WeatherPy

Starter Code to Generate Random Geographic Coordinates and a List of Cities

In [89]:
```
# Dependencies and Setup
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
import requests
import time
from scipy.stats import linregress

# Impor the OpenWeatherMap API key
from api_keys import weather_api_key

# Import citipy to determine the cities based on latitude and longitude
from citipy import citipy
```

Generate the Cities List by Using the `citipy` Library

In [90]:
```
# Empty list for holding the latitude and longitude combinations
lat_lngs = []

# Empty list for holding the cities names
cities = []

# Range of latitudes and longitudes
lat_range = (-90, 90)
lng_range = (-180, 180)

# Create a set of random lat and lng combinations
lats = np.random.uniform(lat_range[0], lat_range[1], size=1500)
lngs = np.random.uniform(lng_range[0], lng_range[1], size=1500)
lat_lngs = zip(lats, lngs)

# Identify nearest city for each lat, lng combination
for lat_lng in lat_lngs:
    city = citipy.nearest_city(lat_lng[0], lat_lng[1]).city_name

    # If the city is unique, then add it to a our cities list
    if city not in cities:
        cities.append(city)

# Print the city count to confirm sufficient count
print(f"Number of cities in the list: {len(cities)}")
```

Requirement 1: Create Plots to Showcase the Relationship Between Weather Variables and Latitude

Use the OpenWeatherMap API to retrieve weather data from the cities list generated in the started code

In [91]:
```
cities[0]
city
```

Out[91]:
```
'qaqortoq'
```

In [92]:
```
city_url = f"https://api.openweathermap.org/data/2.5/weather?q={city}&ap
response = requests.get(city_url)
city_weather = response.json()
city_weather
```

Out[92]:
```
{'coord': {'lon': -46.0333, 'lat': 60.7167},
 'weather': [{'id': 804,
   'main': 'Clouds',
   'description': 'overcast clouds',
   'icon': '04n'}],
 'base': 'stations',
```


In [93]:
```
city_latitude = city_weather["coord"]["lat"]
#city_lat = city_weather.get("coord", {}).get("lat", None)
#city_lng = city_weather.get("coord", {}).get("lon", None)
#city_max_temp = city_weather.get("main", {}).get("temp_max", None)
#city_humidity = city_weather.get("main", {}).get("humidity", None)
#city_clouds = city_weather.get("clouds", {}).get("all", None)
#city_wind = city_weather.get("wind", {}).get("speed", None)
#city_country = city_weather.get("sys", {}).get("country", None)
#city_date = city_weather.get("dt")
city_longitude = city_weather["coord"]["lon"]
city_max_temperature = city_weather["main"]["temp_max"]
city_humidity = city_weather["main"]["humidity"]
city_clouds = city_weather["clouds"]["all"]
city_wind = city_weather["wind"]["speed"]
city_country = city_weather["sys"]["country"]
city_date = city_weather["dt"]
```

In [94]:
```
city_weather.keys()
```

Out[94]:
```
dict_keys(['coord', 'weather', 'base', 'main', 'visibility', 'wind', 'c
louds', 'dt', 'sys', 'timezone', 'id', 'name', 'cod'])
```

In [95]:
```
city_weather["coord"]
```

Out[95]:
```
{'lon': -46.0333, 'lat': 60.7167}
```

In [96]:
```
{"City": city,
  "Lat": city_latitude,
  "Lng": city_longitude,
  "Max Temp": city_max_temperature,
  "Humidity": city_humidity,
  "Cloudiness": city_clouds,
  "Wind Speed": city_wind,
  "Country": city_country,
  "Date": city_date}
```

Out[96]:
```
{'City': 'qaqortoq',
 'Lat': 60.7167,
 'Lng': -46.0333,
 'Max Temp': 38.12,
 'Humidity': 77,
 'Cloudiness': 100,
 'Wind Speed': 27.25,
 'Country': 'GL',
 'Date': 1700447259}
```

0

In [97]:
```
# Set the API base URL
url = "https://api.openweathermap.org/data/2.5/weather"

# Define an empty list to fetch the weather data for each city
city_data = []

# Print to logger
print("Beginning Data Retrieval     ")
print("-----------------------------")

# Create counters
record_count = 1
set_count = 1

# Loop through all the cities in our list to fetch weather data
for i, city in enumerate(cities[0:500]):

    # Group cities in sets of 50 for logging purposes
    if (i % 50 == 0 and i >= 50):
        set_count += 1
        record_count = 0

    # Create endpoint URL with each city
    city_url = f"{url}?q={city}&appid={weather_api_key}&units=imperial"

    # Log the url, record, and set numbers
    print("Processing Record %s of Set %s | %s" % (record_count, set_cou
```

```
    # Add 1 to the record count
    record_count += 1

    # Run an API request for each of the cities
    response = requests.get(city_url)
    try:
        # Parse the JSON and retrieve data
        city_weather = response.json()

        # Parse out latitude, longitude, max temp, humidity, cloudiness,
        city_latitude = city_weather["coord"]["lat"]
        city_longitude = city_weather["coord"]["lon"]
        city_max_temperature = city_weather["main"]["temp_max"]
        city_humidity = city_weather["main"]["humidity"]
        city_clouds = city_weather["clouds"]["all"]
        city_wind = city_weather["wind"]["speed"]
        city_country = city_weather["sys"]["country"]
        city_date = city_weather["dt"]

        # Append the City information into city_data list
        city_data.append({"City": city,
                          "Lat": city_latitude,
                          "Lng": city_longitude,
                          "Max Temp": city_max_temperature,
                          "Humidity": city_humidity,
                          "Cloudiness": city_clouds,
                          "Wind Speed": city_wind,
                          "Country": city_country,
                          "Date": city_date})

    # If an error is experienced, skip the city
```

