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SetDirectory["C:/drorbn/AcademicPensieve/Projects/Arrow_Diagrams_and_gl(N)"];
<< "Arrow_Diagrams_and_gl(N).m"

diag = BasisAArrow[4][[120]]

Diag[ar[4, 7], ar[5, 3], ar[6, 2], ar[8, 1]]

allterms = List@@Expand[(Times @@ diag) /. ar[p_, q_] =>
    LTAt[p, q] + 1/2 (EQAt[p, q] - Cat[p] + Cat[q] - Cat[])
];
s = Sum[
  dirs = allterms[[m1]];
  coeff = dirs /. (_Cat | _EQAt | _LTAt) -> 1;
  k = 0;
  w = Table[1, {2 Length[diag]}];
  ltpairs = {};
  dirs /. {
    LTAt[p_, q_] => (
      w[[p]] = e[i = ++k, j = ++k];
      w[[q]] = e[j, i];
      AppendTo[ltpairs, {i, j}];
    ),
    EQAt[p_, q_] => (w[[p]] = w[[q]] = e[i = ++k, i]);
    Cat[p_] => (
      w[[p]] = e[i = ++k, i];
      coeff *= h[i];
    ),
    Cat[] => (coeff *= h[++k]^2);
  };
  w = DeleteCases[w, 1];
  allots = OrderTypes[k, ltpairs];
  Sum[
    ot = allots[[m2]];
    Times[
      (* Binomial[n, Max[ot]], *)
      n^Max[ot],
      coeff /. h[i_] => h[ot[[i]]],
      w@@w /. e[i_, j_] => alpha[ot[[i]], ot[[j]]]
    ],
    {m2, Length[allots]}
  ], {m1, Length[allterms]}
];

Length[Ws = Cases[s, _W, Infinity]]

178 122

Length[Union[Ws]]

159 957

Length[Cases[Expand[s], _W, Infinity]]

178 122

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