Reconstruct Orbits from Symbols

This notebook is intended to produce the figures found on our arXiv article, found here:
https://arxiv.org/pdf/1912.02940.pdf

There is another notebook which includes additional symbolic and phase representation of the trajectories, but that were not selected for the final version of the paper.

Configuration A: Two different sequences, sharing a common core

In this configuration, the idea is to find how two symbolic dynamics with a shared rectangular-shaped sequence of symbols (blue symbols) generate phase space trajectories that overlap one another exponentially toward the core of their common blocks. To that end:
- we generate the sequence of symbols and highlight in blue the shared symbols
- we generate the trajectories in phase space (q, p) and only retain the Lagrangian formulation (q's only)
- we plot the difference between the 2 trajectories of all ($q_{n,t}$)
- we repeat the experiment twice with symbols ranging between [0, 3] (s = 7, slow convergence) and [0, 9] (s = 11, fast convergence).

with value s = 7 (slow exponential convergence)

In[•]:=
```
sA = 7;
intA = sA - 4;
mA1 = RandomInteger[{0, intA}, {27, 28}];
mA2 = RandomInteger[{0, intA}, {27, 28}];
{T, Np} = Dimensions[mA1];
```

The two sequences are forced to share a common rectangular-shaped core (blue symbols).

In[∘]:=
```
pos = {4, 5};
tout = 20;
nout = 19;
tfac = 0;
nfac = 0;
posbis = {tfac, nfac};

{oA1, oA2} = diffoutside[intA, mA1, mA2, pos, tout, nout];
oA1C = coloring1blockwithfont[oA1, pos, posbis,
   tout, nout, tout - 2 * tfac, nout - 2 * nfac, Blue, 17.5, 17];
oA2C = coloring1blockwithfont[oA2, pos, posbis, tout, nout,
   tout - 2 * tfac, nout - 2 * nfac, Blue, 17.5, 17];

posbig1 = {pos[[2]] - 1, T - pos[[1]] - tout + 1};
posbig2 = {pos[[2]] + nout - 1, T - pos[[1]] + 1};
possmall1 = {pos[[2]] + nfac - 1, T - pos[[1]] - tout + tfac + 1};
possmall2 = {pos[[2]] + nout - nfac - 1, T - pos[[1]] - tfac + 1};

GA1 = oA1C // MatrixForm
GA2 = oA2C // MatrixForm
```

Out[∘]//MatrixForm=

$$\begin{pmatrix}
1 & 0 & 0 & 2 & 0 & 2 & 1 & 3 & 3 & 0 & 2 & 0 & 0 & 0 & 3 & 0 & 0 & 2 & 1 & 2 & 3 & 3 & 2 & 2 & 1 & 2 & 1 & 2 \\
3 & 2 & 3 & 0 & 2 & 0 & 0 & 3 & 2 & 1 & 2 & 3 & 3 & 2 & 1 & 2 & 2 & 1 & 1 & 1 & 3 & 0 & 0 & 0 & 2 & 1 & 0 & 0 \\
2 & 2 & 3 & 1 & 3 & 2 & 1 & 2 & 0 & 0 & 1 & 3 & 2 & 1 & 2 & 2 & 2 & 2 & 0 & 2 & 3 & 3 & 2 & 2 & 3 & 1 & 1 & 2 \\
3 & 3 & 2 & 0 & 2 & 1 & 2 & 2 & 1 & 0 & 0 & 1 & 2 & 3 & 2 & 2 & 2 & 0 & 0 & 0 & 0 & 1 & 2 & 0 & 3 & 1 & 0 & 2 \\
0 & 0 & 1 & 0 & 1 & 3 & 2 & 2 & 1 & 0 & 3 & 1 & 0 & 0 & 3 & 3 & 0 & 2 & 1 & 2 & 2 & 3 & 3 & 0 & 0 & 3 & 1 & 3 \\
0 & 1 & 1 & 1 & 2 & 0 & 3 & 1 & 2 & 2 & 1 & 2 & 2 & 1 & 1 & 1 & 2 & 3 & 0 & 2 & 1 & 0 & 0 & 2 & 3 & 3 & 3 & 3 \\
0 & 2 & 3 & 0 & 3 & 2 & 1 & 2 & 0 & 1 & 0 & 3 & 0 & 1 & 3 & 0 & 1 & 3 & 0 & 2 & 1 & 0 & 2 & 3 & 0 & 1 & 1 & 0 \\
2 & 3 & 0 & 3 & 0 & 3 & 0 & 2 & 1 & 3 & 0 & 3 & 0 & 1 & 3 & 3 & 3 & 2 & 0 & 2 & 0 & 1 & 3 & 0 & 1 & 2 & 3 & 3 \\
3 & 0 & 0 & 1 & 3 & 0 & 1 & 2 & 2 & 0 & 2 & 0 & 0 & 3 & 0 & 1 & 0 & 3 & 0 & 3 & 0 & 3 & 3 & 1 & 0 & 2 & 2 & 2 \\
3 & 0 & 0 & 3 & 3 & 0 & 0 & 2 & 2 & 3 & 0 & 3 & 2 & 3 & 3 & 0 & 0 & 1 & 2 & 3 & 1 & 0 & 0 & 0 & 3 & 1 & 3 & 1 \\
3 & 1 & 0 & 1 & 3 & 0 & 1 & 3 & 2 & 3 & 0 & 1 & 2 & 3 & 0 & 2 & 0 & 2 & 0 & 2 & 1 & 0 & 0 & 2 & 1 & 1 & 1 & 2 \\
0 & 0 & 1 & 2 & 1 & 1 & 0 & 1 & 2 & 3 & 1 & 1 & 2 & 1 & 3 & 0 & 2 & 1 & 3 & 0 & 2 & 3 & 3 & 0 & 1 & 0 & 3 & 2 \\
2 & 0 & 0 & 1 & 2 & 2 & 1 & 1 & 1 & 3 & 3 & 3 & 1 & 2 & 0 & 2 & 1 & 1 & 0 & 3 & 1 & 3 & 3 & 0 & 1 & 1 & 3 & 3 \\
1 & 0 & 0 & 2 & 3 & 2 & 3 & 1 & 2 & 3 & 3 & 2 & 2 & 0 & 1 & 1 & 1 & 1 & 3 & 0 & 1 & 0 & 3 & 1 & 3 & 0 & 2 & 2 \\
0 & 1 & 1 & 1 & 1 & 3 & 0 & 2 & 0 & 2 & 2 & 1 & 3 & 0 & 1 & 3 & 2 & 0 & 0 & 0 & 0 & 3 & 1 & 3 & 0 & 0 & 1 & 0 \\
1 & 2 & 2 & 1 & 1 & 0 & 3 & 2 & 1 & 1 & 2 & 3 & 2 & 3 & 3 & 1 & 2 & 3 & 2 & 0 & 1 & 1 & 3 & 1 & 0 & 3 & 1 & 1 \\
3 & 2 & 3 & 0 & 1 & 0 & 2 & 2 & 0 & 0 & 1 & 0 & 3 & 1 & 1 & 1 & 0 & 1 & 3 & 2 & 0 & 1 & 2 & 0 & 3 & 2 & 3 & 0 \\
2 & 1 & 2 & 0 & 0 & 2 & 2 & 2 & 0 & 1 & 2 & 3 & 3 & 1 & 3 & 1 & 3 & 1 & 3 & 0 & 2 & 3 & 0 & 3 & 2 & 2 & 0 & 3 \\
0 & 0 & 0 & 1 & 0 & 3 & 1 & 1 & 3 & 1 & 2 & 1 & 0 & 1 & 0 & 1 & 2 & 0 & 0 & 1 & 0 & 1 & 0 & 0 & 3 & 0 & 1 & 1 \\
3 & 3 & 2 & 1 & 2 & 2 & 3 & 1 & 2 & 1 & 0 & 3 & 0 & 3 & 0 & 3 & 3 & 3 & 0 & 2 & 3 & 3 & 3 & 3 & 1 & 2 & 2 & 1 \\
1 & 0 & 3 & 2 & 1 & 2 & 2 & 0 & 3 & 0 & 2 & 0 & 3 & 0 & 2 & 2 & 3 & 0 & 1 & 3 & 0 & 0 & 2 & 2 & 2 & 2 & 0 & 2 \\
3 & 1 & 0 & 0 & 3 & 0 & 2 & 1 & 1 & 0 & 3 & 2 & 0 & 0 & 0 & 2 & 2 & 1 & 3 & 2 & 3 & 1 & 3 & 2 & 1 & 2 & 1 & 3 \\
2 & 1 & 0 & 1 & 2 & 0 & 1 & 1 & 2 & 3 & 1 & 2 & 3 & 1 & 3 & 0 & 3 & 3 & 2 & 0 & 1 & 2 & 1 & 0 & 1 & 1 & 3 & 0 \\
1 & 2 & 0 & 2 & 0 & 3 & 3 & 1 & 1 & 3 & 3 & 3 & 1 & 2 & 0 & 1 & 3 & 0 & 0 & 2 & 2 & 2 & 2 & 2 & 1 & 0 & 3 & 0 \\
3 & 0 & 3 & 3 & 1 & 1 & 2 & 0 & 1 & 0 & 2 & 3 & 2 & 0 & 0 & 3 & 1 & 0 & 2 & 1 & 2 & 3 & 1 & 3 & 3 & 2 & 1 & 1 \\
2 & 0 & 3 & 0 & 2 & 1 & 0 & 2 & 3 & 0 & 1 & 2 & 1 & 1 & 2 & 2 & 2 & 2 & 2 & 1 & 2 & 1 & 0 & 3 & 3 & 1 & 2 & 3 \\
1 & 2 & 2 & 1 & 3 & 3 & 1 & 1 & 3 & 3 & 1 & 0 & 0 & 1 & 1 & 2 & 0 & 0 & 1 & 3 & 1 & 3 & 2 & 0 & 1 & 2 & 1 & 3
\end{pmatrix}$$