In [98]:
```
# Convert the cities weather data into a Pandas DataFrame
city_data_df = pd.DataFrame(city_data)

# Show Record Count
city_data_df.count()
```

Out[98]:
```
City          469
Lat           469
Lng           469
Max Temp      469
Humidity      469
Cloudiness    469
Wind Speed    469
Country       469
Date          469
dtype: int64
```

In [99]:
```
# Display sample data
city_data_df.head()
```

Out[99]:

In [100]:
```
# Export the City_Data into a csv
city_data_df.to_csv("output_data", index_label="City")
```

In [101]:
```
# Read saved data
city_data_df = pd.read_csv("output_data", index_col="City")

# Display sample data
city_data_df.head()
```

Out[101]:

City	City.1	Lat	Lng	Max Temp	Humidity	Cloudiness	Wind Speed	Country	
0	st. john's	47.5649	-52.7093	42.98	93	100	6.91	CA	170
1	adamstown	-25.0660	-130.1015	72.09	89	100	18.92	PN	170
2	chail	25.4333	81.6333	69.48	66	0	2.10	IN	170
3	port-aux-francais	-49.3500	70.2167	41.29	84	83	46.30	TF	170
4	pervomaysk	48.0443	30.8507	32.65	79	100	11.27	UA	170

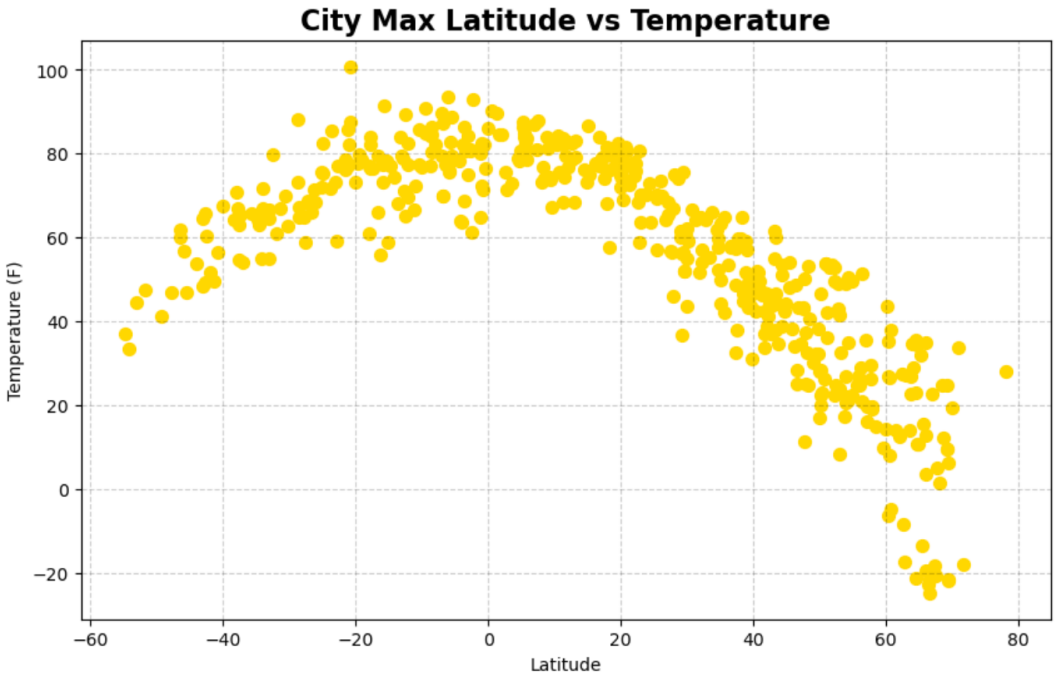
Create the Scatter Plots Requested

Latitude Vs. Temperature

In [102]:

```
# Build scatter plot for latitude vs. temperature
# YOUR CODE HERE

# Incorporate the other graph properties
# YOUR CODE HERE

# plot
plt.figure(figsize=(10,6))
plt.scatter(city_data_df.Lat, city_data_df["Max Temp"], color="gold", s=
plt.xlabel("Latitude")
plt.ylabel("Temperature (F)")
plt.title("City Max Latitude vs Temperature", fontweight="bold", fontsiz
plt.grid(color="black", alpha=0.2, linestyle="--")

# Save the figure
plt.savefig("output_data_1")

# Show plot
plt.show()
```

