Pensieve header: Implementing the HOMFLYPT Arc Algebra.

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In[•]:= ν[a_i_,j_, a_k_,l_] := HeavisideTheta[i - k] -
           HeavisideTheta[i - l] - HeavisideTheta[j - k] + HeavisideTheta[j - l];

In[•]:= PT_k_[w[lft___, a_i_,j_, a_k_,l_, rgt___]] := Module[
           {ν = ν[a_i,j, a_k,l]},
           PT_k[a^(2 ν) w[lft, a_k,l, a_i,j, rgt] + ν a^ν w[lft, a_k,j, a_i,l, rgt]]
         ];
        PT_k_[w[a_k_,l_, rest___]] := w[a_k,l, rest];
        PT_k_[ℰ_] /; (Head[ℰ] =!= w) := Expand[ℰ /. ω_w :> PT_k[ω]]

In[•]:= PT_2[w[a_4,1, a_3,6, a_2,5]]
Out[•]= a^3 w[a_2,1, a_4,5, a_3,6] + a^2 w[a_2,1, a_4,6, a_3,5] + a^4 w[a_2,5, a_4,1, a_3,6] + a^3 w[a_2,6, a_4,1, a_3,5]

In[•]:= PT_4[w[a_4,1, a_3,6, a_2,5]]
Out[•]= w[a_4,1, a_3,6, a_2,5]

In[•]:= PT_4@PT_2[w[a_4,1, a_3,6, a_2,5]]
Out[•]= a^2 w[a_4,1, a_2,5, a_3,6] + a w[a_4,1, a_2,6, a_3,5]

In[•]:= PT_2@PT_4@PT_2[w[a_4,1, a_3,6, a_2,5]]
Out[•]= a^3 w[a_2,1, a_4,5, a_3,6] + a^2 w[a_2,1, a_4,6, a_3,5] + a^4 w[a_2,5, a_4,1, a_3,6] + a^3 w[a_2,6, a_4,1, a_3,5]

In[•]:= PT_4@PT_3@PT_2@PT_2@PT_4@PT_2[w[a_4,1, a_3,6, a_2,5]]
Out[•]= w[a_4,1, a_3,6, a_2,5]

In[•]:= PT_2@PT_3@PT_4@w[a_4,1, a_3,6, a_2,5]
Out[•]= a^4 w[a_2,1, a_3,5, a_4,6] + 2 a^3 w[a_2,1, a_3,6, a_4,5] + a^5 w[a_2,5, a_3,1, a_4,6] +
         a^6 w[a_2,5, a_3,6, a_4,1] + a^4 w[a_2,6, a_3,1, a_4,5] + a^5 w[a_2,6, a_3,5, a_4,1]

In[•]:= PT_3@PT_2@PT_4@w[a_4,1, a_3,6, a_2,5]
Out[•]= a^3 w[a_3,1, a_2,5, a_4,6] + a^2 w[a_3,1, a_2,6, a_4,5] + a^3 w[a_3,6, a_2,1, a_4,5] + a^4 w[a_3,6, a_2,5, a_4,1]

In[•]:= PT_4@PT_3@PT_2@w[a_2,1, a_3,5, a_4,6]
Out[•]= -w[a_4,5, a_3,6, a_2,1]/a + w[a_4,6, a_3,5, a_2,1]/a^2
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In[•]:= CF[ℰ_] := Expand@Module[{},
          ℰ //. w[lft___, a_i_,j_, a_k_,l_, rgt___] /; i > k :> (n = ν[a_i,j, a_k,l];
            a^(2 n) w[lft, a_k,l, a_i,j, rgt] + n a^n w[lft, a_k,j, a_i,l, rgt]
           )
         ]

In[•]:= CF[a^3 w[a_2,1, a_4,5, a_3,6] + a^2 w[a_2,1, a_4,6, a_3,5] + a^4 w[a_2,5, a_4,1, a_3,6] + a^3 w[a_2,6, a_4,1, a_3,5]]

Out[•]=
a^4 w[a_2,1, a_3,5, a_4,6] + 2 a^3 w[a_2,1, a_3,6, a_4,5] + a^5 w[a_2,5, a_3,1, a_4,6] +
 a^6 w[a_2,5, a_3,6, a_4,1] + a^4 w[a_2,6, a_3,1, a_4,5] + a^5 w[a_2,6, a_3,5, a_4,1]

In[•]:= BestCyclicMatch[a_List, b_List] := Module[{i, j, k, la = Length@a, lb = Length@b, m},
          m = Join @@ Table[
              k = 0; While[a[[Mod[i + k, la, 1]]] === b[[Mod[j + k, lb, 1]]], ++k];
              {k, i, j},
              {i, la}, {j, lb}
             ];
          MaximalBy[m, First][[1]]
         ]

In[•]:= BestCyclicMatch[{9, 2, 5, 4, 6, 7}, Range[10]]

Out[•]=
{2, 5, 6}

In[•]:= BestCyclicMatch[{11, 23}, Range[10]]

Out[•]=
{0, 1, 1}
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