Out[•]//MatrixForm=

$$\begin{pmatrix}
1&1&0&0&1&2&1&1&2&0&0&1&1&2&0&0&0&3&3&3&2&3&0&1&2&0&2&1\\
3&2&3&0&2&0&1&3&2&2&3&2&0&3&3&3&3&3&1&2&3&2&1&2&2&1&1&1\\
2&0&2&3&3&3&1&0&3&1&3&1&0&0&2&1&3&1&0&2&2&2&3&0&3&3&2&0\\
0&2&3&0&\mathbf{2}&\mathbf{1}&\mathbf{2}&\mathbf{2}&\mathbf{1}&\mathbf{0}&\mathbf{0}&\mathbf{1}&\mathbf{2}&\mathbf{3}&\mathbf{2}&\mathbf{2}&\mathbf{2}&\mathbf{0}&\mathbf{0}&\mathbf{0}&\mathbf{0}&\mathbf{1}&\mathbf{2}&1&2&2&1&2\\
0&3&2&1&\mathbf{1}&\mathbf{3}&\mathbf{2}&\mathbf{2}&\mathbf{1}&\mathbf{0}&\mathbf{3}&\mathbf{1}&\mathbf{0}&\mathbf{0}&\mathbf{3}&\mathbf{3}&\mathbf{0}&\mathbf{2}&\mathbf{1}&\mathbf{2}&\mathbf{2}&\mathbf{3}&\mathbf{3}&2&0&3&3&2\\
0&0&2&3&\mathbf{2}&\mathbf{0}&\mathbf{3}&\mathbf{1}&\mathbf{2}&\mathbf{2}&\mathbf{1}&\mathbf{2}&\mathbf{2}&\mathbf{1}&\mathbf{1}&\mathbf{1}&\mathbf{2}&\mathbf{3}&\mathbf{0}&\mathbf{2}&\mathbf{1}&\mathbf{0}&\mathbf{0}&3&0&2&1&3\\
0&3&0&3&\mathbf{3}&\mathbf{2}&\mathbf{1}&\mathbf{2}&\mathbf{0}&\mathbf{1}&\mathbf{0}&\mathbf{3}&\mathbf{0}&\mathbf{1}&\mathbf{3}&\mathbf{0}&\mathbf{1}&\mathbf{3}&\mathbf{0}&\mathbf{2}&\mathbf{1}&\mathbf{0}&\mathbf{2}&3&0&1&2&1\\
2&2&0&2&\mathbf{0}&\mathbf{3}&\mathbf{0}&\mathbf{2}&\mathbf{1}&\mathbf{3}&\mathbf{0}&\mathbf{3}&\mathbf{0}&\mathbf{1}&\mathbf{3}&\mathbf{3}&\mathbf{3}&\mathbf{2}&\mathbf{0}&\mathbf{2}&\mathbf{0}&\mathbf{1}&\mathbf{3}&2&3&2&1&0\\
3&0&1&1&\mathbf{3}&\mathbf{0}&\mathbf{1}&\mathbf{2}&\mathbf{2}&\mathbf{0}&\mathbf{2}&\mathbf{0}&\mathbf{0}&\mathbf{3}&\mathbf{0}&\mathbf{1}&\mathbf{0}&\mathbf{3}&\mathbf{0}&\mathbf{3}&\mathbf{0}&\mathbf{3}&\mathbf{3}&1&0&3&0&2\\
0&2&1&0&\mathbf{3}&\mathbf{0}&\mathbf{0}&\mathbf{2}&\mathbf{2}&\mathbf{3}&\mathbf{0}&\mathbf{3}&\mathbf{2}&\mathbf{3}&\mathbf{3}&\mathbf{0}&\mathbf{0}&\mathbf{1}&\mathbf{2}&\mathbf{3}&\mathbf{1}&\mathbf{0}&\mathbf{0}&1&1&3&0&3\\
2&2&3&2&\mathbf{3}&\mathbf{0}&\mathbf{1}&\mathbf{3}&\mathbf{2}&\mathbf{3}&\mathbf{0}&\mathbf{1}&\mathbf{2}&\mathbf{3}&\mathbf{0}&\mathbf{2}&\mathbf{0}&\mathbf{2}&\mathbf{0}&\mathbf{2}&\mathbf{1}&\mathbf{0}&\mathbf{0}&2&1&2&1&2\\
1&3&2&2&\mathbf{1}&\mathbf{1}&\mathbf{0}&\mathbf{1}&\mathbf{2}&\mathbf{3}&\mathbf{1}&\mathbf{1}&\mathbf{2}&\mathbf{1}&\mathbf{3}&\mathbf{0}&\mathbf{2}&\mathbf{1}&\mathbf{3}&\mathbf{0}&\mathbf{2}&\mathbf{3}&\mathbf{3}&0&3&1&2&0\\
2&0&0&0&\mathbf{2}&\mathbf{2}&\mathbf{1}&\mathbf{1}&\mathbf{1}&\mathbf{3}&\mathbf{3}&\mathbf{3}&\mathbf{1}&\mathbf{2}&\mathbf{0}&\mathbf{2}&\mathbf{1}&\mathbf{1}&\mathbf{0}&\mathbf{3}&\mathbf{1}&\mathbf{3}&\mathbf{3}&2&2&0&2&2\\
1&2&0&0&\mathbf{3}&\mathbf{2}&\mathbf{3}&\mathbf{1}&\mathbf{2}&\mathbf{3}&\mathbf{3}&\mathbf{2}&\mathbf{2}&\mathbf{0}&\mathbf{1}&\mathbf{1}&\mathbf{1}&\mathbf{1}&\mathbf{3}&\mathbf{0}&\mathbf{1}&\mathbf{0}&\mathbf{3}&0&0&2&2&3\\
2&0&1&3&\mathbf{1}&\mathbf{3}&\mathbf{0}&\mathbf{2}&\mathbf{0}&\mathbf{2}&\mathbf{2}&\mathbf{1}&\mathbf{3}&\mathbf{0}&\mathbf{1}&\mathbf{3}&\mathbf{2}&\mathbf{0}&\mathbf{0}&\mathbf{0}&\mathbf{0}&\mathbf{3}&\mathbf{1}&1&0&0&0&3\\
0&3&3&1&\mathbf{1}&\mathbf{0}&\mathbf{3}&\mathbf{2}&\mathbf{1}&\mathbf{1}&\mathbf{2}&\mathbf{3}&\mathbf{2}&\mathbf{3}&\mathbf{3}&\mathbf{1}&\mathbf{2}&\mathbf{3}&\mathbf{2}&\mathbf{0}&\mathbf{1}&\mathbf{1}&\mathbf{3}&0&3&1&3&0\\
3&3&0&3&\mathbf{1}&\mathbf{0}&\mathbf{2}&\mathbf{2}&\mathbf{0}&\mathbf{0}&\mathbf{1}&\mathbf{0}&\mathbf{3}&\mathbf{1}&\mathbf{1}&\mathbf{1}&\mathbf{0}&\mathbf{1}&\mathbf{3}&\mathbf{2}&\mathbf{0}&\mathbf{1}&\mathbf{2}&1&1&0&1&1\\
3&2&3&0&\mathbf{0}&\mathbf{2}&\mathbf{2}&\mathbf{2}&\mathbf{0}&\mathbf{1}&\mathbf{2}&\mathbf{3}&\mathbf{3}&\mathbf{1}&\mathbf{3}&\mathbf{1}&\mathbf{3}&\mathbf{1}&\mathbf{3}&\mathbf{0}&\mathbf{2}&\mathbf{3}&\mathbf{0}&2&1&3&1&0\\
0&3&3&1&\mathbf{0}&\mathbf{3}&\mathbf{1}&\mathbf{1}&\mathbf{3}&\mathbf{1}&\mathbf{2}&\mathbf{1}&\mathbf{0}&\mathbf{1}&\mathbf{0}&\mathbf{1}&\mathbf{2}&\mathbf{0}&\mathbf{0}&\mathbf{1}&\mathbf{0}&\mathbf{1}&\mathbf{0}&2&3&3&0&0\\
2&2&3&2&\mathbf{2}&\mathbf{2}&\mathbf{3}&\mathbf{1}&\mathbf{2}&\mathbf{1}&\mathbf{0}&\mathbf{3}&\mathbf{0}&\mathbf{3}&\mathbf{0}&\mathbf{3}&\mathbf{3}&\mathbf{3}&\mathbf{0}&\mathbf{2}&\mathbf{3}&\mathbf{3}&\mathbf{3}&2&2&1&0&3\\
3&3&3&0&\mathbf{1}&\mathbf{2}&\mathbf{2}&\mathbf{0}&\mathbf{3}&\mathbf{0}&\mathbf{2}&\mathbf{0}&\mathbf{3}&\mathbf{0}&\mathbf{2}&\mathbf{2}&\mathbf{3}&\mathbf{0}&\mathbf{1}&\mathbf{3}&\mathbf{0}&\mathbf{0}&\mathbf{2}&1&0&0&0&2\\
2&1&1&1&\mathbf{3}&\mathbf{0}&\mathbf{2}&\mathbf{1}&\mathbf{1}&\mathbf{0}&\mathbf{3}&\mathbf{2}&\mathbf{0}&\mathbf{0}&\mathbf{0}&\mathbf{2}&\mathbf{2}&\mathbf{1}&\mathbf{3}&\mathbf{2}&\mathbf{3}&\mathbf{1}&\mathbf{3}&1&2&3&2&2\\
2&1&1&1&\mathbf{2}&\mathbf{0}&\mathbf{1}&\mathbf{1}&\mathbf{2}&\mathbf{3}&\mathbf{1}&\mathbf{2}&\mathbf{3}&\mathbf{1}&\mathbf{3}&\mathbf{0}&\mathbf{3}&\mathbf{3}&\mathbf{2}&\mathbf{0}&\mathbf{1}&\mathbf{2}&\mathbf{1}&0&1&2&1&2\\
0&2&1&1&2&1&2&1&2&2&3&3&2&1&0&2&0&1&2&1&2&1&2&2&2&3&3&2\\
0&2&0&3&2&1&3&3&1&2&3&1&1&1&3&1&0&0&1&0&1&1&0&0&2&3&3&3\\
0&1&0&0&0&3&2&3&2&2&1&0&3&2&2&3&0&3&3&0&1&3&2&1&0&3&2&2\\
0&3&3&1&3&1&1&2&0&1&3&3&0&0&0&1&3&2&2&0&2&0&2&0&1&0&1&1
\end{pmatrix}$$

In[•]:= **Evaluating and Plotting;**

```
{QA1, PA1} = Orbits[sA, oA1];
{QA2, PA2} = Orbits[sA, oA2];
```

Our focus here is on the distance in between q_i's (or x_i's) only, per the Lagrangian formulation of our equation (which ignores the value of the particles's momentum p_i's)

■ with value s = 13 (faster exponential convergence)

In[•]:=
```
sB = 13;
intB = sB - 4;
mB1 = RandomInteger[{0, intB}, {27, 28}];
mB2 = RandomInteger[{0, intB}, {27, 28}];
{T, Np} = Dimensions[mB1];
```

