

## Hurricane season is here again

Another hurricane (a possible a category 4 storm) is now approaching the U.S. East Coast and it will be sure to cause damaging winds, flooding rains and general destruction.

The Northern Atlantic hurricane season occurs between June 1<sup>st</sup> and November 30<sup>th</sup> and the season sharply peaks from late August through September.

Hurricane Harvey, the hurricane that ripped through Texas and Louisiana, was expected to affect more than 22 million people.

1. Considering that there are more than 323 million people in the U.S. about what fraction, or percent, of people in the U.S. were affected by Hurricane Harvey?
  
2. Do you think most U.S. hurricanes affect this many people?

The chart below tells how hurricanes are classified by wind speed. The higher the wind speed the higher the category. This scale is called the Saffir-Simpson Hurricane Wind Scale.

The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 categorization based on the hurricane's intensity at the time. The scale – originally developed by wind engineer Herb Saffir and meteorologist Bob Simpson – has been an excellent tool for alerting the public to the possible intensity of each hurricane. The scale provides examples of the type of damage and impacts in the United States associated with winds of these intensities. **In general, damage rises by about a factor of four for every category increase.**

Scale Number (Category)	Winds Maximum 1-min (mph)
1	74 - 95
2	96 - 110
3	111 - 130
4	131 - 155
5	> 155

3. According to the readings from the National Weather Service that are shown above, each higher category level can cause about four times as much damage as the previous category level (all other variables being the same).
  - a. How many times greater damage could a category three hurricane cause then a category one hurricane?
  
  - b. How many times greater damage could a category four hurricane cause then a category one hurricane?
  
  - c. How many times greater damage could a category five hurricane cause then a category one hurricane?

We found this chart of the most costly hurricane damages at [Wikipedia/ List\\_of\\_costliest\\_Atlantic\\_hurricanes](#)  
**Top Ten Most Costly Hurricanes in U.S. History**

*Damage amounts in U.S. Dollars, adjusted for inflation. Includes all possible hurricanes from 1900 to 2016 (in 2016 equivalent dollars).*

Rank	Name	Year	Category at US landfall	Damage \$ amount	Approximate Population affected
1	Katrina	2005	3	\$108,000,000,000	5,800,000
2	Sandy	2012	1	\$75,000,000,000	8,000,000
3	Ike	2008	2	\$37,500,000,000	4,500,000
4	Wilma	2005	2	\$20,500,000,000	6,000,000
5	Andrew	1992	3	\$26,500,000,000	1,500,000
6	Ivan	2004	3	\$23,300,000,000	60,000
7	Irene	2011	3	\$16,600,000,000	65,000,000

8	Charley	2004	4	\$16,300,000,000	1,900,000
9	Matthew	2016	2	\$15,090,000,000	2,100,000
10	Rita	2005	2	\$12,000,000,000	3,000,000

- Where do you think Hurricane Harvey will fall in the rankings of most costly hurricanes above?
- I thought that the most damaging and costly hurricanes in U.S. history would have been all category 4 or 5. What is the typical category of these top ten most damaging hurricanes? Explain how you determined your answer.
- What other factors may come into play that may determine how damaging a hurricane is beside wind speed?
- Using your estimation skills, about how much in 2016 dollars have these ten hurricanes caused in total damage?

