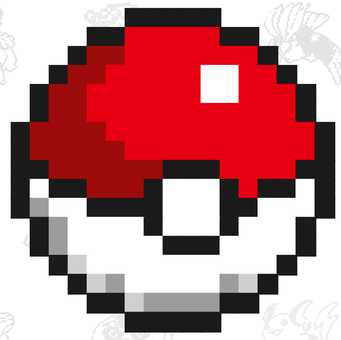


Locked Out

Pokemon

Professor Oak is researching a new legendary Pokémon, the μ_{67}, that resides in a mapped square region of Pokémon Island (shown below). He is sending you into the field to pinpoint the rare Pokémon location — and catch it.

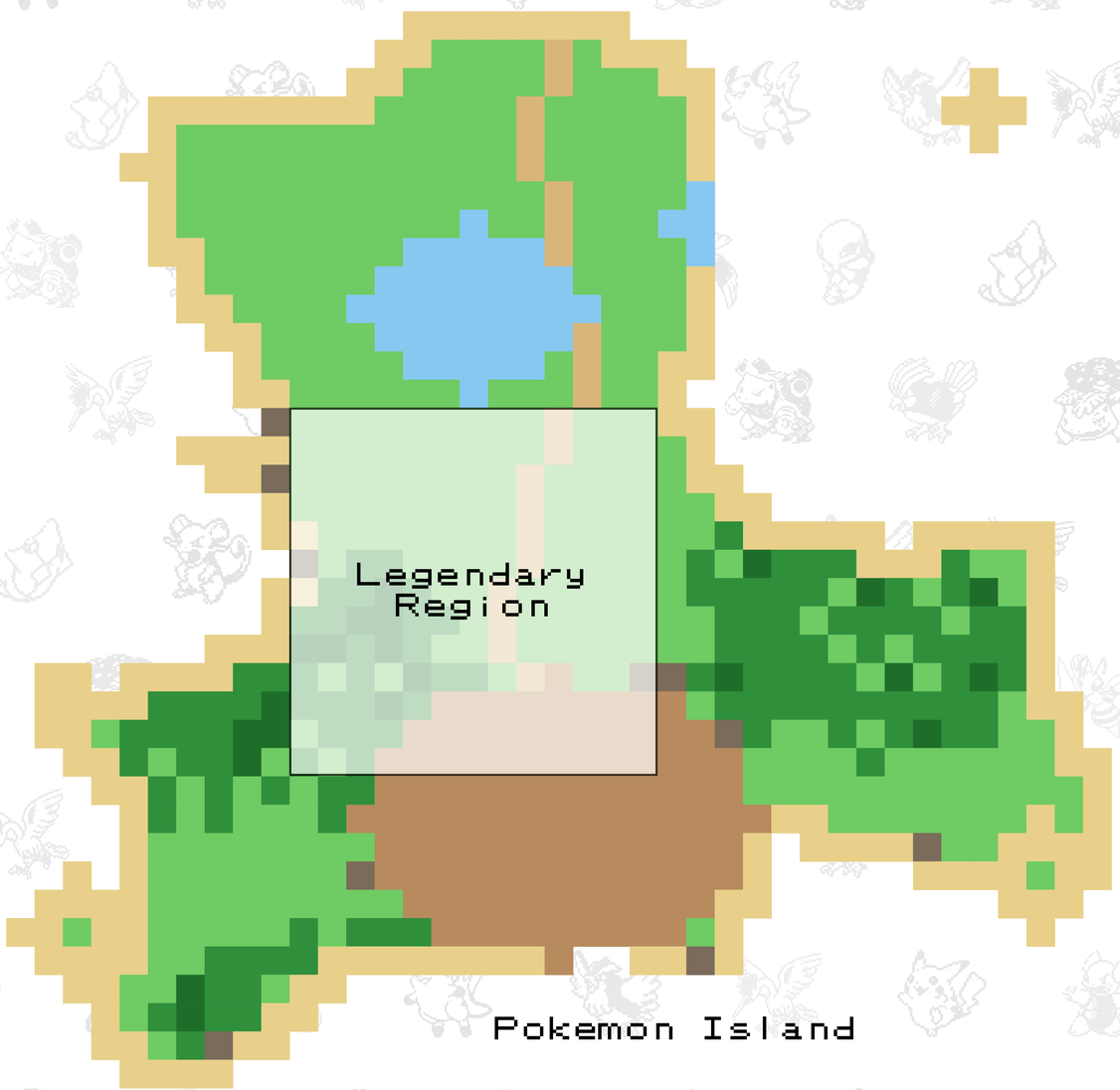
Complete each of the following tasks to catch the μ_{67}. It is suggested to achieve these tasks *in order*, but feel free to split up responsibilities.

