Collections, Part One

Announcements

- Assignment 1 (Welcome to C++!) due Friday, April 13 at 10:00AM.
  - Warm up with C++!
  - Play around with strings and recursion!
- Xcode users: If you are getting weird errors about “iostream not found,” please go to the course website for instructions.

YEAH Hours

- **Y**our **E**arly **A**ssignment **H**elp hours.
- Tomorrow, 7-8PM, location TBA.
- Review problems similar to those on the assignment, go over assignment questions, etc.

Palindromes Revisited

Collections

Organizing Data

- In order to model and solve problems, we have to have a way of representing structured data.
- We need ways of representing concepts like
  - sequences
  - sets
  - associations
  - dictionaries
  - etc.

Collections

- A **collection class** (or **container class**) is a data type used to store and organize data in some form.
- Understanding and using collection classes is critical to good software engineering.
- This week is dedicated to exploring different collections and how to harness them appropriately.

Vector

Vector

- The **`Vector`** is a collection class representing a list of things.
  - Similar to Java's `ArrayList` type.
- Probably the single most commonly used collection type in all programming.

`Vector` In Action

Buying Cell Towers

137 42 95 272 52

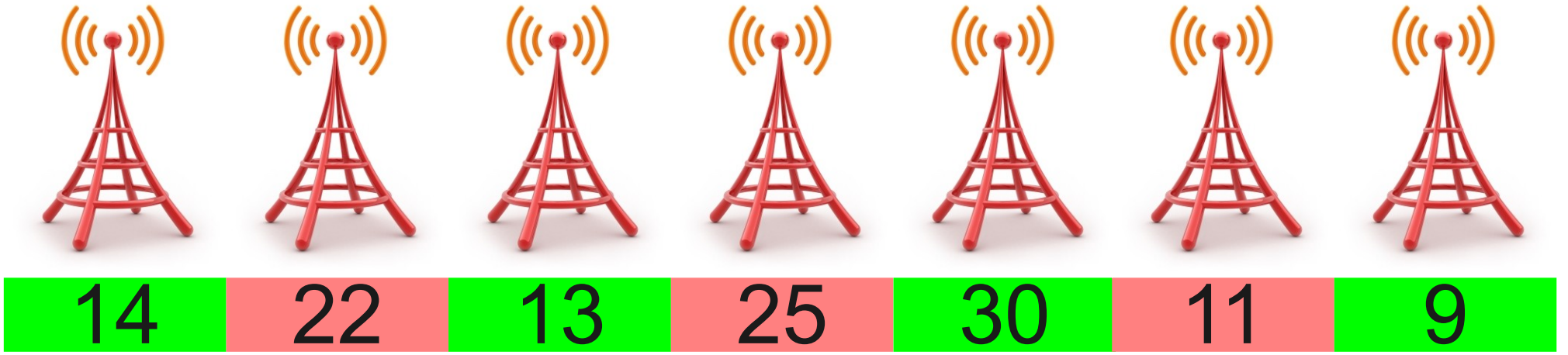
Buying Cell Towers

137	42	95	272	52

Buying Cell Towers

14 22 13 25 30 11 9

Buying Cell Towers



Given the populations of each city, what is the largest number of people you can provide service to?

14 22 13 25 30 11 9

14	22	13	25	30	11	9

14	22	13	25	30	11	9

14 22 13 25 30 11 9

Maximize what's left in here.