In[∘]:=
```
pos = {4, 5};
tout = 20;
nout = 19;
{oB1, oB2} = diffoutside[intB, mB1, mB2, pos, tout, nout];

oB1C = coloring1blockwithfont[oB1, pos, posbis,
   tout, nout, tout - 2 * tfac, nout - 2 * nfac, Blue, 17.5, 17];
oB2C = coloring1blockwithfont[oB2, pos, posbis, tout, nout,
   tout - 2 * tfac, nout - 2 * nfac, Blue, 17.5, 17];
posbig1 = {pos[[2]] - 1, T - pos[[1]] - tout + 1};
posbig2 = {pos[[2]] + nout - 1, T - pos[[1]] + 1};

GB1 = oB1C // MatrixForm
GB2 = oB2C // MatrixForm
```

Out[∘]//MatrixForm=

$$\begin{pmatrix}
1&3&2&4&3&1&9&9&0&6&7&2&3&9&2&1&7&4&5&6&1&2&0&0&6&5&6&3\\
2&7&7&4&6&7&6&4&8&3&2&3&7&5&8&7&2&7&6&1&3&8&6&3&9&2&8&5\\
5&5&9&7&6&4&1&0&8&1&5&8&9&7&2&9&7&3&2&3&7&4&3&0&1&0&7&1\\
8&4&2&2&\mathbf{6}&\mathbf{4}&\mathbf{4}&\mathbf{5}&\mathbf{1}&\mathbf{8}&\mathbf{1}&\mathbf{2}&\mathbf{6}&\mathbf{9}&\mathbf{9}&\mathbf{8}&\mathbf{2}&\mathbf{3}&\mathbf{2}&\mathbf{6}&\mathbf{3}&\mathbf{8}&\mathbf{7}&2&1&0&4&4\\
7&1&0&6&\mathbf{5}&\mathbf{1}&\mathbf{5}&\mathbf{5}&\mathbf{7}&\mathbf{3}&\mathbf{4}&\mathbf{9}&\mathbf{7}&\mathbf{1}&\mathbf{9}&\mathbf{0}&\mathbf{1}&\mathbf{0}&\mathbf{4}&\mathbf{0}&\mathbf{1}&\mathbf{5}&\mathbf{7}&5&7&3&5&9\\
3&3&8&6&\mathbf{1}&\mathbf{4}&\mathbf{5}&\mathbf{5}&\mathbf{9}&\mathbf{0}&\mathbf{0}&\mathbf{0}&\mathbf{2}&\mathbf{0}&\mathbf{4}&\mathbf{5}&\mathbf{0}&\mathbf{3}&\mathbf{5}&\mathbf{2}&\mathbf{6}&\mathbf{0}&\mathbf{0}&3&0&6&8&1\\
9&2&8&4&\mathbf{4}&\mathbf{1}&\mathbf{2}&\mathbf{4}&\mathbf{8}&\mathbf{8}&\mathbf{1}&\mathbf{1}&\mathbf{6}&\mathbf{4}&\mathbf{0}&\mathbf{3}&\mathbf{8}&\mathbf{4}&\mathbf{3}&\mathbf{2}&\mathbf{6}&\mathbf{0}&\mathbf{8}&3&9&8&7&7\\
8&5&8&4&\mathbf{3}&\mathbf{7}&\mathbf{5}&\mathbf{7}&\mathbf{9}&\mathbf{8}&\mathbf{7}&\mathbf{6}&\mathbf{0}&\mathbf{6}&\mathbf{4}&\mathbf{7}&\mathbf{6}&\mathbf{6}&\mathbf{8}&\mathbf{9}&\mathbf{4}&\mathbf{8}&\mathbf{8}&4&8&6&7&4\\
9&5&4&7&\mathbf{6}&\mathbf{1}&\mathbf{6}&\mathbf{0}&\mathbf{3}&\mathbf{6}&\mathbf{0}&\mathbf{8}&\mathbf{0}&\mathbf{4}&\mathbf{9}&\mathbf{1}&\mathbf{6}&\mathbf{8}&\mathbf{3}&\mathbf{3}&\mathbf{0}&\mathbf{5}&\mathbf{5}&8&4&4&8&9\\
9&0&4&0&\mathbf{5}&\mathbf{8}&\mathbf{6}&\mathbf{9}&\mathbf{6}&\mathbf{9}&\mathbf{4}&\mathbf{1}&\mathbf{5}&\mathbf{3}&\mathbf{5}&\mathbf{4}&\mathbf{9}&\mathbf{0}&\mathbf{3}&\mathbf{8}&\mathbf{4}&\mathbf{9}&\mathbf{7}&2&6&1&7&8\\
9&5&2&8&\mathbf{6}&\mathbf{8}&\mathbf{7}&\mathbf{1}&\mathbf{5}&\mathbf{7}&\mathbf{2}&\mathbf{7}&\mathbf{7}&\mathbf{9}&\mathbf{3}&\mathbf{1}&\mathbf{4}&\mathbf{6}&\mathbf{2}&\mathbf{2}&\mathbf{1}&\mathbf{7}&\mathbf{4}&5&1&3&7&5\\
3&8&8&2&\mathbf{8}&\mathbf{4}&\mathbf{4}&\mathbf{2}&\mathbf{4}&\mathbf{4}&\mathbf{2}&\mathbf{0}&\mathbf{3}&\mathbf{3}&\mathbf{9}&\mathbf{4}&\mathbf{6}&\mathbf{6}&\mathbf{4}&\mathbf{4}&\mathbf{0}&\mathbf{3}&\mathbf{9}&6&6&4&5&1\\
8&4&8&4&\mathbf{2}&\mathbf{2}&\mathbf{3}&\mathbf{1}&\mathbf{2}&\mathbf{4}&\mathbf{3}&\mathbf{8}&\mathbf{4}&\mathbf{8}&\mathbf{4}&\mathbf{9}&\mathbf{4}&\mathbf{6}&\mathbf{5}&\mathbf{7}&\mathbf{9}&\mathbf{2}&\mathbf{6}&9&8&1&1&2\\
9&4&9&1&\mathbf{0}&\mathbf{6}&\mathbf{0}&\mathbf{6}&\mathbf{6}&\mathbf{8}&\mathbf{9}&\mathbf{6}&\mathbf{9}&\mathbf{3}&\mathbf{2}&\mathbf{7}&\mathbf{1}&\mathbf{4}&\mathbf{2}&\mathbf{7}&\mathbf{8}&\mathbf{3}&\mathbf{8}&3&2&7&5&5\\
0&8&3&1&\mathbf{2}&\mathbf{0}&\mathbf{1}&\mathbf{8}&\mathbf{4}&\mathbf{1}&\mathbf{2}&\mathbf{1}&\mathbf{1}&\mathbf{3}&\mathbf{9}&\mathbf{1}&\mathbf{3}&\mathbf{3}&\mathbf{8}&\mathbf{0}&\mathbf{6}&\mathbf{1}&\mathbf{6}&4&4&4&3&0\\
9&4&5&7&\mathbf{8}&\mathbf{3}&\mathbf{9}&\mathbf{1}&\mathbf{6}&\mathbf{6}&\mathbf{5}&\mathbf{9}&\mathbf{1}&\mathbf{2}&\mathbf{6}&\mathbf{4}&\mathbf{6}&\mathbf{9}&\mathbf{1}&\mathbf{0}&\mathbf{7}&\mathbf{7}&\mathbf{5}&4&4&5&9&2\\
1&2&4&6&\mathbf{6}&\mathbf{3}&\mathbf{8}&\mathbf{9}&\mathbf{5}&\mathbf{5}&\mathbf{8}&\mathbf{8}&\mathbf{0}&\mathbf{4}&\mathbf{8}&\mathbf{3}&\mathbf{5}&\mathbf{8}&\mathbf{8}&\mathbf{1}&\mathbf{3}&\mathbf{2}&\mathbf{8}&2&1&7&4&0\\
4&8&1&2&\mathbf{2}&\mathbf{3}&\mathbf{1}&\mathbf{2}&\mathbf{2}&\mathbf{5}&\mathbf{3}&\mathbf{8}&\mathbf{8}&\mathbf{9}&\mathbf{2}&\mathbf{9}&\mathbf{0}&\mathbf{6}&\mathbf{3}&\mathbf{1}&\mathbf{4}&\mathbf{0}&\mathbf{6}&6&8&1&6&0\\
3&0&2&9&\mathbf{9}&\mathbf{0}&\mathbf{6}&\mathbf{2}&\mathbf{3}&\mathbf{9}&\mathbf{6}&\mathbf{8}&\mathbf{4}&\mathbf{2}&\mathbf{9}&\mathbf{8}&\mathbf{1}&\mathbf{2}&\mathbf{4}&\mathbf{5}&\mathbf{6}&\mathbf{7}&\mathbf{7}&6&1&3&2&8\\
5&2&7&5&\mathbf{5}&\mathbf{4}&\mathbf{4}&\mathbf{3}&\mathbf{9}&\mathbf{4}&\mathbf{9}&\mathbf{1}&\mathbf{8}&\mathbf{6}&\mathbf{5}&\mathbf{6}&\mathbf{5}&\mathbf{0}&\mathbf{4}&\mathbf{5}&\mathbf{3}&\mathbf{3}&\mathbf{7}&7&4&8&2&4\\
9&0&1&6&\mathbf{6}&\mathbf{1}&\mathbf{8}&\mathbf{5}&\mathbf{4}&\mathbf{7}&\mathbf{2}&\mathbf{9}&\mathbf{0}&\mathbf{1}&\mathbf{9}&\mathbf{6}&\mathbf{9}&\mathbf{5}&\mathbf{2}&\mathbf{2}&\mathbf{5}&\mathbf{4}&\mathbf{7}&5&7&6&0&9\\
7&0&9&3&\mathbf{2}&\mathbf{8}&\mathbf{9}&\mathbf{1}&\mathbf{0}&\mathbf{2}&\mathbf{7}&\mathbf{0}&\mathbf{6}&\mathbf{5}&\mathbf{0}&\mathbf{6}&\mathbf{7}&\mathbf{3}&\mathbf{9}&\mathbf{8}&\mathbf{3}&\mathbf{4}&\mathbf{1}&0&2&8&7&7\\
7&8&4&9&\mathbf{0}&\mathbf{0}&\mathbf{5}&\mathbf{5}&\mathbf{6}&\mathbf{3}&\mathbf{7}&\mathbf{7}&\mathbf{0}&\mathbf{5}&\mathbf{2}&\mathbf{1}&\mathbf{3}&\mathbf{2}&\mathbf{3}&\mathbf{6}&\mathbf{8}&\mathbf{8}&\mathbf{0}&4&1&3&7&2\\
7&8&4&1&2&0&6&7&8&3&9&5&6&4&7&6&8&4&7&3&0&2&6&5&1&2&1&1\\
6&2&6&9&0&0&5&0&4&5&5&7&0&8&7&3&9&2&8&1&8&3&5&4&5&4&2&9\\
7&1&5&8&1&2&2&1&2&3&1&6&9&5&5&7&6&5&6&4&1&6&5&2&9&8&1&7\\
4&9&7&5&1&2&6&5&7&5&3&6&8&8&6&2&4&1&5&2&6&8&7&8&9&1&4&9
\end{pmatrix}$$