1. **Unlock the Poké Ball Vault:** Access Professor Oak's Pokéball Vault.
2. **Possible Locations:** Find regions where the μ_{67} was last spotted.
3. **Decode Dr. Oak's Message:** Decipher the code that was left for you.
4. **Choose the Best Poké Ball:** Determine the best ball for the job.

You will need to use the data that Professor Oak provided for you:

- `Pokemon.csv`: Information on various types of Pokemon.
- `PokeBall.csv`: Information from trainers on recent Pokémon captures.

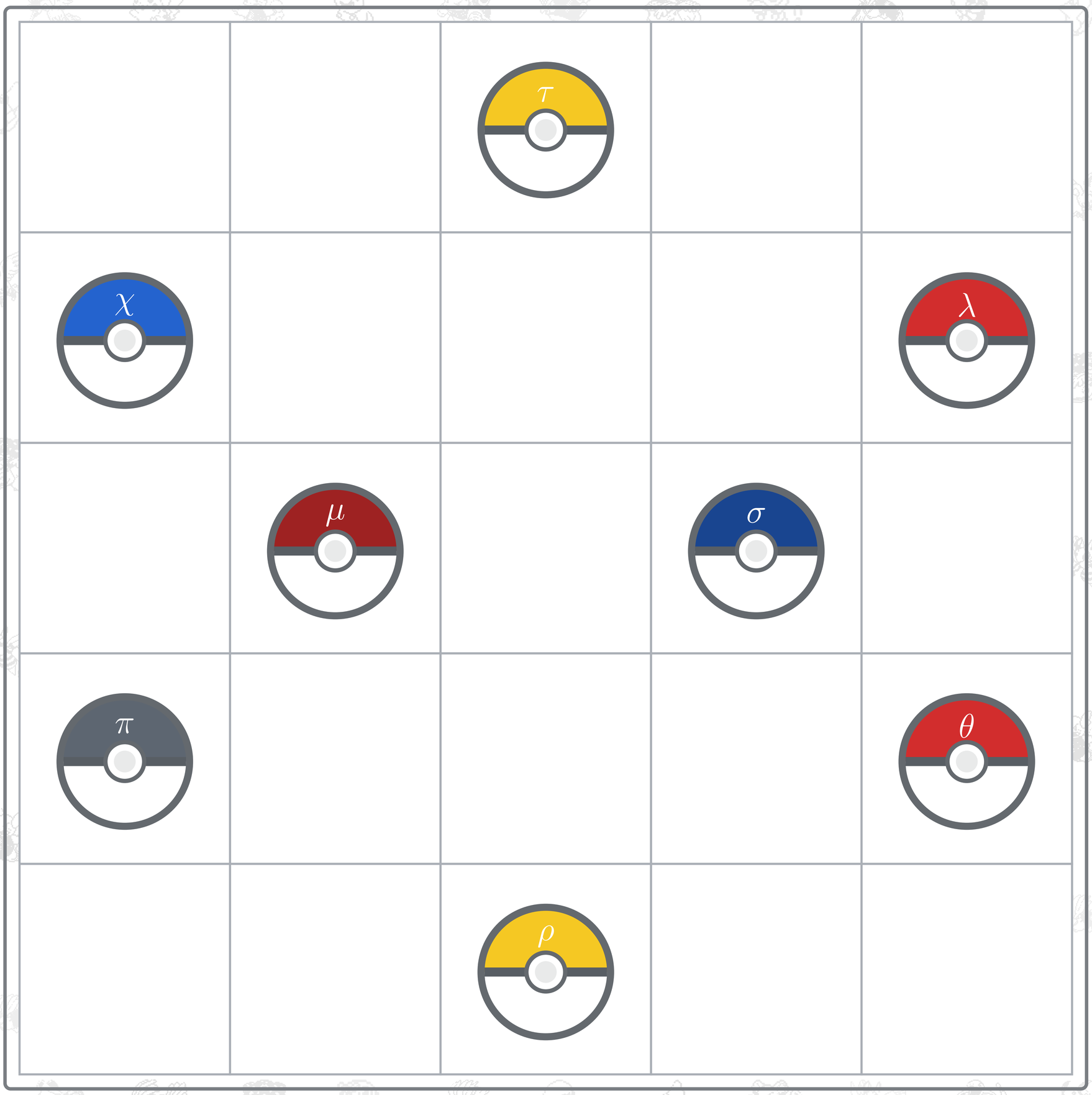
$$\sum[\text{Vault Code}] + \sum[\text{Possible Locations}] + n_{\text{ball}} \;=\; \boxed{\text{FINAL CODE}}$$



