GAP NOTES

KB, PM

1. Draft manual for GRaZ GAP package

Here an n-gon has its vertices labelled $1, 2, ..., n$. An angulation A is encoded as the subset of 'diagonal' vertex pairs $\{i, j\}$ that are edges of A (i.e. ignoring pairs $\{i, i+1\}$, which are always in, as edges of the n-gon itself).

1.1. Functions defined in GRaZ.

Baur(n,m) returns the list of angulations of the n-gon with m diagonals. Thus

```
gap> Baur(5,1);
[ [ [ 1, 3 ] ], [ [ 1, 4 ] ], [ [ 2, 4 ] ], [ [ 2, 5 ] ], [ [ 3, 5 ] ] ]
```

Baurtab(n,m) returns for each angulation A from Baur(n,m):
1. a sequence $tab = [r_1, r_2, ...]$ where r_1 is (the size of) an ear tile of A; r_2 is an ear tile of A/r_1 and so on. Thus tab gives the sizes of all the tiles of A (but in no particular order).
2. a list giving the multiplicities of the various tile sizes — the partition associated to A.
3. a running count of the number of times various specific partitions occur. (Ignore this! See below.)
4. a running total count of the angulations. Thus

```
gap> Baurtab(5,1);
[ 3, 4 ][ 0, 0, 1, 1, 0, 0, 0, 0, 0, 0 ][ 0, 0, 0 ]1
[ 4, 3 ][ 0, 0, 1, 1, 0, 0, 0, 0, 0, 0 ][ 0, 0, 0 ]2
[ 3, 4 ][ 0, 0, 1, 1, 0, 0, 0, 0, 0, 0 ][ 0, 0, 0 ]3
[ 4, 3 ][ 0, 0, 1, 1, 0, 0, 0, 0, 0, 0 ][ 0, 0, 0 ]4
[ 3, 4 ][ 0, 0, 1, 1, 0, 0, 0, 0, 0, 0 ][ 0, 0, 0 ]5
```

Baurtabb(n,m,reftab) is as above but in 3. counts occurences of the partition reftab, given in the 'exponent' format $[t_1, t_2, ..., t_{10}]$. (I.e. t_r is the number of r-gonal tiles. Thus this argument should always start $[0, 0, t_3, ...]$. Note that the array size 10 is coded in, but is arbitrary and needs to be fixed for larger n!)

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1.2. **Jobs.** Main: Write the code to compute the Scott permutation of each angulation.

References

[1] K. Baur, A. King, R.J. Marsh, *Dimer models and cluster categories for Grassmannians*, preprint, 1309.6524v1.pdf

[2] T.K. Petersen, P. Pylyavskyy, B. Rhoades, *Promotion and cyclic sieving via webs.* J. Algebraic Combin. 30 (2009), no. 1, 19–41

[3] J.H. Przytycki, A.S. Sikora, *Polygon dissections and Euler, Fuss, Kirkman and Cayley numbers*, preprint, arXiv:math/9811086v1