Out[∘]//MatrixForm=

8	8	0	3	0	6	3	5	6	9	2	9	9	8	9	9	8	9	0	2	6	4	1	6	3	5	4	6
7	1	2	2	0	7	8	8	7	6	0	1	2	0	7	5	9	6	2	6	1	5	1	0	0	7	0	9
0	0	6	4	9	6	8	7	1	1	0	3	3	9	1	0	2	6	5	9	8	1	0	6	8	9	2	3
8	3	4	1	6	4	4	5	1	8	1	2	6	9	9	8	2	3	2	6	3	8	7	1	2	1	3	3
4	8	5	4	5	1	5	5	7	3	4	9	7	1	9	0	1	0	4	0	1	5	7	3	8	5	0	7
8	4	8	7	1	4	5	5	9	0	0	0	2	0	4	5	0	3	5	2	6	0	0	8	9	0	7	1
9	0	4	2	4	1	2	4	8	8	1	1	6	4	0	3	8	4	3	2	6	0	8	4	3	9	1	0
5	9	9	9	3	7	5	7	9	8	7	6	0	6	4	7	6	6	8	9	4	8	8	2	5	2	7	7
7	3	1	7	6	1	6	0	3	6	0	8	0	4	9	1	6	8	3	3	0	5	5	3	9	6	8	4
2	8	0	6	5	8	6	9	6	9	4	1	5	3	5	4	9	0	3	8	4	9	7	8	8	4	4	2
7	0	6	5	6	8	7	1	5	7	2	7	7	9	3	1	4	6	2	2	1	7	4	6	8	5	7	1
7	5	5	1	8	4	4	2	4	4	2	0	3	3	9	4	6	6	4	4	0	3	9	9	2	8	9	5
5	2	1	6	2	2	3	1	2	4	3	8	4	8	4	9	4	6	5	7	9	2	6	4	4	4	5	2
0	6	7	8	0	6	0	6	6	8	9	6	9	3	2	7	1	4	2	7	8	3	8	7	1	2	7	4
5	6	3	1	2	0	1	8	4	1	2	1	1	3	9	1	3	3	8	0	6	1	6	4	1	1	3	4
1	7	8	7	8	3	9	1	6	6	5	9	1	2	6	4	6	9	1	0	7	7	5	7	3	3	6	9
8	6	3	2	6	3	8	9	5	5	8	8	0	4	8	3	5	8	8	1	3	2	8	2	3	3	8	9
1	6	2	0	2	3	1	2	2	5	3	8	8	9	2	9	0	6	3	1	4	0	6	1	8	0	4	1
1	6	4	6	9	0	6	2	3	9	6	8	4	2	9	8	1	2	4	5	6	7	7	2	5	7	0	3
9	5	5	1	5	4	4	3	9	4	9	1	8	6	5	6	5	0	4	5	3	3	7	4	3	6	0	9
1	9	3	5	6	1	8	5	4	7	2	9	0	1	9	6	9	5	2	2	5	4	7	0	1	6	0	7
2	9	0	7	2	8	9	1	0	2	7	0	6	5	0	6	7	3	9	8	3	4	1	0	4	3	3	5
1	8	9	1	0	0	5	5	6	3	7	7	0	5	2	1	3	2	3	6	8	8	0	5	2	8	1	3
8	1	9	0	9	7	9	1	4	8	9	6	1	1	4	1	9	6	3	0	2	9	6	0	3	7	7	8
6	6	0	9	5	4	7	0	5	3	0	4	9	0	8	8	4	8	6	8	0	0	6	5	3	6	9	3
5	5	2	0	8	0	6	1	3	9	8	1	3	9	3	5	0	9	5	9	4	7	3	6	8	3	3	6
4	4	2	7	6	0	4	2	4	3	7	8	8	9	9	9	5	6	2	1	3	4	7	9	9	8	3	7

In[∘]:=

Evaluating and Plotting;

```
{QB1, PB1} = Orbits[sB, oB1];
{QB2, PB2} = Orbits[sB, oB2];
```

The two configuration in Lagrangian Space

In[∘]:=

```
QA21abs = Abs[QA1 - QA2];
{T, L} = QA21abs // Dimensions;
lminA = Min[QA21abs] // N // Log10
lmaxA = Max[QA21abs] // N // Log10
flminA = lminA // Floor
clmaxA = lmaxA // Ceiling
```

Out[∘]= -8.68319

Out[∘]= -0.218326

Out[∘]= -9

Out[∘]= 0

We store each of the logmin / logmax entries for both data sets. The floor and ceiling of those are actually what matter since we look to range colors from an integer to another.

In[∘]:=
```
QB21abs = Abs[QB1 - QB2];
lminB = Min[QB21abs] // N // Log10
lmaxB = Max[QB21abs] // N // Log10
flminB = lminB // Floor
clmaxB = lmaxB // Ceiling
```

Out[∘]= -11.7726

Out[∘]= -0.0902288

Out[∘]= -12

Out[∘]= 0

In[∘]:=
```
fmin = Min[flminA, flminB];
cmax = Max[clmaxA, clmaxB];
```

The minimum and the maximum of the log scales of the two diff-plots.

In[∘]:=
```
cs = ColorData["DeepSeaColors"];
myCF[x_] := colorRange[1/(cmax - fmin) * x - (cmax - fmin) * cmax] /.
  colorRange → ColorData[{"DeepSeaColors", {-1, 0}}]
break[y_] := Table[y[[i]], {i, 3}]
```

We derive a color function code that spreads over the DeepSeaColors gradient in reverse {-1, 0}.
The min value represents a threshold in darkness, while the max value is the ceiling in brightness.
The idea is that fmin maps to -1 and cmax maps to 0. Any change in the direction below the threshold or above the ceiling won't affect the color coding.

In[∘]:=
```
myCF[cmax]
Table[myCF[cmax][[i]], {i, 3}]
Table[myCF[cmax + 0.03][[i]], {i, 3}]

myCF[fmin]
Table[myCF[fmin][[i]], {i, 3}]
Table[myCF[fmin - 0.03][[i]], {i, 3}]

Table[myCF[fmin + i], {i, 0, cmax - fmin}]
```

Out[∘]=

Out[∘]= {0.772061, 0.92462, 0.998703}

Out[∘]= {0.772061, 0.92462, 0.998703}

Out[∘]=

Out[∘]= {0.16791, 0., 0.301671}

Out[∘]= {0.16791, 0., 0.301671}

Out[∘]= { , , , , , , , , , , , , }

We then map from the data's value to a gradient scheme spread between a (0, 1) bar.
Technically even min and max of each data set won't reach the ends of the bar because those corresponds to floor of min and ceiling of max:
fmin -> 0 and cmax -> 1
nA represents the total number of ticks
The list represents the position and the string display at each tick, given that the position must be between 0 and 1.

However, for listA we look to shift and compress the color spread so that:
fmin_overall -> 0 and cmax_overall -> 1
fmin and cmax will land in between 0 and 1.

The reason we do so is for the bar-legend function: the range of values chosen (bar_min, bar_max) (which must be within 0 and 1)
must correspond to the range of colors we would like to choose for both pairs of system considered.

```
In[∘]:= myTFA[x_] := (x - flminA) / (clmaxA - flminA);
myTFAS[x_] := x * flminA / fmin + 1 - flminA / fmin;
nA = clmaxA - flminA
listticksA = Transpose[{Table[myTFA[flminA + i], {i, 0, nA}],
   Join[{"1"}, Table[Superscript["10", -i], {i, nA}]] // Reverse}]
listticksAS = Transpose[{Table[myTFAS[myTFA[flminA + i]], {i, 0, nA}],
   Join[{"1"}, Table[Superscript["10", -i], {i, nA}]] // Reverse}]
```

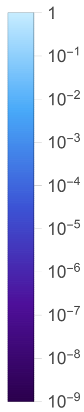
Out[∘]= 9

Out[∘]= $\left\{\left\{0, 10^{-9}\right\}, \left\{\frac{1}{9}, 10^{-8}\right\}, \left\{\frac{2}{9}, 10^{-7}\right\}, \left\{\frac{1}{3}, 10^{-6}\right\}, \left\{\frac{4}{9}, 10^{-5}\right\}, \left\{\frac{5}{9}, 10^{-4}\right\}, \left\{\frac{2}{3}, 10^{-3}\right\}, \left\{\frac{7}{9}, 10^{-2}\right\}, \left\{\frac{8}{9}, 10^{-1}\right\}, \{1, 1\}\right\}$

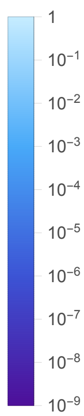
Out[∘]= $\left\{\left\{\frac{1}{4}, 10^{-9}\right\}, \left\{\frac{1}{3}, 10^{-8}\right\}, \left\{\frac{5}{12}, 10^{-7}\right\}, \left\{\frac{1}{2}, 10^{-6}\right\}, \left\{\frac{7}{12}, 10^{-5}\right\}, \left\{\frac{2}{3}, 10^{-4}\right\}, \left\{\frac{3}{4}, 10^{-3}\right\}, \left\{\frac{5}{6}, 10^{-2}\right\}, \left\{\frac{11}{12}, 10^{-1}\right\}, \{1, 1\}\right\}$

In[∘]:=
```
barA = BarLegend[{cs, {0, 1}}, Ticks → listticksA]
barA = BarLegend[{cs, {1 - flminA / fmin, 1}}, Ticks → listticksAS]
```

Out[∘]=



Out[∘]=



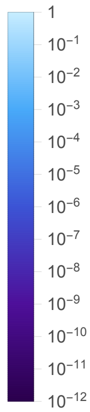
This is the bar-legend of system A (slow convergence) so that the plotting never reaches the darker regions (below 10^{-9}) since this range is reserved to system B

