

# Assignment 5 – Severe Weather

Name:

myUH ID#

In this assignment, you will investigate weather-based disasters in Houston and Galveston.

Assignment Rules:

- All answers must be in complete sentences and written in your own words to receive credit. Questions involving tables or pasting graphs do not need complete sentences.
- Graphs need to be your own work.
- Due by 4/22, uploaded to Canvas via Turnitin

Rules Acknowledgement:

1. Before beginning the assignment, acknowledge that you know the rules of the assignment as listed above. Type “I understand answers need to be written in my own words in full sentences with the exception of values in tables and graphs. I also know graphs need to be my own” **(3 pts)**

## Part 1: Severe weather (36 pts)

Download the associated Weather.xlsx spreadsheet and go to the “Lightning” tab. This data is the number of deaths caused by lightning in the U.S. from 1996 through 2023.

2. What is the total number of lightning deaths in the U.S. from 1996 through 2023? **(3 pts)**
3. Create a scatterplot of this data, add a trendline and display the r-squared value. **(5 pts)**  
**[Paste Graph Here]**
4. Describe the trend you see in the data. **(4 pts)**

Now go to the “Houston Temperature” tab in the Excel file. This is a record of the lowest temperature in Houston every year since 1921. Rank this 103-year record from lowest temperature to highest temperature with 1 being the lowest and 103 being highest. Use the RANK function in Excel; we want years with the same lowest temperature to have the same ranking. For example, if a certain value has a rank of 3, and there are two instances of the value in the data, the RANK function will assign both instances a rank of 3. The next rank assigned will be 5, and no value will be assigned a rank of 4.

The syntax from the RANK function is =RANK(*number*, *ref*, [*order*]) where *number* is the value you want to rank, *ref* is the list of values your comparing in the ranking, and *order* is whether you want to rank the highest value as 1<sup>st</sup> (0) or rank the highest value as your lowest rank (1).

For the first temperature in our Excel file, we'll use =RANK(B2, \$B\$2:\$B\$104, 1). Copy that formula for the entire dataset. You can round to the nearest whole number.

5. What is the ranking for 21°? **(3 pts)**
6. Now calculate the recurrence intervals for your data set (see assignment 2 if you don't remember how to do this). What is the recurrence interval for 21° in Houston? **(3 pts)**
7. Create a scatterplot with recurrence interval on the x-axis and temperature on the y-axis. Choose the appropriate trendline to add and show its equation and r-squared value. Paste this graph and information below. **(6 pts)**  
**[Paste Graph Here]**
8. The lowest temperature recorded during the February 2021 winter storm was 13°. What recurrence interval did you determine for 13° in column D? **(3 pts)**
9. What is the recurrence interval for 13° based on the trendline equation from your graph in #7? You'll need to manipulate the equation like we did in assignment 2. Enter this equation in excel =exp((y-b)/m), where y is 13, b and m are the parts from your line equation. **(4 pts)**
10. What is the difference between what you calculated from the data set and what you calculated based on the trendline from the data? Considering the r-squared value, do you think this is a large error? **(5 pts)**

## Part 2: Hurricanes (44 pts)

11. What do you think the recurrence interval is for a hurricane coming to the Houston area? **(3 pts)** (This is an opinion question; full credit for a well-thought answer)

Head to this NOAA website: <https://coast.noaa.gov/hurricanes/>. This site shows historical hurricane tracks and their intensities. Type Houston into the search box and select "Houston, Harris County, TX" and then set the search distance to 100 miles (be sure to change from nautical miles).

12. Using the category filters to complete this table about hurricane statistics **(8 pts)**:

<b>Total number of storms (tropical storms to Cat 5)</b>	
<b>Number of tropical storms</b>	
<b>Number of hurricanes</b>	
<b>Number of major hurricanes (Cat 3 to 5)</b>	

- 13.** Continuous records start in the year 1851, so there are 173 years on record. Discuss the recurrence intervals for each of the groups in the previous question (to the nearest tenth digit). Describe the relationship between recurrence interval and the magnitude of these storms. **(5 pts)**
- 14.** How did your calculation of hurricane recurrence compare to what you thought in question #10? **(3 pts)**
- 15.** What is the probability (P) each year that a storm in each of these groups can come within 100 mi of Houston? ( $P = 1/r$ ) **(8 pts)**

<b>Any storm rated tropical storm to Cat 5</b>	
<b>A tropical storm</b>	
<b>A hurricane</b>	
<b>A major hurricane (Cat 3 to 5)</b>	

- 16.** Now do the same to Miami, FL. Type Miami into the location box on the home page and select "Miami, Miami-Dade County, FL". Find the numbers of storms (#'s) and calculate the recurrence interval (RI) and probability (P) for each. **(12 pts, 1 pt each)**

	#'s	RI	P
<b>Any storm rated tropical storm to Cat 5</b>			
<b>A tropical storm</b>			
<b>A hurricane</b>			
<b>A major hurricane (Cat 3 to 5)</b>			

- 17.** Describe any similarities and differences in the storm statistics between Houston and Miami. **(5 pts)**

### Part 3: The 1900 Galveston Hurricane (17 pts)

Go to this NOAA website to read about the Great Galveston Hurricane of 1900. Answer the following questions by summarizing the information from the reading:

[https://celebrating200years.noaa.gov/magazine/galv\\_hurricane/welcome.html](https://celebrating200years.noaa.gov/magazine/galv_hurricane/welcome.html)

- 18.** What was the estimated windspeed of the storm, and based on that, what was the category rating of this hurricane? **(3 pts)**
- 19.** What evidence did Galveston Weather Station Chief Isaac M. Cline use to issue a hurricane warning on September 8, one day before the hurricane hit? **(4 pts)**

- 20.** The storm surge from this hurricane is what caused the death and destruction. How high (in feet) was the storm surge of the hurricane compared to the highest elevation of Galveston? **(4 pts)**
- 21.** What three things did the city of Galveston do to help prevent this disaster from happening again? Did these actions taken help prevent or lessen disaster when another hurricane hit in 1915? Explain. **(6 pts)**