

[Advent of Code 2019](#)
[\[About\]](#)
[\[Events\]](#)
[\[Shop\]](#)
[\[Settings\]](#)
[\[Log Out\]](#)
[craigontour 18*](#)
[\[Calendar\]](#)
[\[AoC++\]](#)
[\[Sponsors\]](#)
[\[Leaderboard\]](#)
[\[Stats\]](#)

--- Day 18: Many-Worlds Interpretation ---

As you approach Neptune, a planetary security system detects you and activates a giant tractor beam on Triton! You have no choice but to land.

A scan of the local area reveals only one interesting feature: a massive underground vault. You generate a map of the tunnels (your puzzle input). The tunnels are too narrow to move diagonally.

Only one entrance (marked @) is present among the open passages (marked .) and stone walls (#), but you also detect an assortment of keys (shown as lowercase letters) and doors (shown as uppercase letters). Keys of a given letter open the door of the same letter: a opens A, b opens B, and so on. You aren't sure which key you need to disable the tractor beam, so you'll need to collect all of them.

For example, suppose you have the following map:

```
#####
#b.A.@.a#
#####
```

Starting from the entrance (@), you can only access a large door (A) and a key (a). Moving toward the door doesn't help you, but you can move 2 steps to collect the key, unlocking A in the process:

```
#####
#b....@#
#####
```

Then, you can move 6 steps to collect the only other key, b:

```
#####
#@.....#
#####
```

So, collecting every key took a total of 8 steps.

Here is a larger example:

```
#####
#f.D.E.e.C.b.A.@.a.B.c.#
#####
#d.....#
#####
```

The only reasonable move is to take key a and unlock door A:

```
#####
#f.D.E.e.C.b....@.B.c.#
#####
#d.....#
#####
```

Then, do the same with key b:

Our sponsors help make Advent of Code possible:

Codethink Ltd. - Codethink is a software services company, expert in the use of Open Source technologies for systems software engineering.

```
#####
#f.D.E.e.C.@.....c.#
#####.#
#d.....#
#####
```

...and the same with key **C**:

```
#####
#f.D.E.e.....@.#
#####.#
#d.....#
#####
```

Now, you have a choice between keys **d** and **e**. While key **e** is closer, collecting it now would be slower in the long run than collecting key **d** first, so that's the best choice:

```
#####
#f...E.e.....#
#####.#
#@.....#
#####
```

Finally, collect key **e** to unlock door **E**, then collect key **f**, taking a grand total of **86** steps.

Here are a few more examples:

```
- #####
#.....b.C.D.f#
#.....#
#....@.a.B.c.d.A.e.F.g#
#####
```

Shortest path is **132** steps: **b**, **a**, **C**, **d**, **f**, **e**, **g**

```
- #####
#i.G..c...e..H.p#
#####.#####
#j.A..b...f..D.o#
#####@#####
#k.E..a...g..B.n#
#####.#####
#l.F..d...h..C.m#
#####
```

Shortest paths are **136** steps;
one is: **a**, **f**, **b**, **j**, **g**, **n**, **h**, **d**, **l**, **o**, **e**, **p**, **c**, **i**, **k**, **m**

```
- #####
#@.....ac.GI.b#
###d#e#f#####
###A#B#C#####
###g#h#i#####
#####
```

Shortest paths are **81** steps; one is: **a**, **C**, **f**, **i**, **d**, **g**, **b**, **e**, **h**

How many steps is the shortest path that collects all of the keys?

To begin, **get your puzzle input**.

Answer: [\[Submit\]](#)

You can also [\[Share\]](#) this puzzle.