In[∘]:=
```
myTFB[x_] := (x - flminB) / (clmaxB - flminB);
nB = clmaxB - flminB;
listticksB = Transpose[{Table[myTFB[flminB + i], {i, 0, nB}],
   Join[{"1"}, Table[Superscript["10", -i], {i, nB}]] // Reverse}]
```

Out[∘]= $\left\{\left\{0, 10^{-12}\right\}, \left\{\frac{1}{12}, 10^{-11}\right\}, \left\{\frac{1}{6}, 10^{-10}\right\}, \left\{\frac{1}{4}, 10^{-9}\right\}, \left\{\frac{1}{3}, 10^{-8}\right\}, \left\{\frac{5}{12}, 10^{-7}\right\}, \left\{\frac{1}{2}, 10^{-6}\right\}, \left\{\frac{7}{12}, 10^{-5}\right\}, \left\{\frac{2}{3}, 10^{-4}\right\}, \left\{\frac{3}{4}, 10^{-3}\right\}, \left\{\frac{5}{6}, 10^{-2}\right\}, \left\{\frac{11}{12}, 10^{-1}\right\}, \{1, 1\}\right\}$

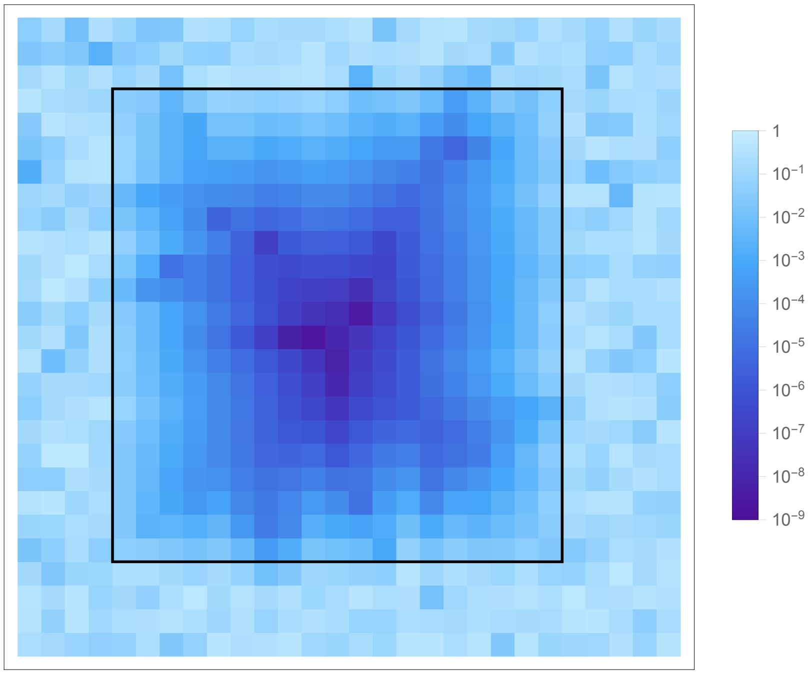
In[ ]:=
```
barB = BarLegend[{cs, {0, 1}}, Ticks → listticksB]
```

Out[ ]=

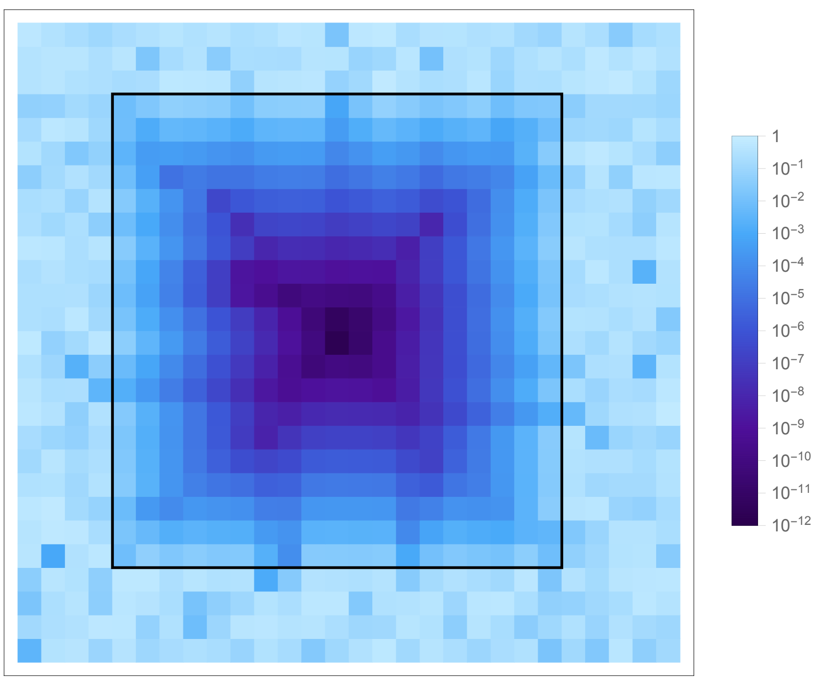


In[ ]:=
```
G1 = ArrayPlot[QA21abs // Log10,
  FrameTicks → {None, None},
  ColorFunction → (myCF[#1] &),
  ColorFunctionScaling → False,
  PlotLegends → barA,
  Epilog → {EdgeForm[Thickness[0.004]], Opacity[0], Rectangle[posbig1, posbig2]}]

G2 = ArrayPlot[QB21abs // Log10,
  FrameTicks → {None, None},
  ColorFunction → (myCF[#1] &),
  ColorFunctionScaling → False,
  PlotLegends → barB,
  Epilog → {EdgeForm[Thickness[0.004]], Opacity[0], Rectangle[posbig1, posbig2]}]
```

Out[]=



Out[]=



In[]:=
```
SetDirectory["/Users/adriensaremi/Downloads/Figs/"];
Export["AKSs7BlockBorderM1.pdf", GA1];
Export["AKSs7BlockBorderM2.pdf", GA2];
Export["AKSs7distM1M2_2.pdf", GA21C];
```

In[]:=
```
Export["AKSs13BlockBorderM1.pdf", GB1];
Export["AKSs13BlockBorderM2.pdf", GB2];
Export["AKSs13distM1M2.pdf", GB21C];
```

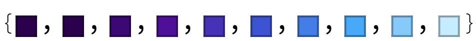
```
Export["AKSLPS12.pdf", G1];
Export["AKSLPS12_1.pdf", G2];
```

In[•]:=
```
minbA = 1;
maxbA = intA;
colorschemeA =
  Table[ColorData[{"DeepSeaColors", {minbA, maxbA}}][i], {i, 0, intA}] // Reverse;

minbB = 1;
maxbB = intB;
colorschemeB =
  Table[ColorData[{"DeepSeaColors", {minbB, maxbB}}][i], {i, 0, intB}] // Reverse;
```

The colorscheme used here is simply obtained by “fractionating” the DeepSea Gradient, where each color corresponds to a symbol (ranging from light to dark using the Reverse command).

In[•]:=
```
colorschemeA // Reverse
colorschemeB // Reverse
Table[myCF[fmin + i], {i, 0, cmax - fmin}]
```

Out[•]= 

Out[•]= 

Out[•]= 

Configuration B : Swapping 2 cores between 2 sequences with shared surrounding

In[•]:=
```
s = 13;
int = s - 4;
m = RandomInteger[{0, int}, {25, 21}];
```

From the m matrix defined above, we generate two matrices m1 and m2, identical, except to small submatrices B and C that are interchanged between m1 and m2. The blocks B (green) and C (red) on both matrices are always surrounded by a bigger “frame” A (blue).

In[•]:=
```
pos1 = {3, 2};
pos2 = {14, 11};
tout = 9;
nout = 8;
tin = 3;
nin = 2;
posin = {3, 3};
{m1, m2} = swapping2blocks[int, m, pos1, pos2, posin, tout, nout, tin, nin] ;

m1C = coloring2blocks[m1, pos1, posin, tout, nout, tin, nin, Blue, Green];
m1C = coloring2blocks[m1C, pos2, posin, tout, nout, tin, nin, Blue, Red];
m2C = coloring2blocks[m2, pos1, posin, tout, nout, tin, nin, Blue, Red];
m2C = coloring2blocks[m2C, pos2, posin, tout, nout, tin, nin, Blue, Green];

m1C // MatrixForm
m2C // MatrixForm
```

