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--- Day 9: Mirage Maintenance ---

You ride the camel through the sandstorm and stop where the ghost's maps
told you to stop. The sandstorm subsequently subsides, somehow seeing you
standing at an oasis!

The camel goes to get some water and you stretch your neck. As you look up,
you discover what must be yet another giant floating island, this one made
of metal! That must be where the parts to fix the sand machines come from.

There's even a hang glider partially buried in the sand here; once the sun
rises and heats up the sand, you might be able to use the glider and the
hot air to get all the way up to the metal island!

While you wait for the sun to rise, you admire the oasis hidden here in the
middle of Desert Island. It must have a delicate ecosystem; you might as
well take some ecological readings while you wait. Maybe you can report any
environmental instabilities you find to someone so the oasis can be around
for the next sandstorm-worn traveler.

You pull out your handy Oasis And Sand Instability Sensor and analyze your
surroundings. The OASIS produces a report of many values and how they are
changing over time (your puzzle input). Each line in the report contains
the history of a single value. For example:

```
0 3 6 9 12 15
1 3 6 10 15 21
10 13 16 21 30 45
```

To best protect the oasis, your environmental report should include a
prediction of the next value in each history. To do this, start by making a
new sequence from the difference at each step of your history. If that
sequence is not all zeroes, repeat this process, using the sequence you
just generated as the input sequence. Once all of the values in your latest
sequence are zeroes, you can extrapolate what the next value of the
original history should be.

In the above dataset, the first history is 0 3 6 9 12 15. Because the
values increase by 3 each step, the first sequence of differences that you
generate will be 3 3 3 3 3. Note that this sequence has one fewer value
than the input sequence because at each step it considers two numbers from
the input. Since these values aren't all zero, repeat the process: the
values differ by 0 at each step, so the next sequence is 0 0 0 0. This
means you have enough information to extrapolate the history! Visually,
these sequences can be arranged like this:

```
0   3   6   9   12   15
  3   3   3   3   3
    0   0   0   0
```

To extrapolate, start by adding a new zero to the end of your list of
zeroes; because the zeroes represent differences between the two values
above them, this also means there is now a placeholder in every sequence
above it:

```
0   3   6   9   12   15   B
  3   3   3   3   3   A
    0   0   0   0   0
```

You can then start filling in placeholders from the bottom up. A needs to
be the result of increasing 3 (the value to its left) by 0 (the value below
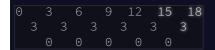it); this means A must be 3:

```
0   3   6   9   12   15   B
  3   3   3   3   3   3
    0   0   0   0   0
```
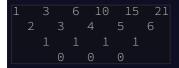
Finally, you can fill in `B`, which needs to be the result of increasing `15`
(the value to its left) by `3` (the value below it), or `18`:

```
0   3   6   9  12  15  18
  3   3   3   3   3   3
    0   0   0   0   0
```

So, the next value of the first history is `18`.

Finding all-zero differences for the second history requires an additional
sequence:

```
1   3   6  10  15  21
  2   3   4   5   6
    1   1   1   1
      0   0   0
```
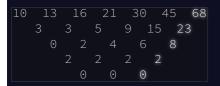
Then, following the same process as before, work out the next value in each
sequence from the bottom up:

```
1   3   6  10  15  21  28
  2   3   4   5   6   7
    1   1   1   1   1
      0   0   0   0
```

So, the next value of the second history is `28`.

The third history requires even more sequences, but its next value can be
found the same way:

```
10  13  16  21  30  45  68
   3   3   5   9  15  23
     0   2   4   6   8
       2   2   2   2
         0   0   0
```

So, the next value of the third history is `68`.

If you find the next value for each history in this example and add them
together, you get `114`.

Analyze your OASIS report and extrapolate the next value for each history.
What is the sum of these extrapolated values?

To begin, get your puzzle input.

Answer: [_____] [Submit]

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