Alt+Q

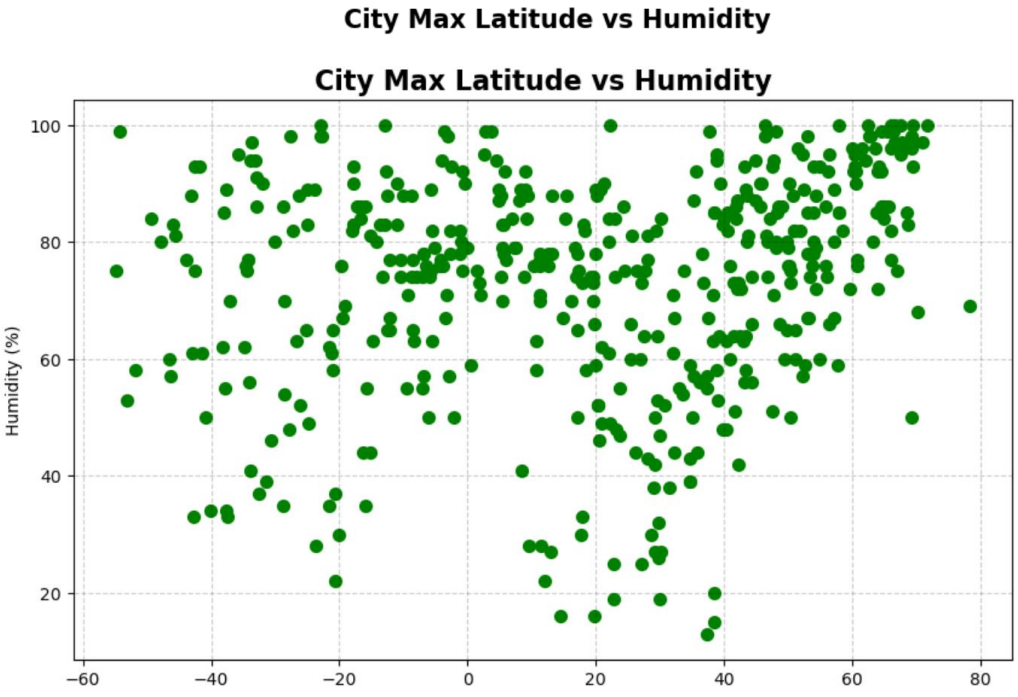


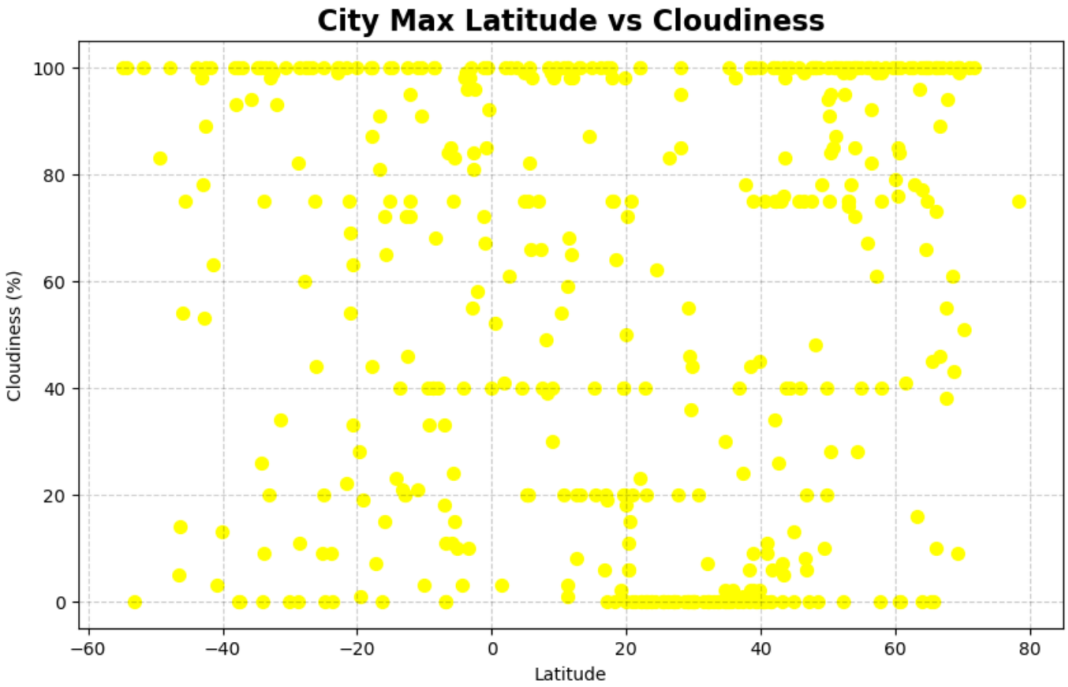
Latitude Vs. Humidity

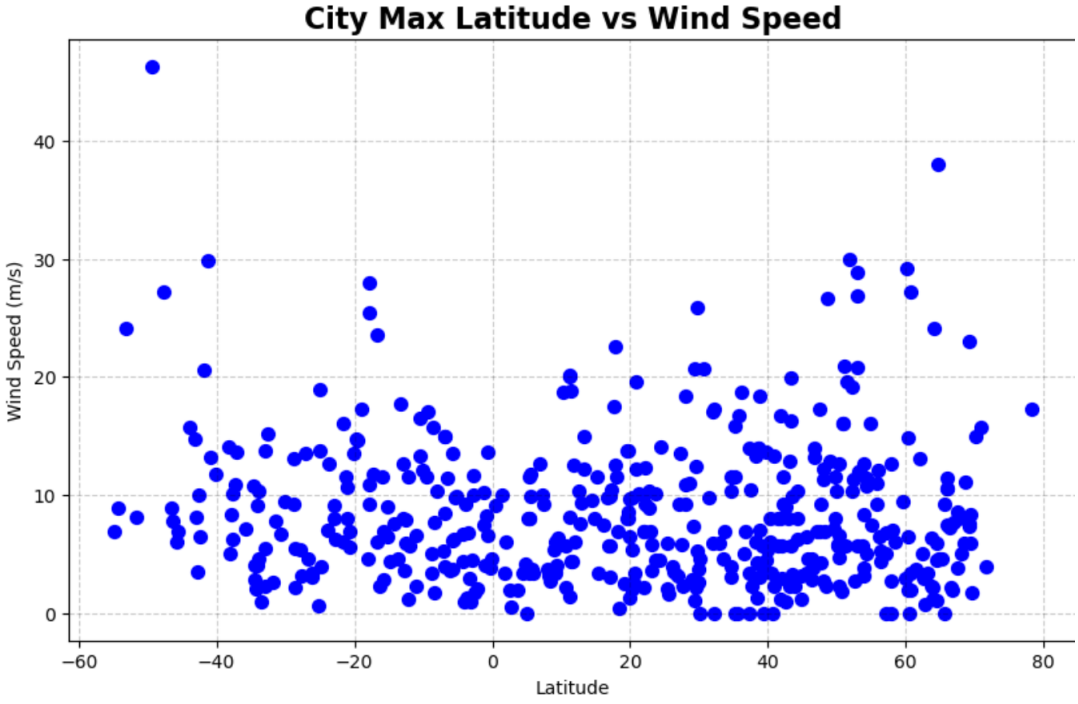
In [103]:

```
# Build the scatter plots for latitude vs. humidity
# YOUR CODE HERE

# Incorporate the other graph properties
# YOUR CODE HERE

# plot
plt.figure(figsize=(10,6))
plt.scatter(city_data_df.Lat, city_data_df["Humidity"], color="green", s
plt.xlabel("Latitude")
plt.ylabel("Humidity (%)")
plt.title("City Max Latitude vs Humidity", fontweight="bold", fontsize=1
plt.grid(color="black", alpha=0.2, linestyle="--")


# Save the figure
plt.savefig("output_data_2")

# Show plot
plt.show()
```