Out[•]//MatrixForm=

$$\begin{pmatrix}
3 & 1 & 9 & 0 & 1 & 7 & 1 & 0 & 2 & 3 & 4 & 1 & 8 & 1 & 7 & 3 & 5 & 0 & 3 & 0 & 1 \\
4 & 8 & 1 & 7 & 2 & 6 & 0 & 7 & 5 & 7 & 8 & 8 & 7 & 7 & 6 & 5 & 9 & 3 & 9 & 5 & 1 \\
3 & \mathbf{9} & \mathbf{8} & \mathbf{1} & \mathbf{5} & \mathbf{8} & \mathbf{2} & \mathbf{4} & \mathbf{5} & 0 & 7 & 0 & 4 & 6 & 9 & 2 & 1 & 0 & 0 & 0 & 4 \\
1 & \mathbf{1} & \mathbf{9} & \mathbf{6} & \mathbf{0} & \mathbf{9} & \mathbf{5} & \mathbf{5} & \mathbf{8} & 1 & 1 & 0 & 5 & 6 & 9 & 4 & 3 & 8 & 5 & 5 & 5 \\
4 & \mathbf{7} & \mathbf{0} & \mathbf{4} & \mathbf{8} & \mathbf{6} & \mathbf{1} & \mathbf{7} & \mathbf{7} & 3 & 7 & 4 & 5 & 9 & 4 & 8 & 4 & 9 & 3 & 6 & 5 \\
3 & \mathbf{3} & \mathbf{5} & \mathbf{8} & \mathbf{7} & \mathbf{6} & \mathbf{0} & \mathbf{6} & \mathbf{0} & 1 & 8 & 2 & 1 & 0 & 7 & 2 & 2 & 9 & 2 & 0 & 3 \\
5 & \mathbf{9} & \mathbf{4} & \mathbf{1} & \mathbf{4} & \mathbf{4} & \mathbf{2} & \mathbf{1} & \mathbf{9} & 7 & 3 & 2 & 1 & 8 & 8 & 7 & 2 & 0 & 9 & 0 & 3 \\
3 & \mathbf{4} & \mathbf{5} & \mathbf{4} & \mathbf{6} & \mathbf{2} & \mathbf{8} & \mathbf{5} & \mathbf{2} & 4 & 7 & 3 & 5 & 0 & 3 & 7 & 7 & 2 & 2 & 9 & 9 \\
5 & \mathbf{4} & \mathbf{8} & \mathbf{6} & \mathbf{9} & \mathbf{6} & \mathbf{0} & \mathbf{7} & \mathbf{9} & 9 & 4 & 2 & 4 & 9 & 0 & 0 & 7 & 6 & 8 & 0 & 2 \\
9 & \mathbf{6} & \mathbf{6} & \mathbf{9} & \mathbf{6} & \mathbf{0} & \mathbf{6} & \mathbf{7} & \mathbf{7} & 9 & 6 & 5 & 5 & 4 & 7 & 0 & 7 & 1 & 3 & 7 & 2 \\
7 & \mathbf{7} & \mathbf{8} & \mathbf{4} & \mathbf{2} & \mathbf{6} & \mathbf{7} & \mathbf{3} & \mathbf{2} & 1 & 9 & 8 & 0 & 6 & 0 & 7 & 9 & 4 & 1 & 8 & 5 \\
8 & 5 & 7 & 5 & 4 & 3 & 6 & 8 & 6 & 7 & 4 & 7 & 7 & 1 & 2 & 1 & 0 & 7 & 3 & 3 & 7 \\
4 & 3 & 7 & 0 & 3 & 9 & 9 & 8 & 9 & 2 & 0 & 8 & 7 & 7 & 6 & 0 & 4 & 3 & 3 & 5 & 6 \\
8 & 8 & 0 & 3 & 0 & 5 & 2 & 5 & 8 & 7 & \mathbf{9} & \mathbf{8} & \mathbf{1} & \mathbf{5} & \mathbf{8} & \mathbf{2} & \mathbf{4} & \mathbf{5} & 8 & 9 & 0 \\
1 & 6 & 9 & 2 & 8 & 6 & 3 & 7 & 1 & 7 & \mathbf{1} & \mathbf{9} & \mathbf{6} & \mathbf{0} & \mathbf{9} & \mathbf{5} & \mathbf{5} & \mathbf{8} & 7 & 1 & 0 \\
8 & 1 & 2 & 8 & 8 & 7 & 9 & 9 & 8 & 4 & \mathbf{7} & \mathbf{0} & \mathbf{4} & \mathbf{8} & \mathbf{6} & \mathbf{1} & \mathbf{7} & \mathbf{7} & 4 & 3 & 1 \\
4 & 6 & 5 & 3 & 1 & 7 & 6 & 2 & 8 & 7 & \mathbf{3} & \mathbf{5} & \mathbf{8} & \mathbf{8} & \mathbf{0} & \mathbf{0} & \mathbf{6} & \mathbf{0} & 1 & 5 & 7 \\
9 & 9 & 1 & 8 & 9 & 0 & 2 & 1 & 4 & 4 & \mathbf{9} & \mathbf{4} & \mathbf{1} & \mathbf{9} & \mathbf{1} & \mathbf{2} & \mathbf{1} & \mathbf{9} & 5 & 7 & 2 \\
6 & 9 & 0 & 6 & 2 & 1 & 0 & 2 & 7 & 3 & \mathbf{4} & \mathbf{5} & \mathbf{4} & \mathbf{4} & \mathbf{4} & \mathbf{8} & \mathbf{5} & \mathbf{2} & 9 & 4 & 9 \\
8 & 9 & 0 & 4 & 1 & 5 & 5 & 1 & 5 & 9 & \mathbf{4} & \mathbf{8} & \mathbf{6} & \mathbf{9} & \mathbf{6} & \mathbf{0} & \mathbf{7} & \mathbf{9} & 7 & 4 & 0 \\
3 & 7 & 9 & 2 & 7 & 5 & 8 & 7 & 3 & 0 & \mathbf{6} & \mathbf{6} & \mathbf{9} & \mathbf{6} & \mathbf{0} & \mathbf{6} & \mathbf{7} & \mathbf{7} & 4 & 2 & 0 \\
9 & 0 & 8 & 1 & 1 & 5 & 5 & 1 & 8 & 9 & \mathbf{7} & \mathbf{8} & \mathbf{4} & \mathbf{2} & \mathbf{6} & \mathbf{7} & \mathbf{3} & \mathbf{2} & 3 & 7 & 9 \\
6 & 6 & 2 & 2 & 7 & 1 & 8 & 6 & 0 & 5 & 9 & 6 & 8 & 6 & 9 & 1 & 6 & 5 & 1 & 2 & 2 \\
5 & 3 & 4 & 0 & 6 & 0 & 3 & 8 & 1 & 6 & 7 & 1 & 6 & 2 & 2 & 9 & 7 & 1 & 5 & 7 & 7 \\
1 & 8 & 0 & 4 & 3 & 1 & 8 & 6 & 1 & 7 & 9 & 8 & 0 & 0 & 3 & 6 & 7 & 1 & 1 & 0 & 8
\end{pmatrix}$$

Out[∘]//MatrixForm=

$$\begin{pmatrix}
3&1&9&0&1&7&1&0&2&3&4&1&8&1&7&3&5&0&3&0&1\\
4&8&1&7&2&6&0&7&5&7&8&8&7&7&6&5&9&3&9&5&1\\
3&9&8&1&5&8&2&4&5&0&7&0&4&6&9&2&1&0&0&0&4\\
1&1&9&6&0&9&5&5&8&1&1&0&5&6&9&4&3&8&5&5&5\\
4&7&0&4&8&6&1&7&7&3&7&4&5&9&4&8&4&9&3&6&5\\
3&3&5&8&8&0&0&6&0&1&8&2&1&0&7&2&2&9&2&0&3\\
5&9&4&1&9&1&2&1&9&7&3&2&1&8&8&7&2&0&9&0&3\\
3&4&5&4&4&4&8&5&2&4&7&3&5&0&3&7&7&2&2&9&9\\
5&4&8&6&9&6&0&7&9&9&4&2&4&9&0&0&7&6&8&0&2\\
9&6&6&9&6&0&6&7&7&9&6&5&5&4&7&0&7&1&3&7&2\\
7&7&8&4&2&6&7&3&2&1&9&8&0&6&0&7&9&4&1&8&5\\
8&5&7&5&4&3&6&8&6&7&4&7&7&1&2&1&0&7&3&3&7\\
4&3&7&0&3&9&9&8&9&2&0&8&7&7&6&0&4&3&3&5&6\\
8&8&0&3&0&5&2&5&8&7&9&8&1&5&8&2&4&5&8&9&0\\
1&6&9&2&8&6&3&7&1&7&1&9&6&0&9&5&5&8&7&1&0\\
8&1&2&8&8&7&9&9&8&4&7&0&4&8&6&1&7&7&4&3&1\\
4&6&5&3&1&7&6&2&8&7&3&5&8&7&6&0&6&0&1&5&7\\
9&9&1&8&9&0&2&1&4&4&9&4&1&4&4&2&1&9&5&7&2\\
6&9&0&6&2&1&0&2&7&3&4&5&4&6&2&8&5&2&9&4&9\\
8&9&0&4&1&5&5&1&5&9&4&8&6&9&6&0&7&9&7&4&0\\
3&7&9&2&7&5&8&7&3&0&6&6&9&6&0&6&7&7&4&2&0\\
9&0&8&1&1&5&5&1&8&9&7&8&4&2&6&7&3&2&3&7&9\\
6&6&2&2&7&1&8&6&0&5&9&6&8&6&9&1&6&5&1&2&2\\
5&3&4&0&6&0&3&8&1&6&7&1&6&2&2&9&7&1&5&7&7\\
1&8&0&4&3&1&8&6&1&7&9&8&0&0&3&6&7&1&1&0&8
\end{pmatrix}$$

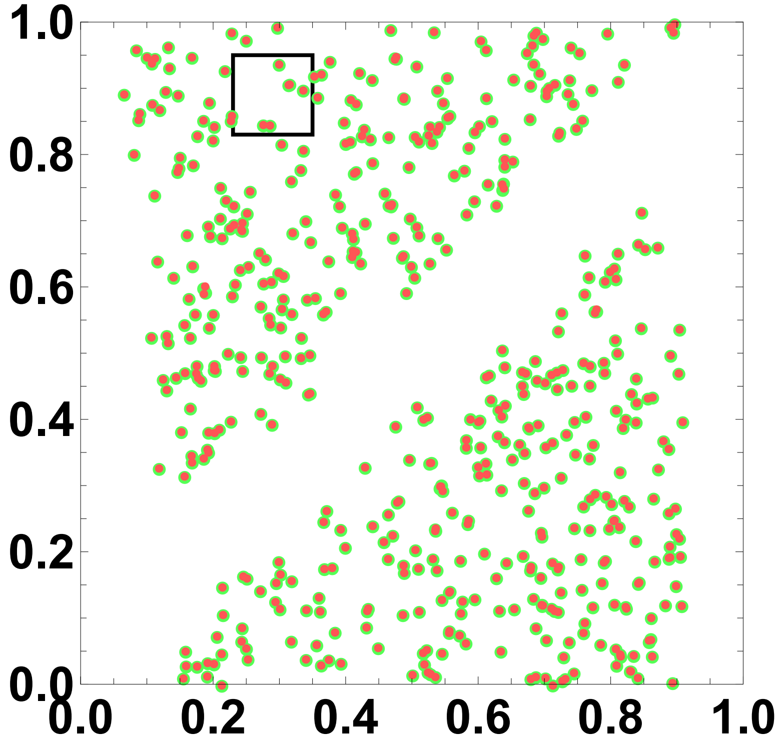
Evaluation and Plotting

```
{Q1, P1} = Orbits[s, m1];
{Q2, P2} = Orbits[s, m2];
```