Unlock the Vault

Professor Oak left the Poké-ball vault locked. You will require some powerful poké-ball to catch the legendary pokémon. Can you decipher the password to the vault?

Only use the numbers 1,2,3,4, and 5. Don't repeat values in rows/columns. Values that are vertically and horizontally adjacent to poké-balls should multiply to their *values*.

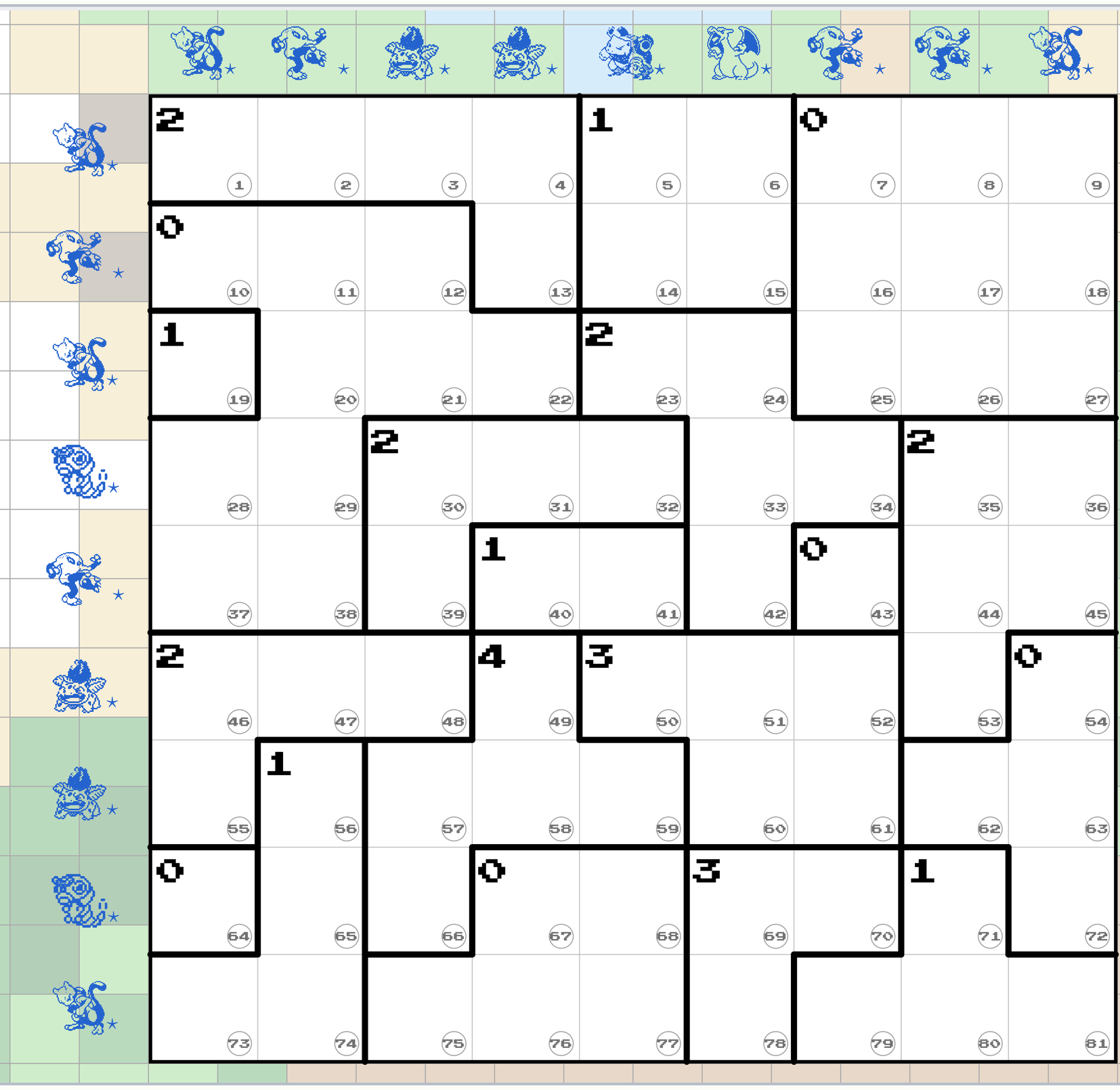


$$\sum[\text{Vault Code}] = \sum[\text{Digits that you place into the cells (not including poké-balls)}]$$

Last Spotted Locations

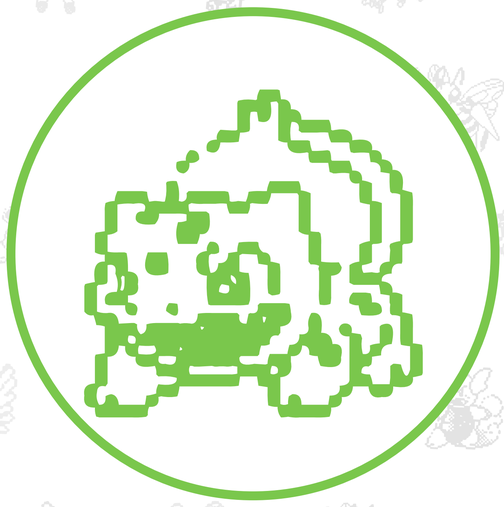
