

```

Timing[perms = Permutations[Range[8]]; Position[perms, #][[1, 1]] & /@ perms;]
{61.293, Null}

P2N[0, {}] = 0;
P2N[1, {1}] = 0;
P2N[n_, l_] :=
  (n - 1)! (n - Position[l, n][[1, 1]]) + P2N[n - 1, Drop[l, -1] /. n → Last[l]];
N2P[0, 0] = {};
N2P[1, 0] = {1};
N2P[n_, k_] := Block[
  {tau = Append[N2P[n - 1, k~Mod~((n - 1)!)], n], p = n - k~Quotient~((n - 1)!)},
  tau /. {n → tau[[p]], tau[[p]] → n}
];
N2P1[0, 0] = {};
N2P1[1, 0] = {1};
N2P1[n_, k_] := Block[
  {
    tau = N2P1[n - 1, k~Mod~((n - 1)!)], p = n - k~Quotient~((n - 1)!)
  },
  If[p == n,
    Append[tau, n],
    Append[tau /. tau[[p]] → n, tau[[p]]]
  ]
];

ns = P2N[5, #] & /@ Permutations[Range[5]]
{0, 24, 6, 30, 54, 48, 2, 26, 8, 32, 56, 50, 14, 38, 12, 36, 60, 62, 86, 74,
  84, 72, 80, 78, 1, 25, 7, 31, 55, 49, 3, 27, 9, 33, 57, 51, 15, 39, 13, 37, 61, 63,
  87, 75, 85, 73, 81, 79, 5, 29, 11, 35, 59, 53, 4, 28, 10, 34, 58, 52, 16, 40, 17,
  41, 65, 64, 88, 76, 89, 77, 82, 83, 23, 47, 19, 43, 67, 71, 22, 46, 18, 42, 66, 70,
  21, 45, 20, 44, 68, 69, 93, 94, 92, 95, 90, 91, 119, 101, 115, 97, 107, 103, 118,
  100, 114, 96, 106, 102, 117, 99, 116, 98, 105, 104, 112, 111, 113, 110, 109, 108}

(N2P1[5, #] & /@ ns) === Permutations[Range[5]]
True

Timing[n = 8; P2N[n, N2P[n, #]] & /@ Range[0, n!];]
{15.179, Null}

Timing[n = 8; P2N[n, N2P1[n, #]] & /@ Range[0, n!];]
{14.415, Null}

Timing[n = 9; P2N[n, N2P[n, #]] & /@ Range[0, n!];]
{156.562, Null}

Timing[n = 9; P2N[n, N2P1[n, #]] & /@ Range[0, n!];]
{151.555, Null}

```