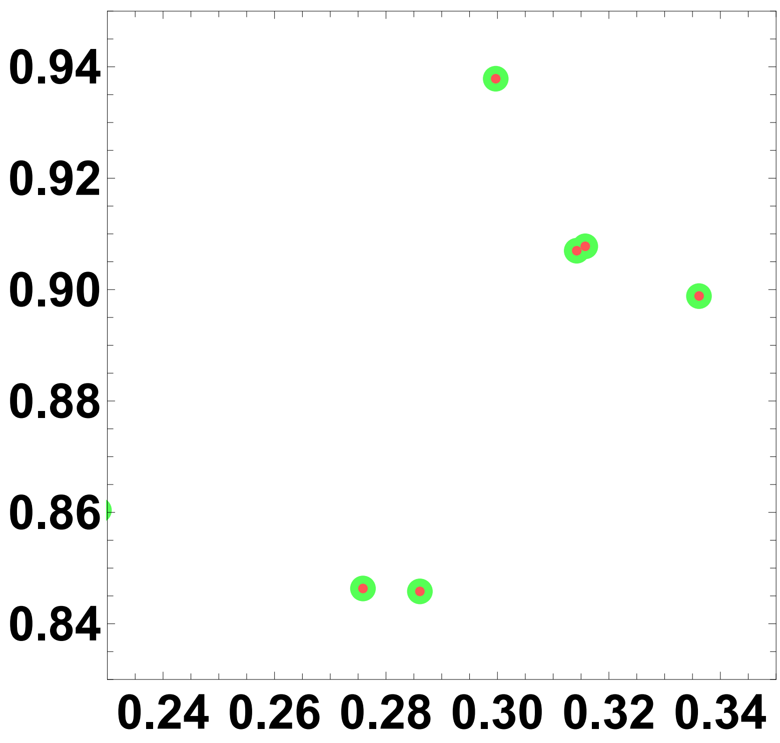
In[∘]:=

```
xplotrange = {0.23, 0.35};
yplotrange = {0.83, 0.95};

size1 = 17;
size2 = 11;
dgreen = 0.04;
dred = 0.015;

{plot1, plot2} =
  plotting2[Q1, P1, Q2, P2, xplotrange, yplotrange, dgreen, dred, size1, size2];
Show[plot1, ImageSize → 400]
Show[plot2, ImageSize → 400]
```

Out[◦]=



Out[◦]=



Configuration C: Swapping 3 diamond-shaped cores between 2 sequences with shared

diamond-shaped surrounding

In[∘]:=
```
s = 7;
int = s - 4;
m = RandomInteger[{0, int}, {34, 33}];
{T, Np} = Dimensions[m1];
```

Here, we just switch three diamond-shaped blocks between three identical sequences (in a cyclic manner), with identical bordering on the outside of these blocks. From the m matrix defined above, we generate three matrices m1, m2 and m3, identical, except to small diamond-shaped submatrices B, C and D that are cyclically permuted between m1, m2 and m3. The blocks B (green) C (red) and D (cyan) on both matrices are always surrounded by a bigger diamond-shaped “frame” A (blue).

In[∘]:=
```
pos1 = {2, 10};
pos2 = {8, 24};
pos3 = {17, 14};
dout = 8;
din = 2;

{o1, o2, o3} = swapping3diamonds[int, m, dout, din, pos1, pos2, pos3];

o1C = coloring2diamonds[o1, dout, din, pos1, Blue, Green];
o1C = coloring2diamonds[o1C, dout, din, pos2, Blue, Red];
o1C = coloring2diamonds[o1C, dout, din, pos3, Blue, Cyan];

o2C = coloring2diamonds[o2, dout, din, pos1, Blue, Red];
o2C = coloring2diamonds[o2C, dout, din, pos2, Blue, Cyan];
o2C = coloring2diamonds[o2C, dout, din, pos3, Blue, Green];

o3C = coloring2diamonds[o3, dout, din, pos1, Blue, Cyan];
o3C = coloring2diamonds[o3C, dout, din, pos2, Blue, Green];
o3C = coloring2diamonds[o3C, dout, din, pos3, Blue, Red];

G1 = o1C // MatrixForm
G2 = o2C // MatrixForm
G3 = o3C // MatrixForm

(*posbig1 = {pos1[[2]],T-pos1[[1]]}+{-1,1};
posbig2 ={pos2[[2]],T-pos2[[1]]}+{-1,1};
posbig3 ={pos3[[2]],T-pos3[[1]]}+{-1,1};
possmall1 ={pos1[[2]],T-pos1[[1]]}-(dout-din)*{0,1}+{-1,1};
possmall2 ={pos2[[2]],T-pos2[[1]]}-(dout-din)*{0,1}+{-1,1};
possmall3 ={pos3[[2]],T-pos3[[1]]}-(dout-din)*{0,1}+{-1,1};*)
```

Out[ ]//MatrixForm=

3	3	3	1	3	1	1	1	2	1	1	0	1	0	2	3	3	3	1	1	0	1	1	1	1	3	0	2	1	1	2	3
3	1	3	0	0	1	3	2	0	3	0	3	3	3	3	0	1	1	3	3	2	0	0	0	2	0	1	0	1	2	3	1
2	0	1	3	1	2	3	3	2	2	2	0	3	0	1	3	1	0	1	2	3	0	2	2	1	0	0	1	0	0	0	1
0	3	2	1	0	2	3	3	3	1	3	1	0	2	1	2	3	2	2	0	2	0	0	0	3	1	3	0	1	2	1	2
0	2	1	0	0	0	1	1	1	2	1	1	2	1	2	1	3	2	3	3	3	0	0	2	1	2	1	1	0	1	3	0
3	2	0	2	3	1	1	0	2	0	1	1	3	1	1	0	2	2	3	0	1	1	2	1	0	3	0	3	2	3	2	2
3	0	3	0	0	3	0	3	0	2	1	3	0	2	1	1	2	2	1	3	1	2	2	2	1	0	3	2	2	2	2	1
0	1	2	2	0	2	3	0	3	1	3	3	2	2	2	3	2	1	0	1	0	3	0	3	3	0	3	2	2	3	2	1
3	3	0	3	3	3	1	0	3	0	2	2	3	0	0	1	2	0	3	0	0	2	2	2	2	3	2	2	1	0	2	1
2	0	2	1	0	1	2	0	2	2	2	1	2	1	1	2	1	2	0	3	2	3	3	1	3	1	0	1	0	2	3	2
1	3	3	1	3	1	3	2	0	3	0	0	2	0	1	2	3	0	1	3	1	1	1	2	1	1	2	2	3	0	0	3
2	0	1	0	2	1	1	2	1	3	1	3	1	1	1	0	0	0	1	1	1	0	2	0	1	1	3	1	1	2	1	0
1	0	3	0	0	0	1	2	1	3	3	1	3	3	0	0	0	3	0	3	0	3	0	2	1	3	0	2	1	1	3	2
2	0	0	0	0	3	0	0	0	0	3	0	3	3	1	2	1	2	0	2	3	0	3	2	3	3	2	2	2	3	0	1
0	2	0	1	1	2	0	3	3	1	1	1	3	3	1	1	0	3	3	3	1	0	0	3	3	2	3	0	0	1	2	0
3	2	1	3	3	0	3	0	1	3	1	0	2	1	1	3	3	1	0	1	2	0	2	0	2	1	2	1	1	2	2	2
3	3	0	1	2	2	2	2	3	1	2	1	0	3	3	3	0	3	3	1	3	2	0	3	0	0	2	0	1	0	2	1
3	3	0	2	0	1	2	1	0	2	1	1	2	2	2	1	3	3	0	1	1	2	1	3	1	3	1	1	3	2	3	3
3	0	1	0	1	2	0	2	3	0	0	3	3	1	3	1	1	2	2	0	1	2	1	3	3	1	3	2	2	0	2	0
3	1	2	0	1	1	2	2	0	1	1	1	1	2	1	1	2	1	0	3	1	0	0	0	3	0	1	1	0	3	2	3
1	0	0	0	3	0	2	0	0	1	1	0	2	0	1	1	3	1	2	1	1	3	3	1	1	1	2	0	0	3	3	0
3	1	2	3	3	3	0	2	0	3	0	3	0	2	1	3	0	2	1	0	3	3	2	3	0	1	3	2	2	3	0	3
0	0	2	2	2	3	3	2	0	2	3	0	3	2	3	3	2	2	2	3	2	1	2	0	3	2	1	2	1	3	0	1
1	3	2	3	1	1	0	3	3	3	1	0	0	0	2	2	3	0	0	1	2	1	1	1	0	3	3	2	3	1	3	1
3	3	2	1	0	2	2	1	0	1	2	0	2	3	2	1	2	1	1	2	2	0	2	0	3	1	1	3	2	2	0	0
1	3	2	3	2	0	1	0	3	1	3	2	0	3	0	0	2	0	1	3	3	0	1	3	1	3	1	3	2	0	1	1
1	3	1	1	0	0	1	0	2	1	1	2	1	3	1	3	1	1	1	1	3	3	0	2	2	2	3	0	3	2	0	3
2	2	3	1	0	3	2	2	3	2	1	2	1	3	3	1	3	1	0	1	1	2	3	2	0	3	0	2	0	0	0	3
1	0	3	0	3	1	2	3	2	3	0	0	0	0	3	0	3	3	3	1	1	3	2	0	1	3	0	1	1	2	2	3
1	3	0	3	0	3	3	2	3	1	0	1	3	1	1	2	3	0	0	2	2	2	3	1	3	3	0	3	2	2	0	2
1	2	3	2	3	1	3	3	2	3	3	3	2	3	1	2	1	3	1	1	1	3	0	0	3	1	3	2	3	2	2	0
1	1	1	3	1	1	2	2	3	2	2	0	2	0	0	3	1	3	0	3	2	0	1	1	0	2	2	1	1	1	2	0
3	0	2	0	2	2	0	3	0	1	3	1	0	1	3	3	1	1	2	0	0	1	2	3	2	0	3	1	1	1	3	3
2	2	2	0	1	0	1	1	2	0	0	0	3	0	0	0	3	2	0	0	0	0	2	1	1	3	2	0	2	0	3	3

