Stat474W/574 HW 1 Solution

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Due: Jan 20, 2022

*Special Instructions*

1. All problems must be solved using R.
2. You type correct code in R Console and get the result copy -pasted in a single word document, as it is.
3. After the word document is created, write necessary comments, as appropriate.
4. Save the word document and submit it in the Canvas, where it say *Submit HW1*.

**Problem 1**

The data values below represent how many credit hours a sample of students taking in a given semester.

4,12,15,15,9,15,9,12,10, 12

1. Assign the data values to a vector called *hours*.
2. How many students are there in the sample?
3. How many credit hour does the fifth student take?
4. How many credit hour do the 3rd and 9th students take?
5. Which students are taking 12 credit hours?
6. How many students take 9 hour?
7. What is the minimum hour a student take?
8. How many students take the maximum hour?

#problem 1  
#(a)  
 hours<-c(4,12,15,15,9,15,9,12,10, 12)  
#(b)   
 length(hours)

[1] 10

credit=c(4,12,15,15,9,15,9,12,10, 12)  
#(c)  
credit[5]

[1] 9

#(d)  
credit[c(3,9)]

[1] 15 10

#(e)  
which(credit==12)

[1] 2 8 10

#(f)  
sum(credit==9)

[1] 2

#(g)  
min(credit)

[1] 4

#(h)  
sum(credit==max(credit))

[1] 3

**Problem 2**

There are a number of ways to represent means in statistics. Of them, three types of means are useful in basic statistical analysis. They are arithmetic mean (AM), geometric mean (GM) and harmonic mean (HM).

Given a set of data values sample of size , the sample arithmatic mean, geometric mean and harmonic mean are defined, respectively, as follows

For the vector *hours* defined in problem 1

1. Compute AM
2. Compute GM
3. Compute HM
4. Set up an existing relationship among AM, GM and HM on the basis of your results in (a)-(c).

Note that you are allowed to use **sum()** and **prod()** functions, along with other operations, for computations in problem 2.

#problem 2  
n=length(hours)  
#(a)  
AM=sum(hours)/n  
#(b)  
GM=(prod(hours))^(1/n)  
#(c)  
HM=n/sum(1/hours)  
c(AM, GM,HM)

[1] 11.300000 10.657032 9.782609

#(d) AM>=GM>=HM

**Problem 3**

The data below refers to time, in minutes, a sample of students spent for completing a homework.

16 39 11 34 37 33 25 48 10 40 9 26 13 46 14 6 41 30 44 20

1. Assign these data values to a vector called *time*.
2. Compute the value of the range of time, given range=maximum value-minimum value.
3. Compute AM, GM, HM defined in problem (2).
4. Establish a relationship among AM, GM and HM based on the results in (c).
5. Does the pattern of the relationship in problem 2 agree with the pattern of the relationship in problem 3? What does it mean, in general?

#problem 3  
#(a)  
time<-scan(text="16 39 11 34 37 33 25 48 10 40 9 26 13 46 14 6 41 30 44 20")  
n=length(time)  
#(b)  
max(time)-min(time)

[1] 42

#(c)  
AM=sum(time)/n  
GM=(prod(time))^(1/n)  
HM=n/sum(1/time)  
c(AM, GM,HM)

[1] 27.10000 23.01600 18.71947

#(d) AM>=GM>=HM  
#(e) Yes, same pattern.