14 22 13 25 30 11 9

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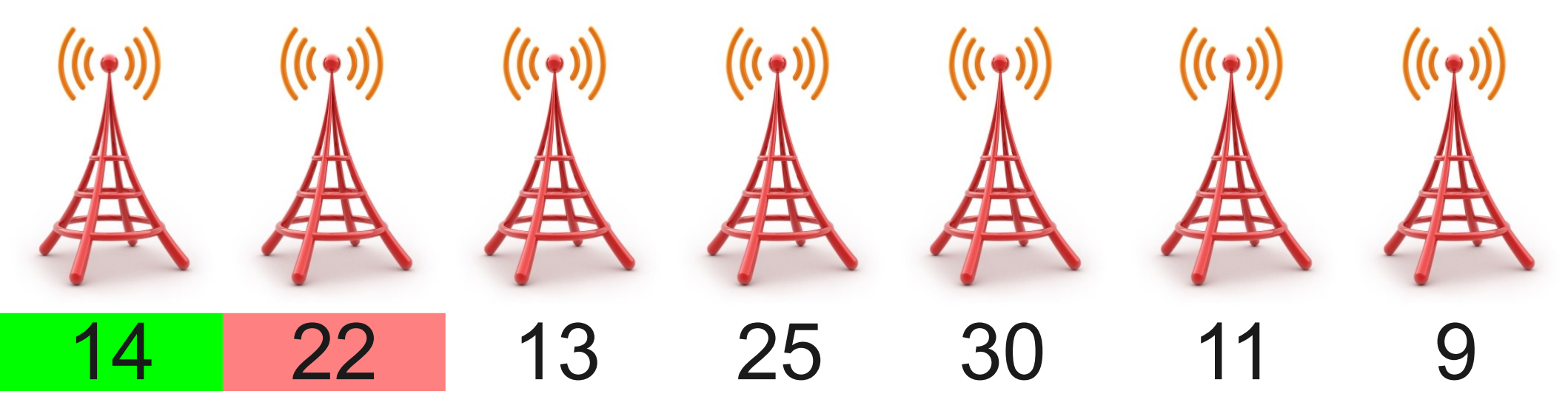
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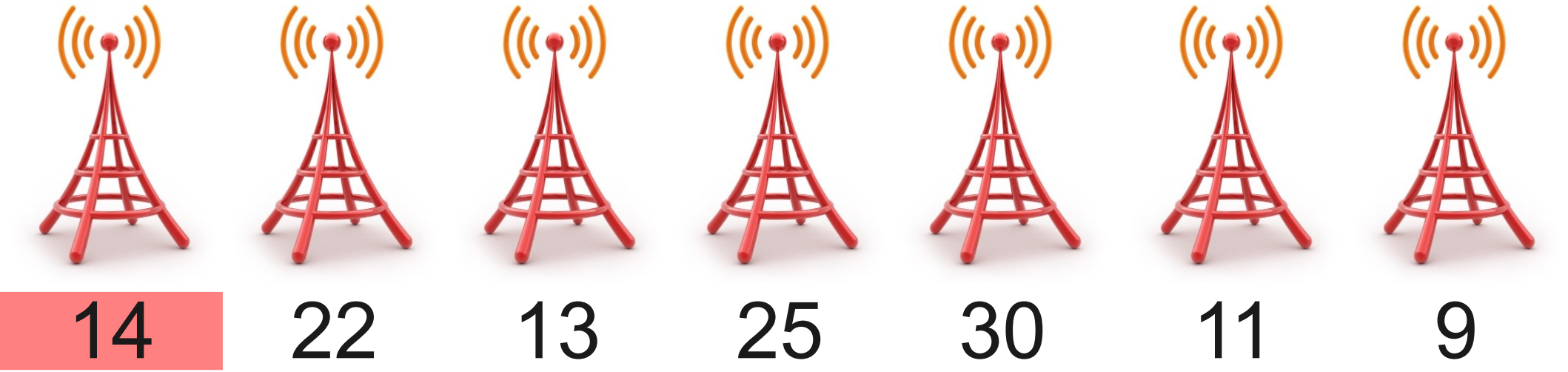
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Maximize what's left in here.

Getting Data from Files

- Now that we have collections classes, we can start working with data pulled in from external files.
- File reading in C++ is done using the **`ifstream`** class.
  - Must **`#include`** `<fstream>` to use `ifstream`.

Reading Line by Line

- You can read a line out of an `ifstream` by using the **`getline`** function:

```
getline(file, str)
```

- If no more data is left, the file stream will enter a “fail state” which you can detect by calling

```
file.fail()
```

Reading Formatted Data

- You can read formatted data from a file by using the **stream extraction operator**:

file >> ***variable***

- Can read any primitive type, plus strings.
- When reading strings, stops at newlines or whitespace.

Grid

Two-Dimensional Data

- The **`Grid`** type can be used to store two-dimensional data.
  - e.g. matrices, scrabble boards, etc.
- Can construct a grid of a certain size by writing

```
Grid<Type> g(numRows, numCols);
```

- Can access individual elements by writing

```
g[rows][cols]
```