Out[ ]//MatrixForm=

$$\begin{pmatrix}
3&3&3&1&3&1&1&1&2&1&1&0&1&0&2&3&3&3&1&1&0&1&1&1&1&3&0&2&1&1&2&3\\
3&1&3&0&0&1&3&2&0&3&0&3&3&3&3&0&1&1&3&3&2&0&0&0&2&0&1&0&1&2&3&1\\
2&0&1&3&1&2&3&3&2&2&2&0&3&0&1&3&1&0&1&2&3&0&2&2&1&0&0&1&0&0&0&1\\
0&3&2&1&0&2&3&3&3&1&3&1&0&2&1&2&3&2&2&0&2&0&0&0&3&1&3&0&1&2&1&2\\
0&2&1&0&0&0&1&1&1&2&1&1&2&1&2&1&3&2&3&3&3&0&0&2&1&2&1&1&0&1&3&0\\
3&2&0&2&3&1&1&0&2&0&1&1&3&1&1&0&2&2&3&0&1&1&2&1&0&3&0&3&2&3&2&2\\
3&0&3&0&0&3&0&3&0&2&1&3&0&2&1&1&2&2&1&3&1&2&2&2&1&0&3&2&2&2&2&1\\
0&1&2&2&0&2&3&0&3&2&3&3&2&2&2&3&2&1&0&1&0&3&0&3&3&0&3&2&2&3&2&1\\
3&3&0&3&3&3&1&0&0&3&3&2&3&0&0&1&2&0&3&0&0&2&2&2&2&3&2&2&1&0&2&1\\
2&0&2&1&0&1&2&0&2&0&2&1&2&1&1&2&1&2&0&3&2&3&3&1&3&1&0&1&0&2&3&2\\
1&3&3&1&3&1&3&2&0&3&0&0&2&0&1&2&3&0&1&3&1&1&1&2&1&1&2&2&3&0&0&3\\
2&0&1&0&2&1&1&2&1&3&1&3&1&1&1&0&0&0&1&1&1&0&2&0&1&1&3&1&1&2&1&0\\
1&0&3&0&0&0&1&2&1&3&3&1&3&3&0&0&0&3&0&3&0&3&0&2&1&3&0&2&1&1&3&2\\
2&0&0&0&0&3&0&0&0&0&3&0&3&3&1&2&1&2&0&2&3&0&3&2&3&3&2&2&2&3&0&1\\
0&2&0&1&1&2&0&3&3&1&1&1&3&3&1&1&0&3&3&3&1&0&0&0&2&2&3&0&0&1&2&0\\
3&2&1&3&3&0&3&0&1&3&1&0&2&1&1&3&3&1&0&1&2&0&2&3&2&1&2&1&1&2&2&2\\
3&3&0&1&2&2&2&2&3&1&2&1&0&3&3&3&0&3&3&1&3&2&0&3&0&0&2&0&1&0&2&1\\
3&3&0&2&0&1&2&1&0&2&1&1&2&2&2&1&3&3&0&1&1&2&1&3&1&3&1&1&3&2&3&3\\
3&0&1&0&1&2&0&2&3&0&0&3&3&1&3&1&1&2&2&0&1&2&1&3&3&1&3&2&2&0&2&0\\
3&1&2&0&1&1&2&2&0&1&1&1&1&2&1&1&2&1&0&3&1&0&0&0&3&0&1&1&0&3&2&3\\
1&0&0&0&3&0&2&0&0&1&1&0&2&0&1&1&3&1&2&1&1&3&3&1&1&1&2&0&0&3&3&0\\
3&1&2&3&3&3&0&2&0&3&0&3&0&2&1&3&0&2&1&0&3&3&2&3&0&1&3&2&2&3&0&3\\
0&0&2&2&2&3&3&2&0&2&3&0&3&1&3&3&2&2&2&3&2&1&2&0&3&2&1&2&1&3&0&1\\
1&3&2&3&1&1&0&3&3&3&1&0&3&0&2&2&3&0&0&1&2&1&1&1&0&3&3&2&3&1&3&1\\
3&3&2&1&0&2&2&1&0&1&2&0&2&2&2&1&2&1&1&2&2&0&2&0&3&1&1&3&2&2&0&0\\
1&3&2&3&2&0&1&0&3&1&3&2&0&3&0&0&2&0&1&3&3&0&1&3&1&3&1&3&2&0&1&1\\
1&3&1&1&0&0&1&0&2&1&1&2&1&3&1&3&1&1&1&1&3&3&0&2&2&2&3&0&3&2&0&3\\
2&2&3&1&0&3&2&2&3&2&1&2&1&3&3&1&3&1&0&1&1&2&3&2&0&3&0&2&0&0&0&3\\
1&0&3&0&3&1&2&3&2&3&0&0&0&0&3&0&3&3&3&1&1&3&2&0&1&3&0&1&1&2&2&3\\
1&3&0&3&0&3&3&2&3&1&0&1&3&1&1&2&3&0&0&2&2&2&3&1&3&3&0&3&2&2&0&2\\
1&2&3&2&3&1&3&3&2&3&3&3&2&3&1&2&1&3&1&1&1&3&0&0&3&1&3&2&3&2&2&0\\
1&1&1&3&1&1&2&2&3&2&2&0&2&0&0&3&1&3&0&3&2&0&1&1&0&2&2&1&1&1&2&0\\
3&0&2&0&2&2&0&3&0&1&3&1&0&1&3&3&1&1&2&0&0&1&2&3&2&0&3&1&1&1&3&3\\
2&2&2&0&1&0&1&1&2&0&0&0&3&0&0&0&3&2&0&0&0&0&2&1&1&3&2&0&2&0&3&3
\end{pmatrix}$$

Out[ ]//MatrixForm=

$$\begin{pmatrix}
3&3&3&1&3&1&1&1&2&1&1&0&1&0&2&3&3&3&1&1&0&1&1&1&1&3&0&2&1&1&2&3\\
3&1&3&0&0&1&3&2&0&3&0&3&3&3&3&0&1&1&3&3&2&0&0&0&2&0&1&0&1&2&3&1\\
2&0&1&3&1&2&3&3&2&2&2&0&3&0&1&3&1&0&1&2&3&0&2&2&1&0&0&1&0&0&0&1\\
0&3&2&1&0&2&3&3&3&1&3&1&0&2&1&2&3&2&2&0&2&0&0&0&3&1&3&0&1&2&1&2\\
0&2&1&0&0&0&1&1&1&2&1&1&2&1&2&1&3&2&3&3&3&0&0&2&1&2&1&1&0&1&3&0\\
3&2&0&2&3&1&1&0&2&0&1&1&3&1&1&0&2&2&3&0&1&1&2&1&0&3&0&3&2&3&2&2\\
3&0&3&0&0&3&0&3&0&2&1&3&0&2&1&1&2&2&1&3&1&2&2&2&1&0&3&2&2&2&2&1\\
0&1&2&2&0&2&3&0&3&2&3&3&2&2&2&3&2&1&0&1&0&3&0&3&3&0&3&2&2&3&2&1\\
3&3&0&3&3&3&1&0&0&0&2&2&3&0&0&1&2&0&3&0&0&2&2&2&2&3&2&2&1&0&2&1\\
2&0&2&1&0&1&2&0&2&3&2&1&2&1&1&2&1&2&0&3&2&3&3&1&3&1&0&1&0&2&3&2\\
1&3&3&1&3&1&3&2&0&3&0&0&2&0&1&2&3&0&1&3&1&1&1&2&1&1&2&2&3&0&0&3\\
2&0&1&0&2&1&1&2&1&3&1&3&1&1&1&0&0&0&1&1&1&0&2&0&1&1&3&1&1&2&1&0\\
1&0&3&0&0&0&1&2&1&3&3&1&3&3&0&0&0&3&0&3&0&3&0&2&1&3&0&2&1&1&3&2\\
2&0&0&0&0&3&0&0&0&0&3&0&3&3&1&2&1&2&0&2&3&0&3&1&3&3&2&2&2&3&0&1\\
0&2&0&1&1&2&0&3&3&1&1&1&3&3&1&1&0&3&3&3&1&0&3&0&2&2&3&0&0&1&2&0\\
3&2&1&3&3&0&3&0&1&3&1&0&2&1&1&3&3&1&0&1&2&0&2&2&2&1&2&1&1&2&2&2\\
3&3&0&1&2&2&2&2&3&1&2&1&0&3&3&3&0&3&3&1&3&2&0&3&0&0&2&0&1&0&2&1\\
3&3&0&2&0&1&2&1&0&2&1&1&2&2&2&1&3&3&0&1&1&2&1&3&1&3&1&1&3&2&3&3\\
3&0&1&0&1&2&0&2&3&0&0&3&3&1&3&1&1&2&2&0&1&2&1&3&3&1&3&2&2&0&2&0\\
3&1&2&0&1&1&2&2&0&1&1&1&1&2&1&1&2&1&0&3&1&0&0&0&3&0&1&1&0&3&2&3\\
1&0&0&0&3&0&2&0&0&1&1&0&2&0&1&1&3&1&2&1&1&3&3&1&1&1&2&0&0&3&3&0\\
3&1&2&3&3&3&0&2&0&3&0&3&0&2&1&3&0&2&1&0&3&3&2&3&0&1&3&2&2&3&0&3\\
0&0&2&2&2&3&3&2&0&2&3&0&3&2&3&3&2&2&2&3&2&1&2&0&3&2&1&2&1&3&0&1\\
1&3&2&3&1&1&0&3&3&3&1&0&0&3&3&2&3&0&0&1&2&1&1&1&0&3&3&2&3&1&3&1\\
3&3&2&1&0&2&2&1&0&1&2&0&2&0&2&1&2&1&1&2&2&0&2&0&3&1&1&3&2&2&0&0\\
1&3&2&3&2&0&1&0&3&1&3&2&0&3&0&0&2&0&1&3&3&0&1&3&1&3&1&3&2&0&1&1\\
1&3&1&1&0&0&1&0&2&1&1&2&1&3&1&3&1&1&1&1&3&3&0&2&2&2&3&0&3&2&0&3\\
2&2&3&1&0&3&2&2&3&2&1&2&1&3&3&1&3&1&0&1&1&2&3&2&0&3&0&2&0&0&0&3\\
1&0&3&0&3&1&2&3&2&3&0&0&0&0&3&0&3&3&3&1&1&3&2&0&1&3&0&1&1&2&2&3\\
1&3&0&3&0&3&3&2&3&1&0&1&3&1&1&2&3&0&0&2&2&2&3&1&3&3&0&3&2&2&0&2\\
1&2&3&2&3&1&3&3&2&3&3&3&2&3&1&2&1&3&1&1&1&3&0&0&3&1&3&2&3&2&2&0\\
1&1&1&3&1&1&2&2&3&2&2&0&2&0&0&3&1&3&0&3&2&0&1&1&0&2&2&1&1&1&2&0\\
3&0&2&0&2&2&0&3&0&1&3&1&0&1&3&3&1&1&2&0&0&1&2&3&2&0&3&1&1&1&3&3\\
2&2&2&0&1&0&1&1&2&0&0&0&3&0&0&0&3&2&0&0&0&0&2&1&1&3&2&0&2&0&3&3
\end{pmatrix}$$

Evaluating and Plotting;

```
{Q1, P1} = Orbits[s, o1];
{Q2, P2} = Orbits[s, o2];
{Q3, P3} = Orbits[s, o3];
```

In[•]:=
```
(*xplotrange = {0.62,0.74};
yplotrange = {0.32,0.45};

size1 = 21;
size2 = 12;
size3 = 6;
dgreen = 0.045;
dred = 0.022;
dblue = 0.011;

{plot3,plot4} = plotting3[Q1,P1,Q2,P2,Q3,P3,
  xplotrange,yplotrange,dgreen,dred,dblue,size1,size2,size3];
plot3
 plot4*)
```