--- Day 10: Monitoring Station ---

You fly into the asteroid belt and reach the Ceres monitoring station. The
Elves here have an emergency: they're having trouble tracking all of the
asteroids and can't be sure they're safe.

The Elves would like to build a new monitoring station in a nearby area of
space; they hand you a map of all of the asteroids in that region (your
puzzle input).

The map indicates whether each position is empty (.) or contains an
asteroid (#). The asteroids are much smaller than they appear on the map,
and every asteroid is exactly in the center of its marked position. The
asteroids can be described with X,Y coordinates where X is the distance
from the left edge and Y is the distance from the top edge (so the top-left
corner is 0,0 and the position immediately to its right is 1,0).

Your job is to figure out which asteroid would be the best place to build a
new monitoring station. A monitoring station can detect any asteroid to
which it has direct line of sight - that is, there cannot be another
asteroid exactly between them. This line of sight can be at any angle, not
just lines aligned to the grid or diagonally. The best location is the
asteroid that can detect the largest number of other asteroids.

For example, consider the following map:

```
.#..#
.....
#####
....#
...##
```

The best location for a new monitoring station on this map is the
highlighted asteroid at 3,4 because it can detect 8 asteroids, more than
any other location. (The only asteroid it cannot detect is the one at 1,0;
its view of this asteroid is blocked by the asteroid at 2,2.) All other
asteroids are worse locations; they can detect 7 or fewer other asteroids.
Here is the number of other asteroids a monitoring station on each asteroid
could detect:

```
.7..7
.....
67775
....7
...87
```

Here is an asteroid (#) and some examples of the ways its line of sight
might be blocked. If there were another asteroid at the location of a
capital letter, the locations marked with the corresponding lowercase
letter would be blocked and could not be detected:

```
#.........
...A......
...B..a...
.EDCG....a
..F.c.b...
.....c....
..efd.c.gb
.......c..
....f...c.
...e..d..c
```

Here are some larger examples:

- Best is 5,8 with 33 other asteroids detected:

```
......#.#.
#..#.#....
..#######.
.#.#.###..
.#..#.....
..#....#.#
#..#....#.
.##.#..###
##...#..#.
.#....####
```

- Best is 1,2 with 35 other asteroids detected:

```
#.#...#.#.
.###....#.
.#....#...
##.#.#.#.#
....#.#.#.
.##..###.#
..#...##..
..##....##
......#...
.####.###.
```

- Best is 6,3 with 41 other asteroids detected:

```
.#..#..###
####.###.#
....###.#.
..###.##.#
##.##.#.#.
....###..#
..#.#..#.#
#..#.#.###
.##...##.#
.....#.#..
```

- Best is 11,13 with 210 other asteroids detected:

```
.#..##.###...#######
##.############..##.
.#.######.########.#
.###.#######.####.#.
#####.##.#.##.###.##
..#####..#.#########
#####################
#.####....###.#.#.##
##.#################
#####.##.###..####..
..######..##.#######
####.##.####...##..#
.#####..#.######.###
##...#.##########...
#.##########.#######
.####.#.###.###.#.##
....##.##.###..#####
.#.#.###########.###
#.#.#.#####.####.###
###.##.####.##.#..##
```

Find the best location for a new monitoring station. How many other
asteroids can be detected from that location?

Your puzzle answer was 260.

--- Part Two ---

Once you give them the coordinates, the Elves quickly deploy an Instant
Monitoring Station to the location and discover the worst: there are simply
too many asteroids.

The only solution is complete vaporization by giant laser.

Fortunately, in addition to an asteroid scanner, the new monitoring station
also comes equipped with a giant rotating laser perfect for vaporizing
asteroids. The laser starts by pointing up and always rotates clockwise,
vaporizing any asteroid it hits.

If multiple asteroids are exactly in line with the station, the laser only
has enough power to vaporize one of them before continuing its rotation. In
other words, the same asteroids that can be detected can be vaporized, but
if vaporizing one asteroid makes another one detectable, the newly-detected
asteroid won't be vaporized until the laser has returned to the same
position by rotating a full 360 degrees.

For example, consider the following map, where the asteroid with the new
monitoring station (and laser) is marked X:

```
.#....#####...#..
##...##.#####..##
##...#...#.#####.
..#.....X...###..
..#.#.....#....##
```

The first nine asteroids to get vaporized, in order, would be:

```
.#....###24...#..
##...##.13#67..9#
##...#...5.8####.
..#.....X...###..
..#.#.....#....##
```
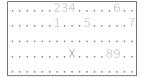
Note that some asteroids (the ones behind the asteroids marked 1, 5, and 7)
won't have a chance to be vaporized until the next full rotation. The laser
continues rotating; the next nine to be vaporized are:

```
.#....###.....#..
##...##...#.....#
##...#......1234.
..#.....X...5##..
..#.9.....8....76
```

The next nine to be vaporized are then:

```
.8....###.....#..
56...9#...#.....#
34...7..........
..2.....X....##..
..1.............
```

Finally, the laser completes its first full rotation (1 through 3), a
second rotation (4 through 8), and vaporizes the last asteroid (9) partway
through its third rotation:

```
......234.....6..
......1...5.....7
.................
........X....89..
.................
```

In the large example above (the one with the best monitoring station location at 11,13):

- The 1st asteroid to be vaporized is at 11,12.
- The 2nd asteroid to be vaporized is at 12,1.
- The 3rd asteroid to be vaporized is at 12,2.
- The 10th asteroid to be vaporized is at 12,8.
- The 20th asteroid to be vaporized is at 16,0.
- The 50th asteroid to be vaporized is at 16,9.
- The 100th asteroid to be vaporized is at 10,16.
- The 199th asteroid to be vaporized is at 9,6.
- The 200th asteroid to be vaporized is at 8,2.
- The 201st asteroid to be vaporized is at 10,9.
- The 299th and final asteroid to be vaporized is at 11,1.

The Elves are placing bets on which will be the 200th asteroid to be vaporized. Win the bet by determining which asteroid that will be; what do you get if you multiply its X coordinate by 100 and then add its Y coordinate? (For example, 8,2 becomes 802.)

Your puzzle answer was 608.

Both parts of this puzzle are complete! They provide two gold stars: **

At this point, you should return to your Advent calendar and try another puzzle.

If you still want to see it, you can get your puzzle input.

You can also [Share] this puzzle.