 $\{24, 51, 35, 47, 29, 32\}, \{25, 27, 42, 44, 40, 38\}, \{33, 39, 34\}\}]]$

$\sigma[9, 45] =$   
 $\text{AP}[16, \text{Cycles}[\{\{9, 45, 15, 48, 16, 36\}, \{24, 51, 32\}, \{25, 27, 38\}, \{30, 39, 31, 33, 37, 34\}\}]]$

$\sigma[9, 46] = \text{AP}[10, \text{Cycles}[\{\{9, 46, 33, 15, 43, 39, 16, 28, 34\},$   
 $\{24, 35, 29, 47, 32\}, \{25, 42, 40, 44, 38\}, \{30, 37, 31\}, \{36, 45, 48\}\}]]$

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σ[9, 48] = AP[3, Cycles[
  {{9, 48, 28, 33}, {15, 36, 46, 39}, {16, 45, 43, 34}, {24, 35, 47, 29}, {25, 42, 44, 40}}]]

σ[19, 21] =
  AP[38, Cycles[{{19, 21, 40}, {22, 29, 49}, {30, 34, 45}, {31, 39, 36}, {33, 48, 37}}]]

σ[19, 22] = AP[40, Cycles[{{19, 22, 44}, {21, 47, 49}}]]

σ[19, 24] = AP[112, Cycles[{{19, 24, 22, 38, 49, 25, 21, 32},
  {28, 37, 45, 43, 30, 36, 46, 31, 48}, {29, 44, 40, 47}, {33, 39, 34}}]]

σ[19, 25] = AP[69, Cycles[
  {{19, 25, 27, 42, 40, 38}, {24, 51, 35, 29, 32, 49}, {28, 46, 43}, {30, 36, 31, 48, 37, 45}}]]

σ[19, 27] = AP[24, Cycles[{{19, 27, 38, 42}, {28, 43, 46},
  {29, 47}, {32, 35, 49, 51}, {33, 34, 39}, {36, 48, 45}, {40, 44}}]]

σ[19, 29] = AP[86, Cycles[{{19, 29, 27, 42, 24, 32, 47},
  {25, 38, 44, 49, 40, 51, 35}, {28, 37, 39, 43, 30, 33, 46, 31, 34}, {36, 45, 48}}]]

σ[19, 32] = AP[81,
  Cycles[{{19, 32, 29, 49, 38, 40}, {24, 51, 25, 27}, {30, 37, 31}, {33, 45, 34, 36, 39, 48}}]]

σ[19, 35] = AP[58, Cycles[
  {{19, 35, 44, 25, 40}, {24, 29, 49, 42, 47}, {28, 37, 33}, {30, 34, 43}, {31, 39, 46}}]]

σ[19, 38] = AP[13, Cycles[
  {{19, 38, 27, 44}, {28, 37, 34, 45}, {30, 39, 36, 43}, {31, 33, 48, 46}, {32, 51, 47, 49}}]]

σ[19, 40] = AP[12, Cycles[{{19, 40, 38}, {27, 42, 44}, {28, 43, 46},
  {29, 32, 49}, {30, 37, 31}, {33, 34, 39}, {35, 47, 51}, {36, 45, 48}}]]

σ[19, 42] = AP[14, Cycles[{{19, 42, 44}, {27, 40, 38},
  {28, 39, 46, 34, 43, 33}, {29, 32, 51}, {30, 45, 31, 36, 37, 48}, {35, 47, 49}}]]

σ[19, 44] = AP[11, Cycles[
  {{19, 44, 27, 38}, {28, 45, 34, 37}, {30, 43, 36, 39}, {31, 46, 48, 33}, {32, 49, 47, 51}}]]

σ[19, 47] = AP[113, Cycles[{{19, 47, 51, 24}, {21, 38, 22, 32},
  {25, 49, 44, 27}, {29, 35, 40, 42}, {30, 36, 37, 45, 31, 48}, {33, 34, 39}}]]

σ[19, 49] = AP[140, Cycles[{{19, 49}, {21, 32, 29, 44, 42},
  {22, 38, 40, 47, 35}, {27, 51}, {28, 45, 39, 43, 36, 33, 46, 48, 34}, {30, 37, 31}}]]

σ[19, 51] = AP[84, Cycles[{{19, 51, 22, 44, 49, 27, 21, 47},
  {29, 42, 40, 35}, {30, 45, 34}, {31, 36, 39}, {33, 37, 48}}]]

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σ[21, 22] =
  AP[149, Cycles[{{21, 22}, {29, 32, 44, 42, 40, 38, 47, 35}, {30, 45}, {31, 36}, {37, 48}}]]