Alt+Q




City Max Latitude vs Cloudiness
Cloudiness (%)
Latitude
100
80
60
40
20
0
−60
−40
−20
0
20
40
60
80


City Max Latitude vs Wind Speed
Wind Speed (m/s)
Latitude
40
30
20
10
0
−60
−40
−20
0
20
40
60
80

Requirement 2: Compute Linear Regression for Each Relationship

In [108]:
```
# Define a function to create Linear Regression plots
# YOUR CODE HERE

def makeLinearRegressionPlot(x_values, y_values, y_col, hemi, annot_loc)
    (slope, intercept, rvalue, pvalue, stderr) = linregress(x_values, y_
    regress_values = x_values * slope + intercept
    line_eq = "y =" + str(round(slope,2)) + "x + " + str(round(intercept

    #Plot
    plt.scatter(x_values, y_values)
    plt.plot(x_values, regress_values, "r-")
    plt.annotate(line_eq, annot_loc, fontsize = 15, color = "blue")
    plt.xlabel('Latitude')
    plt.ylabel(f'{y_col}')
    plt.title(f'Latitude vs {y_col} ({hemi} Hemi)')
    print(f"The r-squared is: {rvalue**2}")
    plt.show()
```

Alt+Q

In [109]:
```
# Create a DataFrame with the Northern Hemisphere data (Latitude >= 0)
northern_hemi_df = city_data_df.loc[city_data_df.Lat >= 0]
```

In [109]:
```
# Create a DataFrame with the Northern Hemisphere data (Latitude >= 0)
northern_hemi_df = city_data_df.loc[city_data_df.Lat >= 0]

# Display sample data
northern_hemi_df.head()
```

Out[109]:

City	City.1	Lat	Lng	Max Temp	Humidity	Cloudiness	Wind Speed	Country	
0	st. john's	47.5649	-52.7093	42.98	93	100	6.91	CA	17004
2	chail	25.4333	81.6333	69.48	66	0	2.10	IN	17004
4	pervomaysk	48.0443	30.8507	32.65	79	100	11.27	UA	17004
6	hamilton	39.1834	-84.5333	49.21	64	0	5.75	US	17004
7	dera bugti	29.0307	69.1510	60.21	38	0	2.89	PK	17004

In [110]:
```
# Create a DataFrame with the Southern Hemisphere data (Latitude < 0)
southern_hemi_df = city_data_df.loc[city_data_df.Lat < 0]

# Display sample data
southern_hemi_df.head()
```

Alt+Q

Out[110]:

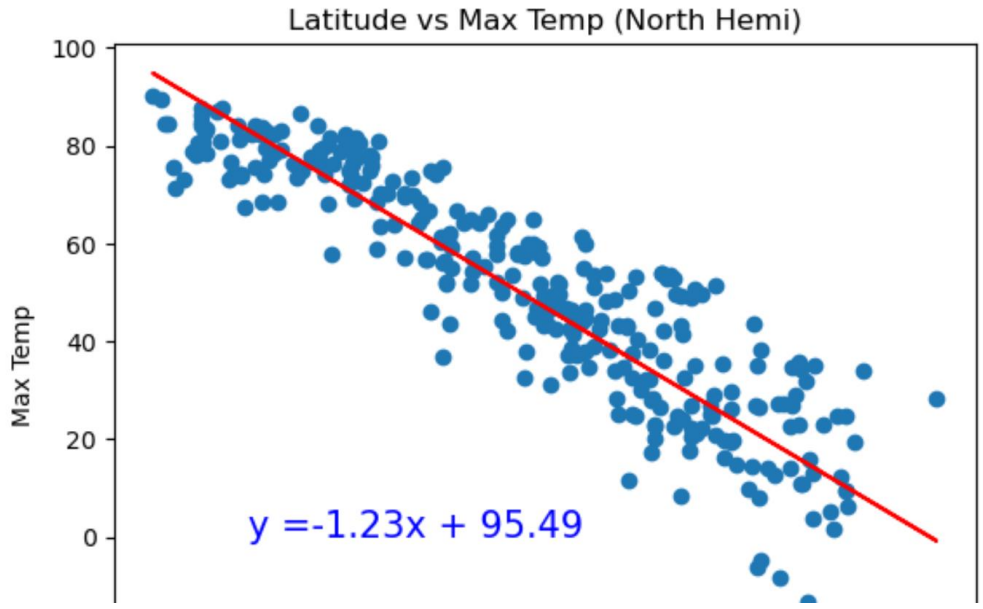
City	City.1	Lat	Lng	Max Temp	Humidity	Cloudiness	Wind Speed	Country	
1	adamstown	-25.0660	-130.1015	72.09	89	100	18.92	PN	1700
3	port-aux-francais	-49.3500	70.2167	41.29	84	83	46.30	TF	1700
5	blackmans bay	-43.0167	147.3167	64.53	61	78	8.16	AU	1700
12	kampene	-3.6000	26.6667	68.67	99	96	1.28	CD	1700
14	tadine	-21.5500	167.8833	76.14	62	22	16.04	NC	1700

