C++ Developer Programming Test

The Race

The Pacific ocean is home to many small chains of volcanic islands, including the little known Tunstall-Pedoe archipelago. The inhabitants are an inventive lot, so once a year they gather on the southern-most island and race to the capital city in their latest contraptions. Who will win?

The Problem

We want you to design and implement a program which does the following:

- reads files containing details of the competitors for this year's race;
- reads a file with a map of the archipelago;
- simulates the race for this year and declares the winner.

A more detailed specification is given in the next section. If after reading this you feel some aspect of the problem is unclear, you are free to use your discretion to resolve the situation provided that you document what you have done, the problem it solves and why you have chosen to proceed the way you have.

Your answer should demonstrate:

- the use of intelligent object-oriented design;
- an understanding of when errors and exceptions can occur and how to handle them;
- use of the C++ standard library;
- understanding of the C++ language;
- an appreciation of program correctness and applicable methods.

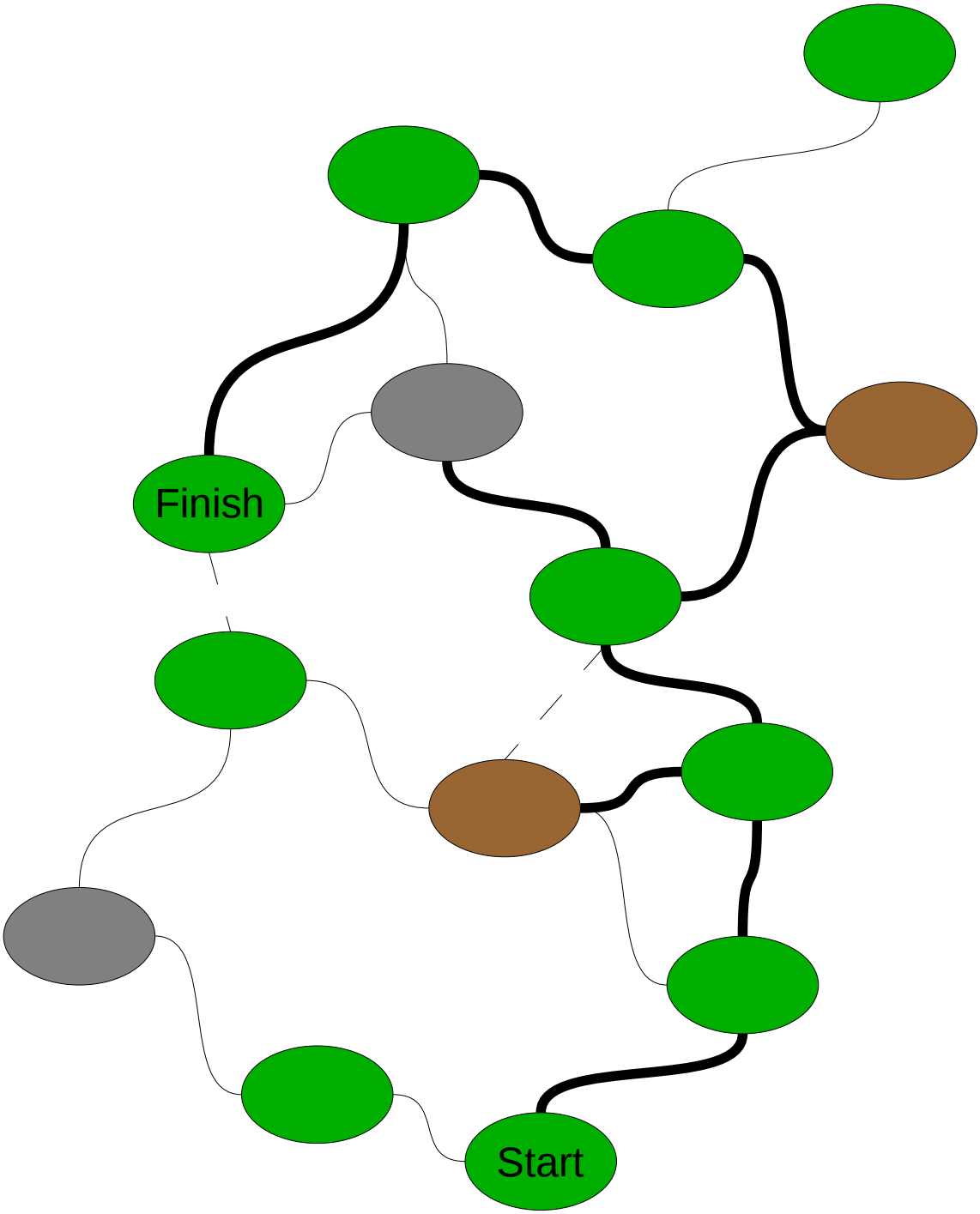
We do not expect that every candidate will be able to complete this test in the time allotted, and encourage you to submit what you have managed to do.

Specification

The Map

The Tunstall-Pedoe archipelago consists of a number of small islands connected by bridges. The islands can be flat and grassy, mountainous or covered in swamps, and this determines how easily competitors can cross them. The bridges have been built at different times and can bear different loads; for our purposes they are classified as weak and strong.

The map below shows the positions of the islands and the bridges. Green ellipses represent grassy islands, grey ellipses mountainous islands, and brown ellipses swampy islands. Strong bridges are depicted using thick lines and weak bridges with thin lines. Connectors with broken or dashed lines indicate the adjacency of islands not connected by a bridge.



The Competitors

Each competitor has designed and built a vehicle which can have one method of locomotion chosen from wheels, wings or legs. These choices impose the following movement restrictions:

- winged vehicles can move between adjacent islands even if there is no bridge;
- winged vehicles cannot move to a mountainous island;
- winged vehicles can move to swampy islands, but they have to miss a turn before moving again;
- wheeled vehicles can move across both weak and strong bridges;
- wheeled vehicles cannot move to a swampy island;
- legged vehicles can only move across strong bridges;
- legged vehicles cannot move to a mountainous island.

In all other cases a move between adjacent islands connected by a bridge is permissible.

The competitors can only see a limited distance and do not have maps – they can only see the terrain of adjacent islands, and have to decide where to move to next based on this information. However, a competitor will recognise the island with the finishing line if it finds itself on an adjacent island.

If a competitor finds that it has multiple valid moves from its current position it chooses one at random.

File Formats

You are free to specify and document the file formats for the map and competitor data, but each of the competitors will submit information about themselves, and they are known to be slightly clumsy and make mistakes.