

Homework-4

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1.A total of 30 Masters students in a Statistics course were asked to state how long they take to finish their weekly homework. The following is the reported time in hours: 2, 3, 1.5, 3.5, 4, 3, 1, 3, 2, 3.5, 4, 3, 2.5, 2.5, 2, 2, 1.5, 2, 2, 3, 3, 3, 1, 1, 1, 1.5, 2, 2.5, 2.5, 3

(a). Write your own R code (function) to calculate the sample mean without using the mean() R function then confirm your answer using the mean() function.

We use below function to calculate the mean

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$$

```
# Function to compute mean of a list of numbers
custoMean <- function(lst){
  n <- length(lst)
  nsum <- sum(lst)
  nmean <- nsum/n
  nmean
}

lst <- c(2, 3, 1.5, 3.5, 4, 3, 1, 3, 2, 3.5, 4, 3, 2.5, 2.5, 2, 2, 1.5, 2, 2, 3, 3, 3, 1, 1, 1, 1.5, 2, 2.5, 2.5, 3)
cmean <- custoMean(lst)
fmean <- mean(lst)
sprintf("Mean using our custom function is %.4f",cmean)

## [1] "Mean using our custom function is 2.3833"
sprintf("Mean using the predefined function is %.4f",fmean)

## [1] "Mean using the predefined function is 2.3833"
```

(b). Write your own R code (function) to calculate the sample variance without using the sd() and var() R functions. You can use the mean() and sum() functions, then confirm your answer using the var() function

We use below function to compute variance

$$var = \frac{1}{n-1} \left(\sum_{i=1}^n x_i^2 - n\bar{x}^2 \right)$$

```
customVar <- function(lst){
  n <- length(lst)
  m <- custoMean(lst)
  res2 <- (lst - m)*(lst - m)
```

```

    nvar <- sum(res2)/(n-1)
    nvar
  }
lst <- c(2, 3, 1.5, 3.5, 4, 3, 1, 3, 2, 3.5, 4, 3, 2.5, 2.5, 2, 2, 1.5, 2, 2, 3, 3, 3, 1, 1, 1, 1.5, 2,
cvar <- customVar(lst)
fvar <- var(lst)
sprintf("Variance using our custom function is %.4f",cvar)

## [1] "Variance using our custom function is 0.7532"
sprintf("Variance using the predefined function is %.4f",fvar)

## [1] "Variance using the predefined function is 0.7532"

```

2. Caleb wishes to take $P = \$10,000$ loan from a bank. The bank offers the loan at a monthly interest rate $r = 3\%$ for a period of $n = 24$ months. Calculate the monthly instalments m that Caleb will have to remit to the bank given that the principal is calculated as

We use below function to compute monthly interest

$$P = m \left(\frac{1 - (1 + r)^{-n}}{r} \right)$$

$$\Rightarrow m = P * \frac{r}{1 - (1 + r)^{-n}}$$

```

compIntrest <- function(prin,rate,per){
  emi <- prin * (rate/(1-(1/(1+rate) ** per))))
  emi
}
mi = compIntrest(10000,0.03,24)
sprintf("Montly interest is %.4f",mi)

## [1] "Montly interest is 590.4742"

```