

David Blaiklock
Homework 1

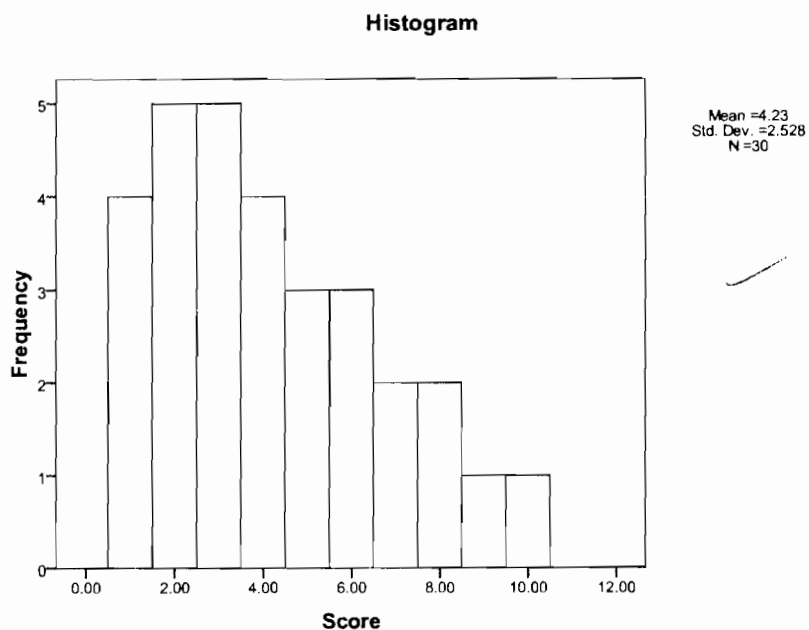
1. Use SPSS to create a) frequency distribution and b) a histogram.

a.

Score

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1.00	4	13.3	13.3	13.3
2.00	5	16.7	16.7	30.0
3.00	5	16.7	16.7	46.7
4.00	4	13.3	13.3	60.0
5.00	3	10.0	10.0	70.0
6.00	3	10.0	10.0	80.0
7.00	2	6.7	6.7	86.7
8.00	2	6.7	6.7	93.3
9.00	1	3.3	3.3	96.7
10.00	1	3.3	3.3	100.0
Total	30	100.0	100.0	

b.



well done!

- Based on the frequency distribution, if a student received a score of 7 what percentage of students obtained the same or lesser score? 86.7 ✓
- Based on the histogram, how would you justify the shape of the distribution? Is it positively skewed, negatively skewed, or neither? Justify your response. This distribution is positively skewed as the majority of the scores fall on the left hand side of the distribution. The tail of the distribution points to the high end of the scores indicating that the mode < median < mean.
- Assuming the scores constitute a population, calculate the value of μ . Show your work and report your response to *at least two decimal places*.

$$\mu = \frac{\sum X}{n} = \frac{\sum 2 \dots 10}{30} = \frac{127}{30} = 4.23 \quad \checkmark$$

- Assuming the scores constitute a population, calculate σ^2 and σ . Show all your work and report your response to at least two decimal places.

$$\sigma^2 = \frac{\sum (x - \bar{x})^2}{n} = \frac{\text{Sum of Squares}}{n} = \frac{185.37}{30} = 6.18 \quad \checkmark$$

$$\sigma = \sqrt{\sigma^2} = \sqrt{6.179} = 2.49 \quad \checkmark$$

- Imagine the scores were obtained from a random sample. What are the values of \bar{x} , s^2 , and s . Use work from previous items where appropriate and report responses to *at least two decimal places*.

$$\bar{x} = \frac{\sum X}{n} = \frac{\sum 2 \dots 10}{30} = \frac{127}{30} = 4.23 \quad \checkmark$$

$$s^2 = \frac{\sum (x - \bar{x})^2}{n-1} = \frac{\text{Sum of Squares}}{n-1} = \frac{185.37}{30-1} = \frac{185.37}{29} = 6.39 \quad \checkmark$$

$$s = \sqrt{s^2} = \sqrt{6.39} = 2.53$$

7. Use SPSS to compute the mean, median, mode, standard deviation, and variance, for the distribution to at least two decimal places. Paste the SPSS output into the assignment.
How do the results compare to your calculations?