σ[21, 24] = AP[198, Cycles[{{21, 24, 44, 32, 35, 22, 25, 47, 38, 42},
  {28, 45, 33, 46, 48, 39, 43, 36, 34}, {29, 40}, {30, 31, 37}}]]

σ[21, 25] = AP[42, Cycles[{{21, 25, 42}, {22, 24, 35}}]]

σ[21, 27] = AP[27, Cycles[{{21, 27, 40, 38, 42, 44},
  {22, 51, 29, 32, 35, 47}, {28, 36, 37, 39}, {30, 33, 43, 48}, {31, 34, 46, 45}}]]

σ[21, 29] = AP[85, Cycles[{{21, 29, 32, 47, 51, 22, 40, 38, 44, 27},
  {24, 35, 25, 42}, {28, 43, 46}, {30, 39, 37, 34, 31, 33}}]]

σ[21, 32] = AP[107, Cycles[{{21, 32, 29, 44, 51, 22, 38, 40, 47, 27},
  {24, 35, 25, 42}, {28, 39, 48, 37}, {30, 43, 33, 45}, {31, 46, 34, 36}}]]

σ[21, 35] = AP[66, Cycles[{{21, 35, 44, 27, 40},
  {22, 42, 47, 51, 29}, {28, 39, 46, 34, 43, 33}, {30, 45, 31, 36, 37, 48}}]]

σ[21, 38] = AP[29, Cycles[
  {{21, 38}, {22, 32}, {27, 40, 42}, {29, 35, 51}, {30, 36, 37, 45, 31, 48}, {33, 34, 39}}]]

σ[21, 40] = AP[28, Cycles[{{21, 40, 38}, {22, 29, 32}, {27, 44, 42},
  {28, 48, 46, 36, 43, 45}, {30, 33, 31, 34, 37, 39}, {35, 51, 47}}]]

σ[21, 42] = AP[42, Cycles[{{21, 42, 27, 25}, {22, 35, 51, 24},
  {28, 31, 43, 37, 46, 30}, {29, 47}, {33, 48, 39, 36, 34, 45}, {40, 44}}]]

σ[21, 44] = AP[43, Cycles[{{21, 44, 38, 42, 27, 25},
  {22, 47, 32, 35, 51, 24}, {28, 34, 43, 39, 46, 33}, {30, 31, 37}, {36, 48, 45}}]]

σ[21, 47] = AP[58, Cycles[{{21, 47, 35}, {22, 44, 42}}]]

σ[21, 51] = AP[52, Cycles[{{21, 51, 47}, {22, 27, 44}}]]

σ[24, 25] = AP[218, Cycles[{{24, 25}, {27, 44, 38, 40, 42, 51, 47, 32, 29, 35},
  {28, 37}, {30, 43}, {31, 46}, {33, 45}, {34, 36}, {39, 48}}]]

σ[24, 27] = AP[190, Cycles[{{24, 27, 38, 44, 29},
  {25, 51, 32, 47, 40}, {28, 37}, {30, 43}, {31, 46}, {33, 48}, {34, 45}, {36, 39}}]]

σ[24, 29] =
  AP[24, Cycles[{{24, 29, 32}, {25, 40, 38}, {30, 33, 48}, {31, 34, 45}, {36, 37, 39}}]]

σ[24, 32] = AP[21, Cycles[{{24, 32}, {25, 38}, {28, 31, 48, 33},
  {29, 35, 47}, {30, 36, 39, 46}, {34, 43, 37, 45}, {40, 42, 44}}]]

σ[24, 35] = AP[22, Cycles[{{24, 35, 29, 47, 32},
  {25, 42, 40, 44, 38}, {28, 34, 37, 43, 39, 30, 46, 33, 31}, {36, 45, 48}}]]

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σ[24, 38] = AP[166, Cycles[{{24, 38, 40}, {25, 32, 29},
  {27, 44, 42}, {30, 39, 45}, {31, 33, 36}, {34, 48, 37}, {35, 51, 47}}]]

σ[24, 40] = AP[179, Cycles[{{24, 40}, {25, 29}, {28, 37, 36, 33},
  {30, 48, 34, 43}, {31, 45, 39, 46}, {32, 47, 35}, {38, 44, 42}}]]

σ[24, 42] = AP[144, Cycles[{{24, 42, 38, 44, 27, 25, 35, 32, 47, 51},
  {28, 30, 36, 43, 31, 48, 46, 37, 45}, {29, 40}, {33, 39, 34}}]]

σ[24, 44] = AP[139, Cycles[{{24, 44, 38, 25, 47, 32}, {27, 42},
  {28, 33, 36, 30}, {29, 40}, {31, 43, 34, 48}, {35, 51}, {37, 46, 39, 45}}]]

