Unit 2, AS2: Variability
(Please write your answers in red)

1. Define the preferred descriptive measure of variability: _____ **standard deviation – average distance of the scores from the means.**

2. All distributions can be fully described by which 3 "measures"?

    1.**_Central Tendency_____**   2. ____**Shape_____**   3.__**Measures of Variability_____**

3. If a professor returned an exam to you and your exam only had a deviation score of 25, what would you know about the location of your X-score (your exam score) on the distribution of the entire set of scores?

_____

That my score was give or take 25 from the mean average of the entire class.

4. If a professor returned an exam to you and your exam had a deviation score of -8, and the professor told you that the class mean was 70, you would know that your exam score was:

    Answer:___**It tell me that I scored below the mean average score.**

5. Make up 3 sets of data, each of which has 6 scores so that one set has very high variability, one has very low, and one has zero variability:

    High variability__ **23, 28, 4, 80, 136, 69**

    Low variability___**35, 36, 32, 29, 33, 35**

    Zero variability___ **8, 8, 8, 8, 8, 8**

6. Imagine a data set for maze running times for n =50 rats. The mean is 25seconds and the standard deviation is 5 seconds. What, specifically, does the measure of standard deviation tell you about the maze running of the n=50 rats?

_____

That the rats that ran in the maze on average ran 5 seconds faster or slower than the mean of 25 seconds.

_____

7. What is the statistical notation for the following?

    Population standard deviation:_ **(σ)**   Sample standard deviation: _**(s)**

    Sum of the squared deviations:__ **SS**

8. Calculate SS (by hand) for the following set of population data:

   Data set: 4, 6, 2, 1, 3, 2, 4, 0, 5

   Answer: _____**30**_____

9. Calculate the population variance (by hand) for the data set in question 8.

   Answer:_____**3.33**_____

10. Calculate the population standard deviation for the data set in question 8.

    Answer:_____**1.82**_____

11. A population has a mean of 80 and a variance of 9 . What is its standard deviation?

    Answer:_____**3**_____

12. A sample data set has a standard deviation of 3.8 . What is its variance?

    Answer:_____**14.44**_____

13. Calculate SS (by hand) for the following set of sample data: 1, 6, 10, 9, 4, 6

    Answer:_____**54**_____

14. Calculate the sample standard deviation for the data set in question 13.

    Answer:_____**3.28**_____

15. What is the variance for the sample data in question 13?

Answer:_____**10.8**_____

16. If a sample has a standard deviation of 2.44, what is its variance?

Answer:_____**5.95**_____

17. If a sample has a variance of 6, what is its standard deviation?

Answer:_____**2.45**_____

18. A study examines the relationship between hours of sleep and the level of relaxation one feels in the afternoon in a SAMPLE of women. One group was allowed to sleep between 5 and 6 hours and the other group was allowed to sleep between 7 and 8 hours.

Here are the data for both groups: 5-6

5-6 hours of sleep: 10, 12, 6, 4

7-8 hours of sleep: 5, 6, 10, 3

Calculate the following by hand:

Calculate the mean for the 5-6 hour group. Answer_____**8**_____

Calculate the mean for the 7-8 hour group. Answer:_____**5.5**_____

Calculate the standard deviation for the 5-6 hour group. Answer: _____**3.65**_____

Calculate the standard deviation for the 7-8 hour group. Answer:____**2.94**_____

What can you say about the differences/similarities in the descriptive statistics between the groups?
_____
That the group that slept shorter hours experienced higher levels of relaxation but the scores had a greater amount of variability than that of the ones who slept longer hours.
_____

19. These data are teacher first year salaries across a number of states. Enter these data, using SPSS (you should enter the data WITHOUT the $ signs) and calculate the mean and the standard deviation for these data as well as an appropriate graph.

$57,000	$32,200
$45,000	$35,100
$32,100	$23,250
$36,000	$35,100
$21,900	$23,250
$27,900	$29,250
$24,000	$30,750
$30,300	$22,350
$28,350	$30,000
$27,750	$30,750
$35,100	$34,800
$27,300	$60,000
$40,800	$45,000
$103, 42,	$300750
$26,250	$38,850
$21,750	$24,000
$16,950	$21,150
$31,050	$60,376
$32,550	$31,200
$36,150	$42,000
$92,000	$81,250
$31,350	