After interviewing trainers and reviewing field reports, Professor Oak has narrowed its trail to the *legendary region* of Pokémon Island (shown below). You'll want to know where to look!

Shade in *potential locations* for μ_{67} so that every row, column, and outlined region matches its required total. The row/column requirements are encoded by the Pokémon on the outside. Each outlined region's total is shown inside the grid in the top left hand corner.



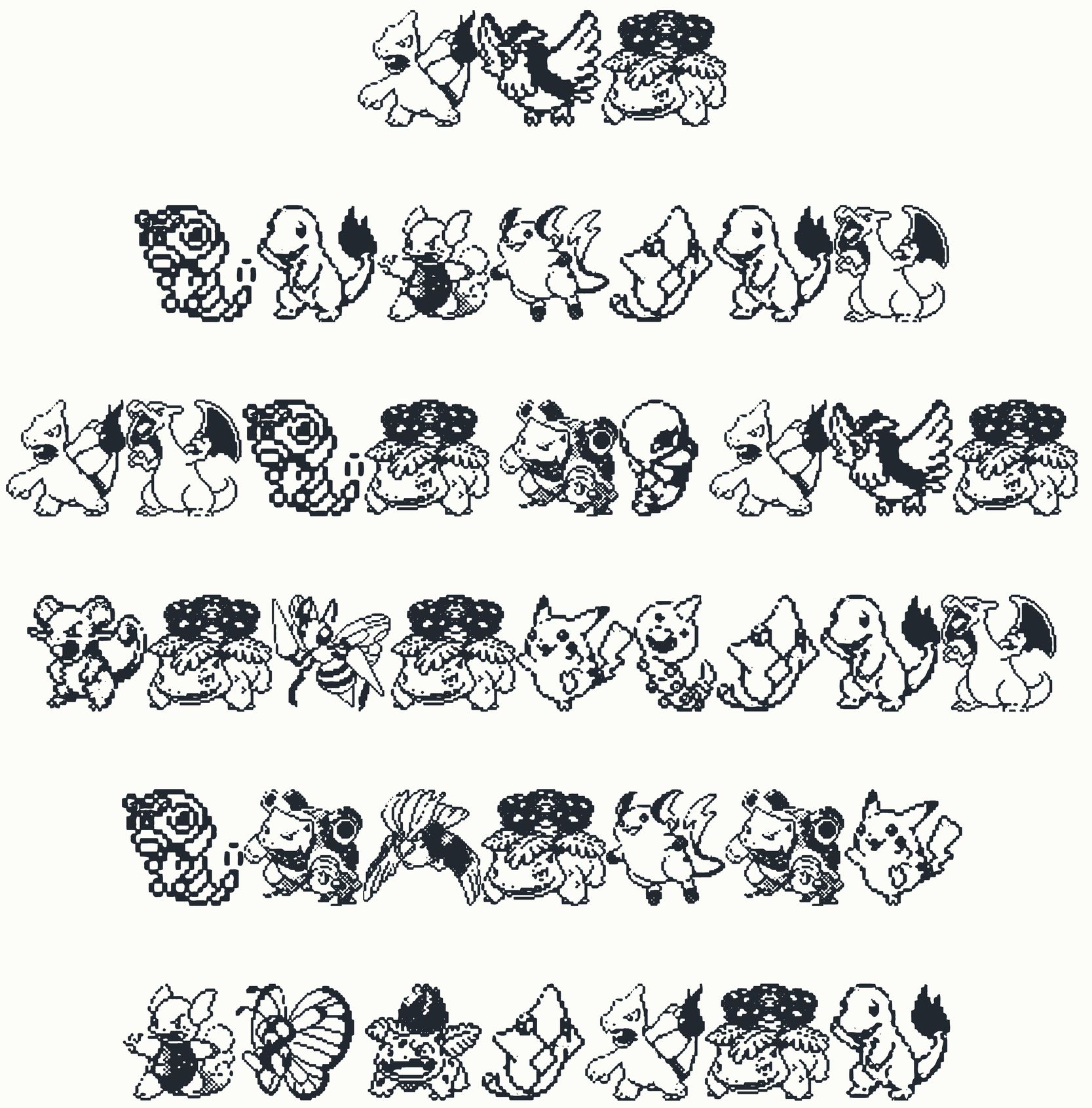
Sum the circled numbers in the bottom right of the *potential locations*.