σ[24, 47] =
  AP[23, Cycles[{{24, 47, 35, 32}, {25, 44, 42, 38}, {28, 48, 46, 36, 43, 45}, {33, 34, 39}}]]

σ[24, 51] = AP[51, Cycles[{{24, 51, 35, 47, 29, 32},
  {25, 27, 42, 44, 40, 38}, {28, 43, 46}, {30, 45}, {31, 36}, {33, 39, 34}, {37, 48}}]]

σ[27, 29] = AP[192,
  Cycles[{{27, 29, 42}, {28, 34, 37, 46, 33, 31, 43, 39, 30}, {35, 51, 40}, {36, 48, 45}}]]

σ[27, 32] =
  AP[62, Cycles[{{27, 32, 47}, {30, 39, 45}, {31, 33, 36}, {34, 48, 37}, {38, 44, 51}}]]

σ[27, 35] = AP[149, Cycles[
  {{27, 35, 32, 29}, {28, 37, 36, 34}, {30, 48, 39, 43}, {31, 45, 33, 46}, {38, 40, 51, 42}}]]

σ[27, 38] = AP[19, Cycles[
  {{27, 38, 42, 44}, {28, 31, 34, 48}, {30, 33, 36, 46}, {32, 35, 47, 51}, {37, 39, 45, 43}}]]

σ[27, 40] = AP[21, Cycles[
  {{27, 40, 42, 44}, {28, 45, 34, 37}, {29, 35, 47, 51}, {30, 43, 36, 39}, {31, 46, 48, 33}}]]

σ[27, 42] = AP[20, Cycles[{{27, 42, 40, 38, 44}, {28, 34},
  {29, 32, 47, 51, 35}, {30, 36}, {31, 48}, {33, 46}, {37, 45}, {39, 43}}]]

σ[27, 44] = AP[21, Cycles[{{27, 44}, {28, 48, 34, 31},
  {29, 35, 32}, {30, 46, 36, 33}, {37, 43, 45, 39}, {38, 40, 42}, {47, 51}}]]

σ[27, 47] = AP[162, Cycles[{{27, 47, 29, 42, 38},
  {28, 37, 39, 46, 31, 34, 43, 30, 33}, {32, 51, 44, 40, 35}, {36, 48, 45}}]]

σ[27, 51] = AP[166, Cycles[
  {{27, 51}, {28, 31, 36, 46, 30, 45, 43, 37, 48}, {29, 44, 38, 40, 47, 32}, {33, 34, 39}}]]

σ[28, 30] = AP[22,
  Cycles[{{28, 30, 46, 37, 43, 31}, {29, 35, 32}, {33, 48, 34, 45, 39, 36}, {38, 40, 42}}]]

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σ[28, 31] = AP[1, Cycles[
  {{28, 31, 34, 48}, {29, 32, 35, 47}, {30, 33, 36, 46}, {37, 39, 45, 43}, {38, 42, 44, 40}}]]

σ[28, 33] = AP[23, Cycles[
  {{28, 33, 36, 30}, {29, 32, 35, 47}, {31, 43, 34, 48}, {37, 46, 39, 45}, {38, 42, 44, 40}}]]

σ[28, 34] = AP[2, Cycles[{{28, 34}, {29, 35}, {30, 36},
  {31, 48}, {32, 47}, {33, 46}, {37, 45}, {38, 44}, {39, 43}, {40, 42}}]]

σ[28, 36] = AP[20,
  Cycles[{{28, 36, 46, 45, 43, 48}, {30, 33, 31, 34, 37, 39}, {32, 35, 47}, {38, 42, 44}}]]

σ[28, 37] = AP[23, Cycles[
  {{28, 37, 33, 48}, {29, 35, 47, 32}, {30, 34, 45, 43}, {31, 39, 36, 46}, {38, 40, 42, 44}}]]

σ[28, 39] = AP[26,
  Cycles[{{28, 39, 46, 34, 43, 33}, {30, 36, 31, 48, 37, 45}, {32, 47, 35}, {38, 44, 42}}]]

σ[28, 43] = AP[24, Cycles[{{28, 43, 46}, {29, 35},
  {30, 36, 39, 37, 45, 34, 31, 48, 33}, {32, 47}, {38, 44}, {40, 42}}]]

σ[28, 45] = AP[24,
  Cycles[{{28, 45, 43, 36, 46, 48}, {29, 32, 47}, {30, 33, 37, 39, 31, 34}, {38, 44, 40}}]]

σ[28, 46] = AP[21, Cycles[{{28, 46, 43}, {29, 32, 47, 35},
  {30, 36}, {31, 48}, {33, 34, 39}, {37, 45}, {38, 44, 42, 40}}]]

