Problem Set Assignment No. 1

Aria Muchhal

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```
## Keep this line always
knitr::opts_chunk$set(echo = TRUE,
                      collapse = TRUE,
                      warning = FALSE, message = FALSE,
                      fig.align = 'center')
```

1. Setup your document

A. Load Libraries

```
library(knitr)
library(wooldridge)
wage2=wooldridge::wage2
```

In the R videos on MediaSpace, you are asked to install multiple packages. Name three of them here. rmarkdown, dplyr, and magrittr.

B. Show installed packages

```
installed.packages()[,c(1,3)]
##                Package         Version
## abind          "abind"         "1.4-5"
## AER            "AER"           "1.2-10"
## askpass        "askpass"       "1.1"
## assertthat     "assertthat"    "0.2.1"
## backports      "backports"     "1.2.1"
## base64enc      "base64enc"     "0.1-3"
## bit            "bit"           "4.0.5"
## bit64          "bit64"         "4.0.5"
## blob           "blob"          "1.2.3"
## brio           "brio"          "1.1.3"
## broom          "broom"         "1.0.2"
## bslib          "bslib"         "0.2.5.1"
## cachem         "cachem"        "1.0.6"
## callr          "callr"         "3.7.3"
## car            "car"           "3.1-1"
## carData        "carData"       "3.0-5"
```

```
## cellranger    "cellranger"    "1.1.0"
## checkmate     "checkmate"     "2.0.0"
## cli           "cli"           "3.6.0"
## clipr         "clipr"         "0.8.0"
## colorspace    "colorspace"    "2.0-3"
## combinat      "combinat"      "0.0-8"
## commonmark    "commonmark"    "1.7"
## cpp11         "cpp11"         "0.4.3"
## crayon        "crayon"        "1.5.2"
## curl          "curl"          "4.3.3"
## data.table    "data.table"    "1.14.6"
## DBI           "DBI"           "1.1.3"
## dbplyr        "dbplyr"        "2.2.1"
## desc          "desc"          "1.4.2"
## diffobj       "diffobj"       "0.3.5"
## digest        "digest"        "0.6.27"
## dplyr         "dplyr"         "1.0.10"
## dtplyr        "dtplyr"        "1.2.2"
## ellipsis      "ellipsis"      "0.3.2"
## evaluate      "evaluate"      "0.19"
## fansi         "fansi"         "0.5.0"
## farver        "farver"        "2.1.1"
## fastmap       "fastmap"       "1.1.0"
## forcats       "forcats"       "0.5.2"
## Formula       "Formula"       "1.2-4"
## fs            "fs"            "1.5.0"
## gargle        "gargle"        "1.2.1"
## generics      "generics"      "0.1.1"
## ggplot2       "ggplot2"       "3.4.0"
## glue          "glue"          "1.4.2"
## googledrive   "googledrive"   "2.0.0"
## googlesheets4 "googlesheets4" "1.0.1"
## gtable        "gtable"        "0.3.1"
## gtools        "gtools"        "3.9.2"
## haven         "haven"         "2.5.1"
## highr         "highr"         "0.9"
## hms           "hms"           "1.1.2"
## htmltools     "htmltools"     "0.5.1.1"
## htmlwidgets   "htmlwidgets"   "1.5.3"
## httpuv        "httpuv"        "1.6.2"
## httr          "httr"          "1.4.4"
## ids           "ids"           "1.0.1"
## isoband       "isoband"       "0.2.7"
## jquerylib     "jquerylib"     "0.1.4"
## jsonlite      "jsonlite"      "1.7.2"
## knitr         "knitr"         "1.41"
## labeling      "labeling"      "0.4.2"
## later         "later"         "1.3.0"
## learnr        "learnr"        "0.10.1"
## lifecycle     "lifecycle"     "1.0.3"
## lme4          "lme4"          "1.1-31"
## lmtest        "lmtest"        "0.9-40"
## lubridate     "lubridate"     "1.9.0"
```