#### HURRICANE DATA CHART

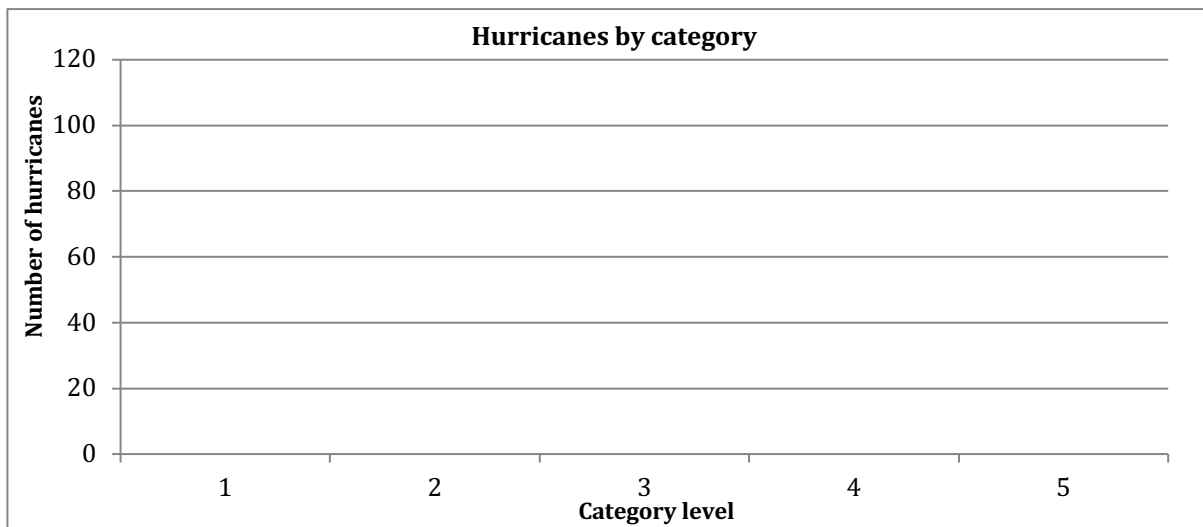
*The chart below gives the **number of hurricanes** by category to strike the mainland U.S. **each decade**. Data from the National Weather Service <http://www.weather.gov/>*

Decade	Category					Total number	Major
	1	2	3	4	5	1,2,3,4,5	3,4,5
1851-1860	7	5	5	1	0	18	6
1861-1870	8	6	1	0	0	15	1
1871-1880	7	6	7	0	0	20	7
1881-1890	8	9	4	1	0	22	5
1891-1900	8	5	5	3	0	21	8
1901-1910	10	4	4	0	0	18	4
1911-1920	8	5	4	3	0	20	7
1921-1930	8	2	3	2	0	15	5
1931-1940	4	7	6	1	1	19	8
1941-1950	8	6	9	1	0	24	10
1951-1960	8	1	6	3	0	18	9
1961-1970	3	5	4	1	1	14	6
1971-1980	6	2	4	0	0	12	4
1981-1990	9	2	3	1	0	15	4
1991-2000	3	6	4	0	1	14	5
2001-2010	8	4	6	1	0	19	7
1851-2010	113	75	75	18	3	284	96

*Note: If a hurricane reached different category levels then only the highest category to affect the U.S. is used in the table.*

- I thought that the occurrence of hurricanes has been increasing over the last several years. Using the data in the chart create a visual representation (a graph) that shows the number of hurricanes per ten year period, since 1851. Carefully consider what type of graph you will create, and how you will set it up. Create your graph on a separate sheet of paper ... preferably graph paper if available.

9. What does your graph tell you? Describe how the occurrence of hurricanes in the U.S. has changed over the last 160 years. How has it changed recently? Are hurricanes occurring more often?
  
10. About how many hurricanes occur in the U.S. each *decade*? Explain how you determined your answer.
  
11. Use your answer to question 8 to determine about how many hurricanes hit the U.S. each *year*.
  
12. What category is the typical hurricane? To find out create a histogram that displays the number of hurricanes that have occurred in each category since 1851. We have started the histogram for you (a histogram is similar to a bar graph, but gives a frequency distribution of the data).



13. Make some mathematical observations from your frequency distribution in regards to how frequent each category of hurricane occurs? Category five hurricanes are often catastrophic. About how often do they occur?
  
14. Using the chart, bar graph and/or frequency table, describe how many hurricanes the U.S. should expect in one decade and in one year. How many category 1, 2, 3, 4 and 5 hurricanes should we expect in a decade and in a year? Show how you found your answers.

All hurricane data was referenced from the National Hurricane Center website: <http://www.nhc.noaa.gov/>  
[http://www.education.noaa.gov/Weather\\_and\\_Atmosphere/Hurricanes.html](http://www.education.noaa.gov/Weather_and_Atmosphere/Hurricanes.html)  
<https://www.census.gov/topics/preparedness/events/hurricanes/harvey.html>  
<https://www.wunderground.com/hurricane/damage.asp>  
[https://en.wikipedia.org/wiki/List\\_of\\_costliest\\_Atlantic\\_hurricanes](https://en.wikipedia.org/wiki/List_of_costliest_Atlantic_hurricanes)

\* Note: The Saffir-Simpson Hurricane Wind Scale is roughly logarithmic. To learn more visit: <http://www.nhc.noaa.gov/aboutsshs.shtml>