

Midterm Test

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Instructions

You may use the book, old homework, notes, and the internet during the exam.

- Change the header information within the RMD to contain your own name.
- Answer all exercise prompts within the RMD. All code must be shown.
- Place answers into the blank R chunks given for each required response.
- Compile the RMD into a PDF when finished.
- Ensure all code is visible within the PDF.
- Submit the PDF through our Canvas portal.

Look in the packages panel in RStudio and make sure the following packages have been installed. If not, install those that are missing using the RStudio Tools->Install Packages menu. Do not add an `install.packages()` command to this markdown file or you will not be able to knit the document. If they are already installed, you may just run the following library commands.

```
suppressPackageStartupMessages({  
  library(tidyverse, quietly = TRUE)    # loading ggplot2, tidyr and dplyr  
  library(readxl, quietly = TRUE)  
  library(stringr, quietly = TRUE)  
})
```

1. (15 pts) Open and save the file Fellowship.xls on your computer. Import the data into an R dataframe (or tibble) called Fellowship. Make sure the resulting dataframe has 4 columns and 9 rows with the column names properly identified as in the original data. There are three missing data elements identified in the excel file by the string "None". Make sure these are stored properly in your data frame. Show me the resulting dataframe.

```
Fellowship <- read_xls( 'Fellowship.xls',  
                        sheet="Fellowship",  
                        skip=5,  
                        na="None")
```

Fellowship

```
## # A tibble: 9 x 4
##   FirstName LastName Species Height
##   <chr>      <chr>    <chr>  <chr>
## 1 Frodo      Baggins   Hobbit  3ft8in
## 2 Sam        Gamgee    Hobbit  2ft10in
## 3 Gandalf    The Grey  Wizard  5ft6in
## 4 Legolas    Greenleaf Elf       6ft1in
## 5 Aragorn    <NA>      Human   6ft6in
## 6 Boromir    <NA>      Human   6ft4in
## 7 Pippin     Took      Halfling 3ft11in
## 8 Merry      Brandybuck Hobbit   3ft10in
## 9 Gimli      <NA>      Dwarf   4ft11in
```

2. (15 pts) Return the fourth row of the fellowship dataset.
 Return the third column of the fellowship dataset.
 Return the third entry in the fourth column of the fellowship dataset.

```
# 4th Row
Fellowship[ 4, ]
```

```
## # A tibble: 1 x 4
##   FirstName LastName Species Height
##   <chr>      <chr>    <chr>  <chr>
## 1 Legolas    Greenleaf Elf     6ft1in
```

```
# 3rd col
Fellowship[ 3 ]
```

```
## # A tibble: 9 x 1
##   Species
##   <chr>
## 1 Hobbit
## 2 Hobbit
## 3 Wizard
## 4 Elf
## 5 Human
## 6 Human
## 7 Halfling
## 8 Hobbit
## 9 Dwarf
```

```
# 3rd entry in 4th col
Fellowship[ 3, 4 ]
```

```
## # A tibble: 1 x 1
##   Height
##   <chr>
## 1 5ft6in
```

3. (15 pts) Pippin is identified as a “Halfling”. While this is true, it is inconsistent with how the other hobbits are identified. Use R code to change Pippin’s Species from “Halfling” to “Hobbit”.
 Show me the resulting dataframe.

```
Fellowship[ 7, 3 ] <- "Hobbit"
```

```
Fellowship
```

```
## # A tibble: 9 x 4
##   FirstName LastName   Species Height
##   <chr>      <chr>      <chr>   <chr>
## 1 Frodo      Baggins    Hobbit  3ft8in
## 2 Sam        Gamgee     Hobbit  2ft10in
## 3 Gandalf    The Grey   Wizard  5ft6in
## 4 Legolas    Greenleaf  Elf     6ft1in
## 5 Aragorn    <NA>       Human   6ft6in
## 6 Boromir    <NA>       Human   6ft4in
## 7 Pippin     Took       Hobbit  3ft11in
## 8 Merry      Brandybuck Hobbit  3ft10in
## 9 Gimli      <NA>       Dwarf   4ft11in
```

4. (20 pts) Use R code to add a numeric column of heights in inches to the data frame (remember the function `as.numeric()` is used to convert a string to a number). For those of you not familiar with the U.S archaic system of measurement: There are 12 inches in a foot. So if the height is 7ft3in, you would calculate $7*12+3 = 87$ to get the number of inches. Show me the resulting data frame.

```
Fellowship <- Fellowship %>%
  mutate( Inches = as.numeric(
    str_extract( Fellowship$Height, '[0-9]' ) ) * 12 +
    as.numeric( str_extract(Fellowship$Height, '(?<=\\d{1}\\w{2})([0-9]+)' ) ) )
```

```
Fellowship
```

```
## # A tibble: 9 x 5
##   FirstName LastName   Species Height  Inches
##   <chr>      <chr>      <chr>   <chr>   <dbl>
## 1 Frodo      Baggins    Hobbit  3ft8in    44
## 2 Sam        Gamgee     Hobbit  2ft10in   34
## 3 Gandalf    The Grey   Wizard  5ft6in    66
## 4 Legolas    Greenleaf  Elf     6ft1in    73
## 5 Aragorn    <NA>       Human   6ft6in    78
## 6 Boromir    <NA>       Human   6ft4in    76
## 7 Pippin     Took       Hobbit  3ft11in   47
## 8 Merry      Brandybuck Hobbit  3ft10in   46
## 9 Gimli      <NA>       Dwarf   4ft11in   59
```

5. (15 pts) Use R to calculate the average height in inches for the hobbits only.

```
hobbits <- Fellowship[ Fellowship$Species == 'Hobbit', "Inches" ]

print( paste( "The mean height of Hobbits in the Fellowship is:",
  mean( hobbits$Inches ) ) )
```

```
## [1] "The mean height of Hobbits in the Fellowship is: 42.75"
```

6. (20 pts) Create a function called `count3s` to examine any input vector of integers and counts the number of 3's present. Test your function by running `count3s(c(3,5,6,3,7,8,21,56,3,7,10,3))` and `count3s(c(3,6,9,3,6,6,6))` (you should get 4 and 2 as a result)

```
count3s <- function( x )
{
  num_3s = 0

  for ( item in x )
  {
    if ( item == 3 )
    {
      num_3s <- num_3s + 1
    }
  }

  return( num_3s )
}

print( "Testing with: 3,5,6,3,7,8,21,56,3,7,10,3" )
```

```
## [1] "Testing with: 3,5,6,3,7,8,21,56,3,7,10,3"
```

```
print( paste("Expecting: 4 - Got: ",
             toString( count3s(c(3,5,6,3,7,8,21,56,3,7,10,3)) ) ) )
```

```
## [1] "Expecting: 4 - Got: 4"
```

```
print( "Testing with: 3,6,9,3,6,6,6" )
```

```
## [1] "Testing with: 3,6,9,3,6,6,6"
```

```
print( paste("Expecting: 2 - Got: ",
             toString( count3s(c(3,6,9,3,6,6,6)) ) ) )
```

```
## [1] "Expecting: 2 - Got: 2"
```