Sorting Network — 6-Input Network
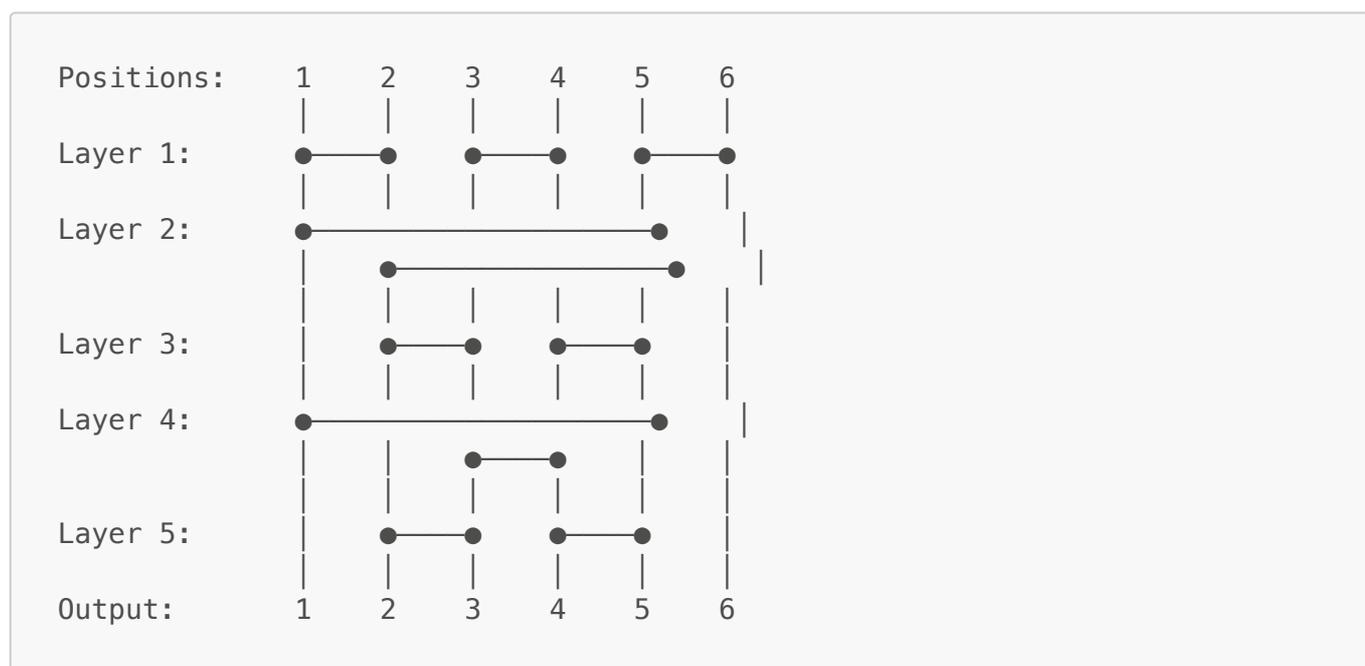
Floor Setup Instructions (Teacher)

Materials needed: Tape or chalk, 6 large number cards (1–6 shuffled), 6 volunteers.

Layout:

1. Mark 6 parallel lines (lanes) on the floor — about 1 metre apart, 8 metres long, running left to right.
2. Label the start of each lane: Position 1 (leftmost) through Position 6 (rightmost).
3. Mark 5 "layers" as vertical lines crossing all lanes.
4. At each layer, mark which positions are connected with a small circle or X.

The Network: Layer by Layer

This is a verified correct 6-input sorting network (12 comparators, 5 layers):

```
Positions:     1      2      3      4      5      6
               |      |      |      |      |      |
Layer 1:       ●——————●      ●——————●      ●——————●
               |      |      |      |      |      |
Layer 2:       ●——————————————————————————●      |
               |      ●——————————————————————————●      |
               |      |      |      |      |      |
Layer 3:       |      ●——————●      ●——————●      |
               |      |      |      |      |      |
Layer 4:       ●——————————————————————————●      |
               |      |      ●——————●      |      |
               |      |      |      |      |      |
Layer 5:       |      ●——————●      ●——————●      |
               |      |      |      |      |      |
Output:        1      2      3      4      5      6
```

Layer details (positions that compare-and-swap):

* **Layer 1:** (1,2), (3,4), (5,6) — 3 simultaneous comparisons
* **Layer 2:** (1,3), (2,6) — 2 simultaneous comparisons
* **Layer 3:** (2,3), (4,5) — 2 simultaneous comparisons
* **Layer 4:** (1,4), (3,6) — 2 simultaneous comparisons
* **Layer 5:** (2,4), (3,5) — 2 simultaneous comparisons (then final check: (2,3),(4,5) if needed)

Note: After these layers, verify with input [3,1,4,2,6,5] — the output should be [1,2,3,4,5,6].

Rule at Each Comparator

When two people meet at a comparator:

- **Lower number → stays in the lower-numbered lane** (or moves left)
- **Higher number → moves to the higher-numbered lane** (or moves right)

Worked Example

Input: [3, 1, 4, 2, 6, 5] — volunteers hold these numbers at positions 1–6.

After Layer 1 (compare 1↔2, 3↔4, 5↔6):

- Pos 1↔2: 3 vs 1 → swap → 1 and 3
- Pos 3↔4: 4 vs 2 → swap → 2 and 4
- Pos 5↔6: 6 vs 5 → swap → 5 and 6
- Result: [1, 3, 2, 4, 5, 6]

After each subsequent layer, the values move toward sorted order. After all 5 layers, output should be [1, 2, 3, 4, 5, 6].

Desk Version

If floor space isn't available: draw 6 columns on paper. Write starting numbers at top. Draw horizontal bridges between columns at each layer. Trace values down, swapping at bridges as needed.