homework\_problem\_set\_2

JP

9/1/2021

1. Tell me what each of these symbols mean. Try this without looking at your notes.

**Answer**

**Answer**

**Answer**

**Answer**

**Answer**

**Answer**

**Answer**

1. If I were to give you the following scores/values, what would the standard deviation be?

10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10

**Answer**

1. What is the range indirectly useful for finding?

**Answer**

1. What is the difference between variance and standard deviation? What is similar about variance and standard deviation?

**Answer**

1. How do we get around the sum of deviations equaling zero? What are we doing to calculate for variance and standard deviation?

**Answer**

1. What is the area under the curve/proportion at or below the following z-scores?

## z  
## 1 1.40  
## 2 -0.40  
## 3 3.10  
## 4 0.80  
## 5 -1.70  
## 6 2.57  
## 7 1.67  
## 8 1.11  
## 9 0.00  
## 10 -2.99

**Answer** For the following z-scores, the area under the curve is: 1.40 = -.4 = 3.1 = .8 = -1.70 = 2.57 = 1.67 = 1.11 = 0 = -2.99 =

1. What is the area between the mean and the following z-scores?

## z  
## 1 1.40  
## 2 -0.40  
## 3 3.10  
## 4 0.80  
## 5 -1.70  
## 6 2.57  
## 7 1.67  
## 8 1.11  
## 9 0.00  
## 10 -2.99

**Answer** For the following z-scores, the area between the mean and these scores are: 1.40 = -.4 = 3.1 = .8 = -1.70 = 2.57 = 1.67 = 1.11 = 0 = -2.99 =

1. What is the percentile for each of the following z-scores?

## z  
## 1 1.40  
## 2 -0.40  
## 3 3.10  
## 4 0.80  
## 5 -1.70  
## 6 2.57  
## 7 1.67  
## 8 1.11  
## 9 0.00  
## 10 -2.99

**Answer** For the following z-scores, the percentiles are: 1.40 = -.4 = 3.1 = .8 = -1.70 = 2.57 = 1.67 = 1.11 = 0 = -2.99 =

numbers

## [1] 7.182374 10.378646 8.706081 11.553582 7.238934 9.792132 13.106835  
## [8] 9.868876 10.794828 4.422300 11.985773 8.801879 8.520575 9.290896  
## [15] 7.579638

1. Calculate the variance and the standard deviation of the estimated population using the two formulas above.

1. Use the two formulas above to calculate the variance and standard deviation.

# Range

data\_example <- data.frame(Maximum = c(30, 35, 40, 98, 47, 51, 61, 91, 41, 50),  
 Minimum = c(20, 29, 7, 64, 40, 34, 50, 14, 10, 12))  
  
data\_example

## Maximum Minimum  
## 1 30 20  
## 2 35 29  
## 3 40 7  
## 4 98 64  
## 5 47 40  
## 6 51 34  
## 7 61 50  
## 8 91 14  
## 9 41 10  
## 10 50 12

# z-Score

1. Calculate the z-score using the formula above

get\_z <- data.frame(observation = c(12, 14, 18, 5, 28 ,30, 14, 6, 14, 15),  
 mean = c(15, 16, 24, 7, 21, 24, 10, 8, 9, 4),  
 sd = c(3, 2, 4, 3.8, 1.4, 5.1, .9, .47, .21, .5))  
  
get\_z

## observation mean sd  
## 1 12 15 3.00  
## 2 14 16 2.00  
## 3 18 24 4.00  
## 4 5 7 3.80  
## 5 28 21 1.40  
## 6 30 24 5.10  
## 7 14 10 0.90  
## 8 6 8 0.47  
## 9 14 9 0.21  
## 10 15 4 0.50

# Raw Score From z-Score

1. Calculate the raw score from the z-score using the formula above.

get\_raw <- data.frame(z = c(1, 2, 3, -3, -2, -1, -3.7, 3.1, 1.5, 1.96),  
 mean = c(14, 16, 30, 13, 18, 19, 5, 16, 27, 20),  
 sd = c(2.1, 3.1, 1.4, 3, 1.2, .2, .9, .47, .16, .67))  
  
get\_raw

## z mean sd  
## 1 1.00 14 2.10  
## 2 2.00 16 3.10  
## 3 3.00 30 1.40  
## 4 -3.00 13 3.00  
## 5 -2.00 18 1.20  
## 6 -1.00 19 0.20  
## 7 -3.70 5 0.90  
## 8 3.10 16 0.47  
## 9 1.50 27 0.16  
## 10 1.96 20 0.67

# Standard Error of the Mean

1. Calculate the standard error of the mean using the formula above.

get\_sample\_distribution <- data.frame(each\_sample\_mean = c(17, 15, 24, 61, 9, 10, 14, 18, 30, 4),  
 mu = c(12, 16, 14, 22, 30, 40, 32, 54, 43, 8),  
 sigma\_x = c(3, 2, 4, 1.4, .2, .6, .7, .1, 2.4, 2.9), #this is not sigma xbar  
 N = c(30, 15, 60, 17, 15, 34, 43, 60, 58, 81))  
  
get\_sample\_distribution

## each\_sample\_mean mu sigma\_x N  
## 1 17 12 3.0 30  
## 2 15 16 2.0 15  
## 3 24 14 4.0 60  
## 4 61 22 1.4 17  
## 5 9 30 0.2 15  
## 6 10 40 0.6 34  
## 7 14 32 0.7 43  
## 8 18 54 0.1 60  
## 9 30 43 2.4 58  
## 10 4 8 2.9 81

get\_sample\_distribution

## each\_sample\_mean mu sigma\_x N  
## 1 17 12 3.0 30  
## 2 15 16 2.0 15  
## 3 24 14 4.0 60  
## 4 61 22 1.4 17  
## 5 9 30 0.2 15  
## 6 10 40 0.6 34  
## 7 14 32 0.7 43  
## 8 18 54 0.1 60  
## 9 30 43 2.4 58  
## 10 4 8 2.9 81

1. Using the formula above, calculate the z score from the standard error of the mean (**Note** remember that you will be using the standard deviation of the sample mean and not the standard deviation of each sample.)
2. Calculate the estimated population variance and standard deviation using either the formulas used for question 1 or the formulas used for question 2.

numbers2

## [1] 5.060850 3.865486 3.521444 3.571518 4.629313 4.115526 4.492806 4.364263  
## [9] 5.067677 2.977059 3.984693 6.151861 3.580645 2.844179 4.676546