Assignment #4 – Pokemon Go/Polymorphism
Due: Sunday, 05/28/17, 11:59pm

Grading: For each programming assignment, you are graded by explaining and demoing your code to a TA. **You must demo your program BEFORE the next assignment is due**, and if you fail to do so, you will automatically lose 50 points! **Your job is to convince the TA that your program works correctly, i.e. show your TA how to use/break your program**☺

Game Description

The object of this Pokemon Go is to guide the trainer to collect all the Pokemon, evolve them, and return to the professor with all Pokemon captured and evolved. Each Pokemon has 3 stages, basic, stage 1, and stage 2. You can evolve a basic Pokemon by capturing it a specific number of times, and you can evolve a stage 1 Pokemon by finding a mega-stone in a cave.

At the start of the game, Poke-stops with balls, caves with mega-stones, and Pokemon are placed in random locations, and you receive a message when you are close to one of these. The trainer also starts the game in a random location, and the starting location is where the trainer must return to the professor with all the Pokemon captured.

There are three **events** that may be at any location: a poke-stop, a cave, or a Pokemon. When the trainer is near a location containing an event, the trainer may receive a percept (a message) to inform them about the events they're close to.

When the trainer collects and evolves all the different types of Pokemon and returns back to the professor, the trainer should be presented with a message and the options to start the game over with the same configuration, start the game over with a new random configuration, or quit the game entirely.

Trainer
Each turn you may take one of two actions:

Move: You can move to an adjacent location on the grid, which may contain a Pokestop with balls, a cave with mega-stones, or a specific basic Pokemon.

Throw a Poke ball: If the trainer is in a location with a Pokemon, then they can choose to throw a ball to try to capture that Pokemon. Of course, the trainer can only throw a ball if they have balls to throw!

Pokemon
There are several types of Pokemon the trainer needs to capture. There are Flying, Rock, and Psychic types, and within each type, there are specific Pokemon.

Rock Pokemon include Geodude and Onix.
Flying Pokemon include Charizard and Rayquaza.
Psychic Pokemon include Mewtwo and Espeon.

Rock Pokemon are the easiest to capture and Psychic are the hardest to capture. When a trainer throws a ball at a Rock Pokemon, it has a 75% chance of being captured. The Flying Pokemon have a 50% chance of being captured, and the Psychic have a 25% chance of being captured. If the Pokemon is not captured, it runs or flies away to another location on the grid.

Each specific Pokemon requires being captured a specific number of times to evolve from a basic Pokemon to a stage 1 Pokemon!

Cave:

The caves contain mega-stones that can be used to evolve a stage 1 Pokemon to a stage 2, which is the last stage needed to return to the professor.

Poke-stop:

The poke-stops contain poke-balls that can be thrown at basic Pokemon to capture them. Each poke-stop gives the trainer a different number of balls, ranging from 3-10.

Percept:

When the trainer is in a location **directly adjacent to** a location containing an event, the trainer receives the following messages:

Nearby Event	Message
Pokemon	"Capture the <specific pokemon name> nearby."
Poke-stop	"Fill up on poke-balls."
Cave	"You see a precious stone nearby."

Notice that there's no percept for the professor! That means the trainer will have to remember where they started and find their way back home after they've completed their task of capturing and evolving all Pokemon.

Remember, the percepts don't tell you *where* the **event** is– just that it's somewhere close!

(90 pts) Program Implementation

Requirements

1. Your program should allow the user to play Pokemon Go as described above.
2. The game should be a square grid of locations. The size of the grid should be specified as a **command line parameter** to your program. A game with a grid smaller than a 3x3 isn't allowed.

3. Your code must have at least the following classes: **Location, Event, Pokemon, Flying, Rock, Psychic, Poke-stop, Cave**.

4. You can create more classes if they would be helpful.

5. Specific types of Pokemon, Poke-stops, and Caves should all be child classes of the abstract (pure virtual) **polymorphic** Event class. Any event does something when the trainer enters the location with an event, and may display a message when the trainer is nearby. Your design of the Event class should reflect this.

6. Each location **has** at most one associated Event. Again, the design of your Location class should reflect that fact.

7. Your program should have no memory leaks.

8. Function 20 lines or under.

9. This Pokemon Go game is all about hiding information from the trainer– which might make it hard to debug! You must use the debug option to turn on and off a testing mode. In the test mode, you will need to set the number of captured for all to 1 for evolving basic Pokemon to stage 1. Also, you need to show the contents of the locations, i.e. the specific event, in testing mode to make it easy to play the game successfully and for grading purposes. Supply a debug target in your makefile for compiling with the debug option turned on, make debug.

10. **Extra credit I (10 points)**: Instead of just allowing the game to be played by a human, design in such that you can create an **AI class** that plays the game for you. This AI class should use the same interface to the game that the trainer does– that is, they use percepts to learn about the world and make decisions.

Hints:
1. Polymorphism only works when you are working with references or pointers. If you use the *value* of an object directly, it may not select the correct member function.

2. This assignment is designed to specifically include the programming concepts you've seen in class so far. Therefore, this game is not intended to play exactly like the current Pokemon Go you download from the app store.