Statistics

Salaries

N	Valid	43
	Missing	0
Mean		37168.0465
Std. Deviation		18274.67710

Histogram

Mean = 37168.05
Std. Dev. = 18274.677
N = 43
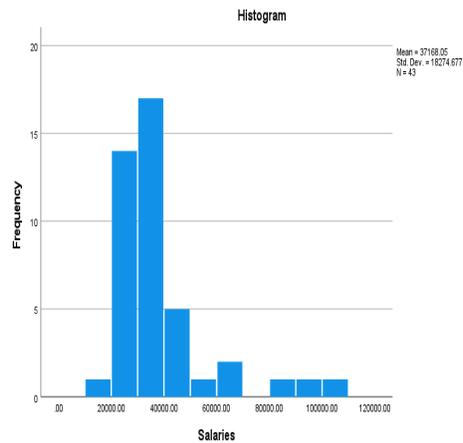
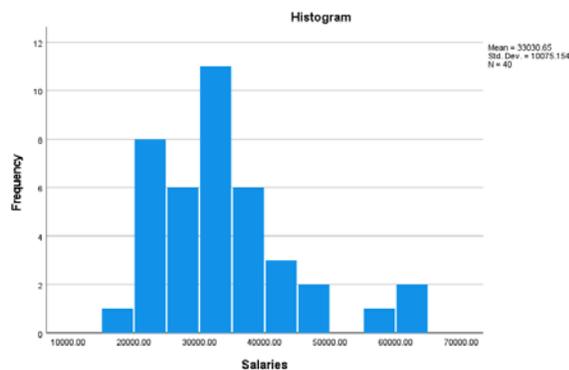Based on your SPSS results, what is the mean? _____**37168.05**_____

Based on your SPSS results, what is the standard deviation?_____ **18274.67**_____

20. Using SPSS and the same data set given in question 19, but this time omitting the following values: $103,750, $81,250, and $92,000, calculate the mean, the standard deviation, and generate an appropriate graph.

Statistics

Salaries

N	Valid	40
	Missing	0
Mean		33030.6500
Std. Deviation		10075.15388

Histogram

Based on your SPSS results, what is the mean? _____**33030.65**_____

Based on your SPSS results, what is the standard deviation? ___ **10075.15**____

21. Review both SPSS results. Compare the SPSS results (the data set with all of the salaries to the data set omitting some of the salaries. Based on both analyses of these data, what measure of central tendency do you think is appropriate for each of the analyses and <u>why?</u> Note your answers below:

For the data set including all of the salaries:

_____

The measure of central tendency that would be best would be the median, because of the outliers, there are a very few high salaries, and therefore the mean would be pulled towards those scores and the mode towards the lower salaries.

For the data set omitting some of the salaries:

_____

For the data set omitting the salaries I would still use the median, even with removing some of the higher salaries there are still outliers in the data to misinterpret the mean as a measure of central tendency.

To what do you attribute the differences in the standard deviations between the two data sets?

_____

The removal of some of the higher salaries changed the means to a lower bracket and brought the amount of money, more or less of the teacher's difference in salaries.

_____

22.

Females	Males
9	8
9	10
10	11
13	9
8	6

Above are SAMPLE data for standardized intelligence scores for men and women.

What is the mean for women?   ___**9.8**_____

What is the mean for men?   _____**8.8**_____

What is the standard deviation for women? _____**1.92**_____

What is the standard deviation for men? _____**1.92**_____

23. Based on the means and standard deviations for #22, describe the differences/similarities in intelligence scores for women and men.

_____

Based on the means and standard deviation of the above scores of the sample data on intelligence score for men and women, they are exactly the same in average and there is no comparatively distinctive variations between the two tested groups. Both groups tested equally intelligent.

_____

24. The following POPULATION data represent memory scores obtained for two groups of women, one older and one younger.

Younger	Older
8	7
7	5
6	8
6	5
6	7
3	10

Calculate the sample mean for younger women__ _____**6**_____

Calculate the sample mean for older women_____**7**_____

Calculate the standard deviation for younger women___**1.52**_____

Calculate the standard deviation for older women_____**1.73**_____

Based on the means and standard deviations, describe the differences in scores between younger and older women

_____

Based on the means and standard deviations the scores between the younger and older women indicate that the older women have a higher memory average than younger women but there are no great variation between them.

_____

TRUE / FALSE

__**T**_ 25. The range, the standard deviation, and variance are all measures of distance.

__**F**__ 26. If the highest score in a distribution is $X = 15$ and the lowest is $X = 3$, then the range is 12 or 13 points.

__**F**_ 27. The range is not usually considered to be a relatively crude measure of variability.

_**T**__ 28. For a population of scores, the sum of the deviation scores is equal to N.

_ **F** __ 29. For a population data set and for a sample data set, a deviation score is computed as $X – \mu$

_ **T**___30. A positive deviation always indicates a score that is more than the mean.

__ **F** __ 31. For a population of $N = 3$ scores with $\Sigma X = 1$ and $\Sigma X^2 = 30$, $SS = 4$.

__ **F** __32. To calculate the variance for a population, SS is divided by N-1.

__ **T** __ 33. A population with $SS = 90$ and a variance of 9 has $N = 10$- scores.

__ **T** ___ 34. If the population variance is 5, then the population standard deviation is its square root.

__ **F** _ 35. If the population variance is 4, then the standard deviation will be $\sigma = 16$.

__ **T** __ 36. If the scores in a population range from a low of $X = 5$ to a high of $X -= 14$, then the population standard deviation must be less than 10 points.

__ **F** __ 37. A sample of $n = 6$ scores has $SS = 30$ and $s^2 = 6$. If the 6 scores were a population, the value of SS would still be 30, but the variance would be $\sigma^2 = 5$.

_ **T** __ 38. A sample with a variance of 25 has a standard deviation equal to 5 points.

_ **F** __ 39. To calculate the variance for a sample, SS is divided by n