Irma and Maria: A (Statistical) Tale of Two Storms

The year, 2017, had been predicted by several forecasters to be above average for hurricane and tropical storm activity in the Atlantic. How many hurricanes had occurred in the Atlantic basin in the years since 2000 leading up to 2017?

Here are the numbers of hurricanes which had previously occurred in each of the years from 2000 through 2016:

8, 9, 4, 7, 9, 15, 5, 6, 8, 3, 12, 7, 10, 2, 6, 4, 7

By all accounts, 2017 met the fears of the forecasters, producing 17 tropical storms *including 10 hurricanes*, four of which were classified as "major hurricanes."

Use the link on the AP Stat page of captainmath.net, and click on "One Quantitative Variable." Name the variable, Number of Hurricanes per Year and enter the numbers above as Raw data. Then click on Begin Analysis and explore the graphs and statistical output.

1. Describe the distribution of the numbers of hurricanes occurring in each year 2000-2017.

2. Which of the Split stems settings available for stemplots do you think gives you the best look at the shape of this distribution? Why?

3. Interpret the standard deviation of the number of hurricanes during the each of the years 2000-2017.

4. How many hurricanes would this year need to produce in order to be declared an "outlier" for the number of hurricanes produced in the Atlantic basin? Check your answer by making a box plot in the applet with your answer for this year's number of hurricanes included in the data.

Irma's Wind Speed

As of 5pm on 9/6/17, Irma was packing sustained winds of 185 mph. Did this make Irma unusually powerful among Hurricanes recorded since 1959? Answer the following questions.

Cat 4-5 Atlantic Hurricanes 1959-present

	Wind_Speed
S1 = mean ( )	149.394 mph
S2 = count ( )	66
S3 = stdDev ( )	15.8725 mph
S4 = min ( )	130 mph
S5 = Q1 ( )	140 mph
S6 = median ( )	145 mph
S7 = Q3 ( )	160 mph
S8 = max ( )	215 mph

1. Describe the distribution of sustained wind speeds of Atlantic hurricanes since 1959.

2. Compare the two measures of center you find in the chart.

3. What is the best reason you can give for the difference you observe in the two measures of center?

4. Based on the statistics in the chart, would any of the Atlantic hurricanes between 1959 and the present be considered outliers for their max wind speeds? Was Irma an outlier?

5. Interpret the standard deviation of the wind speeds of the hurricanes.

6. How many mph above average was Irma's maximum sustained wind speed?

7. How many standard deviations above average was Irma's max sustained wind speed?

Irma's Air Pressure

Hurricanes are not only measured by their wind speeds. Another important consideration is their minimum air pressure: the lower the minimum air pressure, the stronger the hurricane. On 9/6/17, Irma reached its minimum air pressure of 914 mb.

Cat 4-5 Atlantic Hurricanes 1959-present

	Pressure
S1 = mean ( )	932.477 mb
S2 = count ( )	65
S3 = stdDev ( )	14.7087 mb
S4 = min ( )	872 mb
S5 = Q1 ( )	921 mb
S6 = median ( )	935 mb
S7 = Q3 ( )	942 mb
S8 = max ( )	958 mb

1. Describe the distribution of minimum air pressure for Atlantic hurricanes from 1959-present.

2. How low would a hurricane's pressure need to be to be identified as an outlier?

3. How many millibars below average is Irma's pressure?

4. How many standard deviations is Irma's pressure below average?

Your Assessment of Irma

Write a few sentences assessing how Irma compares among all Atlantic hurricanes since 1959, justifying your position using three statistical reasons from the information provided above.

And Then, There Was Maria

With the region still reeling from the effects of Irma, the hyperactive 2017 hurricane season was hardly over. Soon after Irma came hurricanes Jose, Katia, and Lee, but none of these packed the punch of the season's second hurricane to achieve Category Five status, Maria.

While Irma had left 64.76 billion dollars of damage and 52 people dead, Maria, with its 175mph winds and 908mb minimum air pressure was even more destructive, causing a whopping 91.606 billion dollars of damage and 3,057 deaths. Consider the following questions in comparing Maria with Irma.

1. How many mph was Maria's max wind speed above the average for all Atlantic hurricanes?

2. How many standard deviations above average was Maria's maximum wind speed?

3. How many millibars was Maria's minimum air pressure below the average for all Atlantic hurricanes?

4. How many standard deviations below average was Maria's minimum air pressure?

5. Using your calculations of the number of standard deviations above or below average for Irma and Maria, write a few sentences about which of the two hurricanes was the more powerful storm.

6. Why do you suppose Maria caused so much more damage than Irma? What factors other than wind speed and barometric pressure could explain this?