Temperature vs. Latitude Linear Regression Plot

In [114]:

```
# Linear regression on Northern Hemisphere
x_values = northern_hemi_df['Lat']
y_values = northern_hemi_df['Max Temp']

makeLinearRegressionPlot(x_values, y_values, "Max Temp", "North", (10, 0
```

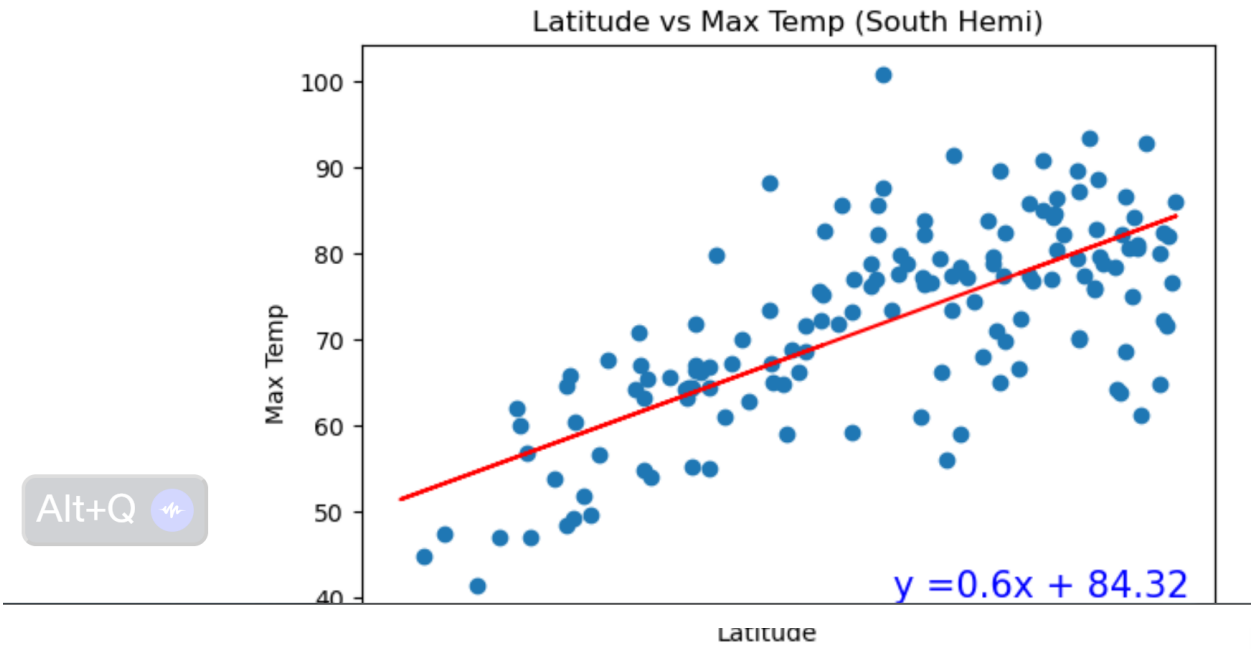
```
The r-squared is: 0.8043190257817847
```



In [113]:

```
# Linear regression on Southern Hemisphere
x_values = southern_hemi_df['Lat']
y_values = southern_hemi_df['Max Temp']

makeLinearRegressionPlot(x_values, y_values, "Max Temp", "South", (-20,
```

```
The r-squared is: 0.5168014455514482
```



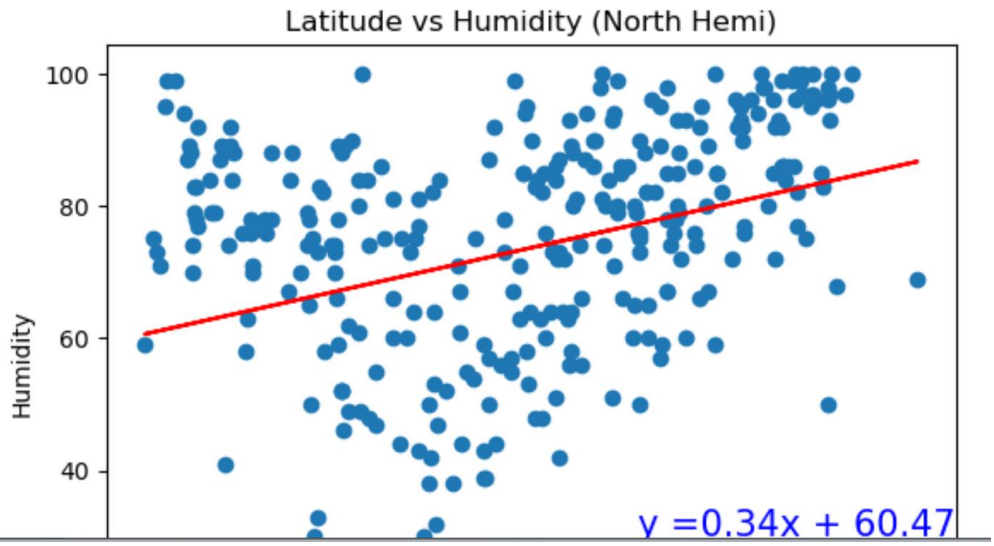
Alt+Q

***There is a high negative relation between northern hemisphere and temperature. while there is a moderate positive relation between southern hemisphere and temperature.

