Pensieve header: Working with permutations, day 2.

From http://www.math.toronto.edu/drorbn/classes/16-1750-ShamelessMathematica/About.html: **Possible Topics** (in no particular order). Whatever you may suggest, and the ~~Fibonacci numbers~~; ~~the Jones polynomial~~; ~~a more efficient Jones-algorithm~~; ~~a riddle on spheres~~; ~~Khovanov homology~~; Γ-calculus; the Hopf fibration; Hilbert's 13th problem; ~~non-commutative Gaussian elimination~~; free Lie algebras; the Baker-Campbell-Hausdorff formula; wacky numbers; ~~an order 4 torus~~; ~~the Schwarz Lantern~~; knot colourings; the Temperley-Lieb pairing; the dodecahedral link; sound experiments; barycentric subdivisions; ~~a Peano curve;~~ braid closures and Vogel's algorithm; the insolubility of the quintic, phase portraits; ~~the Mamdelbrot set~~; shadows of the Cantor Aerogel; quilt plots; ~~some image transformations~~; De Bruijn graphs; ~~the Riemann series theorem~~; finite type invariants and the Willerton fish.

```
0 + √2
```

$\sqrt{2}$

```
0. + √2
```

```
1.41421
```

```
a[n_] := N[(-1)^(n+1)/n];
Manipulate[
 s = 0.; k0 = 0; k1 = 0;
 ArrayPlot[Partition[Table[
    If[s > w,
     ++k0; s += a[2 k0]; 0,
     ++k1; s += a[2 k1 - 1]; 1
    ],
    {1024}
   ], 32], PlotLabel → s],
 {{w, Log[2]}, -15, 15}
]
```

```
SetDirectory[
  "C:\\drorbn\\AcademicPensieve\\Classes\\16-1750-ShamelessMathematica"];
Get["160328-DraftPermutationsPackage.m"]
```

```
? PP
```

PP[a,b,..] gives the product of the permutations a,b,...

```
? t
```

Information::notfound : Symbol t not found. ≫

```
n = 54;
γ1 = {18, 27, 36, 4, 5, 6, 7, 8, 9, 3, 11, 12, 13, 14, 15, 16, 17, 45, 2, 20, 21, 22, 23, 24, 25, 26, 44,
    1, 29, 30, 31, 32, 33, 34, 35, 43, 37, 38, 39, 40, 41, 42, 10, 19, 28, 52, 49, 46, 53, 50, 47, 54, 51, 48};
γ2 = {1, 2, 3, 4, 5, 6, 16, 25, 34, 10, 11, 9, 15, 24, 33, 39, 17, 18, 19, 20, 8, 14, 23, 32, 38, 26, 27, 28,
  29, 7, 13, 22, 31, 37, 35, 36, 12, 21, 30, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54};
γ3 = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 31,
  32, 33, 34, 35, 36, 48, 47, 46, 39, 42, 45, 38, 41, 44, 37, 40, 43, 30, 29, 28, 49, 50, 51, 52, 53, 54};
γ4 = {3, 6, 9, 2, 5, 8, 1, 4, 7, 54, 53, 52, 10, 11, 12, 13, 14, 15, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28,
  29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 18, 17, 16};
γ5 = {13, 2, 3, 22, 5, 6, 31, 8, 9, 12, 21, 30, 37, 14, 15, 16, 17, 18, 11, 20, 29, 40, 23, 24, 25, 26, 27,
  10, 19, 28, 43, 32, 33, 34, 35, 36, 46, 38, 39, 49, 41, 42, 52, 44, 45, 1, 47, 48, 4, 50, 51, 7, 53, 54};
γ6 = {1, 2, 48, 4, 5, 51, 7, 8, 54, 10, 11, 12, 13, 14, 3, 18, 27, 36, 19, 20, 21, 22, 23, 6, 17, 26, 35, 28,
  29, 30, 31, 32, 9, 16, 25, 34, 37, 38, 15, 40, 41, 24, 43, 44, 33, 46, 47, 39, 49, 50, 42, 52, 53, 45};
```

```
$RecursionLimit = ∞; σ_ ∘ τ_ := PP[τ, σ];
Feed[Range[n]] := Null;
Feed[τ_] := Module[{i, j, k, l},
    i = Min[PS[τ]]; j = τ[[i]];
    If[Head[σi,j] === List,
     Feed[IP[σi,j] ∘ τ],
     (*Else*) σi,j = τ;
     For[k = 1, k < n, ++k, For[l = k + 1, l ≤ n, ++l,
       If[Head[σk,l] === List, Feed[σi,j ∘ σk,l]; Feed[σk,l ∘ σi,j]]
      ]]
    ]];
```

```
Table[Feed[γα];
  ∏_{i=1}^{n} (1 + Count[Range[n], j_ /; Head[σi,j] == List]), {α, 6}] // Timing
```

```
{59.9219, {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}}
```