RAINFALL

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Rainfall is an extremely important variable for the farming communities of Oklahoma. They need to know whether or not they can expect too little rain or too much rain, which will affect their ability to produce a large crop. Generally, they are looking for trends or patterns in the data over the past few years. Weather is a cyclical process. We tend to experience a block of dry years followed by a block wet years. How long the "blocks" last can differ from decade to decade. But just because in the last 9 years an area experiences rainfall amounts of 20 inches doesn't mean year number 10 also will be 20 inches.

How do you know if today's weather is an extreme event? You must compare today's weather to all recorded weather events or the climate record for your area. The longer the weather data has been collected the more values you have to compare. It is much easier to compare an average value, which represents the climate record to today's weather value. The problem with averages is that they hide the extreme events.

Let's work through a simple example before we tackle the entire rainfall record of Oklahoma. In your math class, you have five grades (i.e. your climate record). The values are 100, 80, 98, 90, and 65. You just received your final exam grade of 79. Will this final exam help or hinder your overall average?

First, calculate your average score for your five grades. Add up the five values. Divide by five (the total number of scores). Your average is 86.6. Don't rely on my computations. Do the math yourself. It is math class after all.

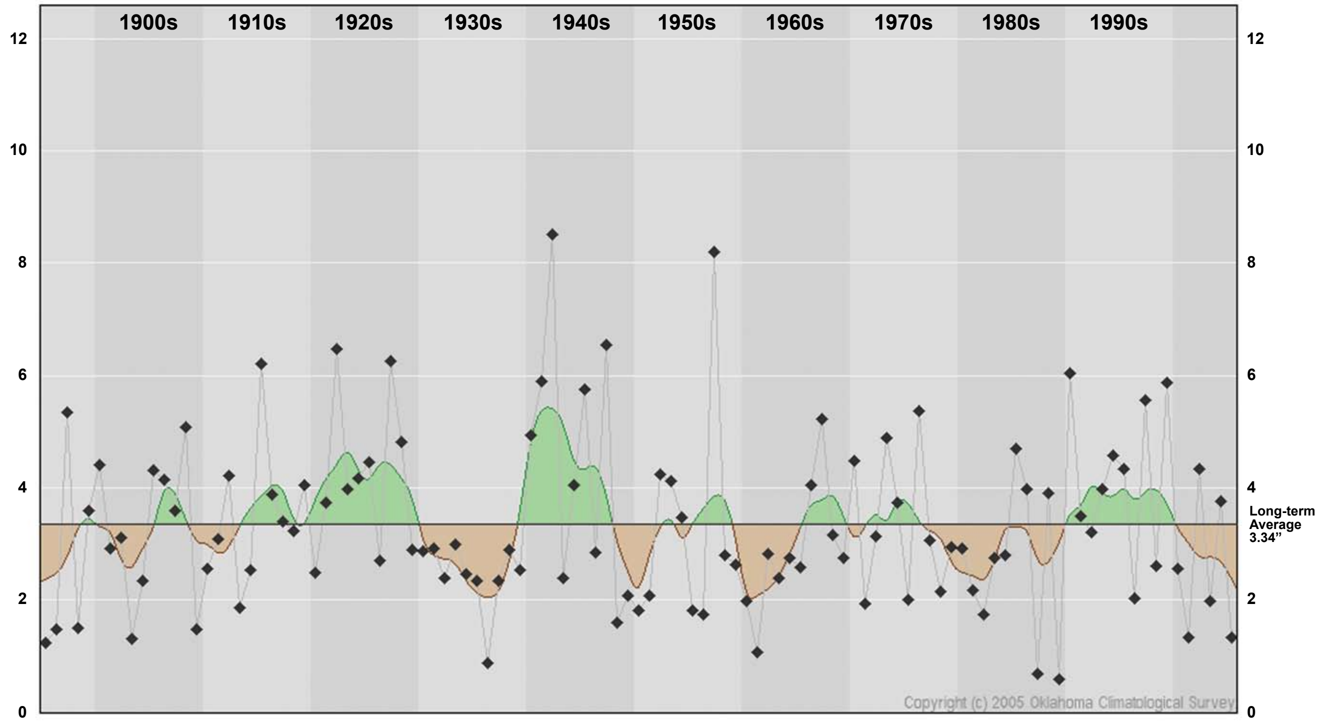
Your final grade of 79 is below your average. Would averaging in a grade of 79 increase of decrease your average? Quickly recalculate to find out.

