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```
"C:\\drorbn\\AcademicPensieve\\Projects\\Arrow_Diagrams_and_gl(N)\\Arrow_Diagrams_and_gl(N).m"
```

```
NoOfDiags = Length[AllDiags = Diagrams[4 ar]]
```

1680

```
DiagToIndex = Dispatch[Thread[AllDiags → Array[B, {NoOfDiags}]]]
```

A very large output was generated. Here is a sample of it:

```
Dispatch[{Diag[ar[1, 2], ar[3, 4], ar[5, 6], ar[7, 8]] → B[1],  
  Diag[ar[1, 2], ar[3, 4], ar[5, 6], ar[8, 7]] → B[2],  
  Diag[ar[1, 2], ar[3, 4], ar[6, 5], ar[7, 8]] → B[3],  
  Diag[ar[1, 2], ar[3, 4], ar[6, 5], ar[8, 7]] → B[4],  
  Diag[ar[1, 2], ar[3, 4], ar[5, 7], ar[6, 8]] → B[5], <<1671>>,  
  Diag[ar[3, 6], ar[4, 5], ar[7, 2], ar[8, 1]] → B[1677],  
  Diag[ar[3, 6], ar[5, 4], ar[7, 2], ar[8, 1]] → B[1678],  
  Diag[ar[4, 5], ar[6, 3], ar[7, 2], ar[8, 1]] → B[1679],  
  Diag[ar[5, 4], ar[6, 3], ar[7, 2], ar[8, 1]] → B[1680]}, -DispatchTables -]
```

Show Less

Show More

Show Full Output

Set Size Limit...

```
OurBasis = BasisAArrow[4] /. DiagToIndex
```

```
{B[960], B[1104], B[1128], B[1151], B[1152], B[1192], B[1195], B[1196], B[1199], B[1200],  
  B[1244], B[1265], B[1266], B[1268], B[1270], B[1272], B[1280], B[1288], B[1289], B[1290],  
  B[1291], B[1292], B[1293], B[1294], B[1295], B[1296], B[1304], B[1308], B[1314], B[1315],  
  B[1316], B[1320], B[1342], B[1344], B[1359], B[1360], B[1363], B[1364], B[1375], B[1376],  
  B[1381], B[1382], B[1383], B[1384], B[1385], B[1386], B[1387], B[1388], B[1389],  
  B[1390], B[1391], B[1392], B[1395], B[1396], B[1397], B[1398], B[1399], B[1400],  
  B[1402], B[1403], B[1404], B[1407], B[1408], B[1409], B[1410], B[1411], B[1412],  
  B[1413], B[1414], B[1415], B[1416], B[1422], B[1423], B[1424], B[1425], B[1426],  
  B[1427], B[1428], B[1434], B[1435], B[1436], B[1437], B[1438], B[1439], B[1440],  
  B[1512], B[1519], B[1520], B[1527], B[1528], B[1529], B[1530], B[1531], B[1532],  
  B[1533], B[1534], B[1535], B[1536], B[1542], B[1543], B[1544], B[1545], B[1546],  
  B[1547], B[1548], B[1554], B[1555], B[1556], B[1557], B[1558], B[1559], B[1560],  
  B[1632], B[1639], B[1640], B[1647], B[1648], B[1649], B[1650], B[1651], B[1652],  
  B[1653], B[1654], B[1655], B[1656], B[1662], B[1663], B[1664], B[1665], B[1666],  
  B[1667], B[1668], B[1674], B[1675], B[1676], B[1677], B[1678], B[1679], B[1680]}
```

```
NoOfRels = Length[Rels = R /@ Diagrams[R6T + 2 ar] /. DiagToIndex]
```

2520

```

v68 = {0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, -1, 1, 0, 0, -1,
  1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, -1, -1, -1, -1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
  -1, -1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, -1, -1, 0, 0, -1, 0, 0, 0, 1, 1, 1, 1, 1, 1, -1, 1, 0, 0, 0,
  0, 1, 1, 0, 1, 0, 1, 0, 0, -1, -1, 0, 0, 1, 0, 0, 0, -1, -1, -1, -1, 0, 0, 1, 0, 0, 0,
  0, 1, 1, 0, 1, 0, 1, 0, 0, -1, -1, 1, 1, 3, 0, -2, 2, -1, -1, -1, -1, -1, -1, 2, 1};
v = v68;
v = First[simplenull];
v = simplenull[[2]];
V = v.OurBasis