Statistics

Score

N	Valid	30
	Missing	0
Mean		4.2333
Median		4.0000
Mode		2.00 ^a
Std. Deviation		2.52823
Variance		6.392
Minimum		1.00
Maximum		10.00

The results of these calculations compare to the calculations made for the sample where the sum of squares was divided by $n-1$ as opposed to the population where the sum of squares is divided by n .

8. Change one value of 5 to 12. Using SPSS, recomputed the mean, median, mode, standard deviation, and variance to at least two decimal places.

Statistics

Score

N	Valid	30
	Missing	0
Mean		4.4667
Median		4.0000
Mode		2.00 ^a
Std. Deviation		2.89748
Variance		8.395
Minimum		1.00
Maximum		12.00

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9. Change the value of 12 to 1. Using SPSS, recomputed the mean, median, mode, standard deviation, and variance to at least two decimal places.

Statistics

Score

N	Valid	30
	Missing	0
Mean		4.1000
Median		3.5000
Mode		1.00 ^a
Std. Deviation		2.59110
Variance		6.714
Minimum		1.00
Maximum		10.00

10. Examine the responses to 7, 8, and 9. Discuss the reason for the changes you observe in the mean, median, mode, standard deviation, and variance. The changes observed in all of the values are a result of the change of one piece of data. These statistics are vulnerable to all of the data that supports them. In question 8, an outlier of twelve increased the mean, standard deviation, and variance while in 9 the extra value of 1 decreased them. The larger the n, the less influence one piece of data has on these values. In terms of the median and mode, replacing a value of 5 with a value of twelve did not impact them because the value remained higher than the median and mode. However, when the value was changed to 1, it presented a value less than the original median and decreased it. The value of 1 also increased the number of times that value occurred making it a multimodal distribution (the distribution was already bimodal with a mode of 2 and 3).

	Mean	Median	Mode	Standard Deviation	Variance
Original Data	4.23	4.00	2.00	2.53	6.39
Value Changed to 12	4.47	4.00	2.00	2.90	8.40
Value Changed to 1	4.10	3.50	1.00	2.59	6.71

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11. Based on the mean, median, and mode computed by SPSS in item 7, how would you describe the shape of the distribution? This distribution is positively shaped as the mode < median < mean. ✓

12) What Z-scores cuts off the bottom 25% of the normal distribution? (1 point)?

-0.674

13) Fred and Sue are in two different US history classes. Fred receives a score of 97 on his test ($\mu = 80, \sigma = 10$). Sue receives score of 88 on her test ($\mu = 75, \sigma = 5$). Who is performing better in US history? Explain your answer. (4 points).

The z-score needs to be calculated for each score to determine who is doing better. The z-score will allow for the comparison of the two scores on a normal distribution.

