

Homework Assignment 4

Note: You may use R to solve or verify any part of this assignment. Please copy the R code and output to your computer clipboard and transfer it to your homework assignment, along with the output lines. This way, we can help you diagnose any errors that occur.

Also, remember that you can use the principle of “checking by example.” If a question (such as question 1) is phrased in terms of “a list of numbers” then any list of numbers satisfying the stipulation of the problem must show the behavior that is the object of the question.

1. (10) Suppose you have a list of numbers with a mean of 12 and a standard deviation of 10. What will the mean and standard deviation change to if you multiply all the numbers by 3 and then add 14 to all the numbers?

2. (10) Suppose you have a list of numbers with a mean of 12 and a standard deviation of 10. What will the mean and standard deviation change to if you add 14 to all the numbers and then multiply all the numbers by 3?

3.(10) John has a z-score of +2.25 on the first midterm. If the grades are linearly scaled to a mean of 70 and a standard deviation of 12, what grade will John receive?

4. (15) Marian needs an 80 in her statistics course to remain eligible for basketball. She has a z-score of +0.70. For which of the following scalings will she exceed a grade of 80, and what will her grade be?

- a. mean 68, standard deviation 12
- b. mean 72, standard deviation 10
- c. mean 70, standard deviation 14
- d. mean 73, standard deviation 10

5. (20) Write an R function that will rescale grades of an input list of scores X to have a desired mean $Ybar$ and standard deviation Sy . In other words, fill in the missing code inside the braces below. I’ll help you get started with two lines of code, and you fill in the rest.

```
rescale <- function(x, Ybar, Sy)
{
  Xbar <- mean(x)
  Sx <- sd(x)
  you fill in the rest here...
}
```

6.(10) Professor Moriarty posts the grades with a mean of 68 and a standard deviation of 12. Maria has a z-score of 1.25 on the exam and a “raw score” of 83. Later Professor Moriarty takes down the grade sheet because he decides to rescale the grades linearly to

have a mean of 72 and a standard deviation of 10. What will Maria's raw score change to? What will her z-score be?

7. (15) Morgan is in section 1 of Psychology 2101, and she gets a grade of 75 on the first midterm. In her class the mean was 68 and the standard deviation was 14. Howard got an 83 in section 2 of Psychology 2101. In his class the mean was 78 and the standard deviation was 10. Later in the semester, the Dean announces that in order to be fair, the grades in each class will be linearly rescaled to have a mean of 72 and a standard deviation of 10. What grades do they receive?

8. (15) Write an R function that returns the scaling coefficients a and b in the equation $Y = aX + b$ to convert a set of scores with mean \bar{X} and standard deviation S_x into scores with a mean \bar{Y} and standard deviation S_y . To return two values from your function, you put them in a vector and "return" them, as shown below where I have provided the last line for you.

```
coefficients <- function(Xbar, Sx, Ybar, Sy)
{
you fill in the rest here...
  return(c(a,b))
}
```