Vanier College

Computer Science Department

Programming 2

LAB 3

Q3: Many Global Positioning Satellite (GPS) units can record waypoints. The waypoint marks the coordinates of a location on a map along with a timestamp. Consider a GPS unit that stores waypoints in terms of an (X, Y) coordinate on a map together with a timestamp t that records the number of seconds that have elapsed since the unit was turned on.

Write a program that allows the user to enter as many waypoints as desired, storing each waypoint in an ArrayList, where each waypoint is represented by a class that you design. Each waypoint represents a successive sample point during a hike along some route. The coordinates should be input as doubles, and the timestamp as an integer.

Have your program compute the total distance traveled and the average speed in miles per hour. Use the map scaling factor of 1 = 0.1 miles. For example, if the only two waypoints are (X=1, Y=1, T=0) and (X=2, Y=1, T=3600), then the hiker traveled a distance of 0.1 miles in 3,600 seconds, or miles per hour.

Q3 extras:

Starting from your original solution, create:

- Accessors and mutators for all attributes you have declared in your WayPoint class.
- A toString() method in your WayPoint class that nicely prints the coordinates and timestamp of a waypoint.
- An equals() method that compares two waypoints and return true if they’re equals, or false otherwise.
- A static attribute numberOfWaysPoints which returns the number of WayPoint objects.
- A new distance method which overloads your original one. Your new method should receive two waypoints as parameter rather than an ArrayList, and should return the distance between these two waypoints only.
- The same as above for your average speed method.
- A *class invariant* that prints a warning message if a waypoint has timestamp <= 0 *or* if at least one of its coordinates is a negative number. Call this invariant at the end of you constructor and also in every mutator of your WayPoint class.