

--- Day 22: Reactor Reboot ---

Operating at these extreme ocean depths has overloaded the submarine's reactor; it needs to be rebooted.

The reactor core is made up of a large 3-dimensional grid made up entirely of cubes, one cube per integer 3-dimensional coordinate (x,y,z). Each cube can be either **on** or **off**; at the start of the reboot process, they are all **off**. (Could it be an old model of a reactor you've seen **before?**)

To reboot the reactor, you just need to set all of the cubes to either **on** or **off** by following a list of **reboot steps** (your puzzle input). Each step specifies a **cuboid** (the set of all cubes that have coordinates which fall within ranges for  $\overline{x}$ ,  $\overline{y}$ , and  $\overline{z}$ ) and whether to turn all of the cubes in that cuboid **on** or **off**.

For example, given these reboot steps:

```
on x=10..12,y=10..12,z=10..12
on x=11..13,y=11..13,z=11..13
off x=9..11,y=9..11,z=9..11
on x=10..10,y=10..10,z=10..10
```

The first step (on x=10..12,y=10..12,z=10..12) turns **on** a 3x3x3 cuboid consisting of 27 cubes:

- 10,10,10
- 10,10,11
- 10,10,12
- 10,11,10
- 10,11,11
- 10,11,12
- 10,12,10
- 10,12,11
- 10,12,12
- 11,10,10
- 11,10,11
- 11,10,12
- 11,11,10
- 11,11,11
- 11,11,12
- 11,12,10
- 11,12,11
- 11,12,12
- 12,10,10
- 12,10,11
- 12,10,12
- 12,11,10
- 12,11,11
- 12,11,12
- 12,12,10
- 12,12,11
- 12,12,12

The second step (on x=11..13,y=11..13,z=11..13) turns **on** a 3x3x3 cuboid that overlaps with the first. As a result, only 19 additional cubes turn on; the rest are already on from the previous step:

- 11,11,13
- 11,12,13
- 11,13,11
- 11,13,12
- 11,13,13
- 12,11,13
- 12,12,13
- 12,13,11
- 12,13,12
- 12,13,13
- 13,11,11
- 13,11,12
- 13,11,13
- 13,12,11
- 13,12,12
- 13,12,13
- 13,13,11
- 13,13,12
- 13,13,13

The third step (off x=9..11,y=9..11,z=9..11) turns **off** a 3x3x3 cuboid that overlaps partially with some cubes that are on, ultimately turning off 8 cubes:

- 10,10,10
- 10,10,11
- 10,11,10
- 10,11,11
- 11,10,10
- 11,10,11
- 11,11,10
- 11,11,11

The final step (on x=10..10,y=10..10,z=10..10) turns **on** a single cube, 10,10,10. After this last step, 39 cubes are **on**.

The initialization procedure only uses cubes that have  $\overline{x}$ ,  $\overline{y}$ , and  $\overline{z}$  positions of at least -50 and at most 50. For now, ignore cubes outside this region.

Here is a larger example:

```
on x=-20..26,y=-36..17,z=-47..7
on x=-20..33,y=-21..23,z=-26..28
on x=-22..28,y=-29..23,z=-38..16
on x=-46..7,y=-6..46,z=-50..-1
on x=-49..1,y=-3..46,z=-24..28
on x=2..47,y=-22..22,z=-23..27
on x=-27..23,y=-28..26,z=-21..29
on x=-39..5,y=-6..47,z=-3..44
on x=-30..21,y=-8..43,z=-13..34
on x=-22..26,y=-27..20,z=-29..19
off x=-48..-32,y=26..41,z=-47..-37
on x=-12..35,y=6..50,z=-50..-2
off x=-48..-32,y=-32..-16,z=-15..-5
on x=-18..26,y=-33..15,z=-7..46
off x=-40..-22,y=-38..-28,z=23..41
on x=-16..35,y=-41..10,z=-47..6
off x=-32..-23,y=11..30,z=-14..3
on x=-49..-5,y=-3..45,z=-29..18
off x=18..30,y=-20..-8,z=-3..13
on x=-41..9,y=-7..43,z=-33..15
on x=-54112..-39298,y=-85059..-49293,z=-27449..7877
on x=967..23432,y=45373..81175,z=27513..53682
```

The last two steps are fully outside the initialization procedure area; all other steps are fully within it. After executing these steps in the initialization procedure region, 590784 cubes are **on**.

Execute the reboot steps. Afterward, considering only cubes in the region  $\overline{x}=-50..50,\overline{y}=-50..50,\overline{z}=-50..50$ , how many cubes are on?

To begin, get your puzzle input.

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