$$\text{Fred- } z = \frac{x-\mu}{\sigma} = \frac{97-80}{10} = 1.7$$

$$\text{Sue- } z = \frac{x-\mu}{\sigma} = \frac{88-75}{5} = 2.6$$

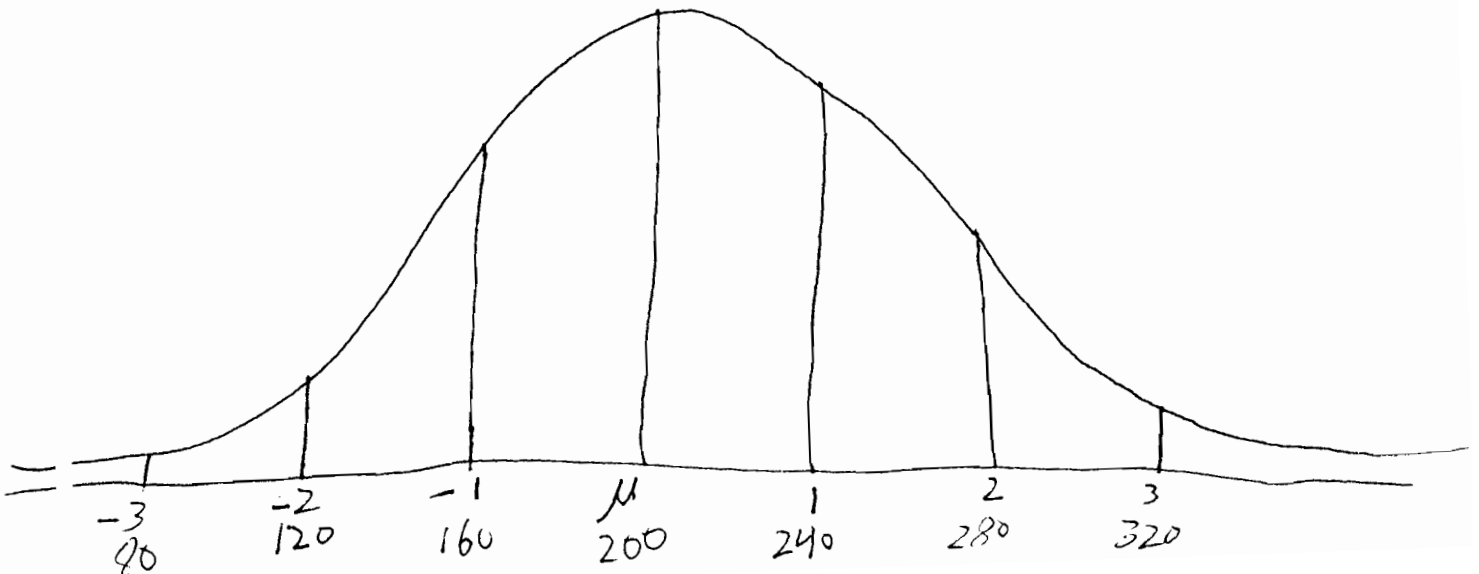
Using a z-table, Sue's z-score of 2.6 indicates that she has performed at the 99.5th percentile of everyone who took the same test as her. Fred's z-score of 1.7 indicates that he performed at the 95.5th percentile of everyone who took the same test as him. Therefore, since Sue had a higher percentile rank, she is performing better in US history.

14) What score would Sue have had to receive to be performing at the same level as Fred? (3 points).

$$z = \frac{x-\mu}{\sigma} = 1.7 = \frac{x-75}{5} = (5)(1.7) + 75 = x = 83.5$$

Sue would need a score of 83.5 to perform at the same percentile rank as Fred.

15) Draw and label the normal curve associated with this distribution of scores, including both raw and z-scores, for at least three standard deviations above and below the mean. (2 points).



16) Compute the Z score for a score of 250. Show your work. (2 point).

$$z = \frac{x-\mu}{\sigma} = \frac{250-200}{40} = 1.25$$

17) What is the raw score that corresponds to a Z-Score of -1.75? (2 points)

$$z = \frac{x-\mu}{\sigma} = -1.75 = \frac{x-200}{40} = (40)(-1.75) + 200 = x = 130$$

18) What is the raw score that 75% of the population fell at or below? (2 points).

Using a z-table, the z-score of 0.674 corresponds with the 75th percentile.

$$z = \frac{x-\mu}{\sigma} = 0.674 = \frac{x-200}{40} = (40)(0.674) + 200 = x = 226.96$$

19) Identify a possible data set and sample you would like to use for your final paper.

I am currently looking at using the public school district data for the state of Virginia that is on the NCES website. The school district will be the unit of analysis.

20) Identify specific variables or issues you are interested in exploring in that data set,

I am looking at the amount of money spent per pupil and the student teacher ratio affects the percentage of students receiving special education services (as identified by students on an IEP). I am also looking at the relationship between the types of staff (teachers versus nonteachers) and students receiving special education services. Finally, I am looking at types of staff and type of location (rural/suburban/city) impacts the percentage of students in special education. Overall, I am looking at how spending and staffing patterns impacts the number of students receiving special education services based on the availability of staffing resources based on the location.

21) Describe the sample as you would for the Participants section of a manuscript (i.e., in paragraph form APA style), including descriptive statistics (e.g., frequency, range, mode, median, mean, standard deviation—as appropriate) for relevant demographic information (e.g., age, gender, level of education).

Participants

Participants in this study were the Virginia public school districts. The data on spending, staffing patterns, type of location, and categorization of receiving special education services, was obtained from Virginia's 2000 report to the National Center for Education Statistics (NCES).