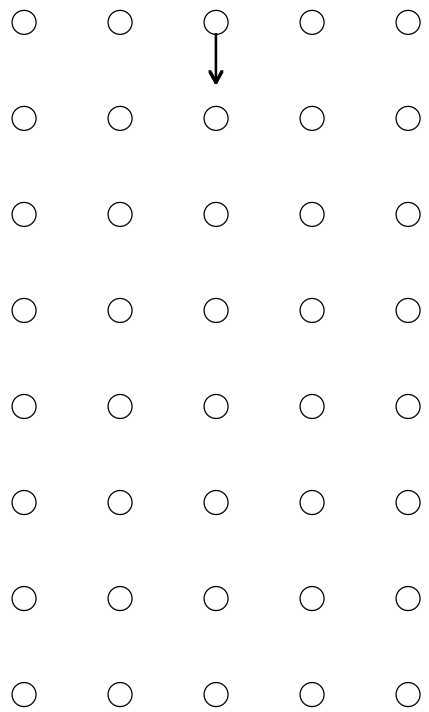
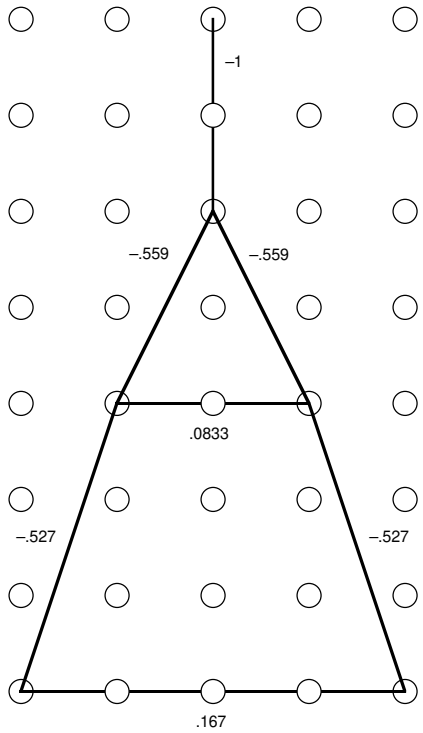
scsd1, scsd6, scsd8; truss: The test problems

The `scsd` problems originated in [1]. The structure for `scsd1` can be regarded as having 8 "levels" of five nodes each:



The admissible bars connect all pairs of nodes in three "stages" consisting of levels 1–3, 3–5, and 5–8. The bottom left node is fixed in both directions, and the bottom right node in the vertical direction only; the only external force is downward vertical on the middle node of the lowest level. An optimal solution looks like this:



Problems `scsd6` and `scsd8` are similar, except with 15 and 40 levels, respectively, and correspondingly more stages.

The `truss` problem is based on the same structural design model (as explained in file `truss.desc`) but has been generated by a Fortran program (`truss.f`) that reads three data files (`numfrnds.dat`, `nodepos.dat` and `loads.dat`). These four files are bundled into the Unix shell archive `truss.gen`, which can be retrieved from the web page.

References

[1] James K. Ho, "Optimal Design of Multi-Stage Structures: A Nested Decomposition Approach." *Computers and Structures* **5** (1975) 249–255.