Humidity vs. Latitude Linear Regression Plot

In [119]:
```
orthern Hemisphere
alues = northern_hemi_df['Lat']
alues = northern_hemi_df['Humidity']

eLinearRegressionPlot(x_values, y_values, "Humidity", "North", (50, 30))
```

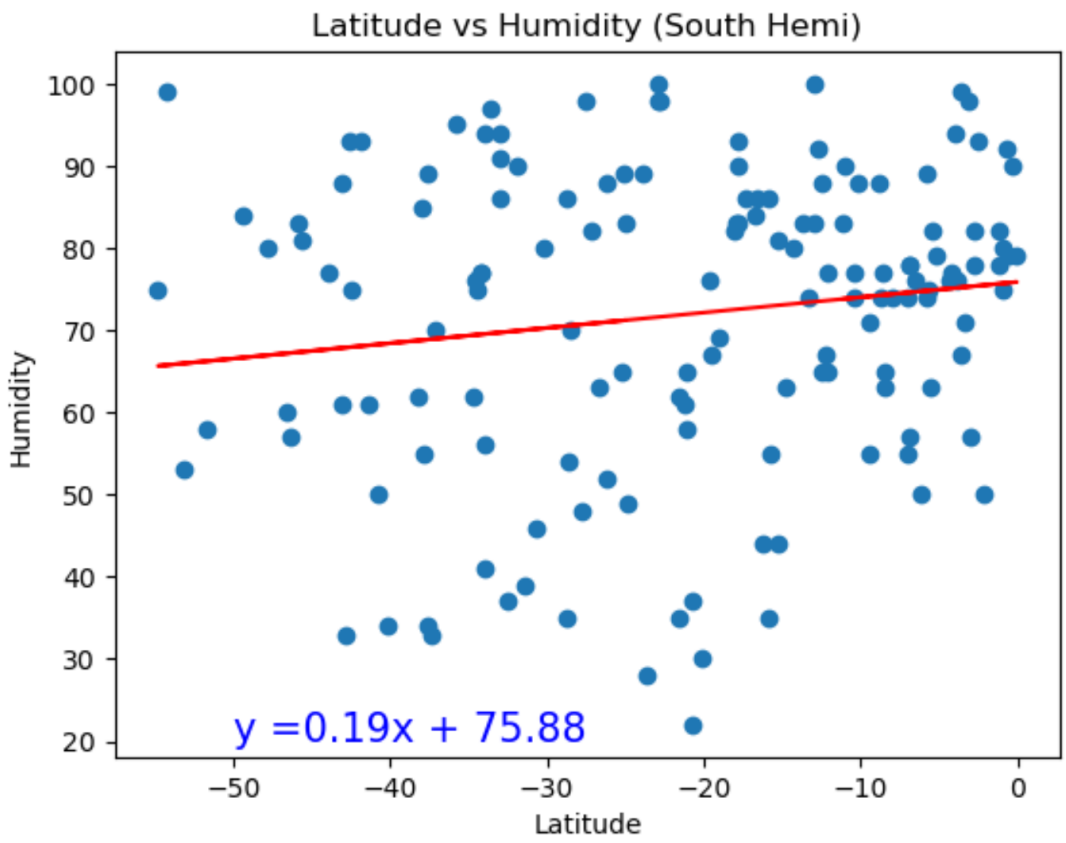
```
The r-squared is: 0.10744435129553005
```



Alt+Q

In [118]:
```
# Southern Hemisphere
x_values = southern_hemi_df['Lat']
y_values = southern_hemi_df['Humidity']

makeLinearRegressionPlot(x_values, y_values, "Humidity", "South", (-50,
```

```
The r-squared is: 0.021837875555541293
```

