C++ Programming - Advanced - Assignment

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Introduction

In SmartCar image processing, you probably need to store the coordinates of certain points in the image. Here you are going to develop a coordinate class for it. There is **NO** provided header.

Requirements

- Include the x and y coordinates with generic type, default is `uint16_t`
- Implement the x, y and coordinate setters & getters
- Overload the following operators
  - `a+b`
  - `a-b`
  - `a+=b`
  - `a-=b`
  - `std::cout << a` (or technically `std::ostream << a`)
- Implement the following arithmetic functions
  - prefix `++x`
  - prefix `++y`
  - prefix `--x`
  - prefix `--y`
  - postfix `x++`
  - postfix `y++`
  - postfix `x--`
  - postfix `y--`
- Implement the following mathematical functions
  - Distance ($d = \sqrt{(\Delta x)^2 + (\Delta y)^2}$)
  - Manhattan Distance ($d = |\Delta x| + |\Delta y|$)
  - Slope ($m = \frac{\Delta y}{\Delta x}$)

  - Triangle Area enclosed by three points A, B, C ($a = \left|\frac{A_x(B_y - C_y) + B_x(C_y - A_y) + C_x(A_y - B_y)}{2}\right|$)
  - Radius of Circle generated by three points A, B, C ($\frac{AB \cdot BC \cdot CA}{4[ABC]}$, where $[ABC]$ is the triangle area of ABC)
- Bonus
  - Figure(Find) a less resource-intensive (in return of less accuracy) implementation of square root and use it in calculating distance.
  - Figure a way to convert one type of Coordinate class into another one with different type. (such as `Coord<float>` to `Coord<int>` for example)

Google is your friend when it comes to problems that you encounter in C++ programming.

Submission

In this assignment, three aspects will be examined.

- Correctness

  The correctness of your implementations.

- Readability

  The readability of your codes, including the presence of documentations.

- Coding Practice

  The coding style that you have, including OOP practices.

Try your best in achieving fully in all three aspects. Deadline of this assignment would be ????/??/??.