```
## magrittr      "magrittr"      "2.0.1"
## markdown      "markdown"      "1.1"
## Matrix        "Matrix"        "1.5-3"
## MatrixModels  "MatrixModels"  "0.5-1"
## mime          "mime"          "0.11"
## minqa         "minqa"         "1.2.5"
## modelr        "modelr"        "0.1.10"
## munsell       "munsell"       "0.5.0"
## nloptr        "nloptr"        "2.0.3"
## numDeriv      "numDeriv"      "2016.8-1.1"
## openssl       "openssl"       "2.0.5"
## pbkrtest      "pbkrtest"      "0.5.1"
## pillar        "pillar"        "1.8.1"
## pkgconfig     "pkgconfig"     "2.0.3"
## pkgload       "pkgload"       "1.3.2"
## praise        "praise"        "1.0.0"
## prettyunits   "prettyunits"   "1.1.1"
## processx      "processx"      "3.8.0"
## progress      "progress"      "1.2.2"
## promises      "promises"      "1.2.0.1"
## ps            "ps"            "1.7.2"
## purrr         "purrr"         "0.3.4"
## quantreg      "quantreg"      "5.94"
## R6            "R6"            "2.5.1"
## rappdirs      "rappdirs"      "0.3.3"
## RColorBrewer  "RColorBrewer"  "1.1-3"
## Rcpp          "Rcpp"          "1.0.7"
## RcppEigen     "RcppEigen"     "0.3.3.9.3"
## readr         "readr"         "2.1.3"
## readxl        "readxl"        "1.3.1"
## rematch       "rematch"       "1.0.1"
## rematch2      "rematch2"      "2.1.2"
## renv          "renv"          "0.14.0"
## reprex        "reprex"        "2.0.2"
## rlang         "rlang"         "1.0.6"
## rmarkdown     "rmarkdown"     "2.10"
## rprojroot     "rprojroot"     "2.0.2"
## rstudioapi    "rstudioapi"    "0.14"
## rvest         "rvest"         "1.0.3"
## sandwich      "sandwich"      "3.0-2"
## sass          "sass"          "0.4.0"
## scales        "scales"        "1.2.1"
## selectr       "selectr"       "0.4-2"
## shiny         "shiny"         "1.6.0"
## sourcetools   "sourcetools"   "0.1.7"
## SparseM       "SparseM"       "1.81"
## stringi       "stringi"       "1.7.3"
## stringr       "stringr"       "1.4.0"
## sys           "sys"           "3.4.1"
## testthat      "testthat"      "3.1.6"
## tibble        "tibble"        "3.1.8"
## tidyr         "tidyr"         "1.2.1"
## tidyselect    "tidyselect"    "1.1.1"
```

```
## tidyverse     "tidyverse"     "1.3.2"
## timechange    "timechange"    "0.1.1"
## tinytex       "tinytex"       "0.33"
## tzdb          "tzdb"          "0.3.0"
## utf8          "utf8"          "1.2.2"
## uuid          "uuid"          "1.1-0"
## vctrs         "vctrs"         "0.5.1"
## viridisLite   "viridisLite"   "0.4.1"
## vroom         "vroom"         "1.6.0"
## waldo         "waldo"         "0.4.0"
## withr         "withr"         "2.5.0"
## wooldridge    "wooldridge"    "1.4-2"
## xfun          "xfun"          "0.36"
## xml2          "xml2"          "1.3.3"
## xtable        "xtable"        "1.8-4"
## yaml          "yaml"          "2.2.1"
## zoo           "zoo"           "1.8-11"
## base          "base"          "4.1.1"
## boot          "boot"          "1.3-28"
## class         "class"         "7.3-19"
## cluster       "cluster"       "2.1.2"
## codetools     "codetools"     "0.2-18"
## compiler      "compiler"      "4.1.1"
## datasets      "datasets"      "4.1.1"
## foreign       "foreign"       "0.8-81"
## graphics      "graphics"      "4.1.1"
## grDevices     "grDevices"     "4.1.1"
## grid          "grid"          "4.1.1"
## KernSmooth    "KernSmooth"    "2.23-20"
## lattice       "lattice"       "0.20-44"
## MASS          "MASS"          "7.3-54"
## Matrix        "Matrix"        "1.3-4"
## methods       "methods"       "4.1.1"
## mgcv          "mgcv"          "1.8-36"
## nlme          "nlme"          "3.1-152"
## nnet          "nnet"          "7.3-16"
## parallel      "parallel"      "4.1.1"
## rpart         "rpart"         "4.1-15"
## spatial       "spatial"       "7.3-14"
## splines       "splines"       "4.1.1"
## stats         "stats"         "4.1.1"
## stats4        "stats4"        "4.1.1"
## survival      "survival"      "3.2-11"
## tcltk         "tcltk"         "4.1.1"
## tools         "tools"         "4.1.1"
## translations  "translations"  "4.1.1"
## utils         "utils"         "4.1.1"
```

Write your answer to 1B here if requested.

2. Standard Error of the Mean

A. Subset wage2

```
wage2 = wage2[wage2$educ==16,1]
NROW(wage2)
## [1] 150
```

How many rows does wage2 have once you have subset it? Use NROW to see. 150

B. Calculate the sample mean and sample variance for wage in our sample of wages

```
meanCollege=mean(wage2)
varCollege=var(wage2)
nCollege=NROW(wage2)
print(meanCollege)
## [1] 1108.713
print(varCollege)
## [1] 152489.1
print(nCollege)
## [1] 150
```

What are the units of the wage column? Hint: you can learn about wooldridge datasets by using the help for that data ?wage2 monthly earnings

C. Calculate the standard error of the mean

```
semCollege = sqrt(varCollege/nCollege)
print(semCollege)
## [1] 31.88407
```

3. Hypothesis testing: population mean

A. Hypothesis testing H0 : μwage = 1, 200

```
dfn=nCollege-1
tcrit=qt(.975,dfn)
ci=(meanCollege-(tcrit*semCollege))
ci2=(meanCollege+(tcrit*semCollege))
print (ci)
## [1] 1045.71
print(ci2)
## [1] 1171.717
```

What is your answer to this question, in your own words, and why? I would say no, because 1200 is not within the 95% confidence interval of (1045.71, 1171).