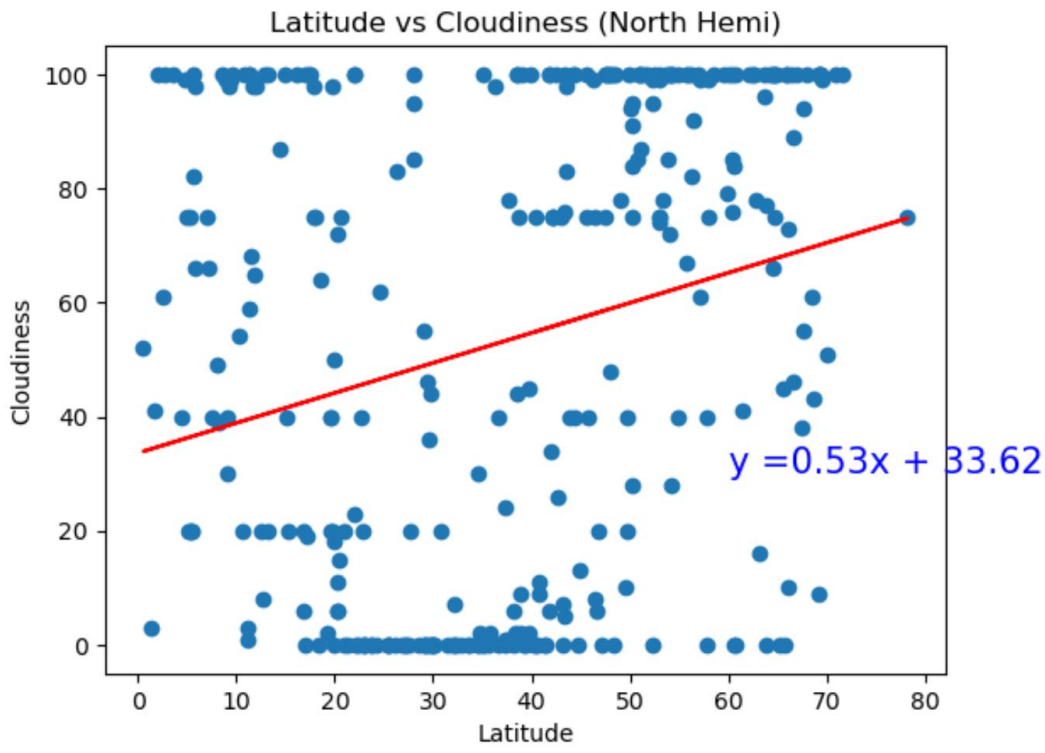


There is a no relationship between humidity and both hemispheres.

Cloudiness vs. Latitude Linear Regression Plot

In [122]:
```
rthern Hemisphere
lues = northern_hemi_df['Lat']
lues = northern_hemi_df['Cloudiness']

LinearRegressionPlot(x_values, y_values, "Cloudiness", "North", (60, 30))
```

```
The r-squared is: 0.06151526658874813
```

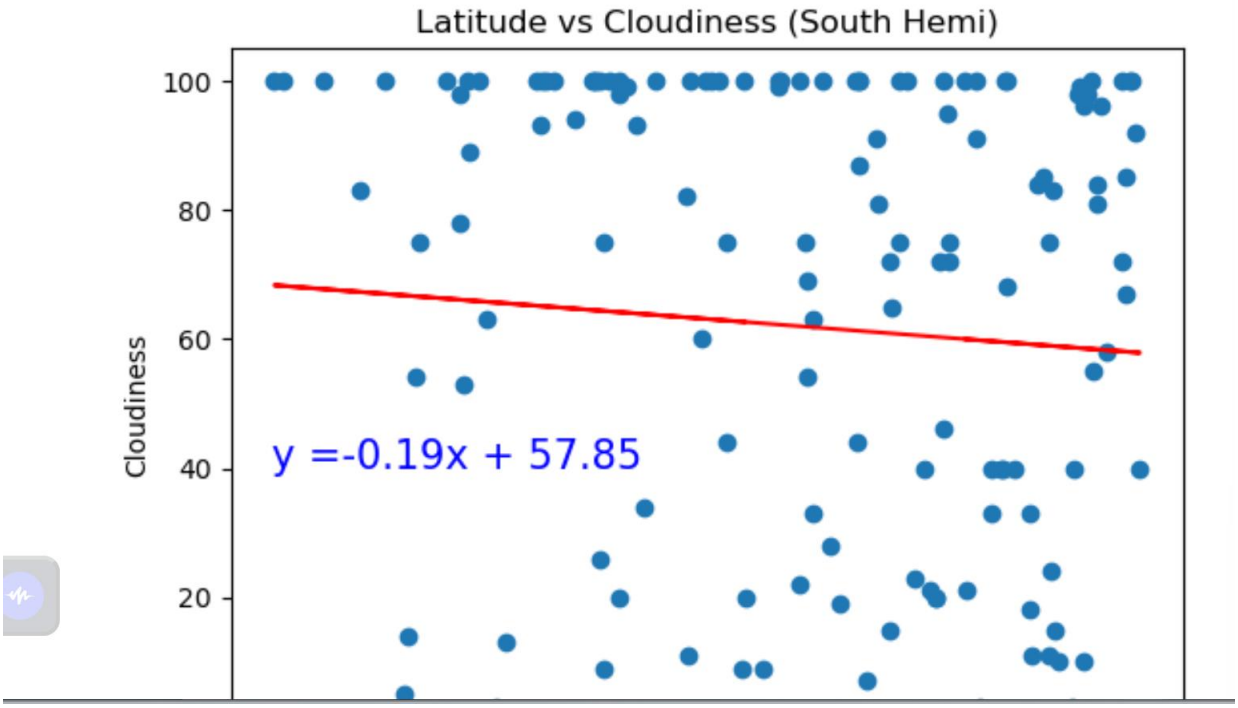


In [125]:

```
# Southern Hemisphere
x_values = southern_hemi_df['Lat']
y_values = southern_hemi_df['Cloudiness']

makeLinearRegressionPlot(x_values, y_values, "Cloudiness", "South", (-55
```

The r-squared is: 0.005447128300760604

```
The r-squared is: 0.005447128300760604
```

