Worksheet 3a. Dr. Nicole Vittoz

Class Exercises for **3.a. Z-scores**

1. A scandal erupted in the U.S. when employees of a major corporation found out that the chief executive officer (CEO) was having an office created that was 160 square feet in size. To find out if this size office was unusual, you measured the square footage of the desks in the official office of four U.S. governors and of four CEOs of major U.S. corporations. The figures for the governors were 104, 112, 124, and 138 square feet. The figures for the CEOs were 86, 110, 140, and 144 square feet. How big is the 160-square-foot office relative to the sampled offices? To find out, convert the scandalous office size into a Z-score using first the governors' office size data and then using the CEOs' office size data.

a. Convert the scandalous office size into a Z-score using first the governors' office size data.

Steps:

1. Find the mean and standard deviation of the governors' office sizes.
2. Subtract from the scandalous office size the mean of the governors' office sizes.
3. Divide by the standard deviation.

NOTE: If the office size is smaller than the mean, the Z-score will be negative.

$$Z = \frac{X - M}{SD}$$

Scores: X	Score - Mean: X-M	(Score-Mean)^2: (X-M)^2
M =	SS: Σ(X-M)^2 =	
	N =	
	SD^2 =	
	SD =	

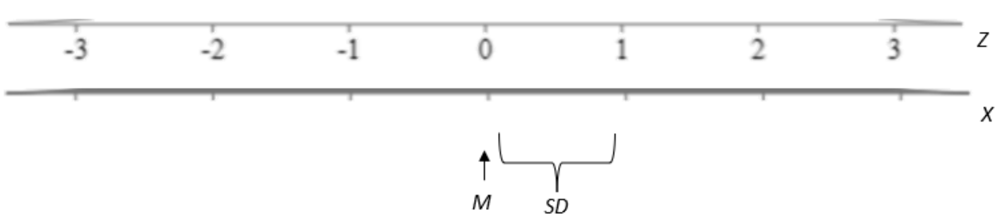
$M = \frac{\sum X}{N} =$

$SD^2 = \frac{\sum(X-M)^2}{N} =$ $SD = \sqrt{SD^2} =$

Z-score for 160 square feet: $Z = \frac{X-M}{SD} =$

Translate that finding into words:

In order to visualize the meaning of Z-scores, you can create a scale aligning raw scores (*X*) to Z-scores in a dataset. Fill in the values on the scale below. Locate 160 square feet on this scale.



b. Convert the scandalous office size into a Z-score now using the CEOs' office size data.

Scores: X	Score - Mean: X-M	(Score-Mean)^2: $(X-M)^2$
M =	SS: $\Sigma(X-M)^2$ =	
	N =	
	SD^2 =	
	SD =	

$$M = \frac{\sum X}{N} =$$

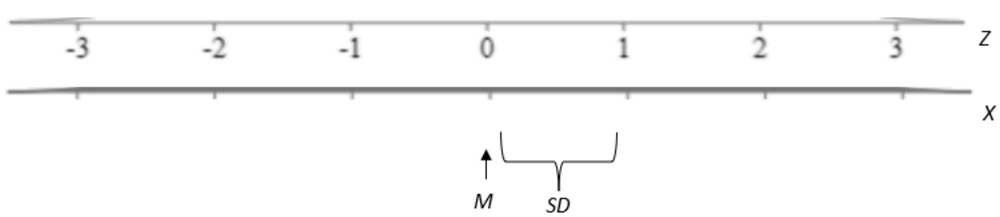
$$SD^2 = \frac{\sum(X-M)^2}{N} =$$

$$SD = \sqrt{SD^2} =$$

Z-score for 160 square feet: $Z = \frac{X-M}{SD} =$

Translate that finding into words:

In order to visualize the meaning of Z-scores, you can create a scale aligning raw scores to Z-scores in a dataset. Fill in the values on the scale below. Locate 160 square feet on this scale.



Is the office size more scandalous among a sample of governors or among a sample of CEOs?

If we set a standard of 2 standard deviations above the mean as truly scandalous, does a 160-square foot office qualify?

---

2. You have been tasked with selecting an intern for your company. You have been instructed to hire the person with the best performance in their business degree. However, you do not have access to the rankings of candidates within their classes. You are also aware that the business schools from which the candidates graduated have very different grading systems, so a higher grade may not imply better performance. Using the information below, standardize the candidates' grades to allow for a direct comparison and determine which candidate you will select.

Candidate A: Grade = 3.3	School A: Mean Grade = 3.2 (SD = 0.5)
Candidate B: Grade = 3.6	School B: Mean Grade = 3.7 (SD = 0.3)
Candidate C: Grade = 2.9	School C: Mean Grade = 3.5 (SD = 0.4)

Z-scores:

A $Z = \frac{X-M}{SD} =$

B $Z = \frac{X-M}{SD} =$

C $Z = \frac{X-M}{SD} =$

The best candidate is: ____

3. Suppose you come across a business school that ranks their candidates by assigning them Z-scores, but you need to include in your candidate selection report their actual grade. You look up the mean grade and the standard deviation for that candidate's graduating class and find out it is Mean = 3.0 (SD = 0.8). If that candidate's Z-score is -0.5, what was her/his actual grade?

$X = (Z)(SD) + M =$
____