2 B[1151] + 2 B[1152] + B[1195] + B[1196] + B[1199] + B[1200] - B[1265] - 2 B[1268] + B[1270] +
  B[1272] + B[1288] + B[1290] - B[1291] + 3 B[1292] + B[1294] - B[1295] - B[1296] + B[1315] +
  2 B[1316] - B[1320] + B[1342] + B[1344] + 2 B[1359] + 2 B[1360] - 3 B[1363] - 3 B[1364] -
  2 B[1375] - 2 B[1376] - B[1381] - B[1382] - 3 B[1383] - 3 B[1384] - B[1385] - 2 B[1386] - B[1387] -
  5 B[1388] + B[1390] + B[1392] + B[1395] + B[1396] + B[1397] + 2 B[1399] + B[1400] - 2 B[1402] -
  B[1404] - B[1407] + 3 B[1409] + 3 B[1410] + 2 B[1411] + 5 B[1412] - B[1414] - 2 B[1415] -
  3 B[1416] + B[1422] + B[1423] + 2 B[1426] - 2 B[1427] + 2 B[1428] + B[1434] + 2 B[1438] -
  2 B[1439] + B[1440] + 2 B[1512] - B[1519] - 2 B[1527] - 6 B[1528] - B[1529] - 2 B[1530] -
  2 B[1531] - 4 B[1532] + B[1533] + 2 B[1535] + 5 B[1536] + 2 B[1543] - B[1544] - B[1546] +
  B[1547] - B[1548] + B[1554] + 2 B[1555] - B[1558] + 2 B[1559] + 2 B[1632] - B[1640] - 3 B[1647] -
  7 B[1648] - 2 B[1650] - 5 B[1652] - B[1653] + 5 B[1656] + 2 B[1664] - B[1665] - 2 B[1666] +
  3 B[1667] - 2 B[1668] + B[1674] + 2 B[1675] + 5 B[1676] - 2 B[1677] - B[1678] + 3 B[1679]

Norm2[expr_] := Length[expr];
Norm2[expr_] := expr /. c_.* B[_] &gt;> Abs[c];
Norm2[V]

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BestV = V;
Norm2BestV = Norm2[BestV];
Dynamic[{Norm2BestV, BestV}]

{Norm2BestV, BestV}

While[True,
  k = RandomInteger[{1, NoOfRels}];
  s = If[Random[] > 0.5, 1, -1];
  NewV = BestV + s * Rels[[k]];
  If[Norm2[NewV] < Norm2BestV,
    BestV = NewV;
    Norm2BestV = Norm2[BestV]
  ]
]

$Aborted

Tally[Length /@ Union[Rels]] // Sort

{{3, 120}, {4, 1200}, {5, 14}, {6, 1186}}

```

```

m = 4;
diags = Diagrams[m ar];
rels = R /@ Diagrams[R6T + (m - 2) ar];
mat = SparseArray[
  Join @@ Table[
    rel = rels[[i]];
    {i, Position[diags, #][[1, 1]]} → Coefficient[rel, #] & /@
      Cases[rel, diag_Diag, Infinity],
    {i, Length[rels]}
  ],
  {Length[rels], Length[diags]}
]
SparseArray[<12 346>, {2520, 1680}]


rmat = LatticeReduce[mat // Transpose];
DeleteCases[Flatten[rmat], 0] // Length

467

matrix = Normal[mat];
Print[{norms = (#.#) & /@ matrix; changes, Total[norms], Sort[Tally[norms]]}];
Dynamic[{norms = (#.#) & /@ matrix; changes, Total[norms], Sort[Tally[norms]]}]
{changes, 12748, {{4, 1200}, {6, 1306}, {8, 14}}}

{changes, Total[matrix], Tally[matrix]}

```



```

T = 0.05;
bestnorm = Min[(#.#) & /@ matrix];
While[True,
  i = RandomInteger[{1, Length[matrix]}];
  j = RandomInteger[{1, Length[matrix]}];
  While[i == j, j = RandomInteger[{1, Length[matrix]}]];
  s = If[Random[] > 0.5, 1, -1];
  new = matrix[[i]] + s * matrix[[j]];
  (* new /= GCD@@new; *)
  If[(norm = new.new) < matrix[[i]].matrix[[i]] || T > 0 && Random[] < E^(-1/T),
    matrix[[i]] = new;
    ++changes;
    If[norm < bestnorm, bestnorm = norm]
  ]
]

```

PreIncrement::rvalue: changes is not a variable with a value, so its value cannot be changed. >>

\$Aborted