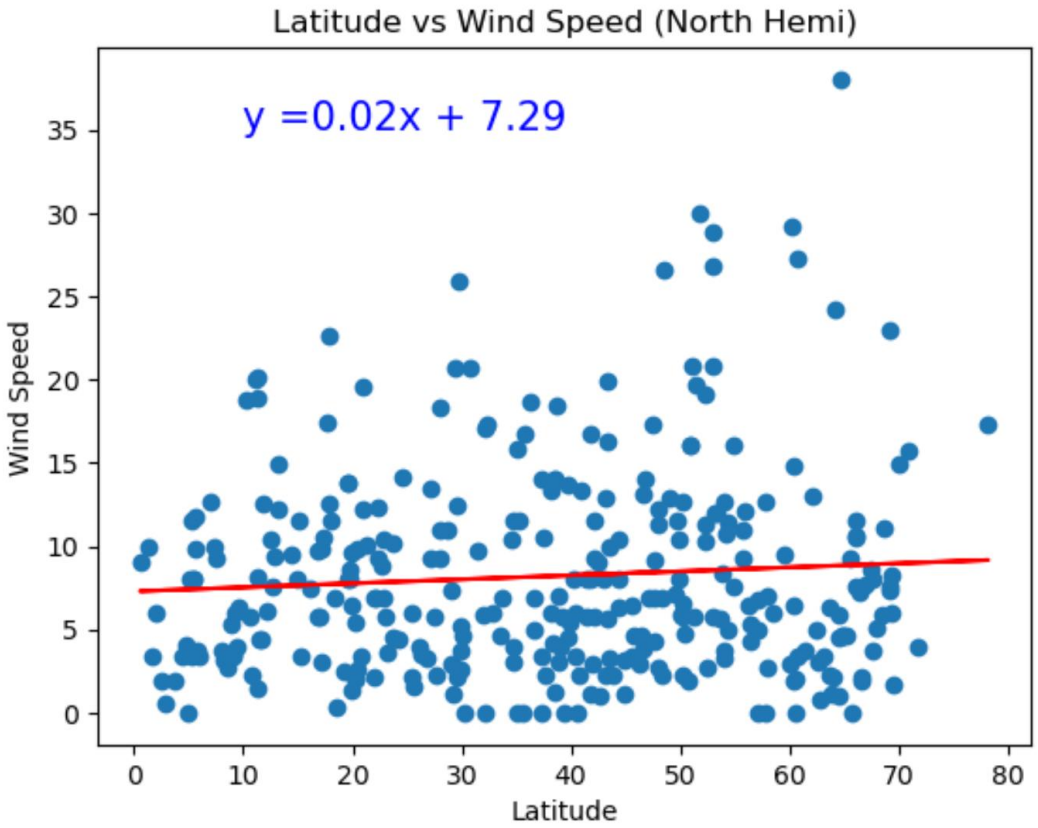


There is a no relationship between cloudiness and both hemispheres.

Wind Speed vs. Latitude Linear Regression Plot

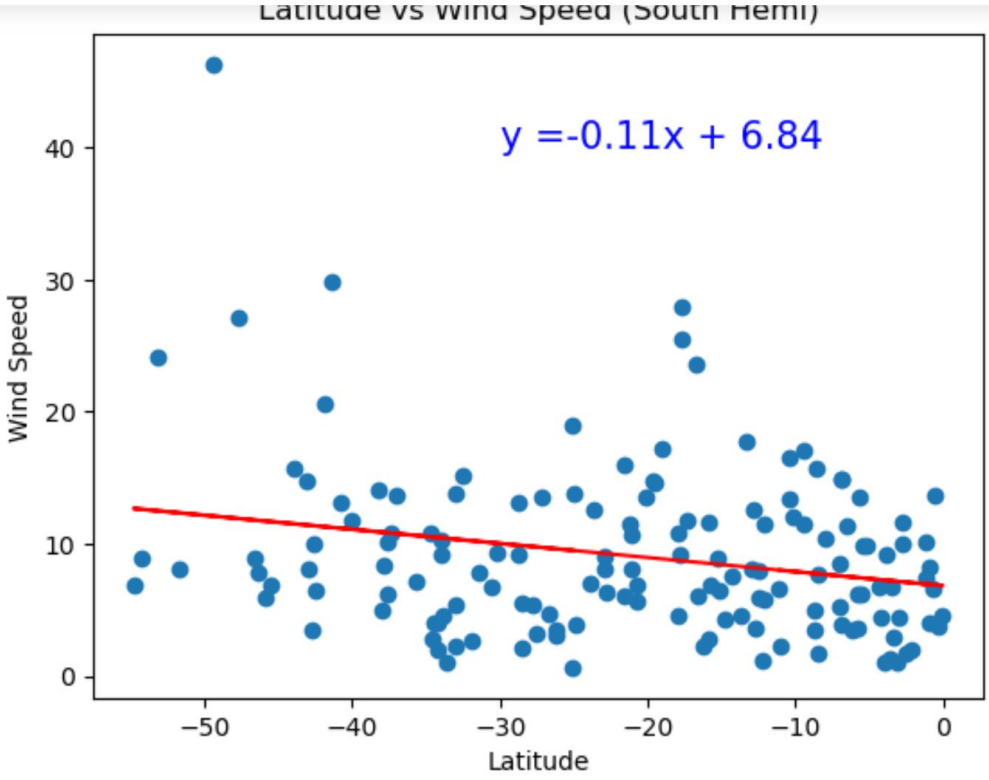
In [127]:
```
# Northern Hemisphere
x_values = northern_hemi_df['Lat']
y_values = northern_hemi_df['Wind Speed']

makeLinearRegressionPlot(x_values, y_values, "Wind Speed", "North", (10,
```

```
The r-squared is: 0.0056228510309526405
```



In [129]:

```
# Southern Hemisphere
x_values = southern_hemi_df['Lat']
y_values = southern_hemi_df['Wind Speed']

makeLinearRegressionPlot(x_values, y_values, "Wind Speed", "South", (-30
```



Alt+Q

**Looking at r-squared there is a no relationship between cloudiness and both hemispheres.