

Catalan Numbers Poster

Armanpreet Pannu

```

ts[n_Integer] := ts[Range[0, n + 1]];
ts[{}, {}] = {ds[]};
ts[vs_List] :=
Module[{l, r, k, t1, t2, tds}, Union@@Table[l = ts[Prepend[vs[[k ;;], vs[[1]]]];
r = ts[vs[[2 ;; k]]];
Flatten[Table[tds = Join[t1, t2];
If[k > 3, AppendTo[tds, d[vs[[2], vs[[k]]]]];
If[k < Length[vs], AppendTo[tds, d[vs[[1], vs[[k]]]]];
tds, {t1, l}, {t2, r}], {k, 3, Length[vs]}]]];

(*A function to create a picture of the triangulation*)
Draw[d_ds] := jksdfhsfgksdglksdfglkfsfk1

tspic[ls_] := Module[{l1, l2, n = Length[ls] + 1},
l1 = List@@Function[Line[{{#1, #2}}] @@@ ls /. j_Integer -> {Cos[2 π j / n + 2], Sin[2 π j / n + 2]}];
l2 = Line[Range[0, n + 2] /. j_Integer -> {Cos[2 π j / n + 2], Sin[2 π j / n + 2]}];
Graphics[Append[l1, l2]]
]

(*A function to create the charts from the triangulations. The output is a list of {0,1}
or {1,0} where {1,0} indicates one step right and {0,1} indicates one step up*)
chart[tri_] := Module[{tri1, a = {R}, i = 0, n = Length[tri] + 1},
tri1 = tri;
While[Length[tri1] ≠ 0 ,
a = a~Join~Table[R, Count[tri1, d[i, _]]];
(*a=Nest[Function[Append[#, {1,0}]],a,Count[tri1,d[i,_]]];*)
tri1 = DeleteCases[tri1, d[i, _]];
a = Append[a, U];
i++;
];
a = Nest[Function[Append[#, {0, 1}]], a, 2 * n - Length[a]];
a
];

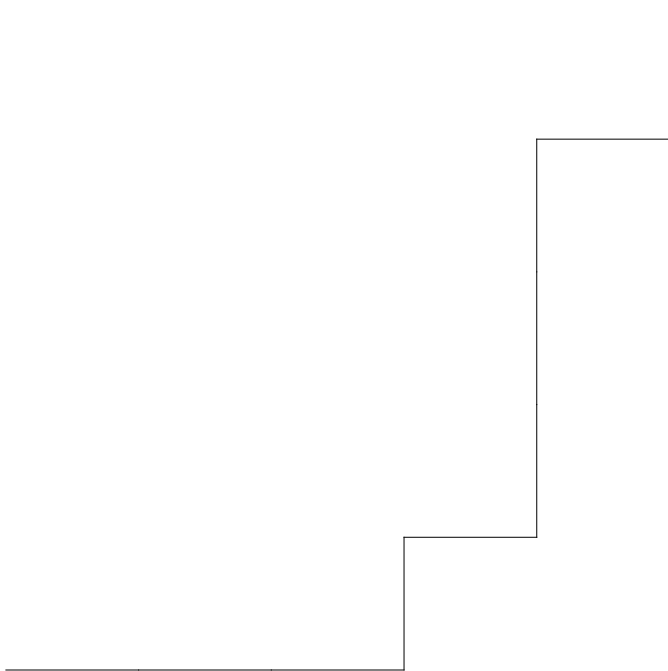
triang = RandomChoice[ts[5]]
ds[d[4, 6], d[0, 4], d[1, 3], d[0, 3]]

```

```
(*A function to create the graphics of the chart from the chart list*)
chpic[List_] := Module[{start = {0, 0}, i = 1, output = {}, n = Length[List]/2},
  While[i ≤ Length[List],
    output = Append[output, Line[{start, start + List[[i]]}]];
    start = Plus@@List[[1 ;; i]];
    i++;];
  Graphics[output, GridLines → {Range[0, n], Range[0, n]},
    GridLinesStyle → Directive[Gray, Dashed]]
]

Poster[n_Integer] := Grid[Table[{tspic[i], chpic[chart[i]]}, {i, ts[n]}], Frame → All]
```

```
Graphics[
  Line /@ Partition[FoldList[Plus, 0, chart[triang]], 2, 1] /.
  {U → {0, 1}, R → {1, 0}, 0 → {0, 0}}
]
```



Poster [5]

