Project Title: Airport Connectivity and distance

Purpose: This utility software uses IACO airport codes to find the distance and airport connectivity between two airports.

Software Design:

main.rs:

- fn main ()
  - Creates an object called flights which then populated a graph with nodes and edges of international airports. There is a main loop to take in two airports and calculate the distance between them and how many hops(transfers).
- test(&mut Flights)
  - Test function to input source and destination with edge cases

Travel.rs

- Struct Flights
  - Field Vars
    - airport: HashMap<i32, Airport> -
      - Its a data structure mapping of airport IDs to airport objects
    - connections: vec<(i32,i32)>
      - Its a vector of tuple pairs of sources and destination airports
    - Name_idmap: HashMap<String, i32>
      - A data structure mapping of IACO to airport ID's
  - new()
    - Constructor method to initialize Flights data structure
  - create_graph()
    - Is a method to read two files to populate the empty flights data structure
  - read_airports()
    - A method to read from airports.csv and populate 7k+ airports with the associated fields in the airport data structure
  - read_routes()
    - Reads from routes.csv and populates each airports connections vector by identifying source and destination connections
  - distance(i32, i32)
    - This calculates the distance on a sphere using the haversine formula from the airport latitude and longitude coordinates
  - breadth_first_search(i32, i32)
    - Graph traversal algorithm from one source to destination by discovering adjacent nodes and appending them to a queue data structure that is looped until all nodes are discovered in the visited vector
    - Inserts airport source ID and traverses each airport data structure connection vector to obtain adjacent airport ID's
    - Returns a vector of airport ID's called routes that represents a single path from src to dst airports
  - get_flight_id(i32, i32)

        - A method to call breadth first search and calculate the distance from route vector to obtain cumulative distance between all airports, otherwise returns 0km if there is no flight.
    - get_flight(&str, &str)
        - This method takes in string buffer representation of the IACO names of the airports and traverses the Name_idmap: HashMap<String, i32> to obtain the ID of the airports.
- Struct Airport
    - Field Vars
        - Id: f32
        - Name: String
        - Latitude: f64
        - Longitude: f64
        - City: String
        - Country: String
        - Connections: Vec<i32>
    - display()

Tests.rs

- main()

How to run it:

1. Clone the github repository
2. cargo run
3. Input IACO source and destination after the prompts

Output:

1. Distance between airports
2. Number of airports

Why I chose this project: I chose to develop this project because I was interested in creating software that could calculate the distance between airports and shortest path. This project allowed me to explore and apply algorithms for distance calculation. I also had the opportunity to work with a large dataset.