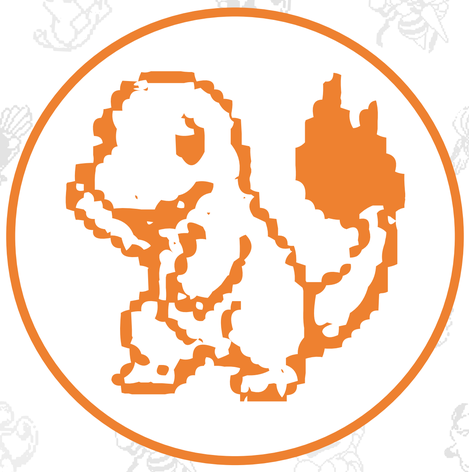
$$\sum[\text{Possible Locations}] = \sum[\text{numbers in last spotted regions.}]$$



Decode Message

Professor Oak delivered an encrypted field note about μ_{67}. Can you Decode it?





Choose Poke-Ball

You *know* the primary type of μ_{67}. Now choose the Poké Ball that works *best*!

Professor Oak has provided you with a dataset of capture attempts collected from trainers (`Pokeball.csv`). Each row is one capture attempt. The variables are:

- **PokeBall:** which ball was used in the capture attempt.
- **Type:** the target Pokémon's primary type.
- **Successful:** YES if the capture succeeded, otherwise NO.

The *optimal* ball is the one that maximizes:

$$P(\text{Successful} \mid \text{Type of } \mu_{67},\ \text{Ball})$$

Poké Ball Legend (icons used in the dataset):

1. Poke Ball: Standard issue.

2. Great Ball: Improved grip and seal.

3. Ultra Ball: High-performance casing.

4. Master Ball: Prototype model.

5. Safari Ball: Designed for wild zones.

6. Level Ball: Trainer mastery boost.

7. Lure Ball: Best for aquatic targets.

8. Moon Ball: Optimized for night activity.

9. Friend Ball: Calming field effect.

10. Love Ball: Affinity-based lock.

11. Heavy Ball: Stabilizes dense targets.

12. Fast Ball: Quick-snap mechanism.

13. Sport Ball: Competition-grade.

14. Premier Ball: Limited edition casing.

15. Repeat Ball: Improves with repeat encounters.

$n_{\text{ball}} =$ (the optimal poké ball's number).