What happens to your average if your score of 65 was 85 instead?

If all you knew about your scores was your average and your final exam score, what can you say about the two values? Did you score higher or lower than your average? Can you tell just from the average whether a score of 79 is the highest or lowest score you have ever received? No. You have to look at all of the values that make of the 86.6 average to see if 79 is an extreme values (highest or lowest) or if it fits right in the middle of your range of values.

Climate averages are a great tool. But they don't tell the whole story. In the classroom activity, let's look at the precipitation climate record for Oklahoma Aprils.

Figure 1



April Rainfall History with 5-yr Weighted Trends
Climate Division 10 (Statewide) 1895-2005

Wetter historical periods
Drier historical periods

Table 1

Year	Apr	Year	Apr	Year	Apr	Year	Apr	Year	Apr	Year	Apr
1895	1.23	1900	4.4	1910	2.55	1920	2.5	1930	2.88	1940	4.94
1896	1.48	1901	2.93	1911	3.08	1921	3.73	1931	2.93	1941	5.9
1897	5.34	1902	3.12	1912	4.21	1922	6.46	1932	2.4	1942	8.5
1898	1.51	1903	1.31	1913	1.87	1923	3.97	1933	2.99	1943	2.39
1899	3.59	1904	2.34	1914	2.52	1924	4.17	1934	2.47	1944	4.03
		1905	4.32	1915	6.21	1925	4.46	1935	2.35	1945	5.74
		1906	4.14	1916	3.87	1926	2.71	1936	0.88	1946	2.85
		1907	3.58	1917	3.4	1927	6.25	1937	2.35	1947	6.53
		1908	5.07	1918	3.23	1928	4.82	1938	2.9	1948	1.6
		1909	1.48	1919	4.03	1929	2.89	1939	2.54	1949	2.06

Year	Apr	Year	Apr	Year	Apr	Year	Apr	Year	Apr	Year	Apr
1950	1.82	1960	1.98	1970	4.48	1980	2.93	1990	6.03	2000	2.56
1951	2.07	1961	1.07	1971	1.92	1981	2.17	1991	3.5	2001	1.32
1952	4.24	1962	2.83	1972	3.12	1982	1.75	1992	3.2	2002	4.32
1953	4.12	1963	2.39	1973	4.87	1983	2.74	1993	3.96	2003	1.99
1954	3.48	1964	2.75	1974	3.74	1984	2.8	1994	4.57	2004	3.75
1955	1.81	1965	2.57	1975	2	1985	4.69	1995	4.34	2005	1.33
1956	1.74	1966	4.04	1976	5.37	1986	3.97	1996	2.02		
1957	8.18	1967	5.22	1977	3.07	1987	0.69	1997	5.55		
1958	2.8	1968	3.17	1978	2.14	1988	3.91	1998	2.6		
1959	2.62	1969	2.76	1979	2.95	1989	0.58	1999	5.86		

CLIMATE TRENDS EXERCISES

The following table contains the statewide-averaged precipitation for each April from 1895-2005, a span of 111 years. The data are the same that make up the graph seen in Figure 1. The long-term average for April precipitation (the average value of these 111 values) is 3.34 inches.

Exercises:

1. What was the average April rainfall during the 1940s (1940-1949)? Is this above or below the long-term average? By how much?

2. Would you describe the 1940s as having generally wet Aprils, average Aprils, or dry Aprils? Did every individual April in this decade match this description?

3. What was the average April rainfall during the 1950s (1950-1959)? Is this above or below the long-term average? By how much?

4. At first glance, the average April rainfall during the 1950s is very close to the long-term average. Would you say this description fits all of the 1950s Aprils?

5. 1957 featured the second-wettest April on record. What happens to the decade's average April rainfall when the 1957 value is removed? Without the 1957 value to influence the average, would you still describe the decade's rainfall as "near average"?

6. Count the number of Aprils in the climate record with above-normal rainfall. Subtract this number from 111 to determine the number of Aprils with below-normal rainfall. Are these numbers equal?

7. ***(advanced)*** Well more than half of the Aprils in this record feature below-average rainfall. What does this say about rainfall patterns in April?