

## --- Day 7: Handy Haversacks ---

You land at the regional airport in time for your next flight. In fact, it looks like you'll even have time to grab some food: all flights are currently delayed due to issues in luggage processing.

Due to recent aviation regulations, many rules (your puzzle input) are being enforced about bags and their contents; bags must be color-coded and must contain specific quantities of other color-coded bags. Apparently, nobody responsible for these regulations considered how long they would take to enforce!

For example, consider the following rules:

```
light red bags contain 1 bright white bag, 2 muted yellow bags.  
dark orange bags contain 3 bright white bags, 4 muted yellow bags.  
bright white bags contain 1 shiny gold bag.  
muted yellow bags contain 2 shiny gold bags, 9 faded blue bags.  
shiny gold bags contain 1 dark olive bag, 2 vibrant plum bags.  
dark olive bags contain 3 faded blue bags, 4 dotted black bags.  
vibrant plum bags contain 5 faded blue bags, 6 dotted black bags.  
faded blue bags contain no other bags.  
dotted black bags contain no other bags.
```

These rules specify the required contents for 9 bag types. In this example, every `faded blue` bag is empty, every `vibrant plum` bag contains 11 bags (5 `faded blue` and 6 `dotted black`), and so on.

You have a `shiny gold` bag. If you wanted to carry it in at least one other bag, how many different bag colors would be valid for the outermost bag? (In other words: how many colors can, eventually, contain at least one `shiny gold` bag?)

In the above rules, the following options would be available to you:

- A `bright white` bag, which can hold your `shiny gold` bag directly.
- A `muted yellow` bag, which can hold your `shiny gold` bag directly, plus some other bags.
- A `dark orange` bag, which can hold `bright white` and `muted yellow` bags, either of which could then hold your `shiny gold` bag.
- A `light red` bag, which can hold `bright white` and `muted yellow` bags, either of which could then hold your `shiny gold` bag.

So, in this example, the number of bag colors that can eventually contain at least one `shiny gold` bag is 4.

How many bag colors can eventually contain at least one `shiny gold` bag? (The list of rules is quite long; make sure you get all of it.)

Your puzzle answer was 316.

## --- Part Two ---

It's getting pretty expensive to fly these days – not because of ticket prices, but because of the ridiculous number of bags you need to buy!

Consider again your `shiny gold` bag and the rules from the above example:

- `faded blue` bags contain 0 other bags.
- `dotted black` bags contain 0 other bags.
- `vibrant plum` bags contain 11 other bags: 5 `faded blue` bags and 6 `dotted black` bags.
- `dark olive` bags contain 7 other bags: 3 `faded blue` bags and 4 `dotted black` bags.

So, a single `shiny gold` bag must contain 1 `dark olive` bag (and the 7 bags within it) plus 2 `vibrant plum` bags (and the 11 bags within each of those):  $1 + 1 \times 7 + 2 + 2 \times 11 = 32$  bags!

Of course, the actual rules have a small chance of going several levels deeper than this example; be sure to count all of the bags, even if the nesting becomes topologically impractical!

Here's another example:

```
shiny gold bags contain 2 dark red bags.  
dark red bags contain 2 dark orange bags.  
dark orange bags contain 2 dark yellow bags.  
dark yellow bags contain 2 dark green bags.  
dark green bags contain 2 dark blue bags.  
dark blue bags contain 2 dark violet bags.  
dark violet bags contain no other bags.
```

In this example, a single `shiny gold` bag must contain 126 other bags.

How many individual bags are required inside your single `shiny gold` bag?

Your puzzle answer was 11310.

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](#).

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