σ[28, 48] = AP[3, Cycles[
  {{28, 48, 34, 31}, {29, 47, 35, 32}, {30, 46, 36, 33}, {37, 43, 45, 39}, {38, 40, 44, 42}}]]

σ[29, 32] =
  AP[22, Cycles[{{29, 32, 35}, {30, 31, 37}, {33, 34, 39}, {36, 48, 45}, {38, 42, 40}}]]

σ[29, 35] = AP[26, Cycles[{{29, 35}, {32, 47}, {38, 44}, {40, 42}}]]

σ[29, 38] = AP[59, Cycles[{{29, 38, 40, 32}, {30, 37, 31}, {33, 48, 34, 45, 39, 36}, {35, 42}}]]

σ[29, 40] = AP[85, Cycles[{{29, 40}, {30, 31, 37}, {32, 35, 38, 42}, {33, 36, 39, 45, 34, 48}}]]

σ[29, 42] = AP[75, Cycles[{{29, 42}, {30, 45}, {31, 36}, {35, 40}, {37, 48}}]]

σ[29, 44] =
  AP[56, Cycles[{{29, 44, 42}, {30, 45, 39}, {31, 36, 33}, {34, 37, 48}, {35, 40, 47}}]]

σ[29, 47] =
  AP[31, Cycles[{{29, 47, 35, 32}, {30, 37, 31}, {33, 48, 34, 45, 39, 36}, {38, 40, 44, 42}}]]

σ[30, 31] =
  AP[28, Cycles[{{30, 31, 37}, {32, 35, 47}, {33, 34, 39}, {36, 48, 45}, {38, 42, 44}}]]

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σ[30, 33] = AP[28, Cycles[{{30, 33, 45}, {31, 34, 36}, {37, 39, 48}}]]
σ[30, 34] = AP[89, Cycles[{{30, 34}, {31, 39}, {32, 47}, {33, 37}, {38, 44}}]]
σ[30, 36] = AP[51, Cycles[{{30, 36, 37, 45, 31, 48}, {33, 34, 39}, {35, 47}, {42, 44}}]]
σ[30, 37] = AP[76, Cycles[{{30, 37, 31}, {33, 39, 34}, {36, 45, 48}}]]
σ[30, 39] = AP[66, Cycles[{{30, 39, 48}, {31, 33, 45}, {34, 36, 37}}]]
σ[30, 45] = AP[28, Cycles[{{30, 45, 39}, {31, 36, 33}, {34, 37, 48}}]]
σ[30, 48] = AP[23, Cycles[{{30, 48}, {31, 45}, {35, 47}, {36, 37}, {42, 44}}]]
σ[32, 35] = AP[37, Cycles[{{32, 35}, {33, 36}, {34, 48}, {38, 42}, {39, 45}}]]
σ[32, 38] = AP[245, Cycles[{{32, 38}, {33, 45}, {34, 36}, {35, 44, 42, 47}, {39, 48}}]]
σ[32, 42] = AP[206, Cycles[{{32, 42, 44}, {33, 39, 34}, {35, 47, 38}, {36, 48, 45}}]]
σ[32, 44] = AP[143, Cycles[{{32, 44}, {33, 45}, {34, 36}, {38, 47}, {39, 48}}]]
σ[32, 47] = AP[76, Cycles[{{32, 47, 35}, {33, 34, 39}, {36, 45, 48}, {38, 44, 42}}]]
σ[33, 34] = AP[90, Cycles[{{33, 34, 39}, {36, 45, 48}}]]
σ[33, 36] = AP[89, Cycles[{{33, 36}, {34, 48}, {35, 47}, {39, 45}, {42, 44}}]]
σ[33, 39] = AP[80, Cycles[{{33, 39, 34}, {36, 48, 45}}]]
σ[33, 45] = AP[93, Cycles[{{33, 45}, {34, 36}, {35, 47}, {39, 48}, {42, 44}}]]
σ[33, 48] = AP[121, Cycles[{{33, 48}, {34, 45}, {35, 47}, {36, 39}, {42, 44}}]]
σ[35, 42] = AP[204, Cycles[{{35, 42}, {44, 47}}]]

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DiscretePlot3D[Table[
  If[Head[σ[i, j]] === AP, σ[i, j][[1]], 0],
  {j, n}, {i, n}], PlotRange → All]

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DiscretePlot3D::argr: DiscretePlot3D called with 1 argument; 3 arguments are expected. >>

```
ListPlot3D[Table[If[Head[σ[i, j]] === AP, σ[i, j][[1]], 0], {j, n}, {i, n}],  
PlotRange → All] // Rasterize
```

