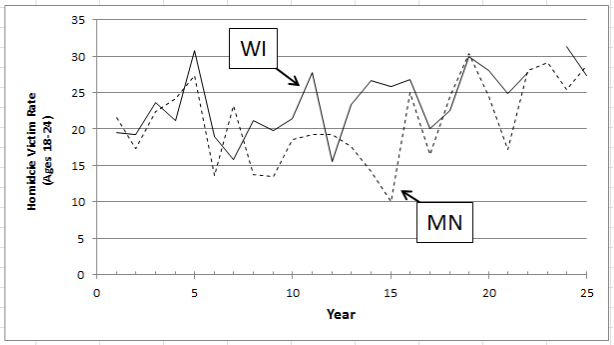
Practice Quiz for Exam #3
Summer 2017

STAT 110: Quiz
Points: 20

Name: Solution

Consider the following data on the homicide victim rate for victims between the ages of 18 and 24. Data was collected for MN and WI over a 25 year period from the U.S. Department of Justice web site.

	A	B	C
1	Year	MN	WI
2	1	21.6	19.5
3	2	17.3	19.2
4	3	22.4	23.7
5	4	24.2	21.2
6	5	27.4	30.8
7	6	13.6	19
8	7	23.2	15.8
9	8	13.8	21.1
10	9	13.5	19.8
11	10	18.5	21.5
12	11	19.2	27.7
13	12	19.2	15.6
14	13	17.6	23.4
15	14	14.2	26.6
16	15	10	25.9
17	16	25	26.8
18	17	16.5	20
19	18	24.4	22.6
20	19	30.4	29.9
21	20	24.4	28
22	21	17.2	24.9
23	22	28.1	27.7
24	23	29.1	
25	24	25.4	31.3
26	25	28.7	27.3



Question of Interest: Are there differences in the homicide victim rates for those victims between the ages of 18 and 24 between MN and WI? If so, what are these differences?

1. The first thing a statistician would do with this data is compute the differences in the data from MN and WI. Why would a statistician do this for this type of data? Explain. (3 pts)

Crime patterns change over time due to various circumstances. If the goal is to compare MN crime patterns to WI, then such comparison should be done on a year-by-year basis. An analysis using the difference will allow for comparisons to be done most fairly.

	A	B	C	D
1	Year	MN	WI	Difference
2	1	21.6	19.5	2.1
3	2	17.3	19.2	-1.9
4	3	22.4	23.7	-1.3
5	4	24.2	21.2	3

2. There is some missing data for WI in Year 23. Your friend suggests putting a 0 in for the missing value so that a difference can be computed for this year. Do you agree or disagree with this suggestion. Explain your reasoning. (3 pts)

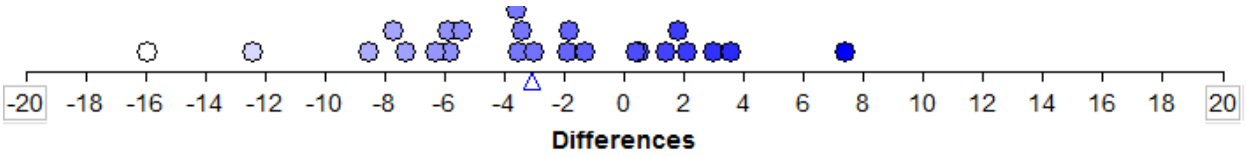
I would disagree with this suggestion. A value of 0 would imply a crime rate of 0 and this is not the same as a missing value. This value should be left blank and hence Year 23 will not be considered in our analysis as WI has missing information for this year.

	A	B	C	D
1	Year	MN	WI	Difference
23	22	28.1	27.7	0.4
24	23	29.1		
25	24	25.4	31.3	-5.9
26	25	28.7	27.3	1.4

3. Consider the following summaries for the differences. Differences were computed as follows.

Difference = MN – WI

	A	B	C	D	E	F	G
1	Year	MN	WI	Difference			
2	1	21.6	19.5	2.1		Average	-3.0625
3	2	17.3	19.2	-1.9		Std Dev	5.2942
4	3	22.4	23.7	-1.3		Count	24
5	4	24.2	21.2	3			
6	5	27.4	30.8	-3.4			
7	6	13.6	19	-5.4			



Give a brief discussion of what is learned by considering the above average and standard deviation. (3 pts)

The average difference is about -3. This value suggests that, on average, MN will have a crime rate that is about 3 less per year than WI. The standard deviation value is about 5, which is fairly large relative to the average. Thus, there appears to be quite a bit of spread in the differences for each year. This is evident in the dotplot as well.

4. I ran a statistical test for the above question of interest in Excel. Consider the following output.

	A	B	C	D	E	F	G	H
1	Year	MN	WI	Difference	Reference Value			
2	1	21.6	19.5	2.1			Average	-3.0625
3	2	17.3	19.2	-1.9			Std Dev	5.2942
4	3	22.4	23.7	-1.3			Count	24
5	4	24.2	21.2	3				
6	5	27.4	30.8	-3.4			**P-Value**	**0.00941**
7	6	13.6	19	-5.4				
8	7	23.2	15.8	7.4				

a. What reference value did I use to run this test? Explain. (2 pts)

For the question of interest given, a reference value of 0 should be used. A value of zero suggests no average difference in crime rates between MN and WI.

b. P-value and decision (1 pt)

P-value: 0.0094

The Decision Rule: If p-value is less than 0.05, then the data supports the question of interest.

Decision: `0.0094 is less than 0.05; thus, we have enough statistical evidence to support the question of interest`

5. Circle the most correct conclusion for this test. (4 pts)

   a. In any given year, we are 95% certain that MN will have a lower homicide rate than WI for the 18-24 age group.
   (b.) In any given year, we are 95% certain that there is a difference in the homicide rates between MN and WI for 18-24 age group.
   c. In any given year, we are 95% certain that WI will have a lower homicide rate than MN for the 18 – 24 age group.
   d. In any given year, we are 95% certain that there is no difference in the homicide rate between MN and WI for the 18-24 age group.

6. I have computed a 95% confidence interval for the difference in the homicide rates between MN and WI. Again, Difference = MN – WI.

$$\text{Lower Endpoint}: -3.06 + \left(-2.07 * \frac{5.29}{\sqrt{24}} \right) = -5.3$$

$$\text{Upper Endpoint}: -3.06 + \left(2.07 * \frac{5.29}{\sqrt{24}} \right) = -0.82$$

   Circle the most correct interpretation for this interval. (4 pts)

   (a.) In any given year, we are 95% certain that the homicide rate in MN will be about 1 to 5 lower than in WI.
   b. In any given year, we are 95% certain that the homicide rate in WI will be about 1 to 5 lower than in MN.
   c. These rates are negative and you cannot have a negative homicide rate, so something is wrong with this interval.
   d. In any given year, we are 95% certain that the homicide rate between MN and WI is different because this interval does not contain 0.